CHINTAMANI CITY MUNICIPAL COUNCIL

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CHINTAMANI

WASH CLIMATE ACTION PLAN



2025

CHINTAMANI CITY MUNICIPAL COUNCIL

ಚಿಂತಾಮಣಿ

CHINTAMANI

WASH CLIMATE ACTION PLAN

2025

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Abbreviations

AMRUT	Atal Mission for Rejuvenation and Urban Transformation
ATI	Administrative Training Institute
BAU	Business-As-Usual
BOD	Biochemical Oxygen Demand
BORDA	Bremen Overseas Research and Development Association
BWG	Bulk Waste Generator
CAP	Climate Action Plan
CASS	Centre for Advanced Sanitation Solutions
CDD	Consortium for DEWATS Dissemination India
C&D	Construction and Demolition (waste)
CGWB	Central Ground Water Board
CHVA	Climate Hazard and Vulnerability Assessment
CMC	City Municipal Council
COD	Chemical Oxygen Demand
CPHEEO	Central Public Health and Environmental Engineering Organisation
CSR	Corporate Social Responsibility
DDMA	District Disaster Management Authority
DMA	Directorate of Municipal Administration
DPR	Detailed Project Report
DWCC	Dry Waste Collection Centre
DUDC	District Urban Development Cell
FHTC	Functional Household Tap Connection
FISH	Foundation for Inclusive and Sustainable Habitats
FSM	Faecal Sludge Management
FPO	Farmer Producer Organisation
GIS	Geographic Information System
GLSR	Ground Level Service Reservoir
GHG	Greenhouse Gas
GPS	Global Positioning System
HIG	High Income Group
HH	Household
HSC	Household Service Connection
HR	Human Resources
IEC	Information, Education and Communication
IHHL	Individual Household Latrine
IMD	India Meteorological Department
IoT	Internet of Things
ICS-WASH	Inclusive Climate-Sensitive Water, Sanitation & Hygiene
iPGRS	Integrated Public Grievance Redressal System
IWRM	Integrated Water Resource Management
KSAPCC	Karnataka State Action Plan on Climate Change
KSDMA	Karnataka State Disaster Management Authority
KSNDMC	Karnataka State Natural Disaster Monitoring Centre
KSPCB	Karnataka State Pollution Control Board
KUWSDB	Karnataka Urban Water Supply and Drainage Board
KUIDFC	Karnataka Urban Infrastructure Development and Finance Corporation
LPA	Local Planning Area
LPCD	Litres Per Capita per Day
LULC	Land Use Land Cover
Mcft	Million Cubic Feet

MI	Minor Irrigation
MLD	Million Litres per Day
MLA	Member of Legislative Assembly
MoHUA	Ministry of Housing and Urban Affairs
MRF	Material Recovery Facility
MSW	Municipal Solid Waste
NA	Not Applicable
NbS	Nature-based Solutions
NEBR	Natural Engineered Biological Reactor
NGO	Non-Governmental Organization
NGT	National Green Tribunal
NRW	Non-Revenue Water
O&M	Operations and Maintenance
ODF	Open Defecation Free
OHT	Overhead Tank
PPE	Personal Protective Equipment
PPP	Public Private Partnership
PT	Public Toilet
RCP	Representative Concentration Pathway
RWH	Rainwater Harvesting
SBM	Swachh Bharat Mission
SDG	Sustainable Development Goals
SHG	Self Help Group
SFD	Shit Flow Diagram
SFC	State Finance Commission
SPI	Standardized Precipitation Index
SSP	Shared Socioeconomic Pathways
STP	Sewage Treatment Plant
SWM	Solid Waste Management
SWM Rules	Solid Waste Management Rules
tCO_2e	tonnes of CO_2 equivalent
TIDE	Technology Informatics Design Endeavour
TUW	Treated Used Water
UGD	Underground Drainage
ULB	Urban Local Body
UDD	Urban Development Department
VES	Vertical Electrical Sounding
WASH	Water, Sanitation and Hygiene
WTP	Water Treatment Plant
WRD	Water Resources Department
WFD	Waste Flow Diagram
m	metre
km	kilometre
mm	millimetre
ml	millilitre
l	litre
t	metric tonne
lpcd	litres per capita per day
HP	Horsepower

FOREWORD AND MESSAGES



Dr. M.C. Sudhakar,
Hon'ble Minister for Higher Education and
District Incharge Minister, Chikkaballapura, Karnataka

I congratulate Chintamani CMC on the Chintamani WASH Climate Action Plan. This forward-looking initiative is a vital step towards building a cleaner city, empowering sanitation workers, and ensuring safe, sustainable water for every household.

It strengthens the city's long-term vision with practical actions for resilient development. Our government remains committed to safeguarding the wellbeing of our people. With this roadmap, Chintamani is on a path to a healthier, more inclusive, and climate-resilient future.



Sri Ravindra P.N., IAS
Deputy Commissioner, Chikkaballapura District

Planning for water security, sanitation, and public health is a critical priority for Chikkaballapura district. Our towns face growing challenges from frequent droughts and increasing water stress, a situation accelerated by climate change.

This Chintamani WASH Climate Action Plan is a key initiative to secure our future. It outlines not only immediate measures, but also long-term actions aligned with our district's developmental goals. Integrating localized urban climate risks into district disaster management planning will ensure better convergence and build a more resilient Chikkaballapura.



Dr. Selvamani R, IAS
State Mission Director, Swachh Bharat
Mission (Urban), Karnataka & MD, KUWSDB

I warmly welcome the initiative by CMC Chintamani in developing this Chintamani WASH Climate Action Plan. This commendable effort aligns with state and national urban development programs, providing a holistic approach to tackling the interconnected challenges of water, sanitation, governance, and climate.

In a time when data-driven climate action is often focused on larger cities, it is inspiring to see a small town like Chintamani leading the way in this critical conversation. This pioneering plan will serve as a valuable model, encouraging towns across Karnataka to initiate their own dialogues on climate impact and preparedness for resilience.



Sri. Chalapathi G.N.
Commissioner, Chintamani City Municipal Council

It gives me immense pride to present the WASH Climate Action Plan for Chintamani. Water and sanitation are key responsibilities of our municipality, and over the years, Chintamani City Municipal Council has worked steadily to improve these essential services for our citizens.

I feel equally proud that Chintamani now joins a small group of cities that have been able to develop such a comprehensive plan to address the impacts of climate change. This action plan has been developed through the collective efforts of our municipal team, supporting departments, NGO partners, and community stakeholders. It provides a practical roadmap to strengthen our WASH systems while preparing Chintamani to deal with the challenges of a changing climate.

I sincerely thank all those who have contributed to shaping this action plan.

Acknowledgement

This WASH Climate Action Plan for Chintamani is the result of the collective efforts of many institutions, experts, and community members, under the able leadership of Dr. MC Sudhakar, Hon'ble Minister for Higher Education and District Incharge Minister, Chikkaballapura, Karnataka. We are deeply grateful to the Chintamani City Municipal Council (CMC), State and District agencies, including KUWSDB and KUIDFC, for their guidance, data sharing, and support throughout the process.

We thank sanitation workers, water supply operators, valve men, Self-Help Groups (SHG), farmer producer organisations, ward representatives, shopkeepers and commercial establishment, educational and other institutions and residents of Chintamani town, whose participation in consultations and surveys ensured that the plan reflects lived realities and local priorities. Their experiences and suggestions have shaped practical, inclusive solutions for the town's climate resilience.

Our sincere appreciation goes to technical experts, partner organisations, and the project team for their dedication in conducting assessments, facilitating discussions, and translating insights into actionable strategies.

This plan stands as a shared commitment to safeguard Chintamani's environment, public health, and future generations, and we look forward to continued collaboration in turning it into concrete, resilient action.

We further extend our gratitude to those organisations and individuals without whoes support, completing this document would not have been possible – Core CarbonX, for assisting with the emissions inventorisation; NatureDots, for supporting us with the climate modelling exercise; Vinod G, for the hydropgeological assessments; Mayank Singh Sakla, for the GIS support and helping us develop the maps; Teesta Mukherjee, independent consultant; Vijaykumar Shirur, Design Engineer, Egis India Consulting Engineers Pvt., Ltd.; WELL Labs and SPA Mysore University.

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Disclaimer: TIDE-BORDA asserts the moral right to be identified as the author of this work. The analysis, maps, charts and tables have been prepared based on data received from respective stakeholder/ line departments and in some cases even from relevant research publications/ reports. While every effort has been made to ensure that these data are accurate and reliable, Chintamani CMC, DUDC,DMA, BORDA LO, TIDE or FISH does not take the responsibility towards any repercussions caused by any errors or omissions in the data. All maps in this report are intended as visualizations to communicate city-wide data analysis for information purposes only and are not to scale.

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EXECUTIVE SUMMARY

Chintamani, a fast-growing small town near Bangalore in Karnataka with little over 1 lakh population, has been facing mounting challenges from climate variability. The town has faced 11 droughts in the past 15 years, more days of intense rainfalls leading to flooding, and an extended summer season with an increasing number of days of extreme heat (above 40°C).

In the past three decades, built-up areas have increased by 300% but water bodies have declined by 70%, and excessive groundwater extraction has reduced the water table significantly as they are in over exploited category for the past 25 years. The town must prepare itself for more extreme rainfall and heat where an inclusive and practical Climate Action Plan can help to reduce these climate difficulties, and also minimize their negative consequences.

The Chintamani Municipality spends 60-80% of its budget on waste management and water services, highlighting the significance and the impact of WASH services on every resident. As an essential service, WASH directly shapes people's health, wellbeing, and urban resilience. However, with climate change intensifying existing challenges, the limitations of current WASH systems are becoming more pronounced, making equitable and reliable access all the more critical. Therefore, the WASH sector can be the ideal entry point to plan for climate adaptation and resilience, and the Chintamani WASH Climate Action Plan (Chintamani WASH CAP) attempts to lay the base for this based on extensive studies and consultations with locals and subject-matter experts.

This action plan, formulated on the basis of the Inclusive Climate-Sensitive WASH (ICS WASH) framework, also closely aligns with Karnataka's State Climate Action Plan, national missions such as AMRUT 2.0 and SBM 2.0, the District Disaster Management Plan, and the Chintamani Masterplan. The study undertakes a detailed assessment of the WASH sector's performance, examining both existing system inefficiencies and climate-induced vulnerabilities. Ground-level data collection was carried out through household surveys and supported by analytical tools such as Water Flow Diagrams (WFD), Shit Flow Diagrams (SFD), and water balance studies.

The resultant Action Plan has been informed by these insights and designed to align with the ongoing and proposed projects and priorities of the town to ensure that is a complementary roadmap to the town's aspirations. The Action Plan includes specific actions for the WASH sector, which are detailed based on key learnings from the assessments. These sector-specific learnings are as follows:

Water Resources

» Strengthen and revive surface water sources to reduce the current 75% dependence on overexploited groundwater.
» Increase groundwater recharge, regulate extraction, and develop reliable backup resources to meet summer water demand.

Water Supply

» Expand the distribution network and increase supply frequency (from once a week) to ensure every resident has access to safe and dependable drinking wate
» Prioritise wards relying on high-risk borewells.

Storm Water Management

» Improve network design and regular maintenance to reduce flooding risks amid rising rainfall intensity.
» Ensure diversion of wastewater to prevent mixing with storm drains and polluting water bodies.

Sanitation & Wastewater

» Enhance the sewerage network to prevent backflows and blockages due to fluctuating rainfalls worsened by unauthorised connections.
» Additionally, increase treatment capacity to enable efficient treatment, paving the way for the identified potential reuse of treated wastewater.
» Ensure sufficient, well-maintained public toilets, particularly in market areas, with attention to the needs of women and children.

Solid Waste

» Optimize use of existing infrastructure to divert 30 TPD of waste from landfills and prioritize remediation of legacy waste, which accounts for nearly 40% of the town's WASH-related emissions.
» Strengthen protection and support for frontline WASH workers, who face growing risks from heat stress.

The WASH-related emissions from the town amounted to 23,099 tCO_2e. Nearly 60% of these emissions are process-related emissions, which the municipality could prioritise for mitigation. Under SSP 2-4.5, gradual improvements could reduce emissions by 94% to 1,496 tCO_2e. SSP 5-8.5, business-as-usual scenario coupled with fossil fuel intensification could see emissions soar by 184% to 65,746 tCO_2e. The cost of inaction for the town is high.

In addition to the key sectoral assessments, the study also undertakes a detailed assessment of the town's preparedness as well, examining regulatory and monitoring mechanisms, disaster response systems, and institutional and financial capacities. They highlight the importance of establishing and enforcing Standard Operating Procedures (SOPs) and systems to manage climate-induced risks in WASH. The detailed action plan, developed through extensive consultations with departments engaged in Chintamani's WASH systems, outlines both immediate and long-term priorities. It also specifies key responsible entities and suggests sources of finance through the existing central and state schemes and grants.

The Chintamani WASH Climate Action Plan provides a practical, comprehensive, and actionable roadmap for embedding climate adaptation and mitigation into core, essential WASH services. It is important to note that the successful implementation of the plan is highly dependent on the coordinated efforts and will of its political, executive bodies, and sustained community engagement. In addition to addressing the urgent local challenges, it positions Chintamani as a light house for other small towns in India. Aligning with vision of Hon'ble Minister for Higher Education and District Incharge Minister, Chikkaballapura, Karnataka, Dr M C Sudhakar, for the town, the Chintamani WASH CAP prioritises access, inclusion, sustainability and efficiency.

VOICES FROM THE TOWN



These voices from the Town section brings out what Chintamani's residents, workers, and market traders say about their needs, hopes, and challenges in WASH and climate resilience.

These voices are from consultations, FGDs, and field visits, and represent the lived experience that shapes the plan.



> Every family should have a good home and safe, steady water.
> *—Sriramnagara resident*

> See new UGD lines being put in near my home. It's good to see Chintamani improving.
> *—RK Nursing Home resident*



> If every house has a water meter, everyone will get their fair share, and there will be enough water for all.
> *—CMC Official*

VOICES FROM THE TOWN



> Some areas get water very regularly, while we get water once a week or more. Why this difference?
> —*Sriramnagara resident*



If we had more sanitation workers, the work would be easier. Also, we need health leave when we fall sick, especially during extreme heat.

–Sanitation worker, DWCC

VOICES FROM THE TOWN



> If we had steady water, we could keep the public toilet clean. With so many people using it and no municipal water connection, it's very hard.
> *—PT operator, market area*


If we get water in the market, we won't have to run around so much. It will make life easier for small sellers like us.
—Flower market shopkeeper



VOICES FROM THE TOWN

> If we have a roof over our shops, our flowers will stay fresh and customers will be happy.
> —*Flower market shopkeeper*

> Additional human resources for tax collection follow-up with the citizens will enhance municipal revenue generation.
> —*Accounts department*

ನೀರು

A town that has safe and dependable drinking water for every resident

ನೈರ್ಮಲ್ಯ

Inclusive and safe sanitation services for a dignified, healthier Chintamani

ಘನ ತ್ಯಾಜ್ಯ

Achieve a Garbage-free Chintamani

ಸಾಮರ್ಥ್ಯ

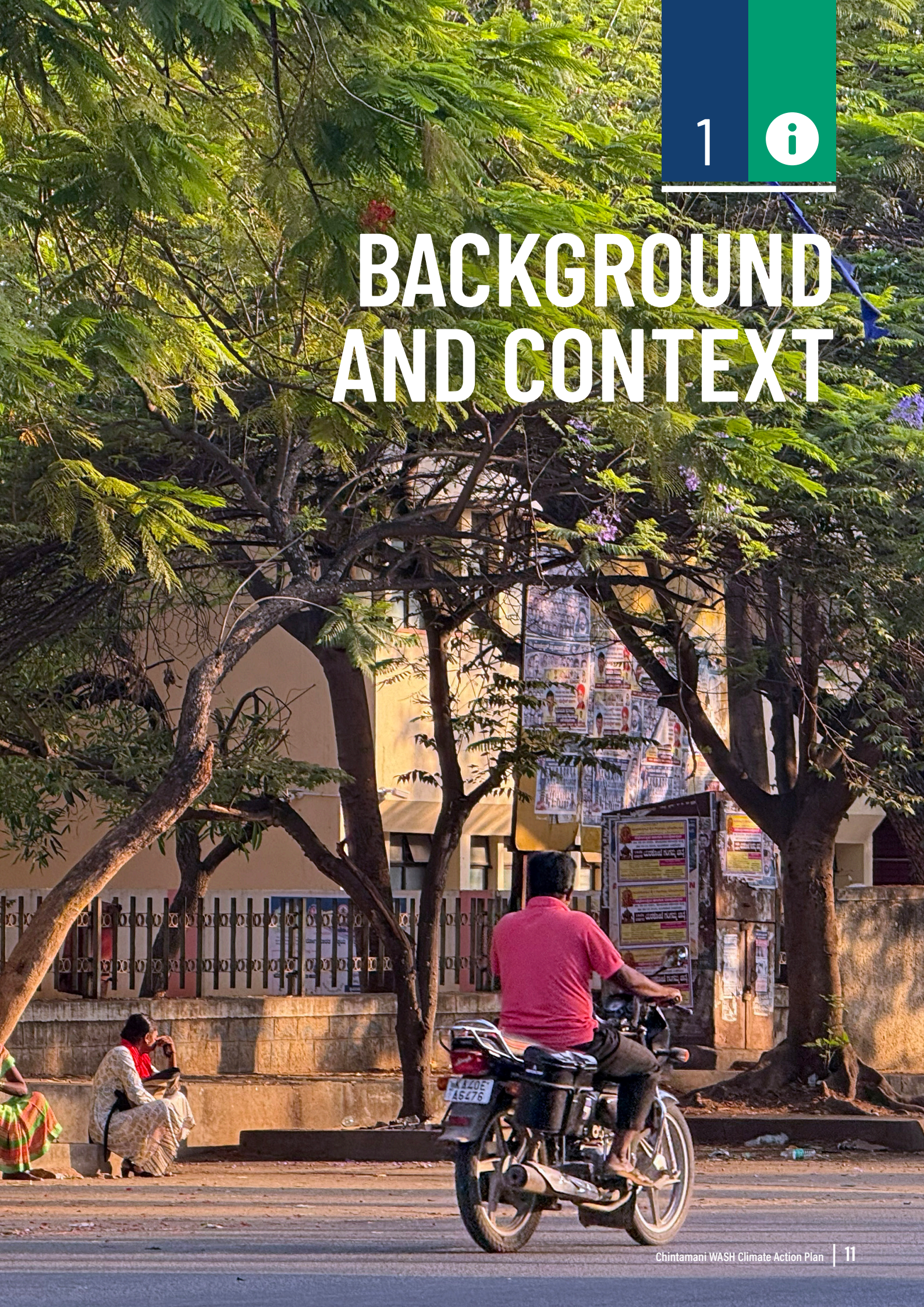
A town that is always prepared, with clear and smarter systems to respond to any hazards





1

BACKGROUND AND CONTEXT





1.1 Why Small Towns Matter - The Local and Immediate Reality

Small towns, with less than 1 lakh population (as per census 2011), are home to 30% of the nation's urban population and are projected to absorb 50% of urban growth by 2030 (NITI Aayog, 2023). Their rapid growth is being driven by rural-urban migration, economic reclassification, and urban sprawl. But despite this momentum, small towns remain ill-prepared for the mounting challenges of urbanization and climate stress.

Unlike metros with dedicated climate resources, systemic gaps intensify these challenges. These towns lack the governance architecture, technical systems, and human capacity seen in large cities.



The Dual Narrative

India's climate and urban transitions are often narrated through the lens of its megacities. Metros like Bengaluru, Mumbai, and Delhi are emerging as climate finance hubs, attracting capital, expertise, and dedicated climate funds. However, an equally critical but less visible story is unfolding in India's small and medium towns. These towns are the hidden engines of India's urban future, yet they remain chronically underserved.

While megacities deploy climate-tech dashboards, in Chintamani, a single junior engineer manages two towns of **100,000** people each.

Planning and Infrastructure gaps:

76%

of census towns and 52% of statutory towns lack master plans (MoHUA, 2020)

<5%

Sewage treatment capacity in small towns as compared to over 23% in Class I cities (CPCB, 2022)

70%

of local water bodies are polluted due to untreated domestic and industrial waste (CPCB, 2021)

50

Only 50 out of 4,800 cities are preparing or have climate action plans; barely ten have started implementation (Ravikant Joshi, 2024)

Chintamani, a small town near Bengaluru embodies these systemic crises in small towns. Chintamani typifies the challenges of India's underserved towns. This WASH Climate Action Plan addresses Chintamani's distinctive context marked by limited fiscal autonomy, acute staffing shortages, fragmented planning, and inadequate infrastructure, challenges that typify the systemic barriers faced by small towns striving for climate resilience.

Why WASH? The Strategic Entry Point

In towns like Chintamani, Water, Sanitation, and Hygiene (WASH) systems lie at the frontline of both climate vulnerability and resilience. These services are often the first to be disrupted by climate shocks, yet, they also offer a strategic foothold for transformative climate action.

A Systemic Lever: WASH is deeply interlinked with water security, public health, gender equity, and environmental integrity. When climate stress hits, it often manifests first through WASH failures, cascading into broader health, food security, and social protection crises.

A Gateway to Climate Resilience: Strengthening WASH systems creates high-leverage co-benefits across the climate agenda:

- **Adaptation:** Building drought-resilient water supply systems and climate-proof sanitation infrastructure helps towns cope with variability and extremes.
- **Mitigation:** Improving wastewater and solid waste management practices reduces greenhouse gas emissions, particularly methane.
- **Equity:** Prioritizing underserved wards and protecting frontline workers ensures inclusive and just climate action.

Aligned with Global and State Mandates: This approach reflects the growing global recognition of WASH as a climate imperative, in line with COP 29's call for WASH-climate integration and supports multiple Sustainable Development Goals—SDG 6 (Clean Water and Sanitation), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action). It also builds on Karnataka's State Action Plan on Climate Change (KSAPCC), reinforcing local commitments through sector-specific action.

The following are the key tenets of this document:

ICS-WASH Framework	Backbone for diagnosing system-wide gaps (water balance studies, shit flow diagrams, GHG inventories)
Existing Town Structures	Leverages municipal engineering/health departments, aligns with ULB capacities
Context-Specific Interventions	Low cost/decentralized NbS solutions
Multi-Stakeholder Embeddedness	12–15 consultation rounds with 25+ actors: sanitation workers, KUWSDB engineers, SHGs
Scheme Convergence	Integrates AMRUT, SBM, and Karnataka's Climate Action Plan (KSAPCC) for financing/ implementation

By positioning WASH not merely as a basic service, but as a climate resilience platform, this WASH Climate Action Plan responds to Chintamani's realities while offering a replicable model for small towns across India.

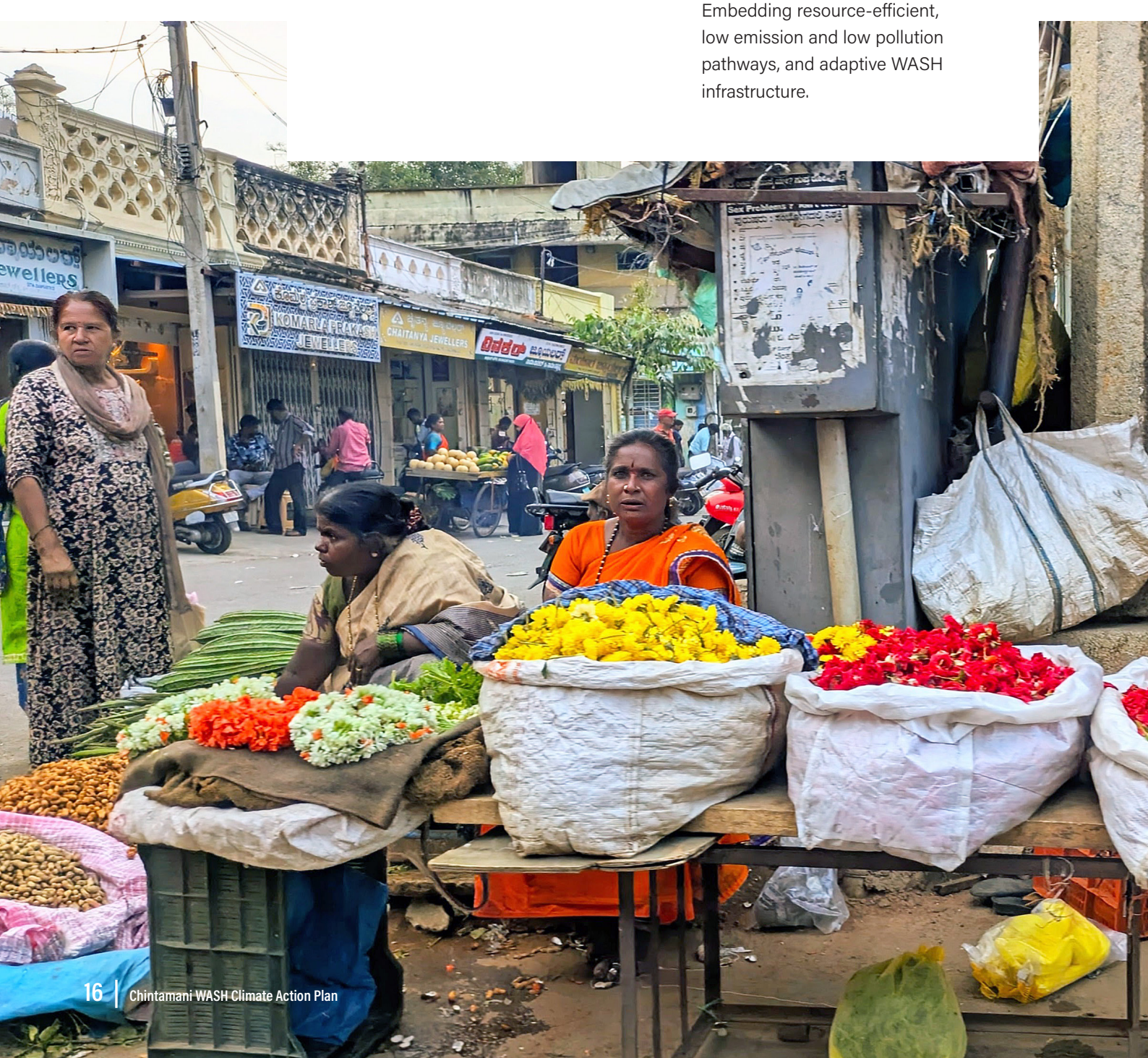
This action plan strategically repositions WASH beyond infrastructure, transforming it into an integrated resilience platform through its key tenets.

At its core the CAP is built around 3 priorities:

Access: Ensuring every household and institution has safe, reliable and affordable WASH services.

Equity and Inclusion: Prioritizing underserved areas, marginalized groups and frontline sanitation workers who are often excluded from planning and service coverage.

Sustainability and Resilience: Embedding resource-efficient, low emission and low pollution pathways, and adaptive WASH infrastructure.



1.2 Approach and Methodology

1. Dialogue:

Sustained stakeholder engagement that ensures buy-in and relevance

Dialogue, as the foundation and the primary strategic pillar of this WASH CAP goes beyond consultations and formal meetings, it is a mechanism through which diverse actors co-create the town's climate agenda. It represents a deliberate shift away from top-down planning toward a bottom-up planning, participatory approach that emphasizes continuous engagement across all actors and levels of governance.

2. Data:

Robust system-wide assessments and climate hazard analyses

Data, as the secondary strategic pillar of WASH CAP is about the relevance and precision of data and not the volume of it, especially in small towns where formal data sets and digital systems are weak or non-existent. Our approach demonstrated that contextual, participatory tools can still drive informed decision making.

3. Decentralization:

Adopting flexible, cost-effective, and nature-based solutions while aligning governance across state, district, and town levels

As our third strategic pillar, complimenting Dialogue and Data, decentralization is the lens through which this Action plan is operated.

Recognizing WASH as both a vulnerability and an opportunity, this plan has been deliberately structured to align with Chintamani's broader urban planning processes, sectoral goals, and institutional frameworks, while contributing to the State's overarching objectives for climate-resilient and inclusive urban development. In doing so, it serves as a strategic entry point for embedding climate action, inclusion, and resilience into the town's foundational systems and long-term visioning.





1. Dialogue:

Sustained stakeholder engagement that ensures buy-in and relevance

The planning process was anchored with Government-to-Government learning through an exposure visit to Leh, where 15 senior officials from Karnataka State Government and Chintamani town observed successful WASH interventions such as 24/7 water supply in extreme winters, legacy waste remediation, and a nature-based FSM system operating under PPP for more than seven years. These first hand exchanges expanded perspectives on positioning WASH from "just infrastructure" to a strategic enabler of urban climate resilience and quality of life.

Phase 1: Kick off and Buy in, and Mapping Pain Points

Building on this momentum and insights, a Kick-off workshop was conducted at the Centre for Advanced Sanitation Solutions (CASS) training center facilitated by Consortium for DEWATS Dissemination India (CDD) with key decision makers including Dr M C Sudhakar, Minister for Higher Education, GoK and District Incharge Minister, Chikkaballapura, Municipal Commissioner of Chintamani, departmental heads from Health Department, Engineering Department KUWSDB and DUDC, TIDE and BORDA. This marked the formal institutional commitment to a co- owned, and participatory and accountable climate action agenda.

A total of 150+ consultations were systematically phased to build momentum, trust and clarity on WASH and Climate linkages in Chintamani.

Phase 2: Mapping the WASH Governance landscape

Out of the 150, over 80 focused consultations with all relevant line departments such as WASH, elected representatives, and SHGs in Chintamani enabled the team to map the full spectrum of stakeholders across State, District, and Town levels, reflecting the multi-layered governance reality of small towns.



Phase 3: Defining Roles and Influence

A structured stakeholder mapping exercise was followed, identifying 25 key actors across State, District and Town levels. Stakeholders were then classified into Core, Contributors and Informed groups based on their decision making authority, operational role and influence *(As per stakeholder matrix on page 20)*. This categorization helped define engagement, frequency, consultation depth and coordination channels.

Phase 4: Deep dive into sectoral assessments, service gaps and Climate risks

Out of the 150, over 20 deep-dive thematic discussions with each stakeholder group were conducted to identify operational bottlenecks, service issues, and climate vulnerabilities in Chintamani town.

Phase 5: Embedding continuous engagement for evidence building

Consultations continued alongside data collection, hazard mapping, and WASH vulnerability assessments. The process will continue to remain ongoing, with stakeholder engagement embedded at every stage of the action plan.

CORE GROUP

Core Group includes high-influence stakeholders responsible for key decisions, guiding the strategic direction and implementation of this WASH CAP.

STATE	DISTRICT	TOWN
UDD	DC	Commissioner
DMA	DUDC	Council body
KUIDFC	KUWSDB	Health department
	MLA	Engineering department
	DDMA	

CONTRIBUTORS

Contributors are stakeholders engaged in active planning and consultation, supporting the co-development and refinement of the interventions.

STATE	DISTRICT	TOWN
	MI	Revenue department
	DDMA	WASH operators
	CTPA	People
		Informal workers
		Local NGO

INFORMED

Informed group includes stakeholders who play advisory and oversight roles, offering guidance and ensuring alignment with broader policy and governance frameworks, the co-development and refinement of Climate Action Plan interventions.

STATE	DISTRICT	TOWN
KSDMA	GWDB	
KSNDMC	KSPCB	
SWDC	Zilla Panchayat	
EMPRI	Statistics Management cell	
NGT		

The stakeholder mapping for the Chintamani WASH CAP reveals that decision-making is largely centralized at the district and state levels forming the Core Group indicating a top heavy governance structure with limited decentralization.

While the process has ensured wide stakeholder consultation across 25+ entities, their influence remains peripheral. Therefore, highlighting a need to strengthen local institutional capacity and embed community voices more formally into the decision-making framework.

A pivotal step in this direction was the detailed review meeting with Dr. MC Sudhakar, Minister for Higher Education, GoK and District Incharge Minister, Chikkaballapura, who has been a mentor and guide for this Chintamani WASH CAP. His engagement in aligning the proposed actions with existing measures and prioritizing key steps has been instrumental in reinforcing ownership. This process has also helped ensure the active onboarding of the key stakeholders, strengthening the pathway for implementation.





KUWSDB officials deliberating during a visit









2. Data:

Robust system-wide assessments and climate hazard analyses

Using BORDA's ICS-WASH framework, a system-level assessment evaluated the end-to-end service delivery across water supply, sanitation, and wastewater. The exercise mapped service infrastructure to identify aging assets, access disparities, and maintenance gaps.

Over 620 households were surveyed, complemented by detailed inputs from FGDs with frontline service providers such as watermen, sanitation workers, and plant operators.

To strengthen this evidence base, the team deployed small-town specific diagnostic tools including Waste Flow diagram, Shit Flow Diagrams, Water Balance study to generate granular, high-quality datasets on system performance, resource flows, and vulnerabilities.

This evidence base was further reinforced through --

- **Climate hazard mapping:** to identify flood-prone, drought-stressed, and heat-vulnerable wards;
- **GHG inventories:** to benchmark emissions from WASH operations;
- **GIS-based spatial modeling:** to integrate hazard data with service performance.

These insights together formed a comprehensive evidence base on vulnerabilities and service baselines of Chintamani.



3. Decentralization:
Adopting flexible, cost-effective, and nature-based solutions while aligning governance across state, district, and town levels

Decentralization in small towns means adopting infrastructure and service delivery models that match local needs. Centralized systems often struggle to be flexible or cost-effective, while decentralized, nature-based solutions are low-cost, energy-efficient, and better suited to climate challenges.

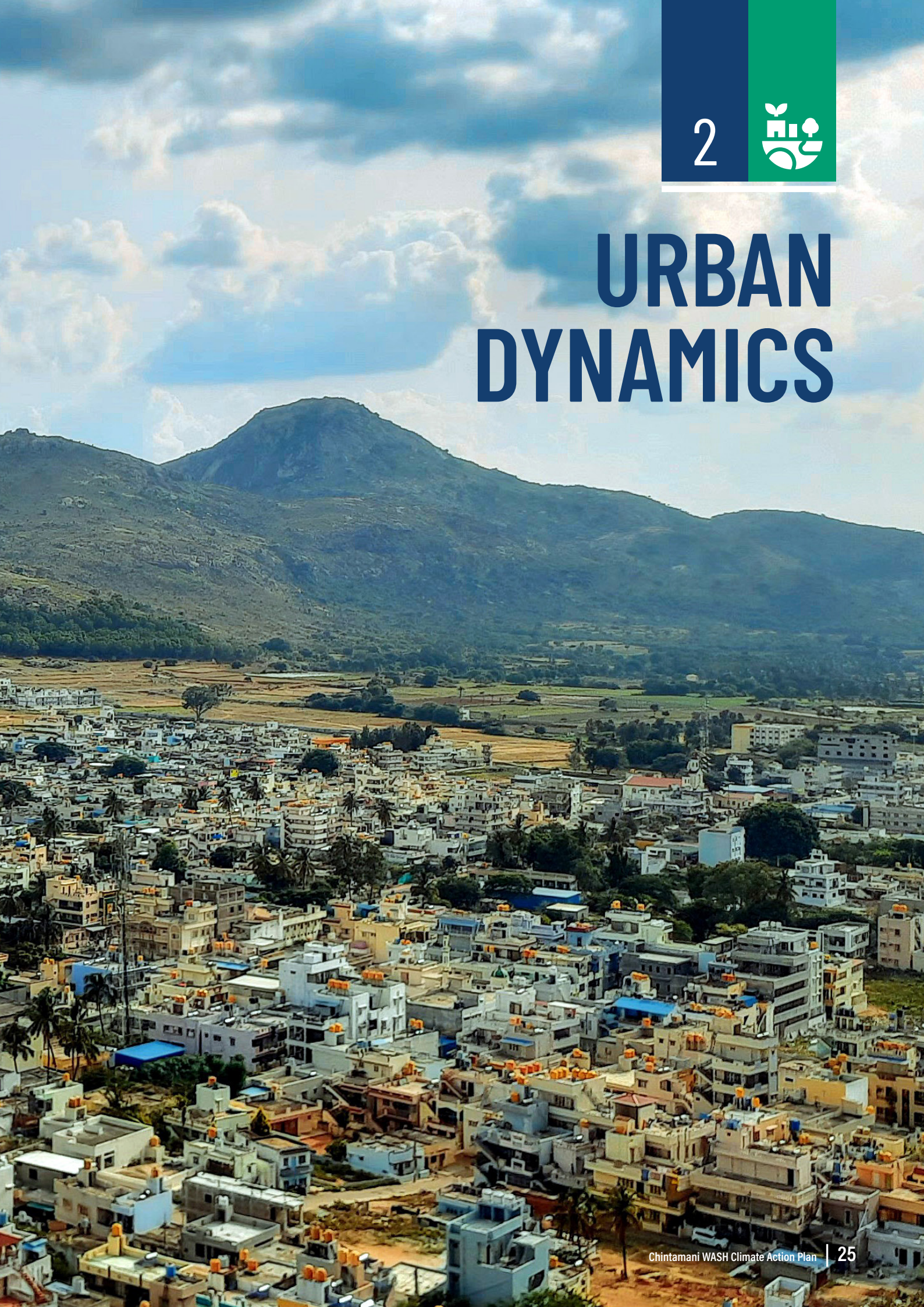
Considering that a town in India is governed at three levels, namely, the town itself, the district and the state, this action plan recognizes that different interventions need different governance anchors. Large-scale planning and infrastructure may require district or state support, but action and accountability must ultimately rest at the town level.

By doing so, evidence (Data) and consensus (Dialogue) are turned into short- and medium-term projects that are practical, locally relevant, and owned by the town.



2

URBAN DYNAMICS



This chapter presents a spatial and socio-economic overview of Chintamani, highlighting the town's growth dynamics, demographic shifts, and governance landscape. It sets the foundation for assessing climate and WASH vulnerabilities in the context of rapid urbanization.

2.1 Geographic and Economic Context

Chintamani is a small town in southeastern Karnataka, situated at 865 meters on the Mysore Plateau. Located just 74 km from Bengaluru and 36 km from Chikkaballapura, it has transitioned from its agrarian roots to a mixed economy driven by silk cocoon markets, agriculture (tomato, ragi, groundnut), and growing connectivity to Bengaluru's service and industrial sectors.

2.2 Current Land Use and Land Cover

Chintamani spans 15.01 sq.km., with a land mix comprising 35.5% built-up, 59% agricultural/barren land, and 5.5% surface water. A 413% surge in built up areas (1985–2025) highlights rapid urbanization. Simultaneously, surface water bodies have shrunk from 2.68 sq.km. in 1995 to 0.8 sq.km. in 2025 on account of encroachment, siltation, and neglect. These trends underline a stark trade-off between urbanization, spatial growth and ecological loss.

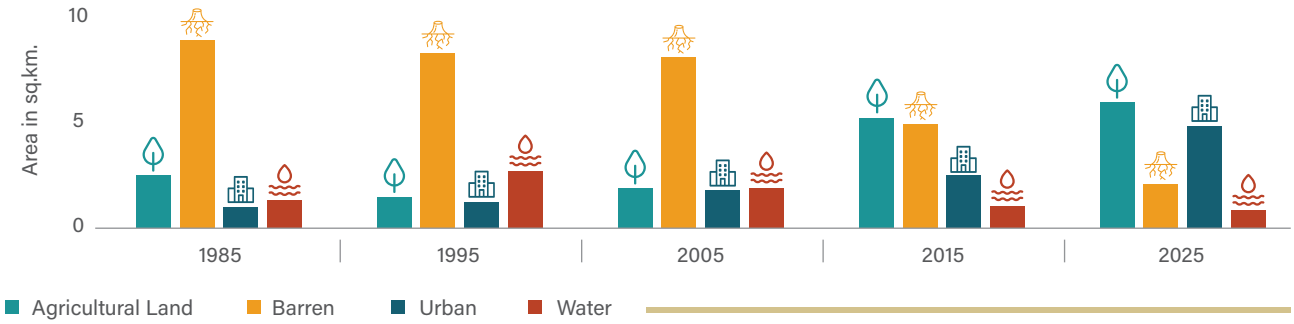
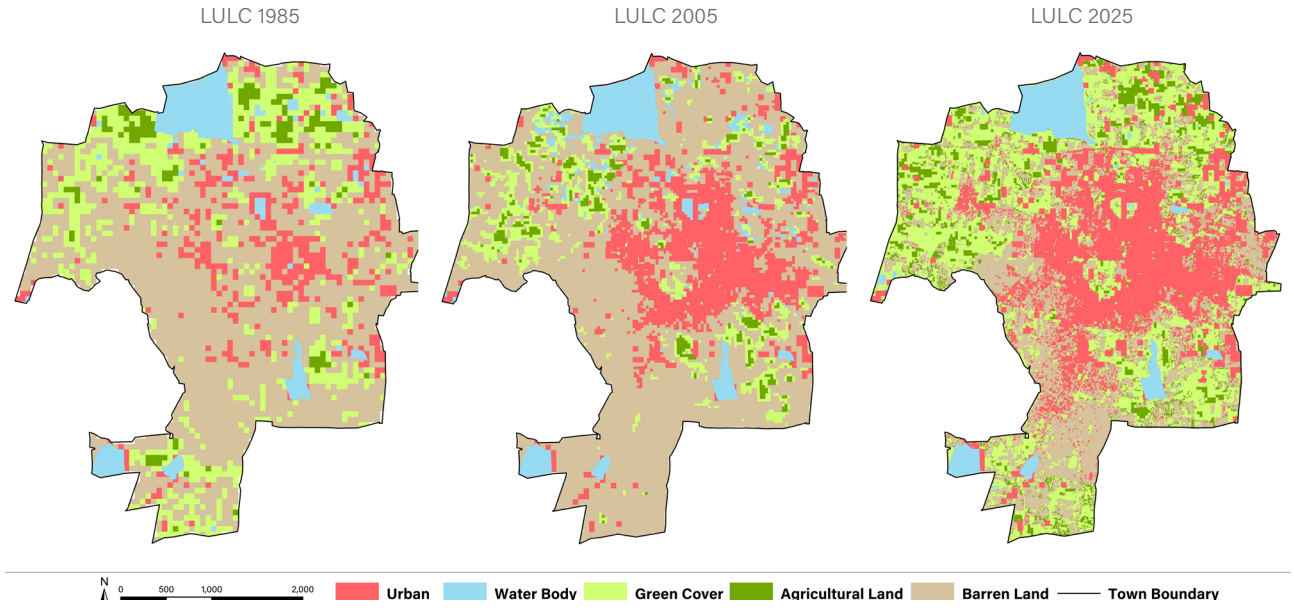


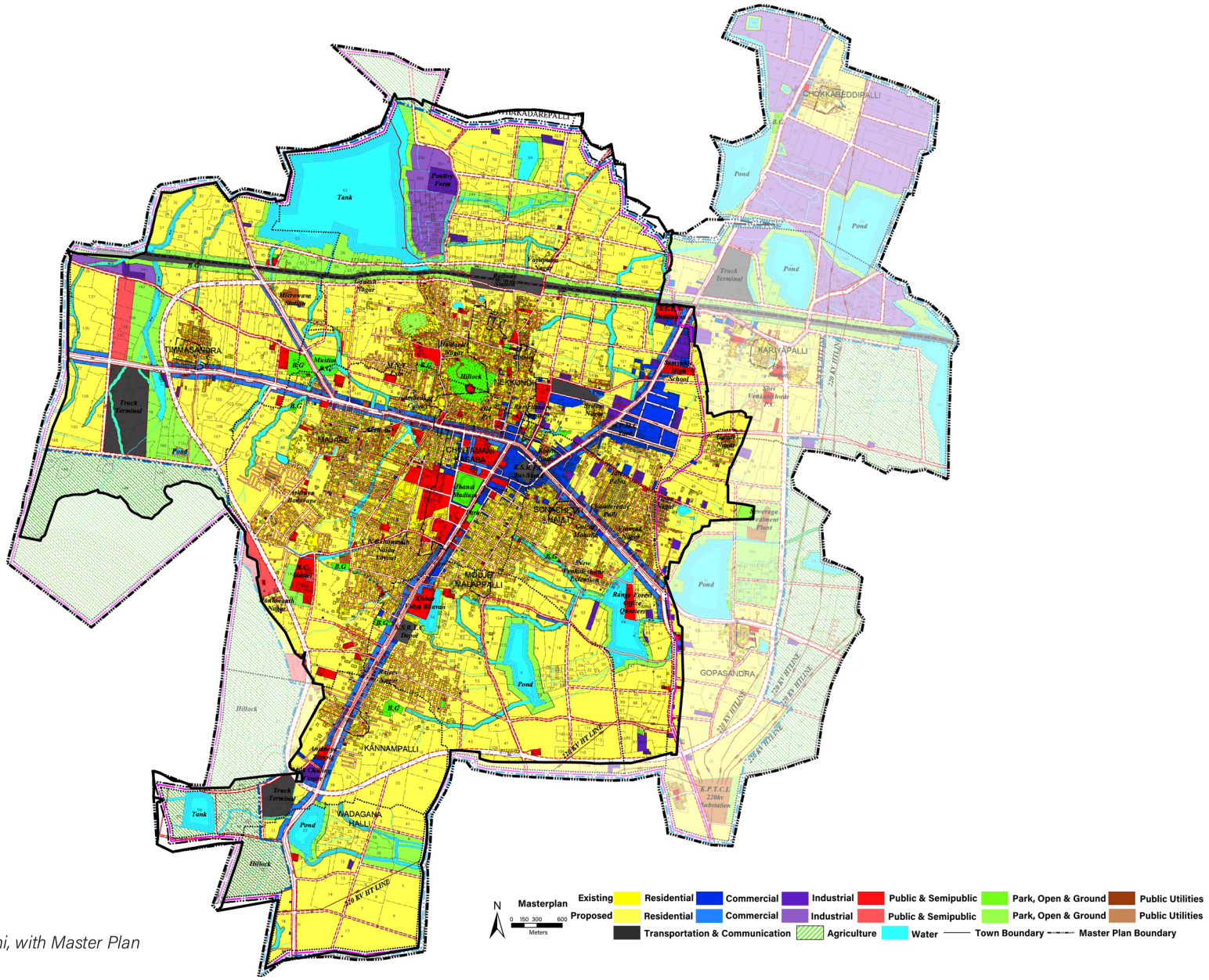
Figure 1 - Land use- Land cover change over the past four decades (Source - Digital Image Processing over Sentinel/Landsat Satellite)

Chintamani's dual economic base anchored in agriculture and connected to Bangalore's job market is accelerating land conversion and infrastructure stress.

Urban area has expanded fivefold while 70% of surface water has vanished—reflecting a trade-off between spatial growth and natural resource loss.



Map 1 - Land use cover change from 1985 to 2025 (Source - Digital Image Processing over Sentinel/Landsat Satellite)



Map 2 - Land use plan for Chintamani, with Master Plan 2031 boundaries and growth areas
(Source - Chintamani City Municipal Council)

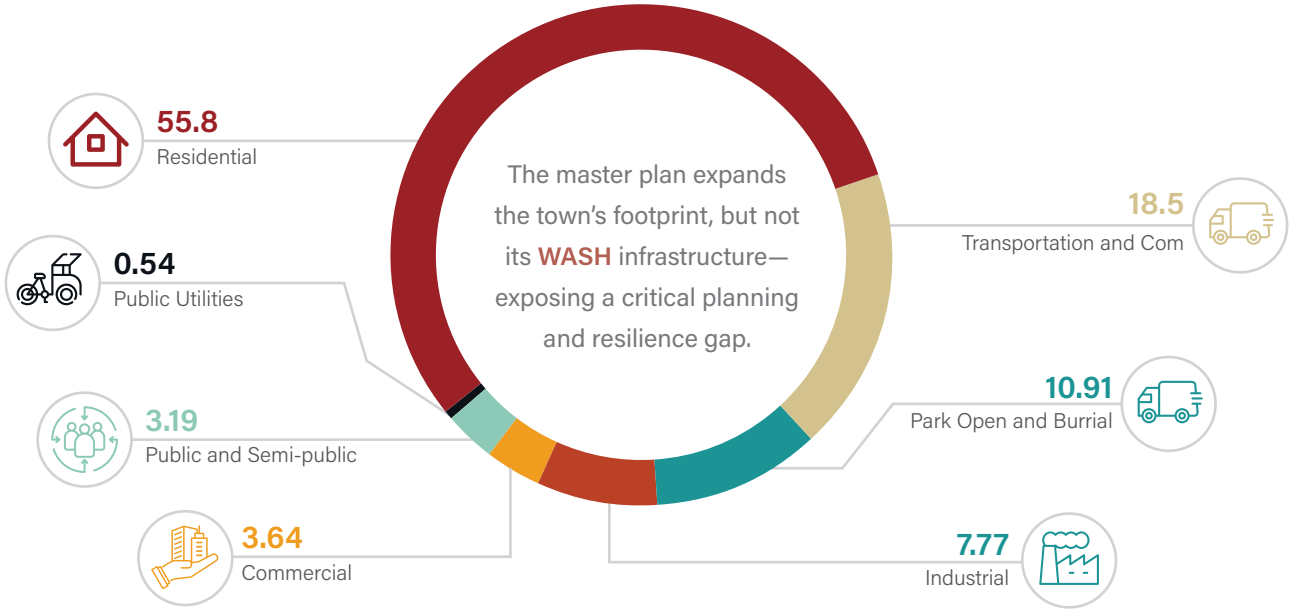


Figure 2 - Proposed Chintamani land use (in percentage) (Source - Chintamani Master Plan 2031)

2.3 Future Growth Directions

The Chintamani Master Plan 2031 proposes a 13% expansion of the Local Planning Area to 16.98 sq.km., with growth concentrated in the eastern and southeastern periphery (Map 2). Villages such as Chokkareddyhalli, Kariyapalli, and Gopasandra are likely to be absorbed into the urban fabric.

As per the 2031 master plan, 55.8% of the land is zoned for residential use, while 11.5% is assigned for commercial and industrial activity. Parks and open spaces constitute 10.9%, signalling a push toward green infrastructure. However, the plan makes no provisions for scaling water or solid waste management systems, aside from one existing wastewater treatment plant — raising critical concerns about WASH preparedness.

2.4 Demographics and Population

Chintamani's population grew from 76,068 (2011) to a projected 102,568 by 2025 (2.13% annual growth), aligning with national urban trends. With a current population density of 5,067 persons per sq.km., pressure on water and sanitation infrastructure is rising—especially in 17 slums, home to 18% of residents. With ward 24 (Narasimhapete) and ward 1 (Venkatagirikote North) anchoring the densely populated center, while ward 31 (Thimmasandra) and ward 27 (Shantinagar) remaining sparse, the spatial imbalance persists. Slums like Tapatheswara (W14) and Tippunagar (W15) (>3,000 residents each) cluster near Kolar Cross, reflecting organic expansion from Varadhanjaneya Swamy Hill, that drew migrants to central/peripheral zones.

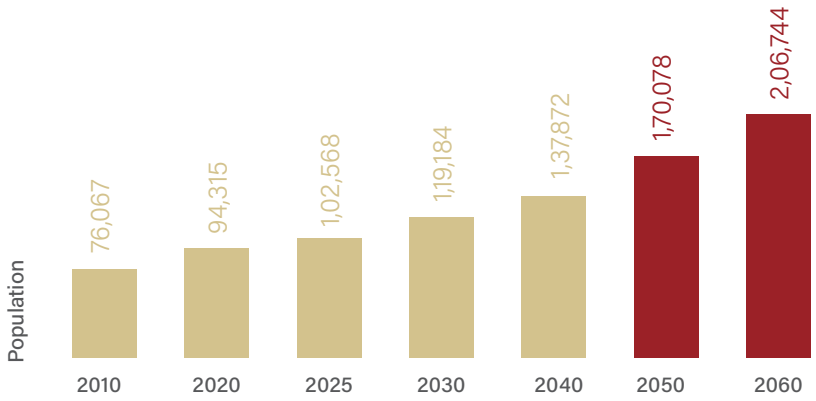
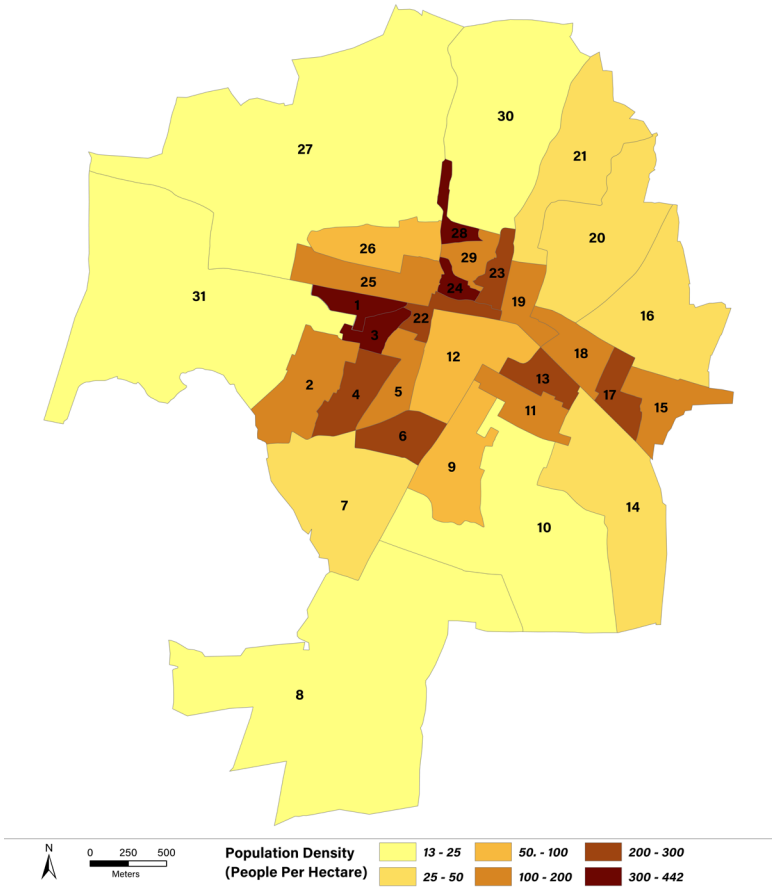


Figure 3 - Population projection 2060
(Source - Baseline Population - Census of India, 2011 projected using standard population projection models)



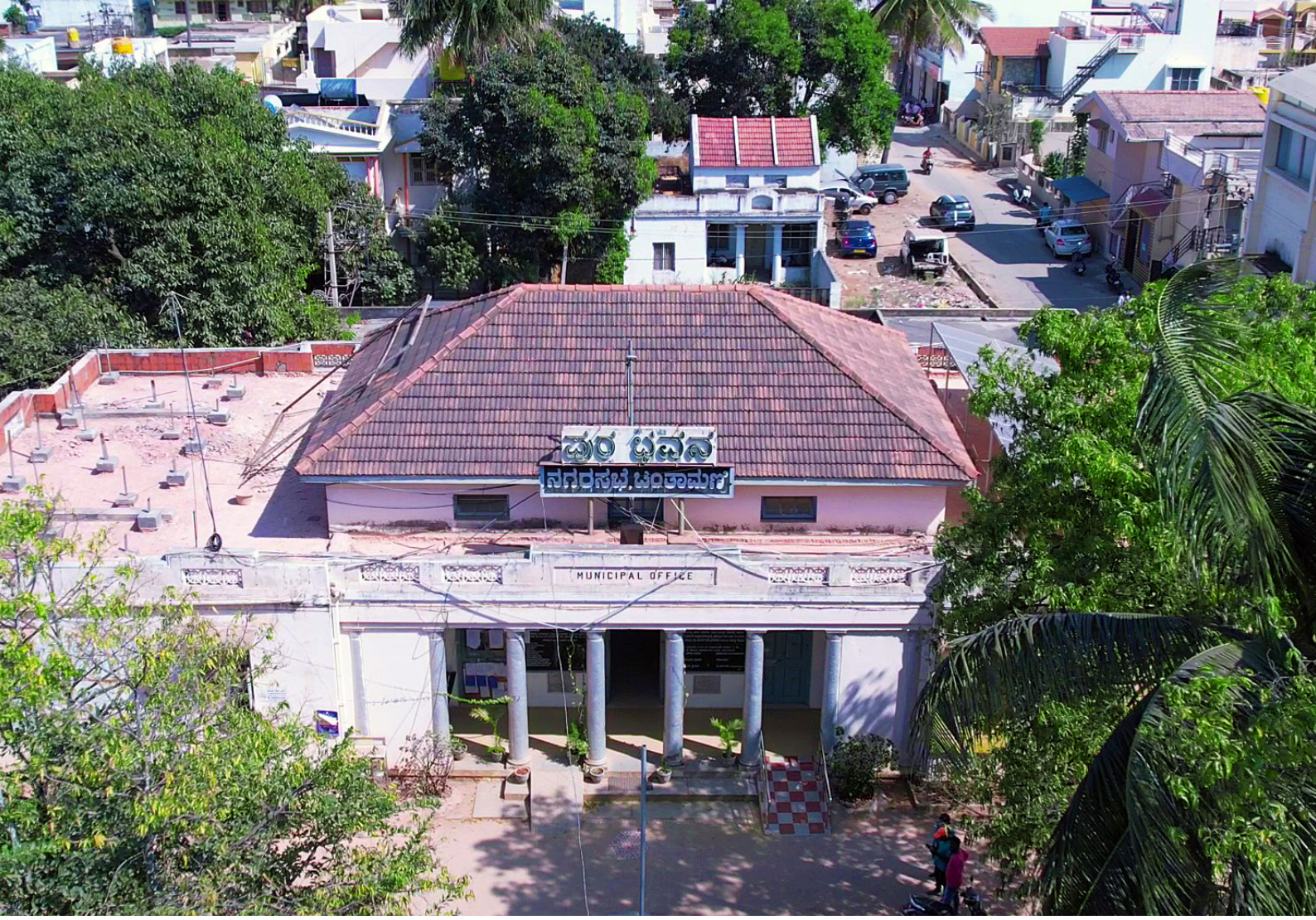
Slums are at the core of Chintamani's demographic pressures, highlighting the need for targeted WASH and infrastructure interventions.

High literacy and favourable sex ratio offer a unique lever for inclusive, community-led resilience programs.

Map 3 - Wardwise population density (Source - Chintamani City Municipal Council Website, Census of India, 2011)

Table 1 - Governance entities and their key responsibilities in Chintamani

Entity	Key Personnel/ Structure	Primary Responsibilities	Supporting Agencies	Legal Framework
Chintamani City Municipal Council (CMC)	31 municipal wards **Elected wing:** President Vice President 29 ward councillors **Administrative wing:** Commissioner Departmental officers Non-technical staff	Overall urban governance Basic service delivery (water, waste, sanitation) Public health Local policymaking	DUDC Directorate of Municipal Administration (State) **KUWSDB (Water/ sewerage):** Infrastructure planning/implementation **KUIDFC (Infrastructure):** Technical assistance for services	Karnataka Municipalities Act, 1964; State mandates
Town Planning Authority	Chairman Town Planners	Land-use planning Development regulations Zoning enforcement	Not Applicable	Karnataka Town & Country Planning (KTCP) Act
Disaster Management	District Disaster Management Authority	Climate emergency response Coordination of relief measures, Risk mitigation planning	National/State Disaster Management Authorities	Disaster Management Act, 2005


ಪುರ ಭವನ
ನಗರಸಭೆ ಚಿಂತಾಮಣಿ
MUNICIPAL OFFICE



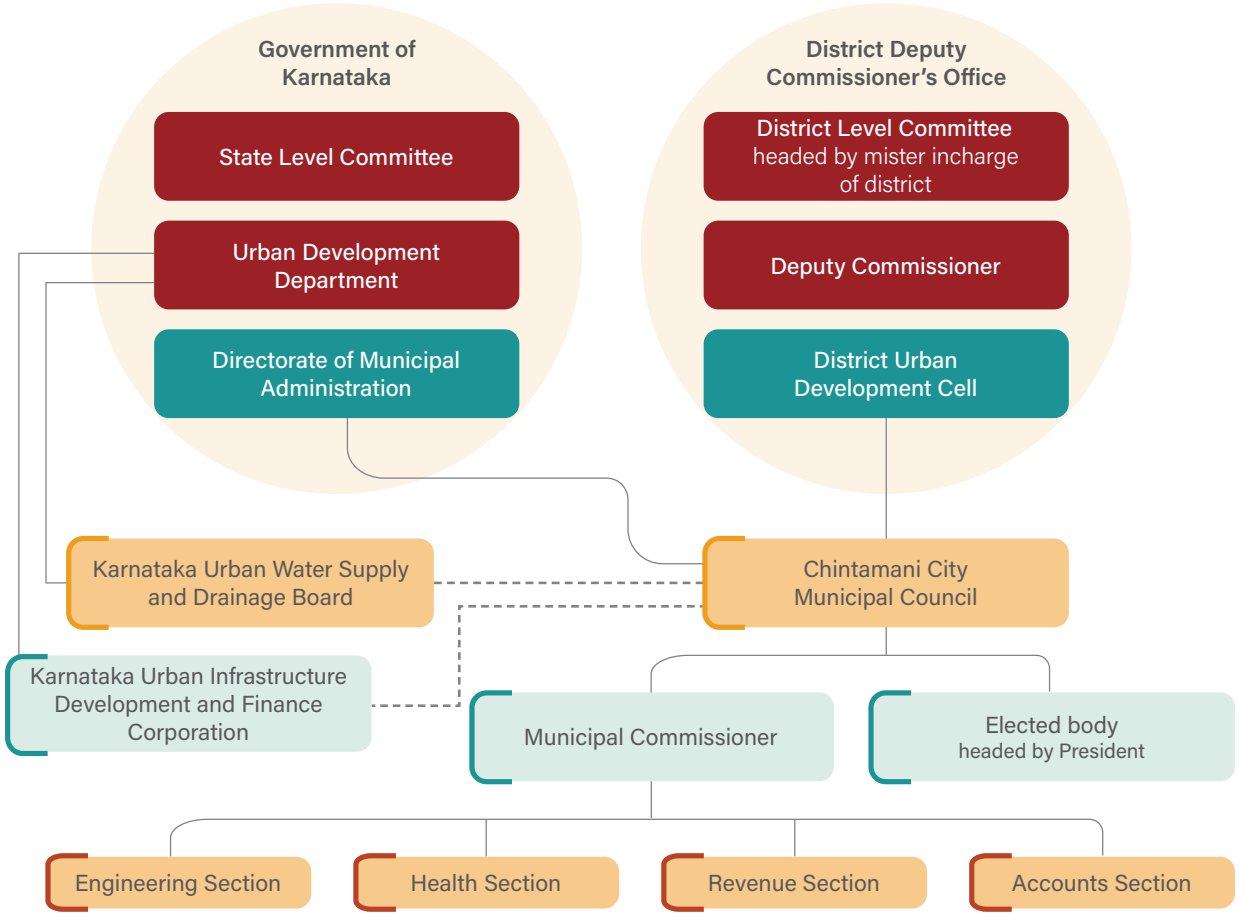


Figure 4 - Organisational Structure of Chintamani town
(Source - Mapping Water in a Small Town: Insights from Chintamani, Karnataka - 2023)

This structure enables localized service delivery but relies heavily on state agencies for technical capacity – a critical dependency during climate crises.

High literacy (83.9%, greater than state average of 75.36%) enables community-driven climate/WASH initiatives. This demographic advantage supports the use of Information, Education, and Communication (IEC) strategies to drive public participation in climate adaptation and WASH behaviour change initiatives. With a sex ratio of 984, closely aligned with the Karnataka average of 973, the town maintains a relatively balanced gender profile, which is favourable for inclusive planning.

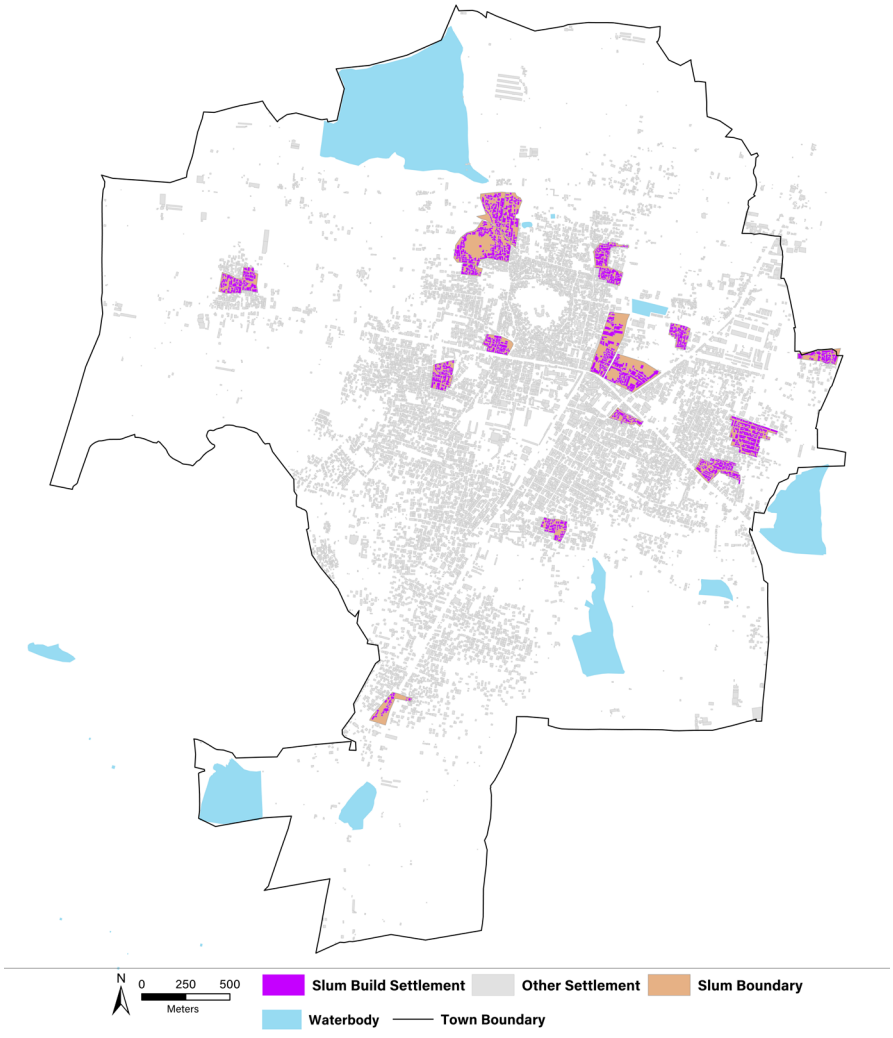
2.5 Governance and Administration

Chintamani is governed by a City Municipal Council (CMC) under the Karnataka Municipalities Act, comprising 31 wards. The responsibility for governance is shared between an elected body (President, Vice President, 29 councillors) and an administrative arm (Commissioner, technical staff). The CMC handles core WASH services, with support from parastatal agencies such as KUWSDB (water/sewerage) and KUIDFC (infrastructure). Land development is overseen by the Town Planning Authority under the Karnataka Town and Country Planning Act. Climate emergencies are managed by the District Disaster Management Authority.

2.6 Socio-economic Vulnerability

In the context of climate induced disruptions, it is essential to assess the town's landscape through the lens of vulnerable populations who are most at risk due to limited access to basic WASH services. Key groups which include slum and other informal dwellers, low-income households, sanitation workers, SHGs, and informal waste pickers, face heightened exposure and reduced adaptive capacity. This vulnerability makes them particularly susceptible to the adverse impacts of climate change on WASH systems.





Map 4 - Spatial distribution of slums (2025) (Source - Chintamani City Municipal Council)

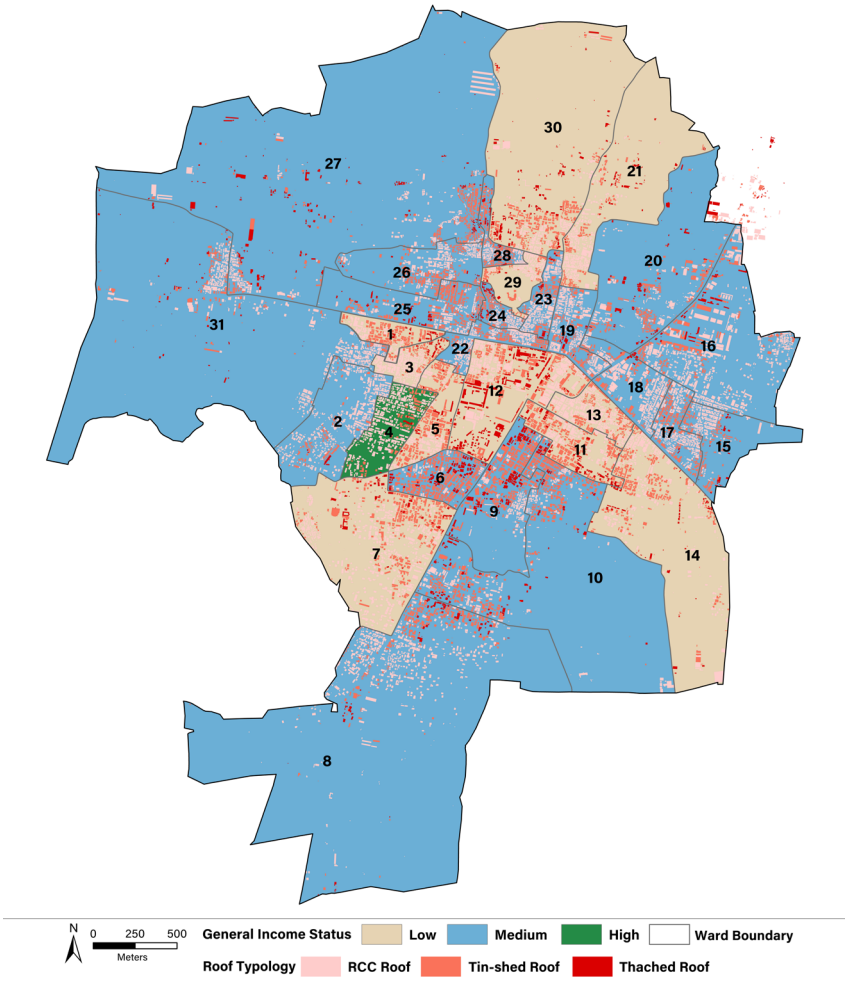
Slums: 17 notified slums house 15,037 residents (18% of population) at five times the town's average density, creating severe pressure on shared WASH systems – especially in hotspots like Tapatheswara (Ward 14) and and Tippunagar (Ward 15). Further, challenges such as chronic water shortages and sewer overflows disproportionately impact women (49%) and marginalized communities (66% of slum dwellers). Refer Map 4 for spatial mapping of slums in Chintamani.

Low-income communities: This density-risk nexus is compounded by 44% of households having temporary roofs (mostly across 11 slum-dominated wards) and 38% reliance on daily wages, limiting resilience to climate shocks.

WASH operators (detailed in Figure 5): Chintamani's 199 frontline WASH workers, out of which, 70% are outsourced, 20% are women, and 15% are over 50 in age, face compounded vulnerabilities due to low wages, lack of safety nets, and hazardous working conditions, particularly during extreme heat or floods. With only 30% receiving protective gear, and women exposed to additional gender-specific risks, these essential workers operate under a resilience paradox: they sustain critical WASH systems during climate shocks, yet remain among the least protected, amplifying systemic vulnerabilities when services fail.

Chintamani's rapid urban transition presents both opportunities and vulnerabilities. A proactive approach to spatial planning, inclusive governance, and climate-resilient WASH systems is essential to safeguard its urban future.

> Balancing growth with resilience in small towns like Chintamani demands not just infrastructure expansion, but a systemic shift toward equity, ecological preservation, and empowered local governance.



Map 5 - Economic vulnerability by income and roof typology (Source - Composite data analysis based on deep learning model and field observations)

SWM Workers

Primarily responsible for Collection, transportation, and processing of waste and additionally responsible for tasks including train cleaning, removal of open dump spots, and waste management during events.

126

Line Operators

Inspecting and repairing leaks, monitoring and regulating water flow, and maintaining storage tanks, pumps, and other water infrastructure.

30

Self-Help Groups (SHG)

Supporting waste management services in eight wards of the town in collection and decentralized waste processing.

24

Underground Drainage (UGD) Operators

Addressing wastewater grievances—fixing sewer blockages/overflows, manhole maintenance, septic tank emptying, and resolving complaints regarding waterlogging.

09

Toilet Operators

Daily O&M, facility upkeep, and user fee collection.

10

Informal Workers

Waste picking and pit cleaning (unrecorded in official data).

UA

Figure 5 - WASH frontline workers and their responsibilities (Source - Chintamani City Municipal Council)

WASH workers in Chintamani face a resilience paradox—essential to service continuity during climate shocks, yet among the most insecure and least protected, heightening systemic risk





Town Profile Brief

Urban Dynamics

413% Urban Growth (1985- 2025)

70% Surface Water Loss (1995- 2025)

74km Proximity to Bangalore

+13% Local Planning Area Expansion

Town statistics

1,02,568 Projected population for 2025

83.90% Literacy rate

984 Sex Ratio

15.01 sq.km. Area of the town

5,067 people/sq.km. Population Density

17 Notified slums

11,387 Residential Establishments

2,973 Others Establishments

Socio-economic Status

18% of population lives in notified slums

170 WASH workers in water & waste management

44% HH- economically weaker section (based on roof typology)

38% are daily wage workers

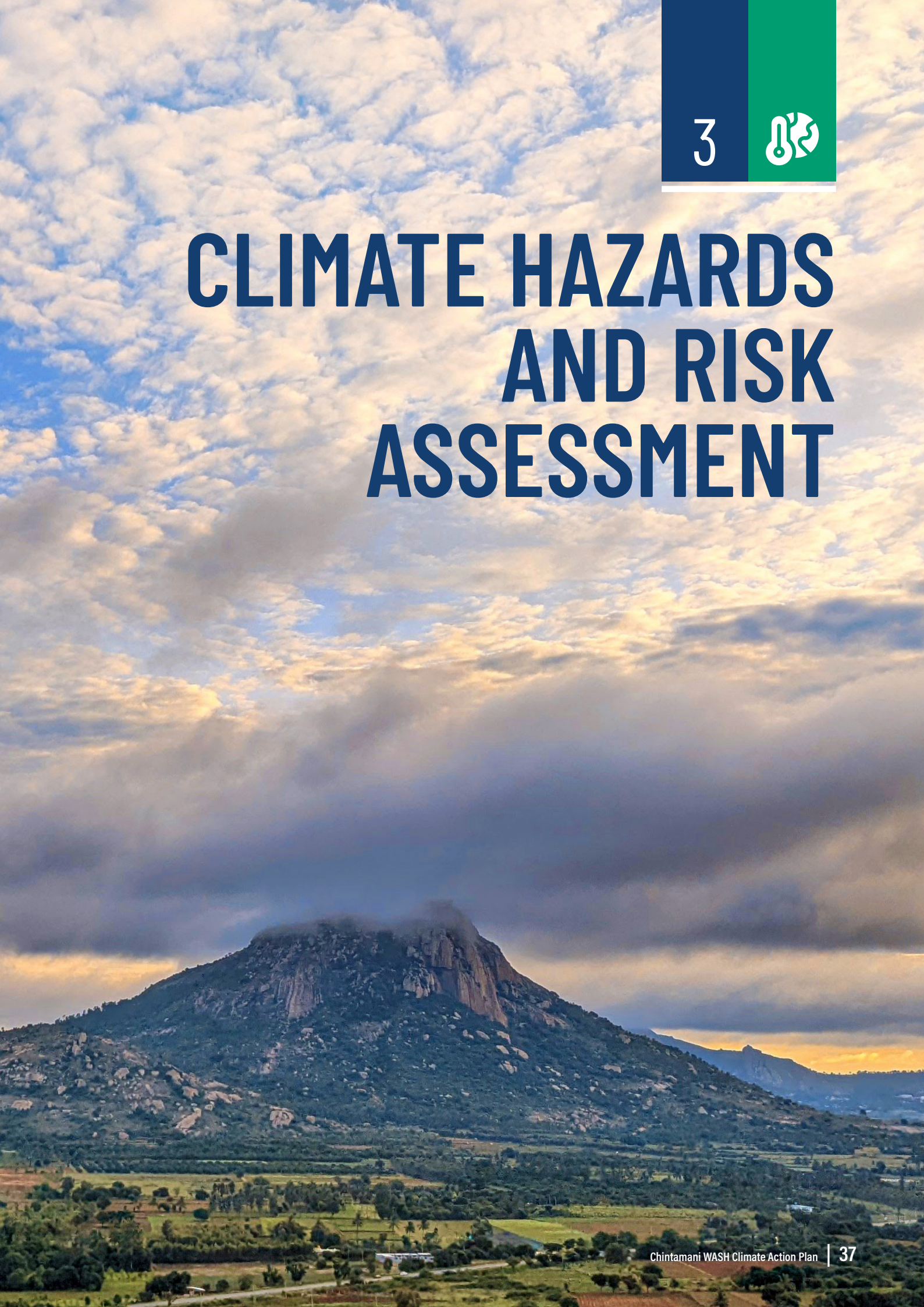
66% of slum population from socially backword class

20% formal WASH workers in the town are women



3

CLIMATE HAZARDS AND RISK ASSESSMENT



This chapter provides a focused assessment of the key climate hazards impacting Chintamani, including drought, precipitation variability, groundwater overexploitation, and rising thermal stress. The analysis was guided by the Climate Resilient WASH Framework and employed a consultative approach, engaging local stakeholders, district and municipal officials, and community members, to ensure a context-specific and inclusive evaluation. Current and projected risks at the town and district levels were identified through an evaluation of secondary data, enriched by stakeholder insights, aligned with the ICS WASH framework's key indicators. Major hazards and their impacts were systematically mapped, with detailed data and methods presented in the Annexure 1 for reference. This section details a comprehensive understanding of Chintamani's climate risks, supporting forward-looking planning.

3.1 Climate and Hazard Overview

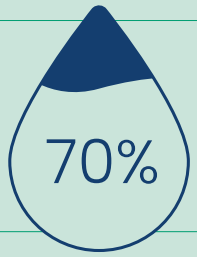
Chintamani, in the central Mysuru (Mysore) Deccan Plateau of Karnataka, is situated within a dry agro-climatic zone and influenced by a western hill range. The town experiences a monsoon tropical climate, with hot, dry summers (often exceeding 40°C) and mild winters (down to 17°C). The average annual rainfall is

	Drought	Precipitation Change	Thermal Stress	Groundwater Depletion	Water Quality Degradation	Water logging
Intensity[1]	High	Medium	Medium	High	Low	Low
Area	High	High	High	High	Low	Medium
Frequency	High	High	Medium	High	Medium	Low

Figure 6 - Indicative impact of hazard based on intensity, area and frequency (Source: Stakeholder consultation)

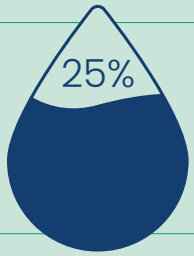


Capturing the resident's and stakeholders' perspective on climate hazard and its impacts



At least 70% of the residents have **experienced water shortages during peak summers.**

Nearly 25% of the respondents have **experienced decrease in water quality/quantity during summer**





> The water table has been getting lower in the past 15 years with increased variation in Tippunagar, Sriramnagar, Gandhinagar and Ashraya layout.
>
> - Chintamani CMC

> District Disaster Management Plan has identified precipitation change, drought, groundwater depletion and fire has the major climate hazards.
>
> - DDMA

> The users are coming to the toilet not just to use the toilet but also for shade from the scorching heat, especially during noon time in summers.
>
> - Public toilet operator

Drought, groundwater depletion, increasing temperature, and water logging are the concerns that have a direct impact on WASH service and infrastructure.



about 787 mm, notably lower than the state average of 1,153 mm. Precipitation (percentage of annual rainfall) is distributed as follows:

» Southwest Monsoon (June–September): ~60%
» Northeast Monsoon (October–December): ~30%
» Pre-monsoon showers (March–May): ~10%

Rainfall variability has increased over the past three decades, presenting persistent challenges for water security. A consultative process with local stakeholders and municipal officials systematically mapped the major climate hazards and their impacts (in Figure 6). The following sections present a detailed analysis of each major hazard, outlining their specific impacts and underlying trends in Chintamani.

3.2 Hazard impact and exposure assessment

3.2.1 Drought

Chintamani taluk is chronically drought-prone, over the past 15 years. Chintamani has experienced significant drought in 11 years, with the longest consecutive stretch from 2011 to 2018 (except 2017). The severe deficit in 2018 led to an emergency declaration and additional funding for private tanker water supply. As per the State Drought Memorandum (2023), Chintamani is classified under the "severe drought" category, while the State

Over the past 15 years, 11 droughts were officially declared, though only 2 were identified on account of rainfall (as per IMD criteria). This highlights that drought declarations factor in multiple indicators—such as soil moisture, crop health, vegetation indices, and hydrology—and underscores the region's underlying vulnerability to drought.

Drought Vulnerability Index (DVI) places it as moderately vulnerable.

A long-term trend analysis[1] indicates a statistically significant decline in drought frequency and severity over the past five decades. This finding aligns with the State Climate Action Plan's projection of reduced drought years by 1 year in Representative Concentration Pathways (RCP) RCP 4.5, and 2 years in RCP 8.5 in the short term projection (2030s) for Chikkaballapura district. Additionally a detailed Standardized Precipitation Index (SPI) assessment was carried out where the trend showed a decline in drought frequency and severity over the past five decades. This suggests that Chintamani is transitioning from predominantly dry conditions to a more variable dry-wet pattern, with reduced drought occurrences.

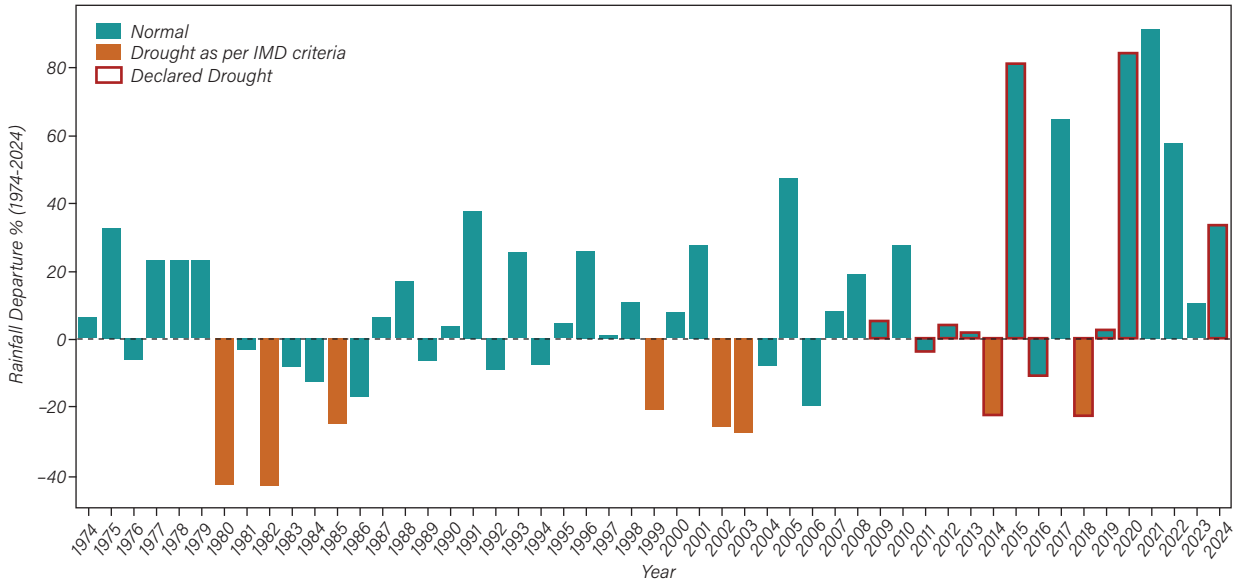


Figure 7 - Estimated drought years based on rainfall departure (Source - IMD rainfall data, KSDMA)

Drought frequency and severity are declining, but Chintamani remains highly vulnerable due to its chronic drought history and high groundwater dependence.

[1] *Refer to Annexure 1 for detailed methodology, data tables, SPI graphs, and additional figures.*

3.2.2 Groundwater Depletion

Chintamani and the wider Chikkaballapura district have been categorized as "over-exploited" for groundwater for over 25 years, reflecting sustained withdrawal rates far exceeding natural recharge. Groundwater levels in Chintamani declined sharply between 2017 and 2021, with only marginal recovery in the last two years. Given that nearly 75%-80% of the town relies on groundwater for domestic and agricultural needs, this dependency intensifies during drought-declared years, further accelerating depletion and placing significant stress on local aquifers.

Stage of Groundwater extraction: **185%**
Groundwater has been in an overexploited state for the past 25 years across the district.

3.2.3 Precipitation Change

Chintamani has experienced significant fluctuations in rainfall patterns, with multiple years of deficit and surplus, unpredictability in the trend is contributing to ongoing water stress. While annual rainfall shows a slight upward trend in recent years, the regime remains highly variable.

Chronic over-extraction and drought-driven demand continue to threaten groundwater sustainability in Chintamani.

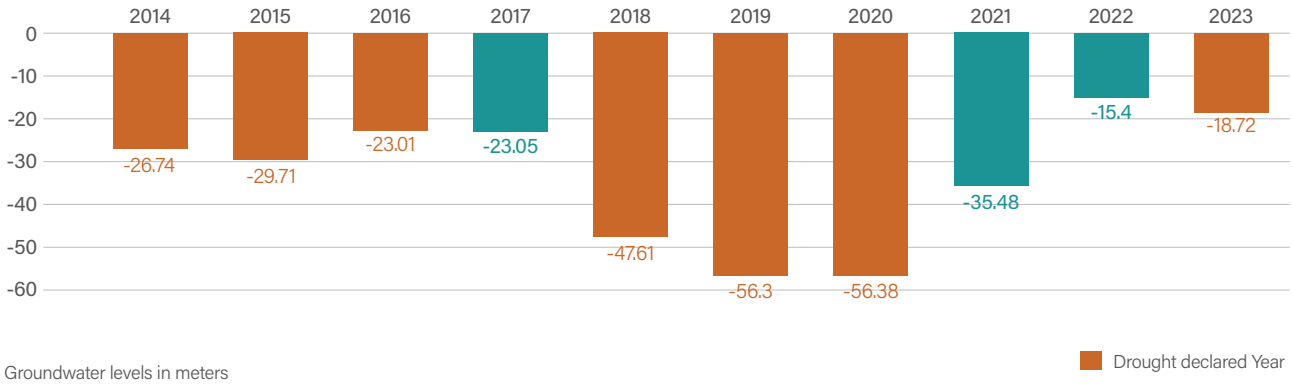


Figure 8 - Ground water level in Chintamani Taluk in the last decade (Source - https://antharjala.karnataka.gov.in)



Recent decades have seen:

Fluctuating Annual Rainfall: Deficits in the 1980s, with increased but variable rainfall in the past decade (except 2014, 2016, 2018).

More Rainy Days: Since 2000, several years recorded over 80 rainy days, compared to under 50 days in the 1980s/early 2000s. The peak rainfall period has shifted earlier (from September/October to July/August).

Increased Rainfall Intensity: More frequent high-intensity, short-duration events have been observed, with greater rainfall delivered per event and higher interannual variability.

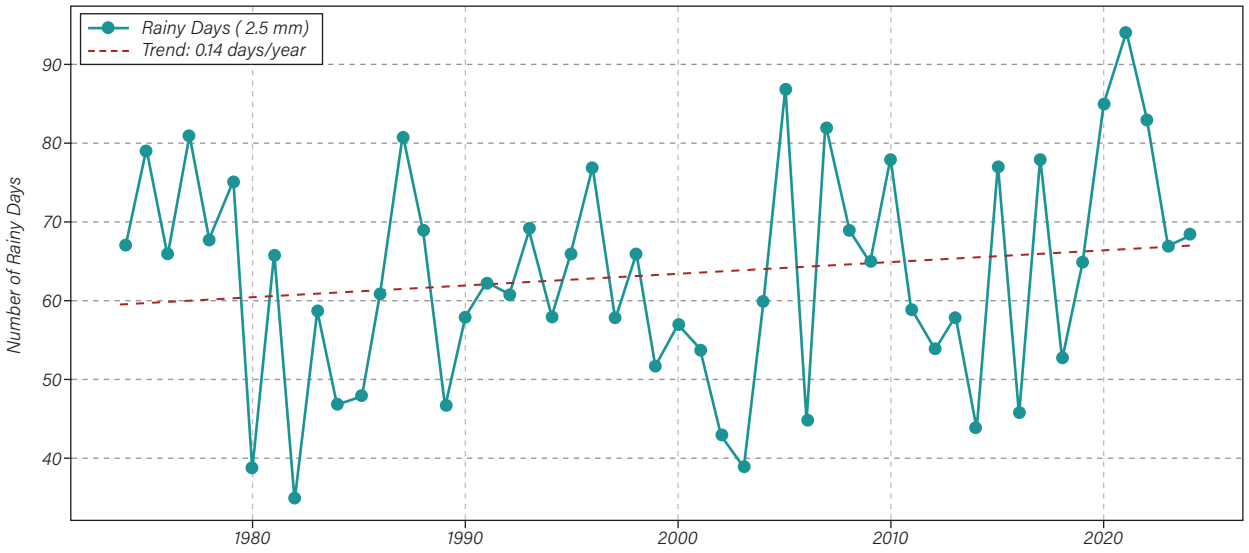


Figure 9 - Number of annual rainy days (1974-2024) (Source - IMD Data, Analysis by NatureDots)

Rainy days have gradually increased—from about 50 days annually in the early 2000s to nearly 80 days in recent years—indicating a shift in rainfall distribution

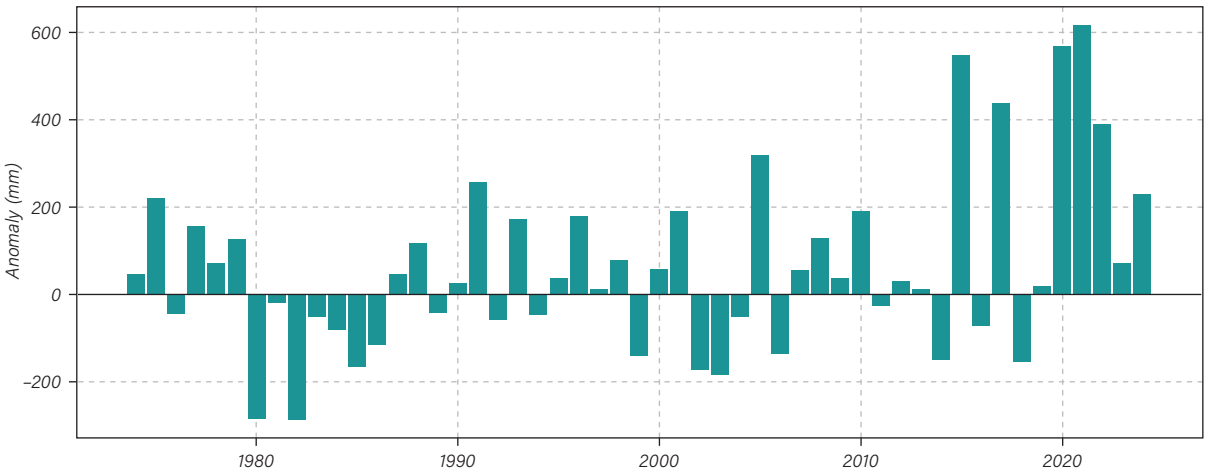


Figure 10 - Annual rainfall anomalies (1974-2024) (Source - IMD Data, Analysis by NatureDots)

Derivation of rainfall in mm from the long-term annual mean rainfall shows high fluctuations

Increased Rainfall Intensity: More frequent high-intensity, short-duration events (cloudbursts) have been observed, with greater rainfall delivered per event and higher interannual variability. Projected rainfall changes suggest challenged current water and drainage systems, requiring adaptive infrastructure and proactive water management to harness benefits and reduce risks.

Increased Rainfall Intensity and Future Scenarios: Chintamani is seeing more frequent, high-intensity rainfall events with greater variability. Under Shared Socioeconomic Pathways (SSP) 245, rainfall is projected to rise modestly by 2060 with more low-intensity events, while SSP 585 forecasts a 157% increase in rainy days and extreme 3-day events by 2060, indicating heightened risk of extreme rain events. Both scenarios will challenge the current water and drainage systems if not addressed proactively.

3.2.4 Thermal stress

Chintamani is experiencing a clear and significant rise in temperature and heat extremes, intensifying thermal stress across the town.

Long-Term Warming: Both maximum and average temperatures have increased by over 0.6°C from 1974 to 2024, with a statistically significant upward trend consistent with broader regional patterns.

Rising Heatwaves: The frequency of heatwave days has surged since 2000, with recent years (2016–17, 2023–24) recording over 10 days above 40°C and multiple yellow alerts issued in 2024

Extended Heat Season: The heat index reveals 200 "caution" days and 50 "extreme caution"[2] days per year, with the hot season now stretching from February through July.

Future Projections: By 2060, under SSP 245, average temperatures are expected to rise by 3°C with 64 extreme hot days per year; under SSP 585, maximum temperatures could increase by 4°C, with up to 98.5

Maximum Temperature:> **40°C**

Trend: **+0.0121°C/year**
Over 50 years: **+0.61°C**
Statistical Significance: **Strong**

Average Temperature: **27°C**

Trend: **+0.0133°C/year**
Over 50 years: **+0.67°C**
Statistical Significance: **Very Strong**

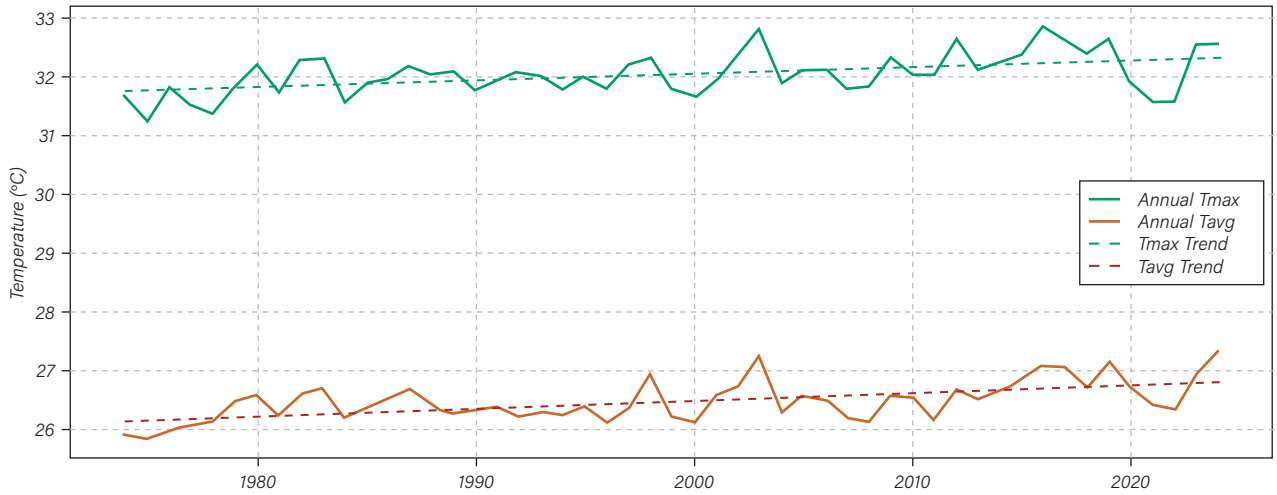


Figure 11 - Maximum and average temperature trend (1974-2024) (Source - IMD Data, Analysis by NatureDots)

With both the frequency and duration of extreme heat days projected to rise sharply, Chintamani faces heightened risks to health, water supply, and infrastructure—demanding urgent adaptation and robust local heat management strategies.

[2] *Caution and extreme caution days are estimated based on the heat index (HI) that indicates that precautions should be taken to avoid heat-related illnesses. Heat index is estimated based on the temperature and humidity of the region.*

extreme hot days and 109.8 hot days annually.

3.2.5 Water Quality Degradation

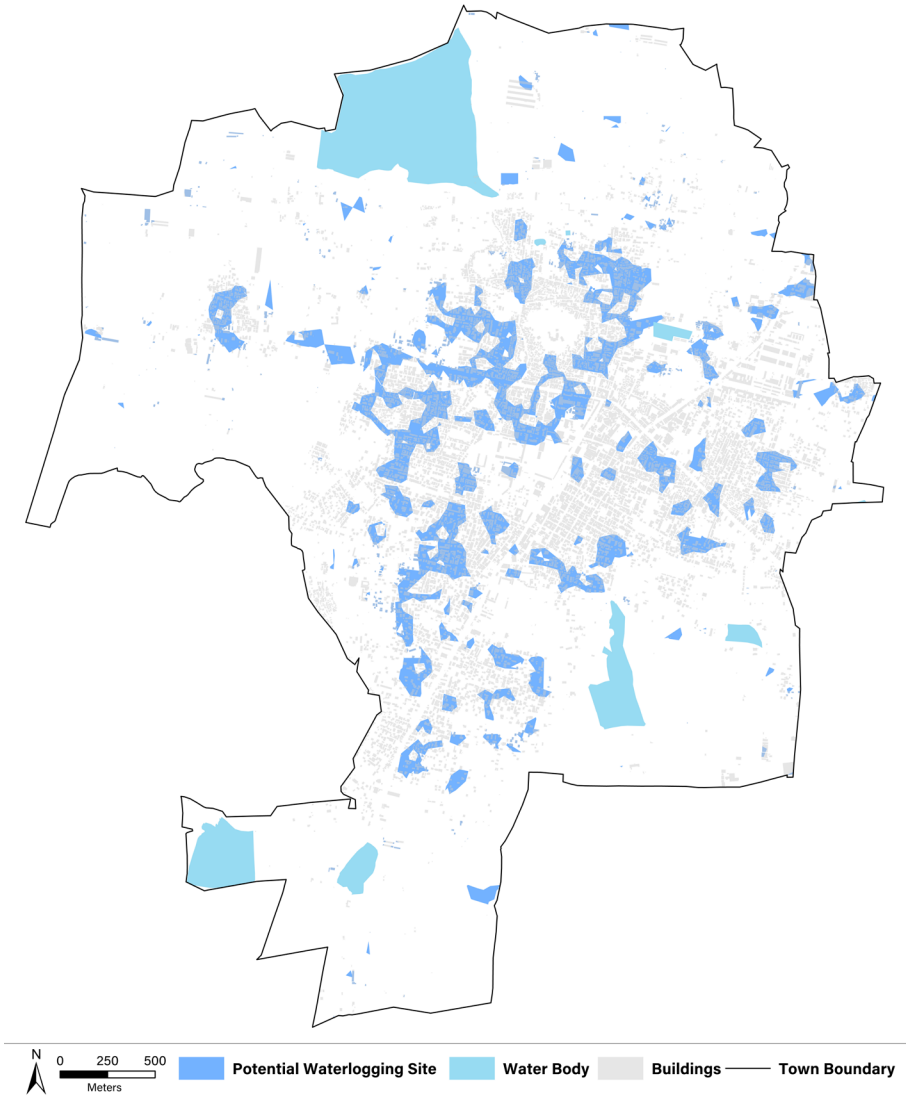
Groundwater quality in Chintamani town has so far remained within permissible limits, as per the sampling and analysis conducted by TIDE in 2022 across multiple depths. However, at the taluk and district levels, elevated fluoride concentrations (above 1.5 mg/l) have been reported, particularly in the neighbouring Bagepalli Taluk, as highlighted in the Chikkaballapura District Disaster Management Plan. The absence of a functional observation well within Chintamani makes it difficult to monitor groundwater quality trends at the town level. Given the town's heavy reliance on groundwater, establishing a system for regular quality checks, supported by proper documentation, is critical to ensure safe and sustainable use.

> Continued over-extraction and fertilizer use are driving groundwater contamination, posing growing health risks for residents and highlighting the urgent need for systematic water treatment and regular quality monitoring.

3.2.6 Waterlogging

Waterlogging in Chintamani is currently confined to specific low-lying areas, where water remains stagnant for 2–3 hours following heavy rainfall. These instances are primarily associated with encroachments and blockages in the stormwater drainage system, particularly during continuous rain. Affected areas include KGN Colony, Venkatagiri Kote, and KR Extension linked to the Nekkundi catchment and Rajeev Nagar, Venkateshwara Extension, and Tippunagar under the Gopasandra catchment. While waterlogging is not currently perceived as a major concern, there are instances of WASH service disruptions, particularly





Map 6 - Water logging areas in Chintamani (Source - SAR Image Analysis)

affecting sewer network operations and solid waste collection.

Despite the current manageable situation, Chapter 4.1.3 provides a detailed assessment and identifies vulnerable areas to enhance the town's preparedness for potential future challenges. High-density areas, especially the slums are of particular concern, where waterlogging poses elevated risks due to potential mixing with septic tanks, which could lead to contamination of groundwater resources. This requires special attention in the town's climate resilience planning.

3.3 Identifying the Hazard Impact on WASH

The key hazards affecting Chintamani have been mapped against People, Water ecosystems and WASH systems to understand the extent of exposure. For WASH systems, the focus is on service impacts as assessed from the user's perspective, capturing disruptions at the point of service delivery along with impact on infrastructure. The service shall look at the access, equity, inclusivity and efficiency of services during the hazard time. The impact of the hazards on WASH has been categorized into high, medium and low based on the ground observation, data collected and extensive stakeholder consultations.

Figure 12 - Mapping detailed impact of hazards on people, natural environment, WASH infrastructure and WASH service delivery



Key Insights on climate impact on people, water ecosystems, WASH infrastructure and service delivery:

People

- High vulnerability to thermal stress and drought, indicating direct health and livelihood risks.
- Groundwater depletion and water quality degradation cause high perceived impact, pointing to equity concerns in water access.
- Occasional disruption from water logging and precipitation changes, showing need for resilience to these hazards.

Water Ecosystems (Surface and Groundwater)

- Drought causes severe stress on both surface and groundwater sources, threatening long-term water availability.
- Precipitation changes result in high but mixed impacts, potentially influencing recharge patterns.
- Groundwater depletion and water quality degradation impacts the quantity and quality of the major water resource in the town.

WASH Infrastructure

- No major infrastructure damage noted during droughts or groundwater depletion, indicating sufficient hardware—but source vulnerability remains.
- Largely resilient across most hazards, including precipitation change, thermal stress, and drought.
- Thermal stress affects solid waste infrastructure operations, hinting at heat-related equipment or workforce challenges.

WASH Service Delivery

- Drought most critically affects water supply services, with limited effect on solid waste.
- Precipitation change disrupts water supply and wastewater disposal but has minimal impact on toilet access.
- Groundwater depletion and quality degradation impact majorly water supply, leaving other services largely unaffected.
- Thermal stress has moderate impact across all services, including solid waste- Majorly linked to workforce operation challenge.
- Water logging affects only sanitation services (toilets and sewerage network operations), but at a very low-medium level.

Cross-Cutting Insights

- **Water Supply Vulnerability:** Most severely affected service across multiple hazards (drought, precipitation change, groundwater depletion, water quality, thermal stress).
- **Infrastructure Resilience:** Despite multiple hazards, minimal direct impact on infrastructure suggests that impacts manifest primarily through service disruption rather than physical damage.
- **Priority Hazards:** Drought, Groundwater depletion and thermal stress have the most widespread impacts across people, water ecosystems and WASH systems.



4

WASH VULNERABILITY ASSESSMENT

WASH systems are central to community health and resilience, yet in small and medium towns they are increasingly under stress from climate variability, rapid urbanization, and resource depletion. Vulnerable communities face the sharpest impacts, as limited access to safe water, sanitation, stormwater, and solid waste services intersects with climate hazards such as erratic rainfall, prolonged droughts, heat extremes, and flooding.

This section provides an integrated assessment of how climate risks intensify existing WASH vulnerabilities and emphasizes the urgency of building climate-resilient and inclusive WASH systems and services.



4.1

WATER RESOURCE AND SUPPLY MANAGEMENT





4.1.1 Water Resources

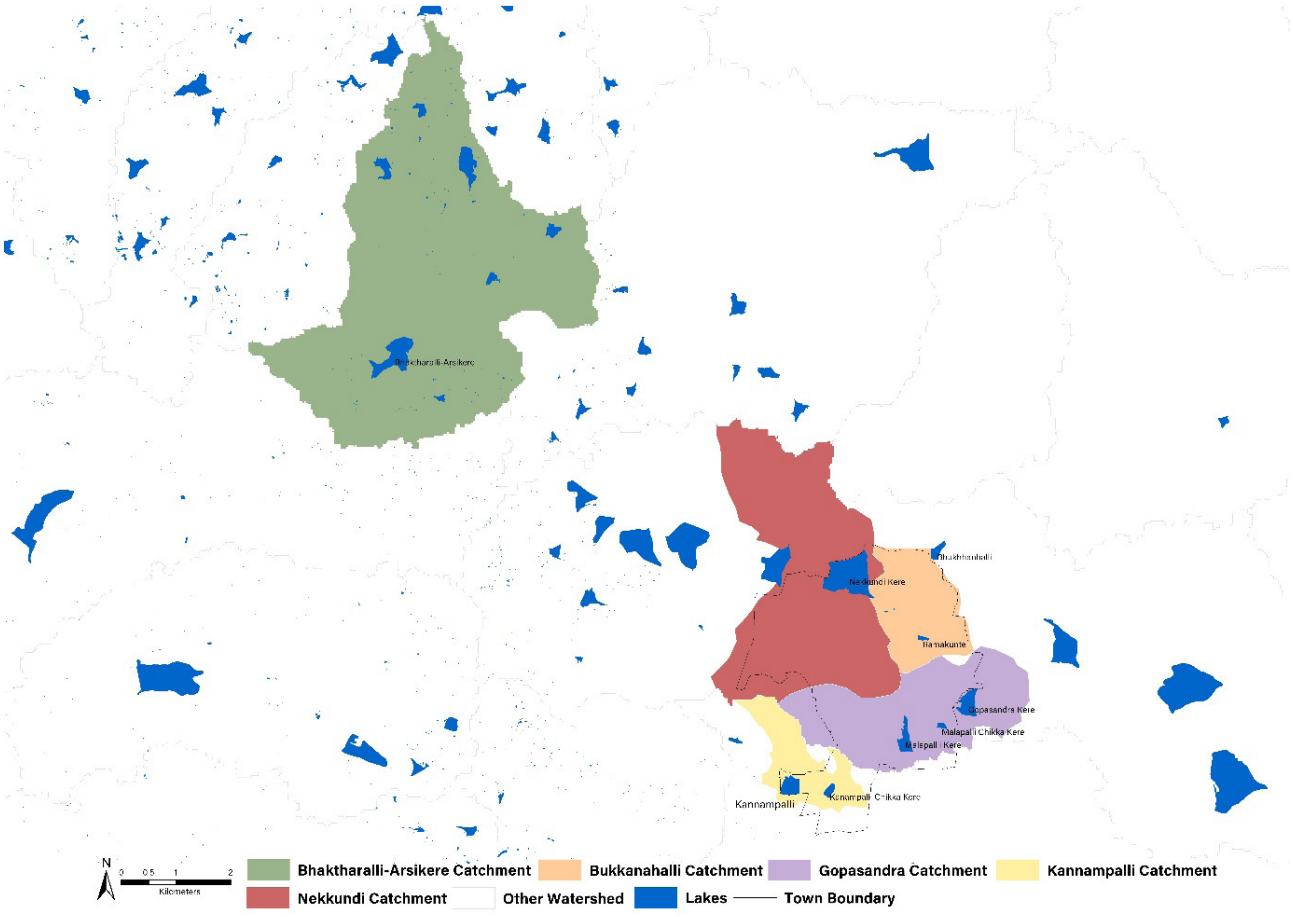
Chintamani's water security is under significant stress due to its overdependence on groundwater, which currently meets 60-80% of the town's water demand. In contrast, surface water mainly sourced from seasonal lakes contributes only about 40%, and is highly variable depending on rainfall patterns. This skewed reliance on groundwater has led to overexploitation, triggering declining water tables, reduced recharge rates, and long-term aquifer stress. With increasing climate variability, this imbalance poses a severe risk to the town's water resilience.

This section presents a comprehensive assessment of Chintamani's water resources, covering the status of key surface water bodies, trends in availability, groundwater dependency, recharge potential, and climate-induced vulnerabilities. It also outlines ongoing interventions, governance gaps, and recommendations to enhance the sustainability and resilience of the town's water system.

i. Surface Water

Status: Chintamani's eight lakes, spread across four catchments, hold substantial—but underutilized—surface water potential. Currently, Kanampalli (1.0 MLD) and Bhaktharahalli-Arasikere located 15.0 KM from the town (3.0 MLD for 6 months) supply most of the town's lake-sourced water, yet both exhibit seasonal unreliability. Nekkundi Doddakere—once a key supplier—is offline due to sewage inflow however, it is currently being restored, While Gopasandra was chronically contaminated by its proximity to the sewage treatment plant, it is now being rectified by cleaning and relaying the outfall sewer line laid along the Gopasandra tank, leading to the existing 2 MLD STP. Widespread pollution, infrastructure neglect, and seasonal drying constrain overall utilization; (detailed lake data is included in Annexure 2 and are summarized in Table 2.)

Seasonal Variability and Groundwater Pressure: Kanampalli Lake, the town's primary surface water source for more than two decades, has experienced significant fluctuations in water availability due to erratic rainfall and continuous groundwater extraction.



Map 7 - Catchment of surface water resources in and around Chintamani (Source – Hydrological Analysis over SRTM Dataset)

Table 2 - Status of Major Lakes in Chintamani (Source - TIDE - BORDA Assessments on Chintamani WASH)

Lake	Storage Capacity (Mcft)	Water supply Contribution	Pollution level	Operational Status	Intervention Status
Kanampalli	12.63 → 30.00 (proposed)	1.0 MLD	Mostly Dry in drought years, No pollution	Operational	AMRUT 2.0: Expansion
Nekkundi	31.00 → 75.00 (Proposed)	Abandoned due to pollution	Sewage inflow, algal bloom, Agriculture runoff	Degraded	AMRUT 2.0: Restoration
Bhaktharahalli Arasikere	35.00 → 100.00 (Proposed)	3.0 MLD (6 months)	Clean, backup source	Operational	Minor Irrigation (MI) Dept: Expansion
Gopasandra	-	Not used	Polluted, Wastewater inflow from damaged/ missing sewer network	Degraded	Neglected
Malapalli	-	Seasonal	Mostly Dry, wastewater inflow in small quantity	Non-Operational	Lake rejuvenation in progress
Chikka Kanampalli	-	Not used	Mostly Dry, illegal waste dumping	Non-Operational	Neglected
Bhukkanahalli		Not in use	To be filled	Non-Operational	Neglected

Key information

- Chintamani town's watershed comprises of four catchments spread across an area of 19.8 sq.km.
- Alarmingly, six of the town's seven water bodies face degradation due to anthropogenic pressures.
- Water quality samples collected from Nekkundi, and Gopasandra in 2022 were found to have quality issues as per drinking water quality standards, Kanampalli had occasional fluctuations; highlighting the importance of regular quality tests and the importance of WTPs.
- Spatial study indicates 37% decrease in the lake area between 1985 to 2025.
- Preliminary analysis from water balance study indicates that that over 50% of the town's drinking water needs could be met through local surface water.
- Kanampalli Lake levels fell below dead storage each dry season with March–April the most critical months.
- Bhaktharahalli - Arasikere serves as a critical backup water source for the during drought period with supply provision of 3.0 MLD for 6 months.



View of dried out Chikka Kanampalli







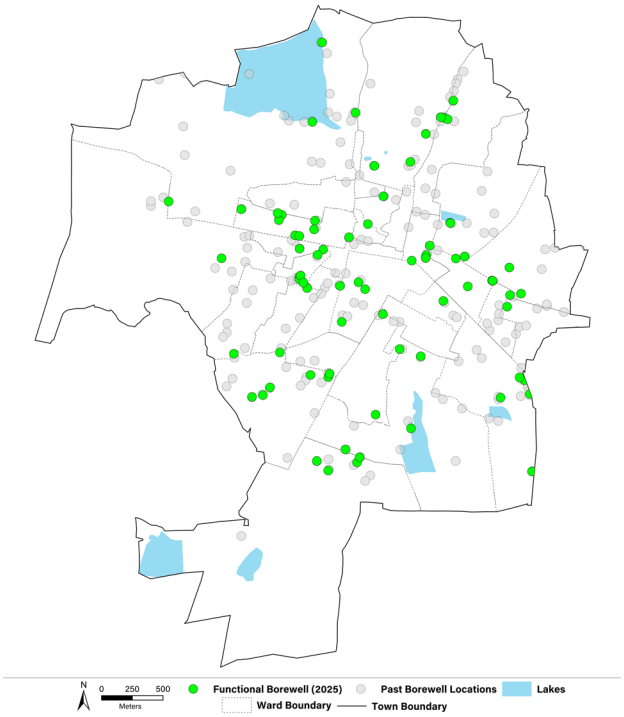




Kanampalli lake showing difference in water levels in the month of December in 2022 and 2024

Over the 2016–2025 period, Kanampalli Lake levels fell below dead storage each dry season (October–May), with March–April being the most critical months. Although 72.5% of rainfall arrives in the monsoon (June–October), erratic monsoon patterns and extraction for municipal, agricultural, and domestic uses have led to occasional recharge deficits. Severe stress occurred during drought years (2018–2020, 2023–24, and 2025). As surface sources falter, the town increasingly relies on groundwater for 75–80% of demand, driving overexploitation and declining aquifer resilience.

These patterns highlight the need for better water management, including frequent monitoring of water sources, enhanced storage, and drought contingency plans, to mitigate the growing dependency on groundwater.



Map 8 - Map showing functional and past borewell sites (Source - Chintamani City Municipal Council, 2025)

ii. Groundwater

Groundwater Status in Chintamani: Chintamani's water security is heavily reliant on groundwater, which currently meets nearly 75% of domestic demand. The town sits on a hard rock aquifer system, where water is stored primarily in fractured granite and weathered gneiss. However, groundwater is increasingly unreliable—municipal data from 2020 reveals a 40% borewell failure rate, and as of 2024–25, only 140 out of 322 borewells remain functional. Over-extraction, limited recharge, and deep drilling (over 40% of borewells exceed 1,000 feet) reflect a stressed aquifer system. Water quality test done for borewell water in 2022 indicate critical quality parameters within the permissible range particularly nitrate and fluoride, for select borewells in the town.

Seasonal Variability and Drought Impacts: Chintamani's groundwater availability is highly sensitive to rainfall variability. During drought years like 2018, 2020, and 2023, the number of functional borewells dropped significantly, directly correlating with poor recharge and excessive extraction. For instance, only 25 borewells remained functional in 2018. In contrast, years with good rainfall, such as 2022, saw improved borewell performance. These trends highlight the dependence on the aquifer on monsoon recharge and the urgent need to regulate extraction during dry spells.

> Invisible and unregulated, groundwater in Chintamani is in systemic decline.
>
> Groundwater availability in Chintamani is closely tied to fluctuations in rainfall.

Hydro-connectivity Between Lakes and Aquifers and Recharge Potential: Preliminary evidence indicates surface–subsurface linkages exist between lakes and underlying aquifers. Borewells near Nekkundi and Malapalli lakes exhibit improved post-monsoon yields, likely due to recharge from surface water percolation. Vertical Electrical Sounding (VES) surveys identify deeper fracture zones around these lakes, suggesting promising recharge corridors. Strengthening this hydro connectivity through mapped recharge zones, yield monitoring, and nature-based infiltration structures is vital to improve groundwater sustainability.

Projected Climate Trends and Implications: By 2050, Chikkaballapura district is expected to experience a 1.5–2°C rise in average temperature and increasingly erratic rainfall, characterized by cyclic dry spells interrupted by short, high-intensity precipitation. Climate projections under both SSP2-4.5 and SSP5-8.5 scenarios indicate that Chintamani will face a dual challenge: intensifying heat and irregular precipitation, with rainfall concentrated in brief episodes that limit natural recharge. Projected increase in annual rainfall is also an opportunity to store more rainwater either by increasing surface water storage capacity

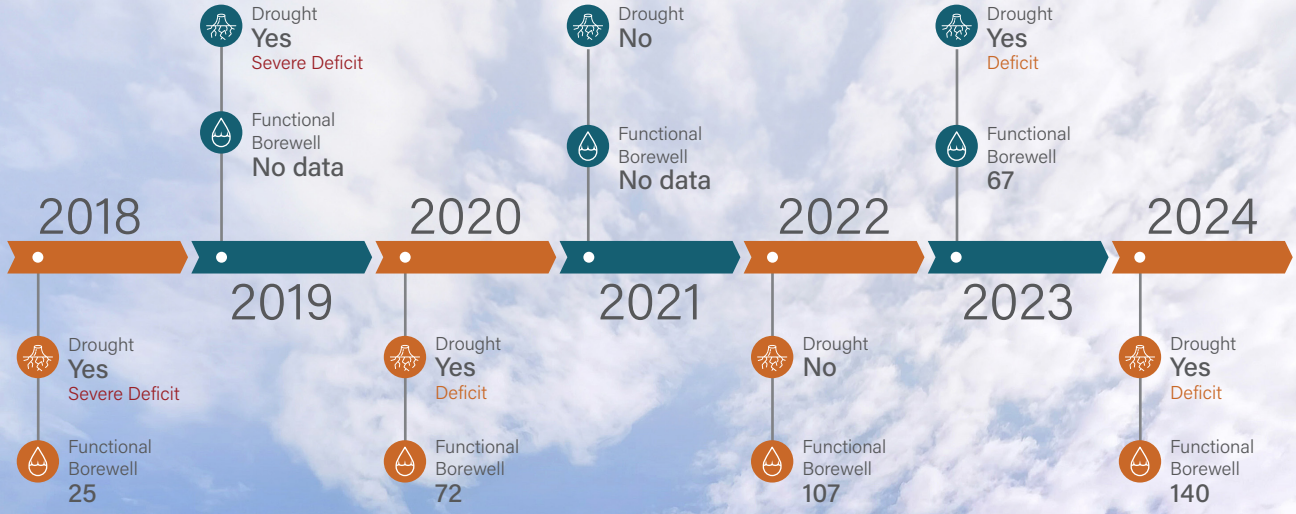
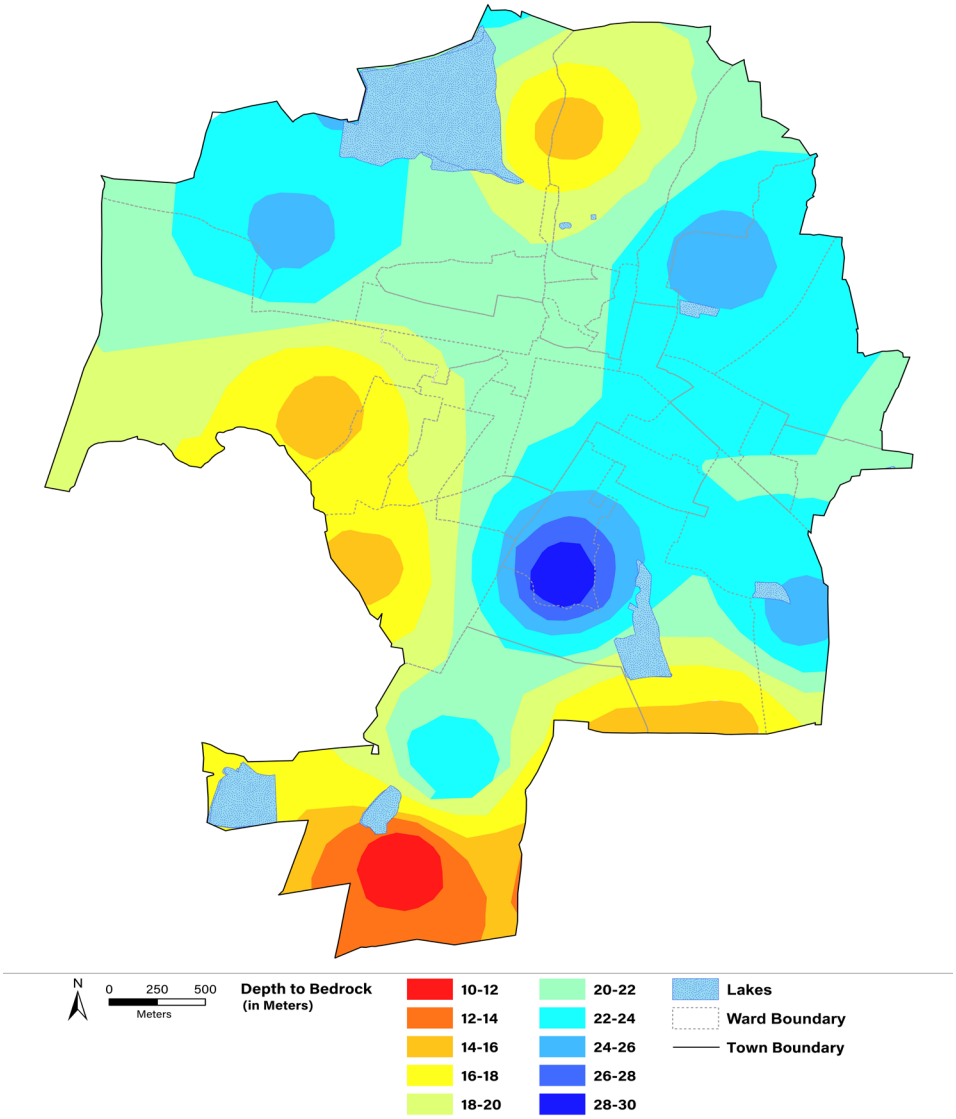


Figure 13 - Drought years and borewell functionality mapping from 2018 to 2024
(Source - Chintamani City Municipal Council, District Diaster Management Plan 2024-25)





Map 9 - Depth to bedrock map indicating potential recharge sites, 2022 (Source - Mapping Water in a Small Town: Insights from Chintamani, Karnataka, 2023)





Multiple borewells pumping water into GLSR

or groundwater recharge. Rising temperatures and more frequent heatwaves will further accelerate evaporation, placing greater stress on already stressed surface reserves. While current groundwater quality in Chintamani remains within safe limits, nearby areas have reported elevated nitrate, continues fluoride, and uranium levels, with the latter linked to declining water tables. If over-extraction continues, water quality is likely to deteriorate, compounding risks to public health and water security.

> In the future, Chintamani will face hotter days, flashier rains, and deeper aquifers—with water that is not just scarce, but increasingly unsafe.

iii. Ongoing and proposed improvement

This increasing vulnerability due to seasonal water stress and overreliance on groundwater underscores the urgency of long-term solutions—making the Yethinahole Project a pivotal intervention to stabilize Chintamani's water supply and build future resilience. A list of the current and proposed projects is included in Annexure 2.

By March 2027, the Yethinahole Project is planned to deliver a significant, reliable surface water supply (162 Mcft) and double the strategic storage capacity, providing crucial drought resilience and relieving immediate pressure on groundwater. This major infrastructure achievement – the essential first pillar of Chintamani's water security – strategically focuses resources where they are most impactful right now: building the core capacity to receive, store, and distribute this new water source efficiently.

This strong foundation creates the opportunity to build the equally important second pillar, i.e., holistic water sustainability. With the core system established, Chintamani can synergistically expand efforts to restore all its lakes, implement widespread groundwater recharge programs, and enhance the entire watershed's health. In addition to creating new water resources, the Yethinahole Project, is the catalyst empowering to build a truly resilient and sustainable water future for generations to come. Continued collaboration will ensure we maximize both the project's benefits and our town's long-term water health.

> **Yethinahole Project**
> To mitigate the problem of acute drinking water in drought prone districts in eastern and central Karnataka, the Government of Karnataka has accorded approval to divert 24.01 TMC of water from west flowing streams to cater the drinking water needs. While the Stage-1 of the project was commissioned in September 2024, transfer of water to Chikkaballapura district through gravity canal is being completed, and the projected is expected to complete by March 2027.





The selection of Kanampalli, Nekkundi, and Bhaktharahalli-Arasikere for expansion was driven by their larger catchments, existing infrastructure, and suitability for storing Yethinahole water close to urban zones. However, lakes like Gopasandra, Malapalli and others despite being underutilized, offer strong natural recharge potential through lake-bed percolation and must be prioritized alongside to ensure balanced and sustainable water management. The successful shift away from unsustainable groundwater reliance is already underway. Some key potential benefits and opportunities are detailed in Table 3.

Table 3 - Yethinahole Project – Benefits, trade-offs and opportunities for action

Key Benefits	Strategic Trade-offs and Opportunities for Action
Reliable Water Supply: 162 Mcft allocation provides year-round bulk water security.	**Dependence on external supply**: Ensure contingency planning, operational coordination, and advocate for delivery guarantees within state water-sharing frameworks.
Doubled Surface Storage: Lake capacity increased from 122.23 to 248.63 Mcft.	**Four lakes prioritized**: This momentum can be utilized to initiate phased revival of other neglected lakes (e.g., Gopasandra, Bhukkanahalli) to build catchment-wide resilience.
Shift from Groundwater Dependency: Reduces pressure on aquifers, lowering over-extraction.	**Groundwater recharge lagging**: Integrate large-scale recharge structures, rainwater harvesting, and aquifer mapping to ensure sustainable dual-source security.
Drought Resilience Boost: Combines local runoff + imported water for multi-year buffering.	**Hydrological variability risk**: Develop adaptive lake management protocols, install real-time monitoring, and invest in decentralised storage during poor allocation years.
Infrastructure Modernization: Upgrades to storage, conveyance, and treatment systems.	**High capital investment**: Ensure systems are designed for long-term O&M viability and energy-efficient operations; co-finance through convergence with climate and Jal Jeevan Mission funds.
Platform for Integrated Planning: Enables data-driven supply management.	**Governance complexity**: The project can be used to build local institutional capacity and a multi-agency coordination cell for integrated water resource management (IWRM).
Improved Public Confidence: Visible infrastructure instils hope and legitimacy.	**Ecological restoration gap**: Position Lake beautification and biodiversity conservation as public engagement strategies co-funded with eco-tourism/CSR and/ or MGNREGA activities.
Climate Adaptation Backbone: Buffers temperature extremes and rainfall variability.	**Engineered focus risk:** Use climate funds to incorporate nature-based solutions alongside grey infrastructure (e.g., wetlands, green buffers, recharge parks).

Key Challenges in Chintamani's Water Resources Management:

- **Overdependence on Groundwater:** 75–80% of water supply is from stressed hard rock aquifers, with over 40% borewells deeper than 1,000 feet and only 140 of 322 borewells sites are functional as of 2024–25.
- **Underutilized and Degraded Surface Water:** Despite the presence of eight lakes, widespread pollution, seasonal drying, and infrastructure neglect, limit their contribution to just 20–25% of supply.
- **Climate Sensitivity and Drought Risk:** Both surface and groundwater systems are highly vulnerable to erratic rainfall and prolonged dry spells, as seen in multiple drought years (2018, 2020, 2023–24), leading to sharp declines in borewell yield.
- **Singular Focus on Yethinahole Project:** The disproportionate investment in augmenting only two lakes to absorb Yethinahole inflows has diverted attention from holistic lake revival and groundwater recharge, increasing long-term water security risks.
- **Weak Lake–Aquifer Integration:** The absence of mapped recharge zones and supporting infrastructure hampers efforts to strengthen lake-aquifer hydro-connectivity.
- **Lack of Monitoring Tools Limits Preparedness:** The town lacks real-time monitoring and early warning systems for groundwater levels, lake storage, and climate impacts, impairing data-driven planning and adaptive management.
- **Rising Climate Risks:** Projected increases in temperature and rainfall variability by 2050 are expected to intensify pressure on already fragile water systems.

Chintamani's water resources sector is evolving, with significant investments in lake storage augmentation aimed at reducing groundwater dependency. However, groundwater recharge efforts are limited and unstructured. Project implementation remains uneven, with most initiatives still in planning stages, and coordination is challenged by fragmented institutional responsibilities. The lack of real-time monitoring and data systems further constrains effective management and long-term climate resilience.




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4.1.2 Water Supply

Chintamani's water demand is primarily residential and commercial, with negligible industrial use. The 2022 water balance study found average per capita usage at just 75 liters per day, which is well below the 135 lpcd standard for cities with sewer systems. Consumption patterns reveal significant disparities: 70% of households surveyed use only 45 to 70 lpcd, while the remaining 30%, typically higher income groups consume 100-175 lpcd. This variation reflects underlying socio-economic differences, with 29% of households surveyed located in lower-income neighborhoods across 16 of the town's 31 wards.

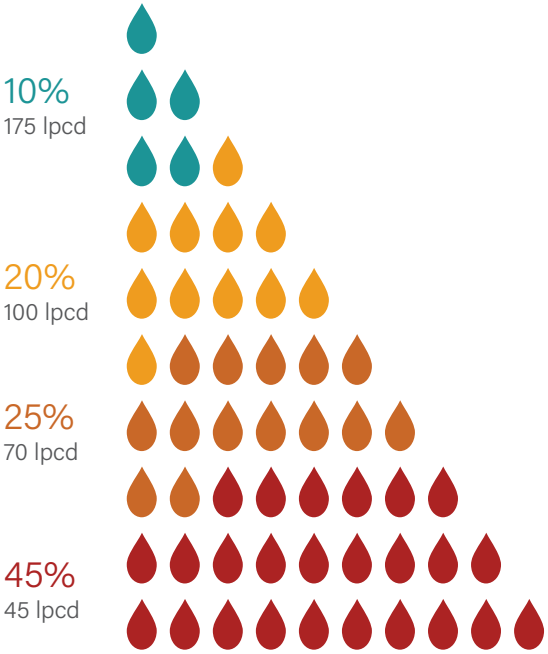


Figure 14 - Per capita water consumption (Source - Mapping Water in a Small Town: Insights from Chintamani, Karnataka, 2023)

> Water Inequity: Nearly half of Chintamani's low-income residents receive less than half the recommended daily water, exposing stark service inequities

i. Demand and Effective Supply

Usage based estimates for 2025 show residential water use at 6.9 MLD and commercial/institutional use at 0.33 MLD, totaling 7.23 MLD nearly half the CPHEEO standard of 13.84 MLD. Over half of commercial and institutional establishments rely solely on private sources. Effective municipal supply (4.6 MLD) meets just 64% of this demand, with the remaining 36% covered by private borewells and tankers. Groundwater extraction accounts for 85% of all water



drawn, reflecting unsustainable dependence despite the addition of new surface water sources in 2024. Dependence despite recent surface water additions (Bhaktharahalli - Arasikere water supply scheme) in 2024.

> **Supply gap and groundwater dependency:** As of 2025, effective municipal supply meets only 45% of Chintamani's total water demand (at 25% below current usage standards), forcing a critical reliance on private and unsustainable groundwater sources.

ii. Projected Demand

Projections show that, with an ideal supply of 100 lpcd (25% below CPHEEO standards), the demand-supply gap will widen from 55% in 2025 to 67% by 2040 under business-as-usual, highlighting the inadequacy of current infrastructure and questioning the suitability of uniform national standards for Chintamani's socio-economic context.

Table 4 - Summary: water demand vs supply

Component	Annual flow (MLD)	Data referenced
Domestic water consumption	6.9	at 75 lpcd as per the HH survey conducted in 2022
Commercial water consumption	0.33	per establishment (unit consumption) water meter survey 2022, TIDE
Total demand for 2025	10.26	at 100 lpcd based on 2025 projected population of 102,568
Supply from Bhaktharahalli - Arasikere reservoir	1.5	3.0 MLD available for 6 months, as per municipal records
Supply from Kanampalli	0.75	As per municipal records
Supply from CMC Borewells	3.5	Mapping Water in a Small Town: Insights from Chintamani, Karnataka, 2023
Total municipal supply	5.75	As per municipal records
Effective municipal supply	4.6	20% losses (Assumption - overflow and leakages)
Private supply (individual BWs, tankers)	2.63	As per consultations with private suppliers and CMC

Table 5 - Analysis and projection of future demand and supply

Year	2022	2025	2030	2035	2040
Population	92,802	1,02,568	1,19,184	1,28,501	1,37,872
Demand as per CPHEEO standards (MLD)	12.5	13.8	16.1	17.3	18.6
Ideal water requirement- 100 lpcd (MLD)	7.0	10.3	11.9	12.9	13.8
Effective municipal supply -Business as usual scenario (MLD)	3.8	4.6	4.6	4.6	4.6
Gap in municipal supply (MLD)	3.1	5.7	7.3	8.3	9.2
Supply gap (%)	45%	55%	61%	64%	67%

Chintamani's widening demand-supply gap underscores the urgent need for tailored water management strategies that address local socio-economic and climatic realities.

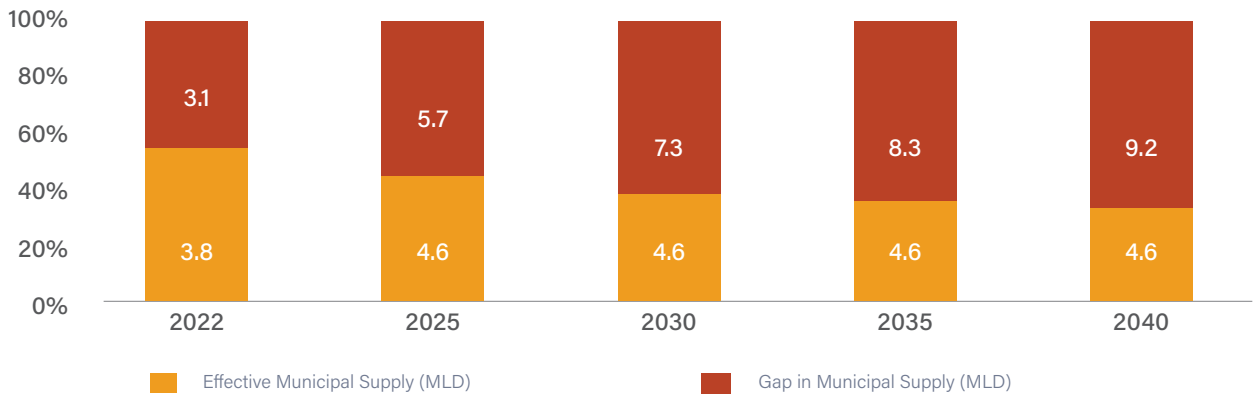


Figure 15 - Effective Water Supply vs Water Demand in the town

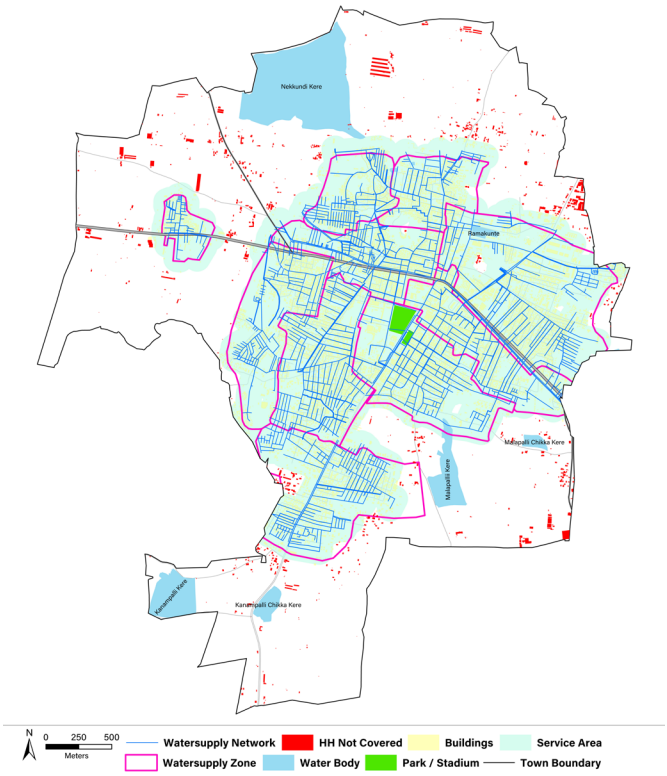
iii. Service Coverage and Gaps

Chintamani's water network spans approximately 250 kilometers (considering the fact that networks are laid on both sides of the road in few parts of the town), with municipal data suggesting that 98% of households have some form of access. However, detailed surveys reveal that only 67% have a functional household tap connection (FHTC), and about 1,322 properties remain outside the network, highlighting persistent vulnerabilities.

Key Insights from the Household Survey (Figure 16)

Overwhelming Reliance on Municipal Supply: 96% of households depend on municipal water as their primary source, with minimal use of private borewells, community wells, or tankers.

Severely Limited Supply Frequency: 76% of households receive water only once a week, while just 3% get daily supply, indicating highly inadequate and irregular service.



Map 10 - Water supply service coverage in Chintamani (Source - Chintamani City Municipal Council, Open Building Dataset. Spatial Data Analysis)

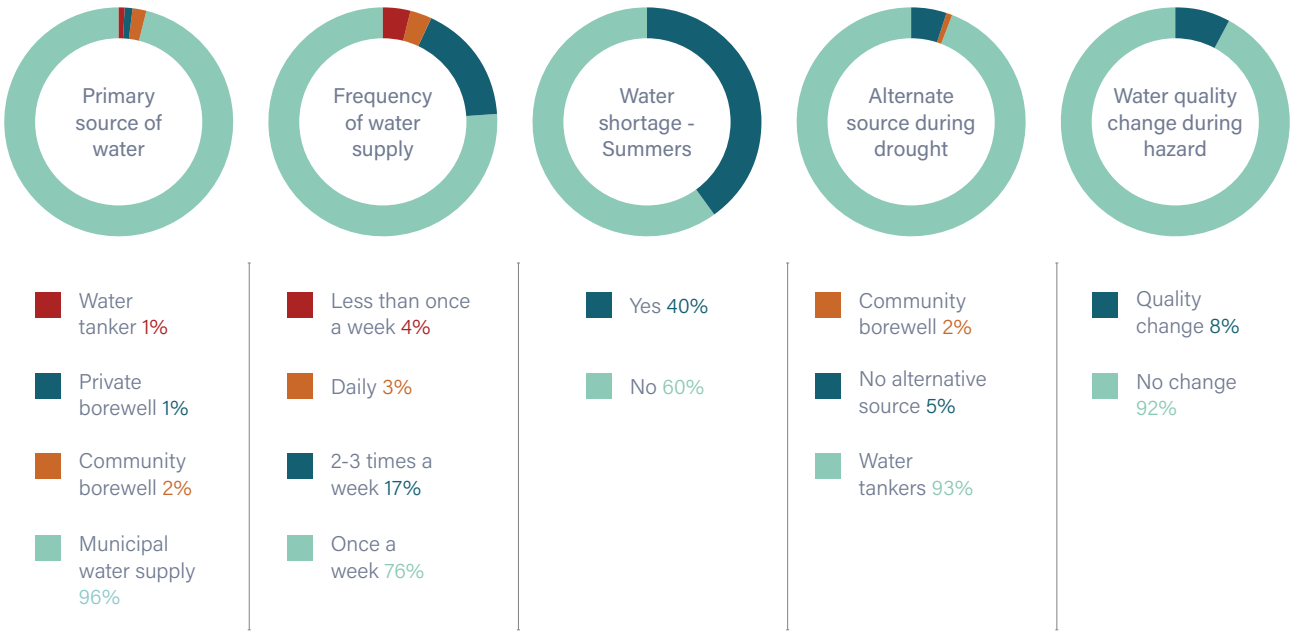


Figure 16 - Key findings of household survey (Source - TIDE - BORDA Assessments on Chintamani WASH)

Seasonal Vulnerability: Water shortages intensify during summer and drought periods, with supply frequency and duration dropping further for the most vulnerable residents.





Widespread Seasonal Shortages: 40% of households experience water shortages during summers. Municipal supply frequency and hours are also altered as per water availability, which is determined by reduction in borewell yield or availability of surface water. This highlights the system's vulnerability to seasonal stress and droughts.

Dependence on Private Tankers During Drought: During droughts, 93% of households turn to water tankers as their alternate source, reflecting a heavy reliance on costly and unregulated private supply when municipal systems fail.

Water Quality Remains Largely Unchanged During Hazards: 92% report no change in water quality during hazards, but 8% do experience quality deterioration, indicating some risk during supply disruptions.

iv. Vulnerability in Slums

All 17 notified slums in Chintamani lack direct tap connections and have public taps, while slums like Ambedkar Colony, Venkatagirikote Colony, NNT Colony, JJ Colony, Nallagutta, Hyderali Nagar, Malapalli, Bamboo Bazar, Tippu Nagar, and Thapteshwara Colony depend on just 1-2 shared public taps or standposts per street. These taps serve multiple households and are usually insufficient, leading to long queues and frequent conflict, even in normal times.

During droughts, when borewells and surface sources like Kanampalli run dry, supply in these slums drops from once a week to once every 10 days, with hours reduced to just 1–1.5 hours, making it hard to meet basic needs. Residents store water in open drums and barrels, risking contamination and poor drinking quality.

> Chintamani's slums face acute water insecurity due to irregular, inequitable supply from shared taps, unsafe storage, and unaffordable alternatives, underscoring the urgent need for inclusive and resilient water solutions.

For drinking and cooking, many slum households pay extra at water ATMs, while municipal supply is used for washing and bathing, increasing both effort and expense. The absence of functional household tap connections (FHTCs) and equitable access means women and children spend longer waiting for water. During severe shortages, families must rely on expensive private tankers, which many cannot afford, leading to compromised hygiene.

Larger or wealthier households can store more water, while smaller and lower-income families struggle most. Despite some recent improvements in supply frequency, these slum communities remain highly vulnerable, highlighting the urgent need for inclusive infrastructure, targeted support, and resilient water management in Chintamani's slums.

v. Private Tankers: Unregulated and Unmonitored

During shortages, 95% of Chintamani households rely on private water tankers, exposing major gaps in the municipal supply. Tankers, ranging from 250 to 6,000 liters, double in price during the dry season, burdening the urban poor, while most remain unregulated and unmonitored by the municipality.

> **Private Tanker Hotspots:** Gandhi Nagar, Bamboo Bazar, Azad Chowk–Bukkanahalli Road, Doddapette Road, Diamond Thakis Road, JJ Colony, Central market area, and Ward 31 see the highest private tanker demand-driven mainly by over 2,000 commercial establishments (less than 10% with municipal supply) and concentrated residential demand in JJ Colony, Ward 31, and the market area.

Dependence on unregulated, private tankers pose several risks:

Water Quality and Health Risks: Private tankers and borewells are often unmonitored and untreated, increasing the risk of contamination and waterborne diseases.



Although 96% of Chintamani households depend on municipal water, unreliable supply and frequent shortages force heavy reliance on unregulated private tankers- posing serious health, financial, and equity risks, and highlighting the urgent need for dependable, equitable, and well-managed water services.

Financial Burden: Prices for private tanker water can double during shortages, disproportionately impacting low-income households and increasing inequality.

Supply Unreliability: Unregulated sources may not provide consistent or adequate supply, especially during droughts, leaving vulnerable communities at risk of severe shortages.

Groundwater Depletion: Heavy reliance on unregulated, private borewells accelerates groundwater extraction, threatening long-term water security for the entire town.

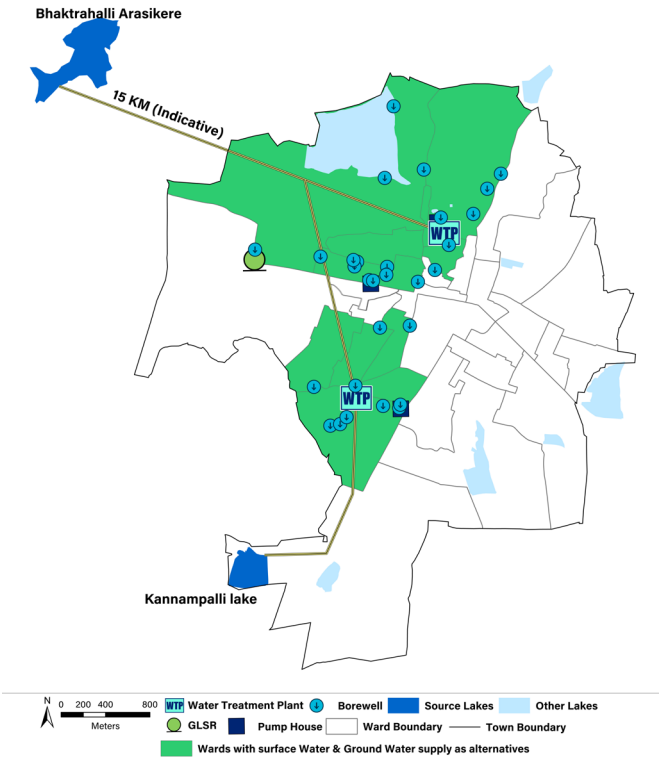
Lack of Accountability: With no municipal records or oversight, there is little transparency or recourse for residents facing poor quality or unfair pricing.

Inequitable Access: Wealthier households and businesses can secure more water from private sources, while the poorest are often left without, deepening social disparities.

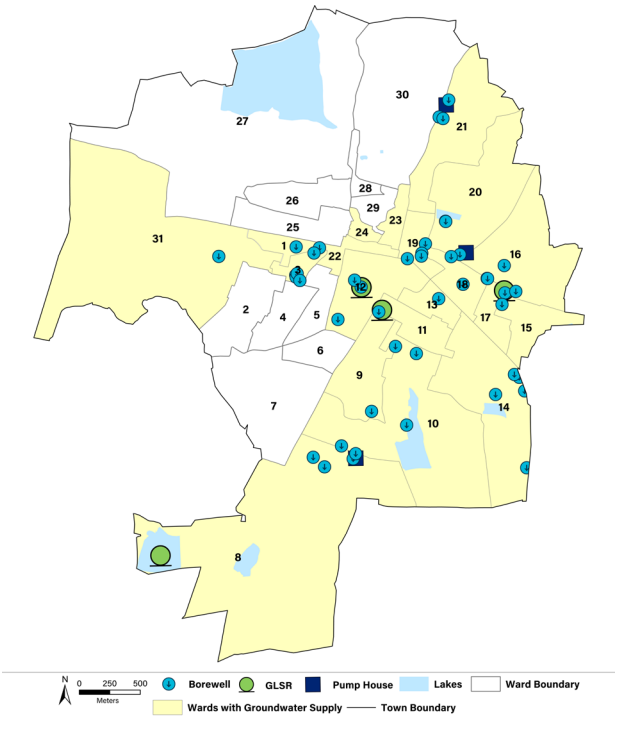
This widespread, unmonitored reliance on private tankers highlights the urgent need for better regulation and investment in municipal water infrastructure to ensure safe and equitable access.

vi. Water distribution systems

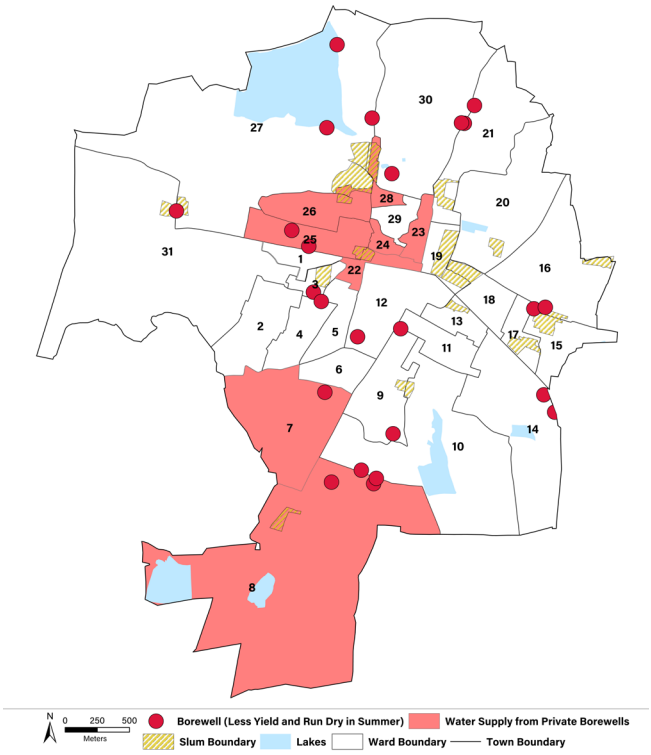
Chintamani's water supply combines surface water from intake wells and Water Treatment Plants (WTPs), distributed via storage tanks and a 350 km network, with groundwater from 140 borewells pumped to Overhead Tanks (OHTs). Some borewells connect directly to the network. The town is split in two zones as indicated in the Maps 11 and 12 below:



Map 11 - Wards having surface and groundwater supply as an alternative source (Source - Chintamani City Municipal Council Data, Open Building Dataset. Spatial Data Analysis)



Map 12 - Wards that entirely depend on groundwater source (Source - Chintamani City Municipal Council Data, Open Building Dataset. Spatial Data Analysis)



Map 13 - Areas dependent on hired private borewells and high risk borewells (Source - Chintamani City Municipal Council Data, Open Building Dataset. Spatial Data Analysis)

- **38% of wards** (Wards 2, 4 to 7, 25 to 30) have both surface and groundwater, offering some drought resilience (Map4).
- **62% of wards** rely solely on groundwater, making them highly vulnerable during shortages (Map 5)
- **Eight wards remain officially water-scarce** and dependant on hired private borewells (Ward no. 7, 8, 22 to 26 and 28) which are centrally located and densely populated remain officially water-scarce and depend on emergency tankers. They continue to receive state finance drinking water security funds to hire private borewells and tankers since 2018. (Map 6)
- **35% of functional 140 borewells** are at high risk of running fully dry or provide very low yield during peak summers.

Droughts, like in 2018, left only 25 of 200+ borewells functional, forcing daily use of 300–400 private tankers. The new Bhaktharahalli scheme (2024) now provides backup surface water to 38% of households, but most still depend on borewells, many of which run dry in summer.

vii. Water treatment infrastructure

The Ashraya Layout WTP (1.63 MLD) is vital for Chintamani's supply but faces operational issues due to outdated infrastructure and poor maintenance, though post-renovation water meets IS 10500:2012 standards. The Agrahara WTP, previously idle due to Nekkundi Lake pollution, now treats 1.5 MLD from the Bhaktarahalli reservoir, while borewell water remains untreated and is supplied directly to households. Together with the Ashraya Layout WTP, these plants form the backbone of Chintamani's water supply, but both face operational challenges and inconsistent performance. Despite recent improvements, the combined treatment capacity (3.13 MLD) still falls short of demand by 2.62 MLD. Reliable, expanded, and consistently managed treatment infrastructure is urgently needed to ensure safe and adequate water for all residents.

> Chintamani's heavy reliance on borewells and limited surface water backup creates stark zonal disparities and acute drought vulnerability, underscoring the urgent need for resilient, equitable water infrastructure.



1.63 MLD WTP in Ashraya layout

Chintamani's limited and inconsistently performing water treatment infrastructure leaves most households reliant on untreated groundwater, heightening health and supply risks.

Table 6 - Existing Water Infrastructure for Chintamani

Infrastructure	Details
Network length	Main distribution water lines across the city are of approximately 250 km length
Water treatment plant	The Ashraya Layout WTP (1.63 MLD) Agrahara WTP (1.5 MLD)
Functional borewells	At present 140 borewells are functional 25 borewells under renovation (planned as back up water points)
Pumphouse	9 pumphouses across the town located in strategic locations Pumphouse receives water from multiple borewells and supply water to various wards
OHT	4 OHTs across the town are having a height of 100feet and the storage capacities range from 1lakh to 5lakh liters.
GLSR	6 Ground level service reservoirs Capacity ranging from 50000 lakh liters to 5lakh liters.

viii. Unauthorized connection and distribution losses

The system suffers from widespread unauthorized access, with only 8,939 official connections out of 27,655 properties (32% coverage) and distribution losses are critical challenges in Chintamani, undermining both the financial viability and equitable delivery of the town's water supply system. Key issues leading to revenue and water losses include:

High Connection Costs: Steep upfront fees (Rs. 4,500 residential/Rs. 8,500 commercial) drive poorer households toward illegal (Rs. 500–1,000), unbilled connections, increasing non-revenue water (NRW) losses.

Unbilled Slum Supply: All slum connections are unmetered and unbilled, accounting for 20% of households and significant revenue leakage.

Aging Infrastructure: Decades-old pipelines with key assets dating back to the 1970s–1980s leading to frequent pump and valve failures, and manual operations result in persistent leaks, overflows, and long repair times.

Lack of Modern Monitoring: Absence of household meters, bulk flow meters, and real-time tank monitoring prevents accurate tracking and management of water overflows.

Operational Inefficiencies: Manual valve operations and intermittent supply with pressure surges worsen leaks and stress old pipes.

Enforcement Gaps: Delays in penalizing illegal connections and poor billing systems perpetuate unauthorized access and financial losses.

Systemic inefficiencies, unauthorized access, and outdated infrastructure drive high water and revenue losses in Chintamani, perpetuating scarcity and inequitable access-especially for the most vulnerable.



Water loss due to pipe damage

ix. Climate Change Implications

Climate change is intensifying Chintamani's water challenges by increasing the frequency and severity of droughts, reducing groundwater recharge, and causing greater variability in rainfall patterns. These shifts exacerbate existing supply-demand gaps, with already vulnerable communities-especially those reliant on borewells or limited public taps-facing heightened risk of prolonged shortages. Seasonal water scarcity is becoming more acute, forcing greater dependence on costly, unregulated private sources and deepening inequities in access. Without urgent adaptation measures and investment in resilient infrastructure, climate impacts threaten to undermine the sustainability and reliability of Chintamani's water supply for years to come.

- **Demand–Supply Deficit**: Municipal supply meets just 45 % of 2022 demand, slipping to 33 % by 2040 with business as usual scenario amid a real usage of 75 lpcd vs the 135 lpcd norm.
- **Coverage vs Connectivity**: Network reaches 98 % of plots but only 67 % have working household taps; 1,322 properties remain off-grid.
- **Slum Water Insecurity** All 17 slums rely on 1–2 public taps, dropping from weekly to once-in-ten-days in drought; open-drum storage and water-ATM fees raise health and cost burdens.
- **Zonal Disparities**: With just 38 % of wards on both surface and groundwater, the other 62 % rely solely on borewells.
- **Dependency on state water security funds**: Due to shortage eight wards officially water-scarce continue to receive SFC drinking water security funds to hire private borewells and tankers since 2018.
- **Groundwater Overdraft** Borewells supply 85 % of water; High borewell dysfunctionality reduced from 300+ borewell sites to current 140 functional borewells of which 35% of them are at high risk.
- **Treatment and Network Losses** Two WTPs treat 3.13 MLD versus a 5.75 MLD draw; 20 %+ leaks in 250 km of aging pipes.



- **Unregulated Private Tankers**: 95 % of households use tankers in shortages; prices double in summer, deepening inequity.
- **Climate-Driven Volatility**: Erratic monsoons and worsening droughts exacerbate zonal disparities

x. Ongoing and proposed initiatives

Increasing treatment capacity of Agrahara and Ashraya WTPs which is already implemented to 3MLD capacity each is happening under AMRUT 2.0, aiming to boost treatment capacity and improve supply resilience. Additionally, after implementing AMRUT 2.0 by providing 5.9km feeder main from existing WTPs to OHT/GLSR, surface water supply will be provided to Chelur road Mehabub Nagar, Idli Palya, NR Extension, Anjani Extension, Ashraya Layout, Narasimhapette, Agrahara, Azad Chowk, Thimasandra, JJ colony and Venkatagiti Kote. The town is also automating borewells at Chelur Road and investing in new and repaired borewells to stabilize groundwater supply. Details of the projects are included in Annexure 3.

Chintamani's water security hinges on, much more than new surface schemes and treatment plants. True resilience also requires safeguarding and managing existing aquifers, rehabilitating aging pipes to cut losses, and guaranteeing equitable access for every ward. By blending surface sources, sustainable groundwater practices, decentralized systems, real-time monitoring, demand management and active community stewardship, the municipality can close the growing gap, adapt to climate extremes and deliver safe, reliable water for all.



4.1.3 Storm Water

Chintamani's stormwater system consists of a network of natural and constructed drains, including approximately 2.5 km of Raja Kaluve that connect four main catchments to local lakes. New covered and uncovered street drains supplement this network, but overall coverage remains incomplete and many natural drains have disappeared due to urban growth.

i. Key Issues

Encroachment and Mandates: 446 properties are built over the Raja Kaluve, violating the Chintamani Master Plan Zonal Regulation, 2031, which mandates a 9.0-meter buffer for Raja Kaluve and 3.0 meters for minor drains. Encroachment is severe in densely populated areas like KGN Colony, Venkatagiri Kote, KR Extension, and parts of Gopasandra catchment.



Map 14 - Encroachment of the natural stormwater drains
(Source - Chintamani City Municipal Council, Open Building Dataset. Spatial Data Analysis)

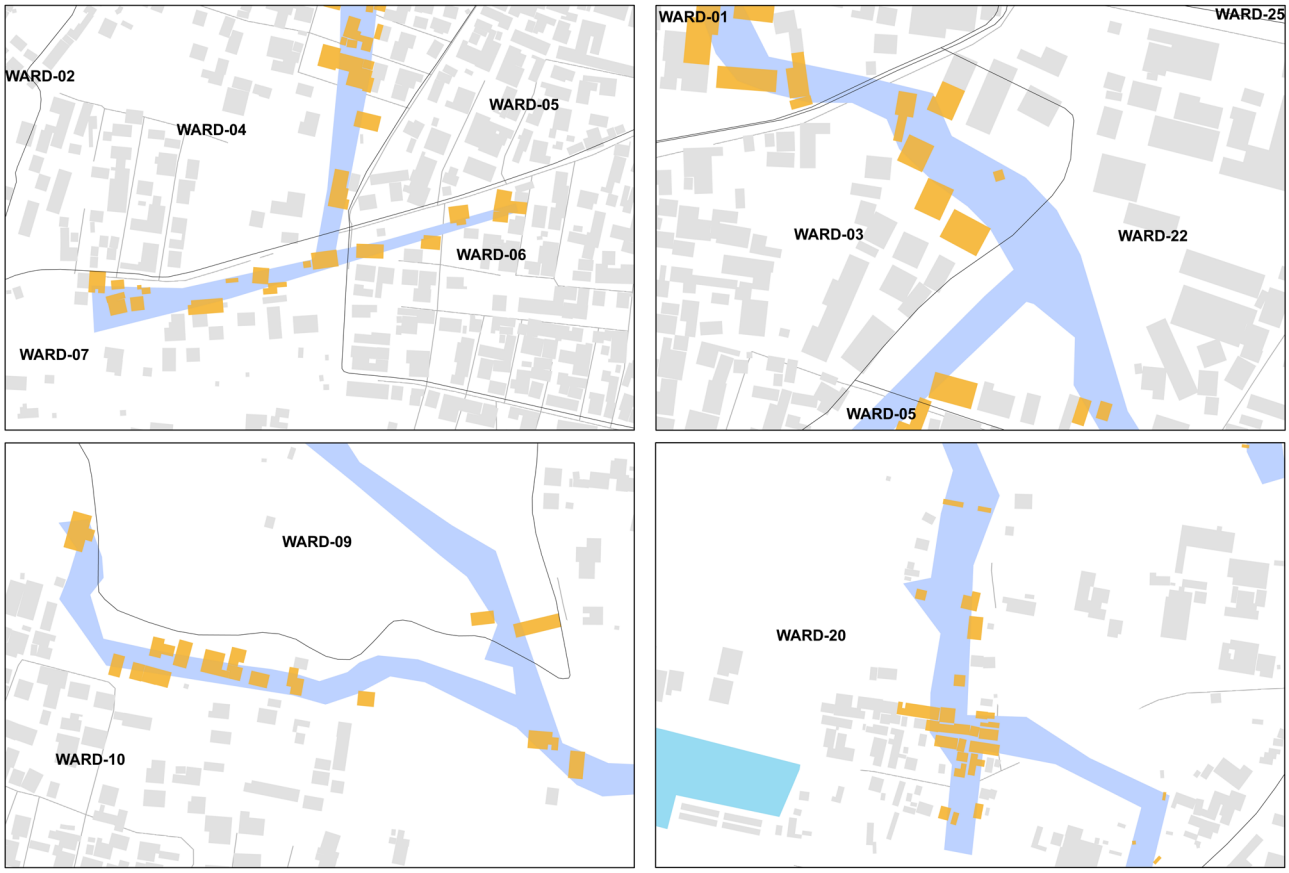


Figure 17 - Built up area/encroachment over stormwater buffer zones as per Master Plan 2031

Solid and Liquid Waste Disposal: Direct discharge of household greywater and rampant solid waste dumping into drains is common, especially in slum areas. There are four major mixing spots around Nekkundi, Gopasandra and Malapalli lake where wastewater is entering, and around sixty open dump sites clog drains and pollute water bodies.

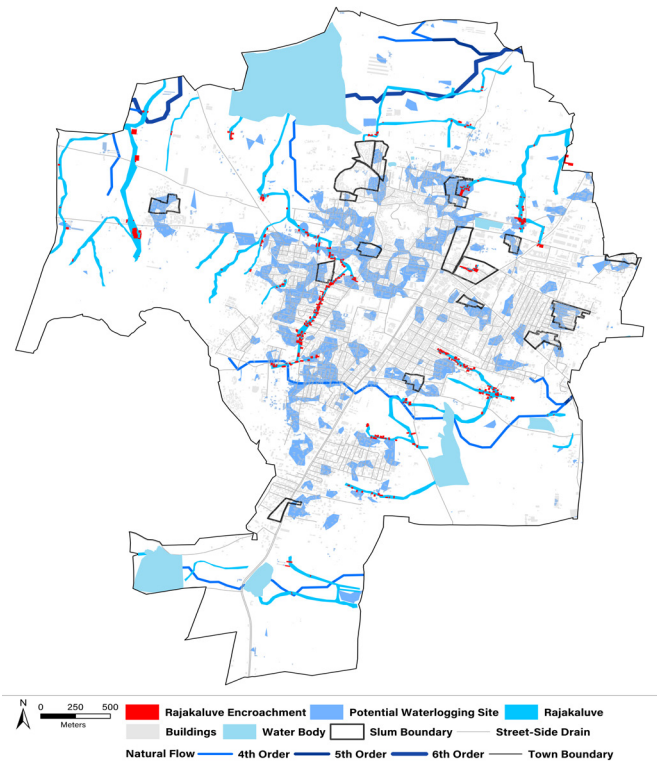
Drain Maintenance: Maintenance is limited due to strained resources, lack of tools, and minimal municipal budget, leaving many drains clogged and neglected. SWM workers are overburdened, handling both waste collection and drain cleaning.

Governance Gaps: Poor coordination between the Chintamani Planning Authority (CPA) and Chintamani CMC, and weak enforcement of buffer zones, hinder effective stormwater management.





Solid and liquid waste disposal in the drains in Tippu Nagar



Map 15 - High risk waterlogging area, Storm drain encroachments over buffer zones and slums (Source - Chintamani City Municipal Council)

Flood and Health Risks: Waterlogging occurs for 1–2 hours in some areas during heavy rain, with 15 out of 17 slums located in high-risk zones. Open drains carrying greywater increase sanitation and health risks, especially during flooding.

ii. Climate Change Impacts

- **Increased Rainfall Intensity and Frequency:** Climate change is projected to bring more intense and erratic rainfall events to Chintamani. This means that short bursts of heavy rain will become more common, overwhelming the town's already stressed stormwater drains and increasing the likelihood and intensity of waterlogging.

Intense, erratic rainfall will worsen flooding and health risks in Chintamani's vulnerable areas. Urgent, coordinated action is essential to upgrade drainage, enforce buffer zones, and protect public health.

Encroachment, poor waste management, and inadequate drain maintenance, compounded by weak governance are driving up flood and health risks in Chintamani, demanding urgent, coordinated action across departments.

- **Loss of Natural Drainage and Buffer Capacity:** Unchecked urbanization has led to the disappearance or shrinking of natural drains and buffer zones. As a result, rainwater that once percolated into the ground or flowed safely to lakes now floods roads and properties, especially when stormwater drains are blocked by solid waste or encroachments.

- **Vulnerability of Urban Infrastructure:** Much of Chintamani's stormwater network is encroached or poorly maintained, with 446 properties built over major drains in violation of buffer zone mandates.

- **Health Impact, especially Slum Areas**: 15 of Chintamani's 17 slums are in waterlogging prone zones, where floodwater often mixes with greywater and solid waste from open drains, sharply increasing the risk of waterborne diseases and post-rain health crises.

- **Maintenance and governance gaps exacerbated**: Further, climate change increasing rainfall extremes, Chintamani's existing gaps in maintenance and governance will require stronger coordination, better funding, and proactive management to prevent worsening flood risks.

As climate change brings more frequent and intense rainfall, Chintamani's encroached, and poorly maintained drainage systems are increasingly vulnerable to flooding, water pollution, and public health risks-especially for its most at-risk communities. Addressing these escalating threats demands strong interdepartmental collaboration between the Health Department, Engineering Department, KUWSDB, and CPA to enforce buffer zones, improve waste management, expand drainage coverage, and implement dedicated maintenance programs. Without urgent, coordinated intervention, the town will face worsening waterlogging, pollution, and health hazards.

Strategic Water Sector Actions: Policy, Plan, and Project Pathways to 2030

The following represent priority and high-impact initiatives identified under the Water sector, categorized into Policy, Plan, and Project actions to guide systematic implementation toward 2030 targets. Projectization and sequencing will be determined based on municipal priorities, technical feasibility, and budget availability.

Please refer to page 134 for detailed objectives and targets.

Year	Action description	Lead agency	Scheme convergence	Category	Linked to Objective
2026-2030	Lake Restoration Plans: Scientific restoration for Malapalli, Nekkundi & Gopasandra to improve recharge capacity to ensure sustainable water supply.	KUWSDB, MI, PRED, CMC	AMRUT, MI	Project	O1T1
2026-2030	Identify, plan and operationalize groundwater recharge measures across at least 50 prioritized locations	CMC, GW Dept, DUDC	Explore funds	Project	O2T2
2026-2030	Provide individual Functional Household Tap Connections (FHTCs) to 3500 households in 17 slums	KUWSDB, CMC, SDB	Explore funds	Project	O3T3.1
2026-2030	WTP Upgrades: Expand 1.6→3.0 MLD WTP at Ashraya layout & 1.5→3.0 MLD WTP at Agrahara layout with process and mechanical improvements	KUWDSB	AMRUT	Project	O3T3.1
2026-2030	Increase Supply Frequency: Increase supply in slums from once/week to twice/week	CMC	CMC	Project	O3T3.1
2026-2030	New Thimmasandra WTP & Lifting Infra: Construct 3.5 MLD WTP to treat Nekkundi Dodda Kere water; develop raw water lifting & distribution infra	KUWDSB, CMC	CMC/AMRUT	Project	O3T3.1
2026-2030	Identify and earmark bore wells in proximity to lakes as emergency reserve sources for use during water scarcity periods	CMC	Municipal funds	Project	O3T3.2
2026-2030	Kanampalli and Nekkundi Desilting: Increase storage to Kanampalli: 12→30 mcft, Nekkundi: 30→75 mcft via desilting, embankment strengthening.	KUWDSB, CMC	AMRUT	Project	O3T3.3
2026-2030	Smart Bore Well Automation: Automate 10 Chelur Road bore wells for real-time flow control.	CMC	Municiapl funds	Project	O3T3.3
2026-2030	Bhaktharahalli–Arasikere Tank Upgrade: Increase tank capacity 35 mcft → 100 mcft via deepening, bund strengthening (200 m), sluice upgrades which serves as strategic emergency reserve	KUWDSB, MI	AMRUT	Project	O3T3.2

Year	Action description	Lead agency	Scheme convergence	Category	Linked to Objective
2026-2030	Undertake a feasibility study to identify and pilot water meter connections for approximately 3,000 households located in high water pressure zones.	CMC	Municiapl funds	Plan	O3T3.1
2026-2030	Conduct a rapid citywide assessment and GIS mapping of existing RWH structures to evaluate condition, functionality capacity and recharge potential	CMC, GW Dept, DUDC	Explore funds	PLan	O2T2.1
2026-2030	Develop a comprehensive Groundwater Management and Recharge Master Plan for Chintamani including mapping of defunct bore wells and delineation of recharge zones Time frame: 2026	CMC, GW Dept, DUDC	Explore funds	Plan	O2T2
2026-2030	Bore well Integration: Integrate 35 direct-supply bore wells into the Central WTP network through distribution system remodeling to ensure uniform water quality and efficient management	CMC	Explore funds	Plan	O3T3.1
2026-2030	Buffer Zone Protection: Identification and demarcate & secure 9 m buffer along Raja Kaluve, 3 m along minor drains with fencing/signage.	CMC, TPA	Explore funds	Plan	O4T4.1
2026-2030	Prepare an effective storm water management plan for high dense and huge encroachment zones to mitigate flooding and improve drainage efficiency	CMC, TPA	Explore funds	Plan	O4T4.1
2026-2030	Drain Network Digitization: Digitize entire storm water & roadside drain network by 2026, prioritizing high-risk zones (Tippunagar, Vinobha Colony).	CMC, TPA	Explore funds	Plan	O4T4.2
2026-2030	Slum Drain Maintenance: Pre/ post-monsoon inspections for drains in 15 high-risk slums	CMC, TPA	Explore funds	Plan	O4T4.2



4.2

SANITATION SYSTEMS AND WASTEWATER SERVICES



The chapter provides an overview of the status of sanitation management in Chintamani, highlighting the existing situation in terms of service coverage across both centralized and decentralized systems. The chapter further explores the existing gaps in infrastructure and services. The chapter highlights the crucial issue of unmanaged wastewater contaminating surface water bodies, along with the impact of climate hazards on infrastructure, sanitation behaviour and service delivery.

i. Overview

The Shit Flow Diagram (SFD) (Figure 18) was developed as a planning tool to better understand sanitation in Chintamani. It illustrates that 70% of Chintamani's total wastewater (6.7 MLD) is not safely managed. It is either discharged, untreated or lost in the system. This underscores the urgent need for infrastructure expansion, regularization of household connections, and system-wide improvements.

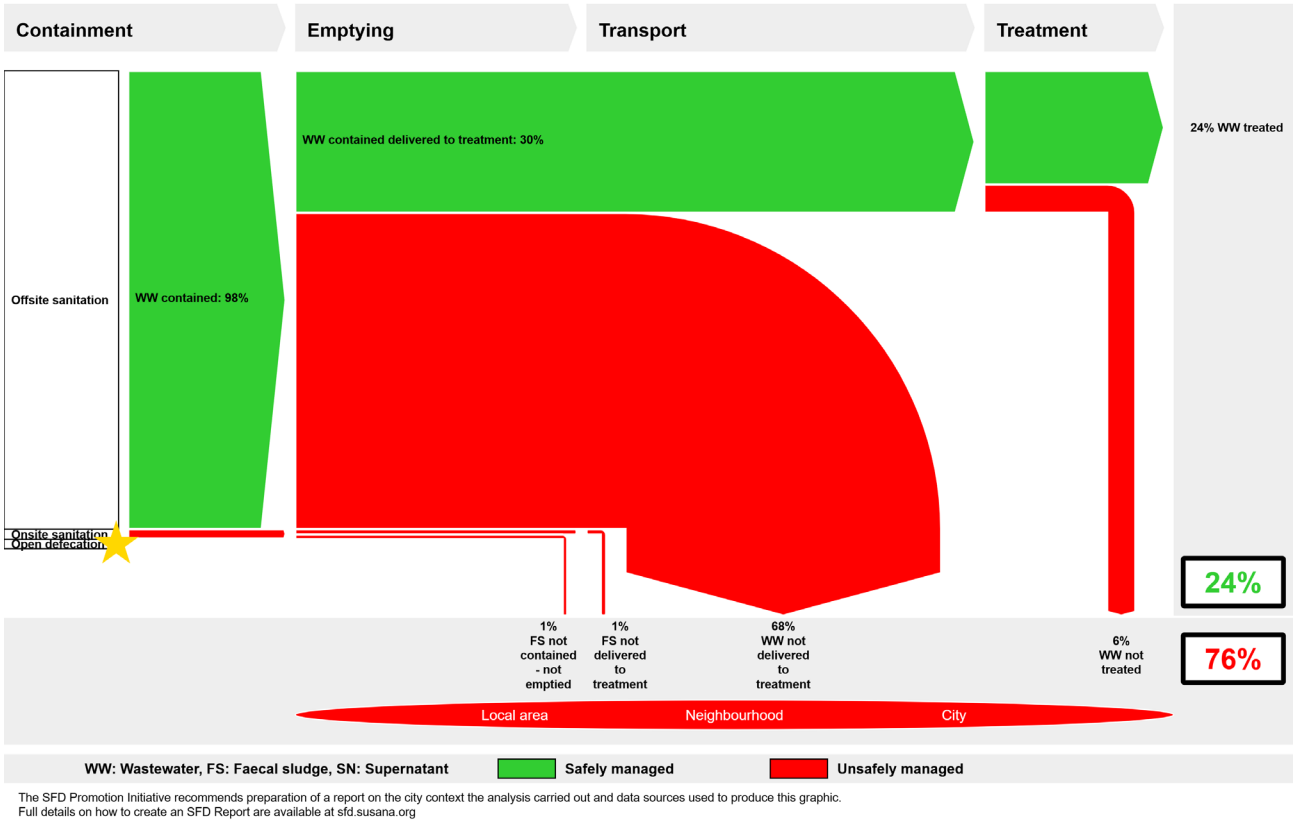


Figure 18 - Shit Flow Diagram (Source - Assessments by TIDE-BORDA)

ii. Key insights from SFD

- Wastewater generation is **6.7 MLD**, but only **2** MLD is treated through the existing STP.
- **70%** of wastewater is unsafely managed (as per SFD).
- Sewer coverage is overstated; unauthorized and non-functional connections are widespread.
- The northern zone has no treatment infrastructure, contributing to lake and groundwater pollution.

4.2.1 Access to Sanitation

i. Household Sanitation Access and Onsite Systems

Access to Sanitation: Access to safe sanitation is relatively high in Chintamani. The town has enjoyed ODF status since 2017. A household-level survey revealed that 97% of residents have Individual Household Latrines (IHHLs), while others rely on shared facilities. However, 26% of users reported difficulty using toilets during water scarcity. Although toilet functionality is generally stable, issues like blockages and backflow affect about a quarter of households.

Condition of Sanitation Systems: While most areas are connected to the sewer network, about 2% of residents depend on onsite sanitation systems such as septic tanks or pits. These are typically located in areas beyond network coverage. The CMC does not actively monitor or manage these systems, considering them at low risk due to their limited spread. However, there is no formal system for safe faecal sludge management, and risks from unsupervised desludging, conveyance, and disposal remain unaddressed.

ii. Key observations from household survey

- **97%** of households have IHHL access; the rest rely on shared toilets.
- **26%** of users faced toilet access issues during water scarcity.
- **27%** of household water is used for toilet flushing-unsustainable during droughts.
- **30%** of residents rely on onsite sanitation, mostly unregulated and beyond network limits.
- No formal Faecal Sludge Management (FSM) system exists in Chintamani.



Shared toilet by 3 families in JJ colony



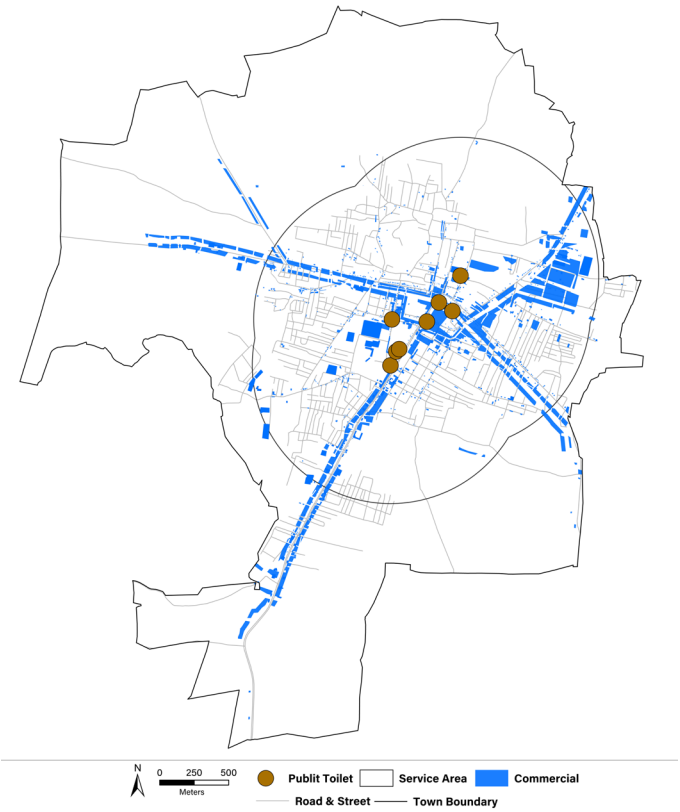
Effluent from onsite sanitation system being disposed in the open

ii. Public Toilet Infrastructure

Coverage: Public toilets are a crucial service for transient populations, vulnerable communities, and informal settlements. Chintamani has 10 public toilets with usage ranging from 200 to 1,000 people per day. However, two facilities-at Gajanana Circle and Shriramnagara-have remained non-functional since the COVID-19 pandemic. Spatial analysis revealed that Public Toilets (PT) are clustered in the city centre, leaving key commercial areas away from the centre underserved. While SBM guidelines recommend a PT within 1 km of high-footfall zones, actual coverage on ground is less, exposing unmet needs in peripheral and key commercial areas outside the city center.

Public Toilet Functionality and User Issues: Interviews with operators and users highlighted persistent problems:

- Water supply is unreliable, especially in summer; operators depend on tanker water.
- Water unavailability impact cleanliness, making many toilets unusable.
- Only 4 of 8 functional PTs had women's facilities; none had child-friendly or disabled-friendly access.
- Obstructed footpaths due to illegal parking and street vendors hinder easy access for women and the elderly.



Map 16 - Public toilets along major commercial establishments

- The presence of loitering men near toilets affects the sense of safety, particularly for female users.

These challenges collectively undermine PTs as safe, inclusive, and equitable public amenities.



Figure 19 – General overview of public toilets

4.2.2 Sewerage Network and Treatment Capacity

i. Network Coverage

Chintamani is expanding rapidly, but its sewerage infrastructure has not kept pace with urban growth. Although the town officially reports 70% sewer network coverage, actual ground realities present a different picture. According to CMC data (2023–24), only 8,324 out of 27,665 properties have authorized household service connections (HSCs). The remaining properties are either unconnected or rely on unauthorized connections.

A recent sewer network map developed by KUIDFC (Map 17) highlights infrastructure gaps and leakage zones, especially in Doddapete Road and Silk Market. These unserved and poorly connected areas continue to discharge wastewater into open drains and lakes.

The backlog in network expansion is most critical in newly developing localities, where the absence of formal connections increases reliance on unsafe practices and contributes to pollution.

The 1st stage of sewerage network is 36 years old. It has been observed that there is significant damage in the stoneware sewer pipe leading to leakages as well as blockages in the sewer network and machine holes.

ii. Treatment Capacity: Current and Proposed

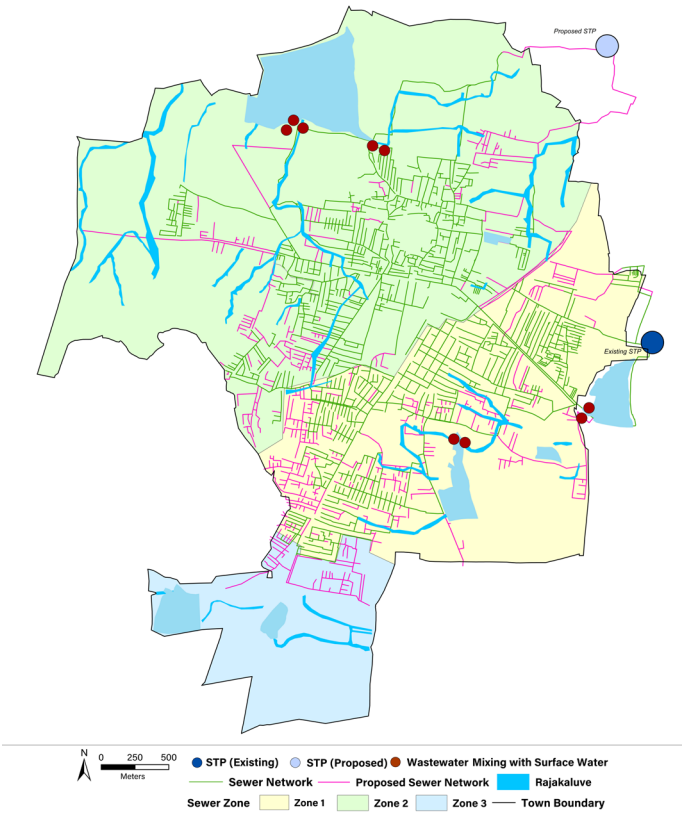
Chintamani's only functional STP is located near Gopasandra, a 2 MLD nature-based treatment system built in 2005. It is overloaded with over 2 MLD inflow and has not been desludged for many years. The STP effluent failed seven out of eight CPHEEO effluent standards indicating challenges in operational efficiency of the plant.

A wet well is proposed to be set up in the Kanampalli area, but timeline for such a development remains uncertain.

A 7 MLD STP using NEBR technology is proposed at Chokkareddihalli to serve the northern slope. This plant is under the proposal stage and expected to address projected treatment demand through 2040. A combined investment of over ₹65 crore is planned across multiple projects to strengthen both sewage treatment capacity and network coverage in Chintamani (Annexure 4).

iii. Coverage Snapshot

- **Current network laid:** 123 km (including UGD)
- **Proposed expansion:** 40+ km to cover missing links and new growth areas
- **Effective ground coverage:** 70%
- **Remaining 30%:** 20% Planned under SBM 2.0 and NGT, to be implemented by KUIDFC; 10% taken up in the future
- **Implementing agency:** KUIDFC (used water management, SBM 2.0 and NGT)



Map 17 - Sewer network coverage and wastewater mixing location (Source - Stakeholder consultations, KUIDFC)







Waste Stabilisation Ponds of 2 MLD STP near Gopasandra Tank



Table 7 - Zone-wise wastewater generation and treatment gaps (Source - GIS map, KUIDFC)

Zone	Direction of Wastewater flow	Properties	Est. Wastewater generated (MLD)	Current Treatment Capacity (MLD)	Gap (MLD)
Zone 1 (South)	East and southeast towards Gopasandra-Malapalli lake system	8,420	3	2.0	1
Zone 2 (North)	Northeast towards Nekkundi-Bhukkanahalli lake system catchment	11,235	3.7	0.0	3.7
Zone 3 (Kanampalli)	Smaller zone around Kanampalli Lake	287	-	-	-

Zone 1 and Zone 3 are planned together due to shared minor catchment.

iv. Operations & Maintenance (O&M) Gaps

Field assessments reveal that a large part of the UGD network, installed in 1989, is now aging and beyond design life. Maintenance is largely reactive due to insufficient personnel and resources at CMC. In many areas, infrastructure deterioration and poor construction standards have resulted in serious service disruptions. Key Challenges identified include:

» Damaged machine holes leading to contamination of stormwater drains with wastewater; UGD leakages from cracked and aged pipelines, unauthorized. household connections contributing to siltation and system overload.
» Greywater entering stormwater channels, polluting open drains, instead of going into the UGD network.
» Lack of preventive maintenance and limited staff capacity.

i. During High Rainfall

» Machine hole overflows due to stormwater ingress into sewer lines.
» Flooding in low-lying areas like Shriramnagara, Vinobha Colony, and KGN Colony.
» Network surcharging and spread of contaminants into storm drains and open areas.

ii. During Drought

» Low water flow velocity leads to frequent blockages from accumulated waste.
» Dry silt buildup in pipelines exacerbates choking and overflow.
» Increased complaints in dense areas where minimal flushing occurs (e.g., Tippu Nagar, Ambedkar Colony).

v. Environmental and Flooding Impact

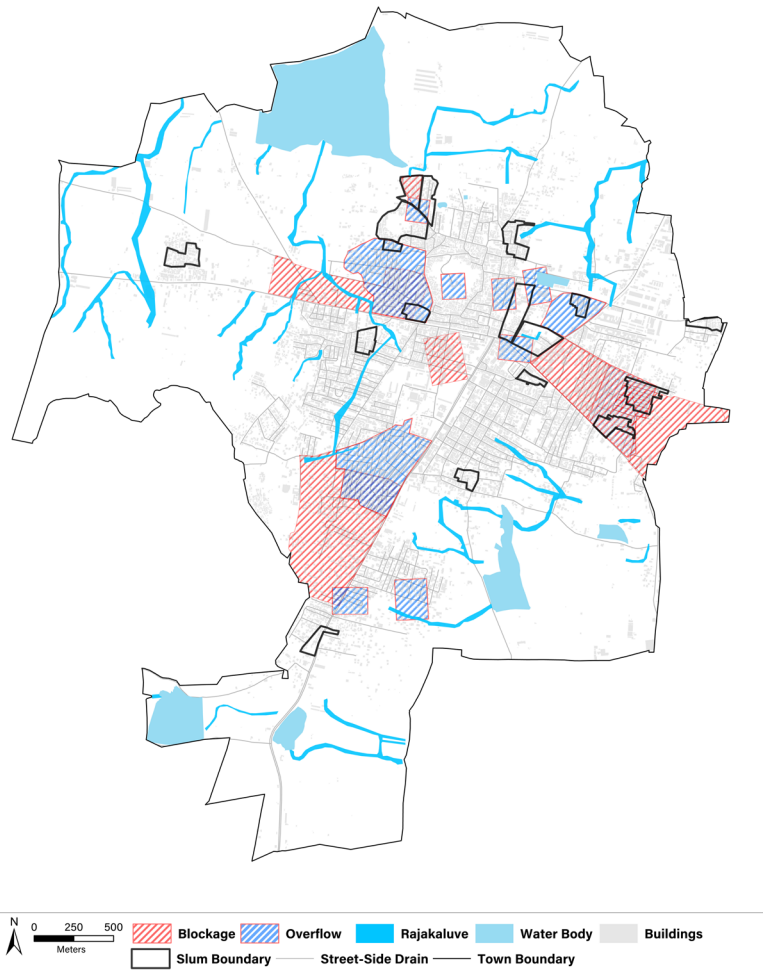
Gaps in sewer coverage and treatment lead to wastewater discharge into stormwater drains and waterbodies. This has caused:

» Pollution of downstream water bodies like Gopasandra, Nekkundi, and Malapalli lakes
» Greater health risk for residents around lake inlets and storm drain crossings

Map 18 shows the observed pollution hotspots as well as the hotspots for frequent blockages and overflows mapped in consultation with the UGD operators, health department and communities on ground. 11 out of 17 slums are under wastewater overflow risk, thereby leading to an increase in the risk for waterlogging. Most complaints related to overflows and blockages are observed in highly dense areas.



Damaged manhole caused by unauthorized household connections contributing to siltation and system overload



Map 18 - Sewer network blockage and overflow, overlay with slum areas

Blockage

05 identified location with issue of block-age in the sewer systems

17.87%
3573 Properties

Overflow

11 location under risk of overflow during wet seasons

19.40%
3878 Properties

Critical Gaps in Sewerage and Treatment Infrastructure

Treatment Gap in Northern Zone: The entire northern half of Chintamani (Zone 2), generating ₹3.7 MLD of sewage, currently has no treatment facility. The proposed 7 MLD NEBR STP at Chokkareddihalli has moved to implementation phase, with work expected to be completed in the next two years.

Overdependence on One Aged STP: The only functional STP (2 MLD at Gopasandra) is overloaded, poorly maintained, and operating beyond its design life. Although a 4.4 MLD replacement STP is planned, delays could accelerate discharge to lakes.

Network Coverage Lag: While about 70 km of new network is required (only 40 km currently proposed to be built), large parts of the city-especially newly developed and low-income areas-remain unconnected. Until execution, unauthorized connections and open discharge will continue.

Slow Progress on I&D and Lake Protection Work: I&D projects for Nekkundi and Gopasandra, which are crucial for protecting downstream lakes, are only in proposal stage with no funding or agency specified. Work at Nekkundi is expected to be initiated shortly.

Lack of Coordinated Timelines: Key projects are at different stages (tendered vs DPR), leading to mismatch in capacity creation and network readiness. For example, HSCs (2,950 new + 800 Upgradation) in the north may not function until the 7 MLD STP is commissioned.

No Defined O&M Strengthening Plan: Though STP projects include 5-year O&M provisions, there is no parallel investment in workforce augmentation or preventive maintenance systems for the existing network.

4.2.3 Sanitation Service Delivery in a low-income community

Low-income communities and slums in Chintamani are disproportionately affected by poor sanitation services and climate risks. With over 20,000 slum residents projected in 2025, the challenges of intermittent and unreliable service delivery are acutely felt. A case study from Shriramnagara Colony (Ward 20) provides the following key insights:

- Wastewater flows into open drains, creating unhygienic conditions and mosquito breeding.
- Frequent machine hole overflows during high water usage and rainfall.
- Open solid waste disposal into drains leads to blockages.
- Laundry and bathing occur on thoroughfares, where greywater enters roadside storm drains.
- 60% of residents reported that open drains are never cleaned.
- Improper HSCs from machine holes contribute to silt accumulation and repeated clogs.
- Congested spaces prevent adequate in-home sanitation.

These conditions result in regular sewer blockages, water stagnation, and heightened exposure to disease environment. Shriramnagara is one of 17 such settlements across Chintamani where similar issues persist. The lack of centralised network coverage in many of these areas leads to unsafe wastewater disposal, deteriorating both local hygiene and the health of downstream communities dependent on lakes and water bodies.



Blockages in UGD network causes frequent overflow during rain

247	~1,500	100%
Households	Population	IHHL Coverage

98%	2%	90%	10%
to sewer	onsite	open drains	network
Blackwater Disposal		Greywater Disposal	

Figure 20 - Snapshot -Shriramnagara Colony (Source – TIDE-BORDA Assessments on Chintamani WASH)



Public taps used for laundry right on the thoroughfare



Waste spotted scattered around stormwater drains

4.2.4 Treated Used Water Reuse

There is no formal reuse of treated wastewater (TUW) in Chintamani. The town generates approximately 6.7 MLD of wastewater, but with limited treatment capacity and poor effluent quality, reuse remains untapped. AMRUT 2.0 recommends reusing 20% of total freshwater demand, which for Chintamani amounts to 1.575 MLD-a target requiring major transformation in WASH infrastructure and institutional practice.

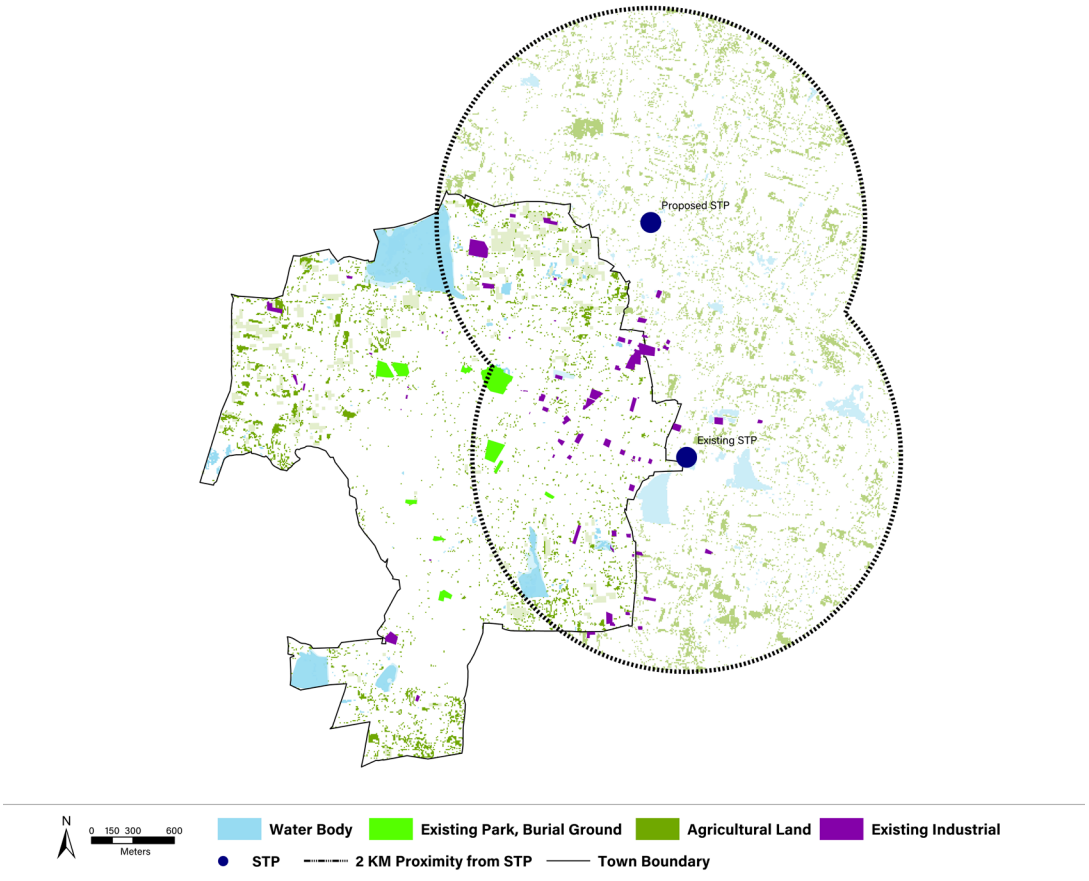
i. Potential Use Cases

Despite existing challenges, land use assessments around the current and proposed STPs identified strong reuse potential (details in Annexure 4), estimating demand from 1,200 acres of current and planned industrial areas and approximately 50 acres of agricultural land, making them promising zones for treated wastewater application.

- **Fire Department:** Ready to use TUW for drills, requiring minimal quality controls.
- **Chintamani CMC Operations:** Currently spends ₹35,000/month on freshwater for roads, parks, and sewer jetting-expenditures that TUW can offset.
- **Horticulture and Parks:** 21 parks and medians require 130 KLD; suitable for TUW via piped or tanker supply.
- **Rose Farmers:** High-value crop growers are willing to pay for reliable TUW supply if basic standards are met.
- **Industrial Zone (Planned):** 1200-acre estate 6 km from proposed STP offers long-term potential for circular reuse.
- **Construction Sector:** A high-consumption sector not yet tapped; TUW can substitute for non-potable use.

ii. Necessary Conditions for Reuse

Despite evident demand across municipal services, agriculture, and industry, several foundational conditions must be addressed for Chintamani to enable safe and sustained treated wastewater (TUW) reuse:



Map 19 - LULC map for existing and upcoming STP showing potential reuse opportunities (Source - Chintamani City Municipal Council)

- **Adequate Treatment Capacity:** Current infrastructure (2 MLD STP) is undersized and underperforming. With only 30% of wastewater treated, reuse is not feasible until planned STPs (4.4 and 7 MLD) are operational.
- **Effluent Quality Assurance:** Effluent testing reveals that the existing STP fails 7 out of 8 CPHEEO quality standards (e.g., BOD, COD). Reuse for agriculture, firefighting, or landscaping requires a minimum quality threshold, currently unmet.
- **Institutional and Policy Support:** There is no official mandate or policy recognition for reuse at the municipal level. CMC lacks formal guidelines for pricing, allocation, service models, and regulation.
- **Conveyance and Reuse Infrastructure:** Chintamani lacks the physical infrastructure for TUW reuse-such as storage tanks, distribution lines, or recharge systems. These must be planned alongside treatment investments.
- **Stakeholder Buy-in and Awareness:** Consultations indicate latent demand, but low awareness and distrust in water quality. Stakeholders-especially farmers and municipal departments-require reliable supply and confidence-building pilots.

The analysis was based on the Reuse Readiness Framework developed inhouse at TIDE and BORDA. (Details in Annexure 4)

Bridging these gaps through a reuse roadmap-linked to phased STP development, effluent quality controls, and stakeholder engagement-will be critical for embedding reuse into Chintamani's water sustainability strategy.

4.2.5 Implications of Climate Events

Chintamani's sanitation system, though nominally expansive, shows deep vulnerabilities across the sanitation value chain when examined through a climate-resilience lens. Floods and droughts-both intensifying due to climate change-have exposed cracks in infrastructure, equity of access, and long-term service sustainability.

i. Impact of Flooding on Sanitation Infrastructure

Frequent and intense rainfall events pose a significant challenge to Chintamani's aging urban infrastructure:

- **Overburdened UGD System:** The centralised sewer network, much of which is decades old and undermaintained, suffers from frequent blockages, machine hole overflows, and leakage. These are worsened during storm events when stormwater enters and overloads the sewer network, leading to backflows and unsanitary flooding in residential areas.

Table 8 - Climate impacts across the sanitation value chain (Source – Stakeholder consultation)

Sanitation Stage	Waterlogging Impact	Drought / Heat Impact	Resulting Risks
Toilet Access and Use	Waterlogging near toilets Inaccessible paths in slums	Reduced flushing due to water scarcity Usage decline in slum areas	Reversion to open defecation Poor hygiene
Containment (Onsite and Sewer)	Pit overflow Sewer surcharging and cross-contamination with storm drains	Dry tanks and slow flows lead to solids build-up and blockages	Machine hole overflows Unsafe on-site containment
Conveyance (UGD and Tankers)	Sewer pipe cracks and infiltration Overflow of combined grey and blackwater	Low flow velocity causes siltation and blockages Frequent UGD chokes	Sewer failure Cross-contamination with drinking water lines
Treatment (STPs)	Influent dilution during rain Risk of lake flooding	Oxidation ponds impacted by heat, algal blooms Reduced process efficiency	Non-compliant effluent Polluted lakes and ecosystems
Reuse (Municipal, Agri, Industrial)	Contaminated TUW distribution during floods	Potential for reuse rises during scarcity Lack of reliable supply	Missed reuse opportunity Unsafe reuse if untreated
Workforce Safety	Working in flooded machine holes Working Unsafe and unprepared conditions	Heat stress Long exposure without protective gear	Health hazards Low morale and absenteeism

» **Concentrated Risk Zones:** A 2.4 sq.km. zone at the town's core-home to 36% of the population and 11 of 17 slums-has emerged as the most hazardous area, suffering repeated flooding, poor drainage, and unsanitary living conditions.
» **Public Health Risk:** The Shit Flow Diagram (SFD) confirms that 70% of Chintamani's wastewater is unsafely managed, making flood-related contamination a severe public health hazard, particularly in high-density and low-income zones.
» **Onsite Systems at Risk:** Areas dependent on onsite sanitation are equally at risk, with no formal desludging system or regulation, leading to pollution during waterlogging or floods.

ii. Impact of Drought and Heat Stress on Service Delivery

Climate stressors such as waterlogging, drought, and heat are compounding existing infrastructure and governance deficits. Without urgent adaptation planning and equitable infrastructure upgrades, large sections of Chintamani's population will remain exposed to chronic sanitation risks**.**

4.2.6 Key Challenges

i. Service Gaps

» **Widening Treatment Deficit:** Chintamani currently generates 6.7 MLD of wastewater. With only 2 MLD treated, the town faces a treatment gap of over 4 MLD, a growing public health and environmental hazard.
» **Treatment Gap in Northern Zone:** The northern area generates 55% of the town's sewage yet has no treatment infrastructure. Planned STP is in the procurement phase, bringing some hope.

ii. System Inefficiencies

» **Aging and Failing UGD Network:** Widespread issues of leakage, blockage, and overflow persist due to under-maintenance and old infrastructure (some laid in 1989).
» **Behavioural Contributors:** Illegal dumping of construction debris and biomedical waste into drains severely chokes the system and contaminates surface water sources.
» **PT Infrastructure Gaps:** 50% of public toilets lack access for women and none are inclusive for children or persons with disabilities. Summer water shortages and poor hygiene make many PTs unusable.
» **Spatial Mismatch:** PTs are clustered centrally, leaving high-footfall commercial zones in outer areas underserved.

iii. Systemic Indifference

» **Onsite Sanitation Neglect:** Onsite systems are sparingly found and these are entirely unregulated. The ULB shows little institutional interest in managing or monitoring these unconnected zones.
» **No Formal FSM System:** Absence of scheduled desludging, safe conveyance, or disposal systems leaves households vulnerable to unsafe and ad-hoc waste handling.
» **Greywater in drains:** Households and other establishments due to lack of awareness let only blackwater in UGD and drain greywater in stormwater drains.

Without urgent, coordinated action to expand treatment capacity, repair network inefficiencies, and institutionalize inclusive service delivery, Chintamani risks compounding public health hazards, environmental degradation, and climate vulnerability across its growing urban footprint.

Strategic Sanitation and Waste Water Sector Actions: Policy, Plan, and Project Pathways to 2030

The following represent priority and high-impact initiatives identified under the Sanitation and Waste water sector, categorized into Policy, Plan, and Project actions to guide systematic implementation toward 2030 targets. Projectization and sequencing will be determined based on municipal priorities, technical feasibility, and budget availability.

Please refer to page 134 for detailed objectives and targets.

Year	Action description	Lead agency	Scheme convergence	Category	Linked to Objective
2026-2030	Replan and lay 40 km of new UGD pipelines in Kanampalli and other priority zones by 2028, addressing current network gaps and ad-hoc linkages	KUIDFC	NGT compensation scheme, SBM2.0, CMC	Project	O5T5.1
2026-2030	Pilot greywater diversion system in Sriramnagar colony	KUWSDB	SBM 2.0	Project	O5T5.1
2026-2030	I&D works for Nekkundi & Gopasandra by 2026	KUIDFC	AMRUT 2.0	Project	O7T7.1
2026-2030	Construct a 7 MLD Nature-based STP at Chokkareddihalli with 2,950 new household connections, 800 household system rejuvenations, and 40 km of sewer network to ensure full catchment connectivity	KUIDFC, KUWDSB	SBM 2.0, AMRUT, PPP	Project	O7T7.2
2026-2030	Develop gender-inclusive, universally accessible public toilets in high-footfall areas (NH69, Chelur–Chintamani Road, Hoskote–Chintamani Road, Doddapete), expanding coverage from 8 to 10 by 2026 and 12 by 2030, ensuring access within 500 m of all commercial zones	CMC	SBM 2.0, CMC	Plan	O6 T6.1
2026-2030	Upgrade all 8 PTs to full inclusivity by 2026 and Improve signage & auxiliary facilities and Redevelop 2 defunct PTs (Gajanand Circle & Sriramnagar)	CMC	SBM 2.0, CMC	Plan	O6 T6.1
2026-2030	Digitize and map 120km of the UGD network by 2026 prioritizing flood prone and pollution impacted areas such as Tippu Nagar, Vinobha colony followed by 20 km of systematic network updates each year thereafter	CMC	CMC	Plan	O5T5.1
2026-2030	Ensure timely maintenance to cut downtime and reduce repair time from 3 days to under 24 hours	CMC	CMC	Plan	O5T5.1
2026-2030	Regular quarterly checks and maintenance for STP	CMC	Municipal funds	Regulation	O7T7.2
2026-2030	STP effluent quality tests every 60 days	CMC	Municipal funds	Regulation	O7T7.2



4.3

SOLID WASTE MANAGEMENT



This chapter provides an overview of the status of solid waste management (SWM) in Chintamani, highlighting generation patterns, infrastructure gaps, and systemic inefficiencies in collection, segregation, and treatment. It emphasizes the mismatch between high per capita waste generation and limited processing capacity, leading to accumulation of unmanaged and legacy waste. The chapter also explores the implications of poor SWM on public health and environmental vulnerability, especially for low-income and informal settlement areas.

4.3.1 Waste Flow in Chintamani

Chintamani generates 30 tons per day (TPD) of municipal solid waste (MSW) with the per capita generation of 292grams/day, which is on the higher end of the small-town generation standards of 200-300gms/day (as per SWM 2016 policy). The waste sources primarily comprise of residential, commercial, and institutional streams, where the overall wet waste constitutes 76%. A visual representation of the waste flow from generation to disposal is illustrated in the diagram in Fig 22, indicating the leakages in the waste flow and processes in place.

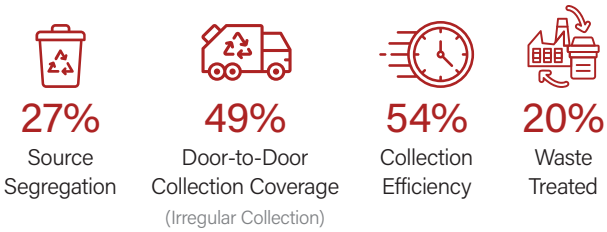


Figure 21 - Service level benchmarks for SWM in the town (Source - Swachh Survekshan data 2025 and WFD study by TIDE-BORDA)

i. Key insights

- **Per capita waste generation is high in comparison to the standards in small towns,** driven by driven by rising consumption patterns, rapid urbanization, and limited waste reduction efforts.
- **Informal sector collects approximately 28% of total collected waste**, yet these workers lack access to basic water and sanitation facilities, increasing their vulnerability during extreme heat events.
- **Around 30% of high-value dry waste** (e.g., paper, PET bottles, LDPE, HDPE, cardboard) continues to reach the dumpsite due to inadequate segregation and insufficient infrastructure.
- **Only 14% of wet waste is currently managed**, despite composting potential, primarily due to low source segregation and shortage of workforce.
- **Only 27% source segregation** achieved.

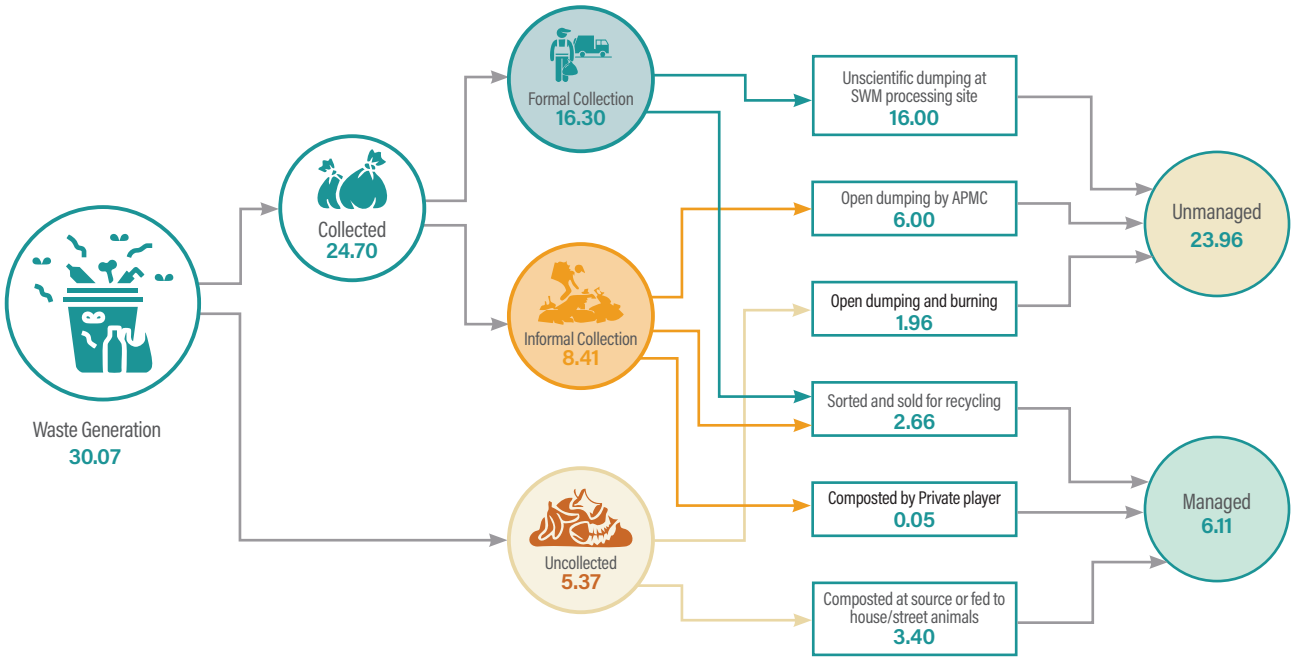


Figure 22 - Waste flow diagram showing the flow of waste from generation to disposal (Source - WFD study on Chintamani, TIDE-BORDA)

4.3.2 Regulatory Framework

Local byelaws on (Karnataka Municipalities Act, SWM Rules 2016) mandate source segregation, user fee collection, plastic ban enforcement, and penalties. Provisions exist for bulk waste generator responsibilities, door-to-door collection, and decentralized waste processing. However, field enforcement remains inconsistent.

4.3.3 Access to Services: Coverage

In Chintamani, solid waste collection is managed through two parallel systems: municipal sanitation workers and Self-Help Groups (SHGs). While approximately 49% of households have access to door-to-door collection, the remaining rely on community dump spots. SHGs contribute to the collection, primarily in wards 6, 9, 10, and select streets of seven other wards.

Despite this coverage, collection frequency remains erratic as only 3% of households receive daily service, while 20% are serviced just once a week, leading to inconsistent waste removal and hygiene concerns.

Collection is performed without segregation across almost all waste streams:

- Residential waste (wet, dry, sanitary) is collected mostly as mixed waste, with no marking or source segregation. Few households segregate the sanitary waste.
- Commercial and market waste are handled similarly, leading to contamination of recoverable wet and dry waste.
- Bulk Waste Generators (BWGs) do not comply with source segregation or on-site processing mandates, most handover the mixed waste to the CMC without penalty.
- Medical waste, though assigned to a private entity, is not consistently collected, resulting in illegal disposal in stormwater drains.
- Construction & Demolition (C&D) waste is openly dumped in vacant plots due to the absence of a defined collection system or disposal guidelines.

These practices significantly compromise waste processing and recovery potential. The procurement of new auto tippers and pushcarts along with monitoring from CMC have reduced the instances of open dumping. This shows improved collection can further make Chintamani a clean town.

Detailed observations and infrastructure gaps are presented in Annexure 5.

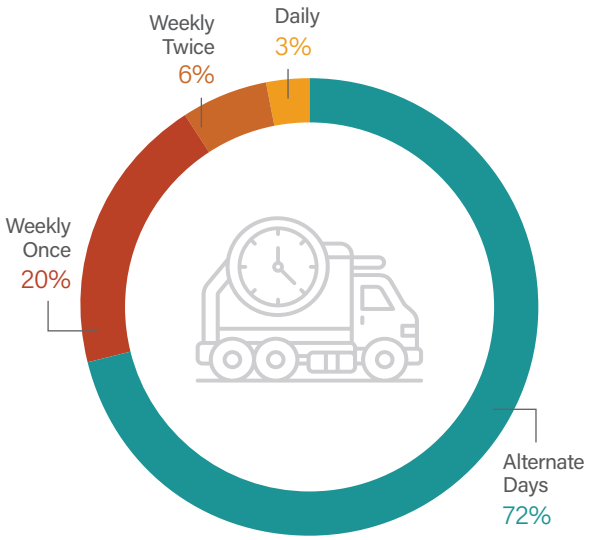
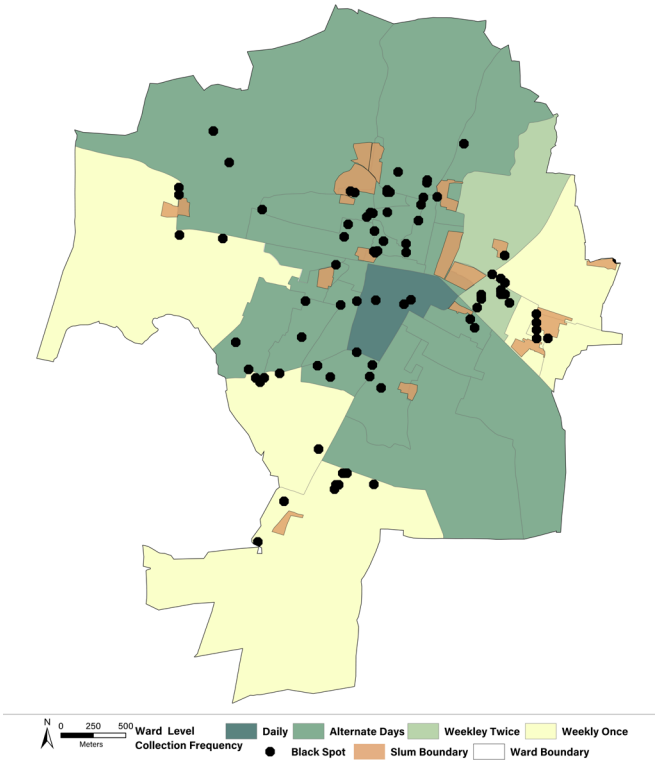


Figure 23 - Ward level waste collection frequency (Source - Chintamani City Municipal Council)

> Lack of segregation, irregular collection, and unregulated waste streams severely limit Chintamani's waste recovery and processing efficiency.



Map 20 - Collection frequency and open dumpsites, overlay with slum areas (Source - Chintamani City Municipal Council)

4.3.4 Vulnerability in Slums

The service delivery remains inconsistent, particularly in low-income, densely populated areas such as Nekkundipete, Narsimpete, Mehboob Nagar, Hydarali Nagar, JJ Colony, Vinobha colony and Ambedkar Colony.

- **Irregular Collection Frequency:** Most slums get waste collected only once or twice a week (fig xx). Even in areas with alternate-day collection, the schedule within slums is often inconsistent.
- **Inappropriate Vehicle Allocation:** These densely packed areas need pushcarts for door-to-door collection due to narrow lanes (as given in the image below). Instead, only auto-tippers operate from outside collection points, leaving large areas unserved.
- **No Clear Schedules or Communication:** Residents are unaware of collection timings, leading to waste being dumped outside for prolonged periods.
- **High Incidence of Open Dumping:** Over 52% of blackspots are within 100 meters of slums; 23 are within 50 meters. This increases health risks, especially during monsoons.

> The garbage from our house is often not picked up by the municipality. I have no choice but to leave it outside. But every time I do, I worry. I'm scared that the waste might cause disease or contaminate our water. We are trying to keep our surroundings clean, but without regular collection, it feels like we're risking our health.
>
> -Kalavathi, Resident, Vinobha Colony

Inadequate collection frequency, poor vehicle access, and lack of communication in slum areas are driving high rates of open dumping, posing serious health and environmental risks.



4.3.5 Waste Collection and Transportation

The town operates a mixed fleet for waste collection, including pushcarts, auto-tippers, tractor-trailers, and compactors, serving both households and informal dumping sites. However, source segregation remains highly ineffective, with only 4% of dry waste being sent to the Dry Waste Collection Centre (DWCC), where sanitation workers recover high-value recyclable materials manually. While 53% of auto tippers are equipped with segregation partitions, most still collect mixed waste due to poor source-level practices. Route optimization of existing primary collection vehicles could address capacity gaps, but significant service gaps remain particularly in slum areas, where nearly 3,500 households lacks door-to-door collection due to the absence of pushcarts. In secondary collection, current compactor capacity falls short by 8 TPD despite double trips as they are used to only 60% of their capacity. A detailed breakdown of vehicle types, capacities, and gaps is provided in Annexure 5.

i. Source Segregation and Primary Collection

Source segregation remains limited, with only 27% household compliance due to low awareness. Despite the availability of new auto-tippers and pushcarts, the capacity is underutilized. Five auto-tippers remain unused due to driver shortages, and pushcarts are concentrated in higher-income areas. Though collection capacity is theoretically adequate, only 54% of waste (16.3 TPD) is captured. GPS systems are in place but inactive due to pending maintenance.

ii. Transfer Point

With the waste processing site located 10 km from town, absence of a formal transfer station results in inefficient manual offloading and spillage at an open site near the town boundary.





Waste collection vehicles: auto-tipper and pushcarts





Left - Wet waste composting; Right - Trommel for waste processing

iii. Secondary Collection

Current operations rely on two compactors and three tractor-trailers. Compactors, operating below capacity, transfer only 6–7 TPD per trip, while trailers carry 2 TPD. However, optimizing trips and vehicle utilization can bridge this gap without additional assets.

> Inefficient segregation, underutilized fleet, and absence of a transfer station severely constrain Chintamani's waste collection and transport efficiency.

4.3.6 Diversion of Waste from the Dumpsite

i. Infrastructure Limitation

The town's waste processing infrastructure is critically inadequate and underutilized. Existing facilities like the SWM Facility and DWCC are either non-functional or significantly below capacity due to factors such as low source segregation, lack of technical oversight, staffing gaps, and poor monitoring. Key components such as mechanized sorting, hazardous waste management, and C&D waste processing are completely absent, creating severe operational bottlenecks. Additional details are provided in Table 9.

ii. Management of Bulk Waste Generators (BWGs)

Despite the registration of 49 Bulk Waste Generators, none practice on-site segregation or treatmentv.

Notably, approximately 6 TPD of mixed waste from markets and event halls is handled by a private vendor but is dumped untreated, posing major environmental and compliance risks. Recyclable recovery is minimal, and compost or scrap revenues are untracked, indicating lost opportunities for both waste diversion and revenue generation. Weak compliance and lack of formal market linkages further undermine diversion efforts.

Key Gaps

- Critical shortages in functional processing infrastructure; existing facilities remain largely idle.
- Absence of key systems like mechanized sorting, hazardous, and C&D waste handling.
- Major portions of collected waste are still disposed of through open dumping, burning, or uncontrolled land disposal with significant environmental risks.
- Financial planning, market linkage, and enforcement among commercial and bulk waste generators remain weak.

4.3.7 Legacy Waste and GHG Mitigation Potential

The untreated daily fresh waste is also dumped at the legacy waste site, contributing to the fresh waste fraction in the composition.

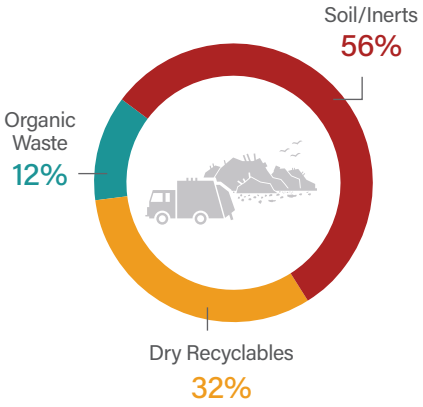
Environmental Impacts

Air: High organic content in anaerobic conditions leads to Methane and GHG emissions

Table 9 - Infrastructure details for waste treatment (Source - Chintamani City Municipal Council)

Infrastructure Component	Installed Capacity	Functional Capacity	Current Required Capacity	Current Gap
SWM Facility (Vermi-composting)	15 TPD	0.3 TPD	~19 TPD (unmanaged wet waste generated)	~19 TPD
DWCC	2 TPD	0.3 TPD	≥4 TPD	≥4 TPD
Mechanized Sorting	Not available	Not available	Required for low-value dry waste	Critical
Sanitary/Hazardous Waste Management	Not available	Not available	Required	Critical
C&D Waste	Not available	Not available	No quantification of C&D has been carried out	Critical

> Only **10%** of the **25TPD** of collected waste is scientifically treated; the rest is mismanaged through open dumping (**6 TPD**), unscientific disposal (**16 TPD**), burning (**~2 TPD**), and other leakage.



Location:	Kanishettihalli village, 10 km from town centre
Total Waste Accumulated:	53,220 MT (as of 2023)
Daily Inflow:	~24 TPD
Spread Area:	10 acres
Remediation Plan:	DPR prepared by TIDE in 2021; project approved by DMA, contract awarded
Recommended Technology:	Bioremediation
Remediation Duration:	6 months
Emission (tCO_2e/Year):	9,028 tCO_2e per year
Habitation under impact radius:	1000 Households under 3 km radius

Figure 24 - Waste Composition at legacy waste site (Source - Chintamani legacy waste DPR)

Water:

» Minimal leachate detected, but poor disposal poses risks

i. Key Challenges in legacy waste management

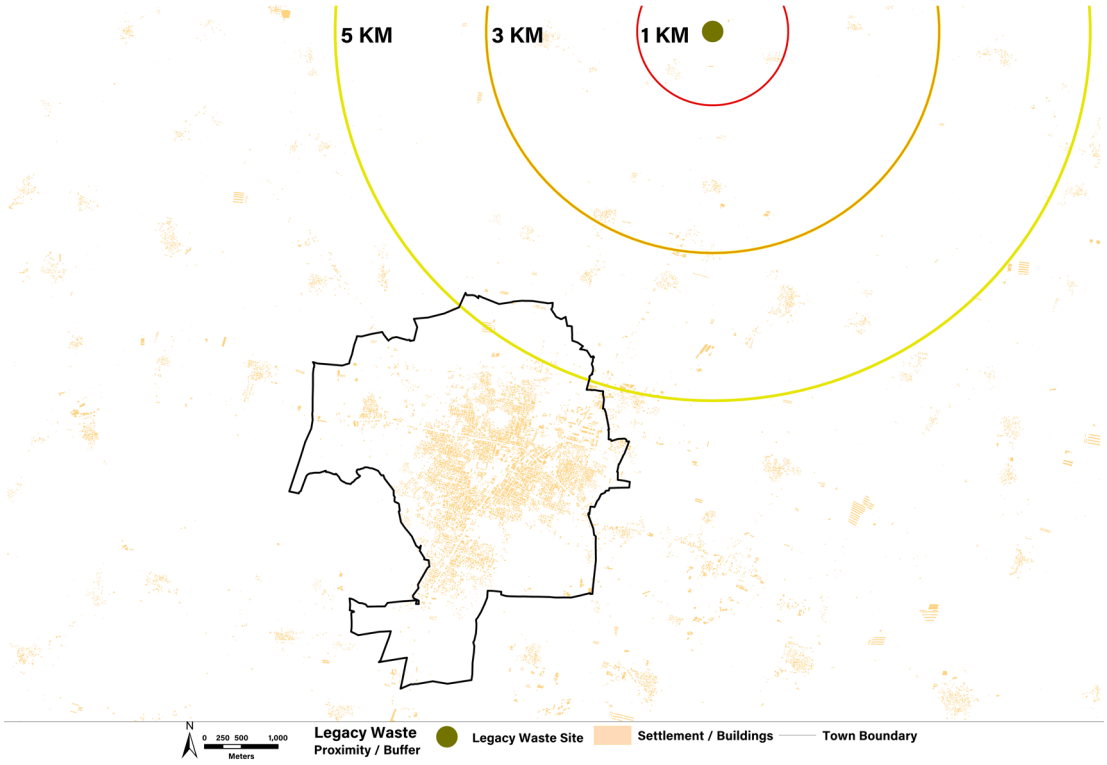
» **Rising Waste Volume:** 78% of daily waste goes to the dumpsite, accelerating accumulation

» **Tendering Delays:** Took over 2 years post-DPR to finalize vendor, on account of low vendor interest in smaller towns and complex procurement terms

» **Health and Environmental Risk:** Emissions and poor waste management directly impact nearby residents

» **Lack of Long-Term Strategy:** No defined roadmap or timelines for post-remediation management causing delays and uncertainty.





Map 21 - Location of the dumpsite with impact radius (Source - TIDE-BORDA Assessments on Chintamani)

Unmanaged legacy waste, delayed remediation, and lack of long-term strategy are fueling environmental risks and GHG emissions near residential areas.

4.3.7 Rising temperatures and impacts on sanitation workers

Chintamani is witnessing a steady rise in temperatures, currently recording around 200 caution days and 50 extreme caution days annually; a figure expected to increase further. This directly impacts the health and well-being of the town's 135 sanitation workers (SWM and UGD) and 24 SHG members involved in solid waste collection. They start work as early as 4 am, often extending up to 12 hours a day, and are exposed to extreme heat during the summer with the existing work schedules.

i. Key Concerns

- 15% of sanitation workers are above 50 years, making them highly vulnerable to heat strokes.
- Outdoor work with no shade, limited access to drinking water, and social taboos restrict hydration during work hours.
- Auto-tippers expose drivers to cabin heat due to seat placement above engines, with frequent breakdowns in summer prolonging exposure.

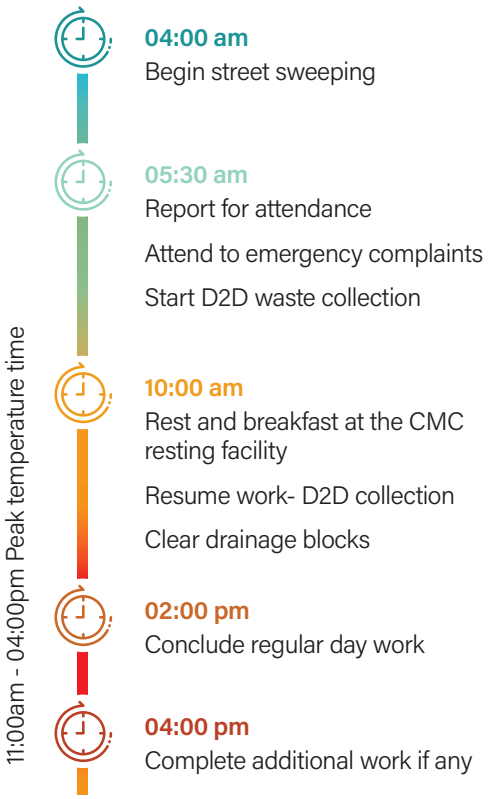


Figure 25 - A regular workday in the life of a sanitation worker

» Personal Protective Equipment (PPE) such as hats, gloves, breathable uniforms, or cooling aids are rarely used or provided, leaving workers unprotected during extreme heat.
» Workers suffer from heat exhaustion, dehydration, and related health issues such as piles, with no formal rest breaks during hot weather.

> "There's no shade, no break. Even if I feel dizzy or weak, the waste won't wait... We need fans, water breaks, or gear to survive these months."
> — Nagaraj, Auto-Tipper Driver, Age 40



Despite rising heat risks, sanitation workers in Chintamani lack climate-adaptive work conditions, with inadequate rest, hydration, PPE, and facility maintenance exposing them to severe health hazards.



ii. Pourakarmikara Virama Kendra

A dedicated WASH and resting facility (500 sq. ft) is available at the CMC office, with provisions for dining, hand/leg washing, and built with passive cooling methods through jali walls, skylights, and Mangalore tiles. However, the open design leads to dust accumulation, and maintenance remains irregular, limiting its effectiveness during peak summer months.

While maintenance of the Kendra was handed over to the sanitation workers, operations and upkeep remain irregular.

4.3.8 Waste Projections and Climate-Responsive Initiatives

Chintamani's daily waste generation is projected to increase from 30.7 TPD (2025) to 50.1 TPD (2040) due to rapid population growth and rising per capita waste generation (projection details in Annexure 5). This escalation places major stress on existing infrastructure, especially with limited source segregation and underperforming processing systems.

Chintamani's growing waste burden and climate-induced disruptions demand urgent execution and efficient management of planned infrastructure to build a resilient, low-emission waste system.

Climate-related disruptions like prolonged or intensive rains in a short period of time and extreme heat are starting to impact collection efficiency, particularly due to open-roof vehicles that lead to leachate, increased waste weight, and worker health risks. The high heat also increases the instances of vehicle breakdowns and increased wear and tear in the summer months.

To address these challenges, key infrastructure projects are underway:

- 2 TPD Dry Waste Collection Centre (15th Finance Commission)
- 12 TPD Material Recovery Facility (SBM 2.0)
- Legacy Waste Management to remediate 49,900 MT of accumulated waste

These projects aim to reduce landfill load, improve recovery, and potentially avoid 9,000 tons of CO_2e generation annually. While aligned with climate

resilience goals, success hinges on timely execution, efficient operations, and strong monitoring. Strategically aligned with climate resilience goals, these developments highlight Chintamani's growing focus on sustainable urban waste systems.

4.3.9 Key Challenges

Despite partial collection coverage and ongoing IEC efforts, systemic gaps persist across collection, processing, financing, and workforce capacity that hinder effective and equitable waste management in Chintamani. Key issues that remain include:

- **Low Source Segregation**
  - » Public awareness and engagement mechanisms are inadequate, especially in low-income settlements.
  - » Only ~27% household compliance.
  - » High-value recyclables and wet waste are not recovered to mixed collection.

- **Inconsistent Collection in Vulnerable Areas**
  - » Only 3% of households receive daily collection.
  - » Slums face irregular services and lack suitable waste collection vehicles for the narrow roads such as pushcarts, leading to open dumping and health hazards.

- **Inadequate Infrastructure Utilization**
  - » Processing facilities and collection vehicles are highly underutilized often due to lack of manpower.
  - » Key gaps include absence of mechanized sorting, hazardous and C&D waste handling.

- **Bulk Waste Mismanagement**
  - » 49 Bulk Waste Generators registered; none segregate or treat waste on-site.
  - » Private vendors dump untreated hazardous, sanitary, and biomedical wastes, mixed with municipal waste on land, violating rules.

- **Occupational Health Hazards**
  - » Sanitation workers face extreme heat, dehydration, and poor toilet access.
  - » Lack of PPE and unsafe vehicle design heighten health threats.
  - » There are no health protocols, shaded rest areas, adaptive work hours, or emergency support which puts older workers and drivers at higher risk.

- **Weak Financial Mechanisms**
  - » Low revenue from user charges, scrap sales, and composting.
  - » No formal market linkages or tracking of resource recovery income.

- **Coordination and Monitoring Gaps**
  - » GPS inactive in collection vehicles.
  - » No structured monitoring for compliance or operational efficiency.

Chintamani must urgently operationalize planned infrastructure, improve segregation, strengthen workforce support, and enforce compliance to tackle rising waste volumes and climate risks. A focused, time-bound action plan is key to building a resilient and inclusive waste management system.

Strategic Solid Waste Sector Actions: Policy, Plan, and Project Pathways to 2030

The following represent priority and high-impact initiatives identified under the solid waste sector, categorized into Policy, Plan, and Project actions to guide systematic implementation toward 2030 targets. Projectization and sequencing will be determined based on municipal priorities, technical feasibility, and budget availability.

Please refer to page 134 for detailed objectives and targets.

Year	Action description	Lead agency	Scheme convergence	Category	Linked to Objective
2026-2030	Pilot 100% waste segregation in Wards 5, 6, 10, and 11 specifically in Malapalli, Kanampalli, Prabhakara Layout, and Ashwini Layout through SHG-led door-to-door collection initiatives	CMC, SHGs, NGOs	SBM 2.0, BMZ, CSR	Project	O8T8.1
2026-2030	Procure 34 pushcarts for primary waste collection in 17 slums and 2 compactors for efficient waste management in commercial areas	CMC, Eng. Dept.,	CMC	Project	O8T8.2
2026-2030	Establish a transfer station at Ashreya Layout to facilitate waste transfer to the MRF and landfill site, with a handling capacity of approximately 2 TPD	CMC	SBM 2.0	Project	O8T8.2
2026-2030	Operate proposed 12 TPD MRF at Kanisettyhalli & revive 2 TPD DWCC at Ashraya Layout with a robust O&M plan and financial model	CMC, TIDE-BORDA, KSPCB	SBM 2.0	Project	O9T9.1
2026-2030	Establish DWCCs (1–2 TPD) in the North and East zones, along with decentralized, community-led 1 TPD composting units at Sriramnagar Colony	CMC, TIDE-BORDA, KSPCB	Municipal funds	Project	O9T9.1
2026-2030	Upgrade and operate the sanitary landfill at Kanisettyhalli for safe disposal of inerts and rejects, with an estimated capacity of ~10 TPD by 2040	CMC, TIDE-BORDA, KSPCB	Municipal funds	Project	O9T9.1
2026-2030	Utilise existing 3 tractors for collection and procure crusher, tippers, JCB for C&D waste (6 TPD) & site	CMC	Municipal funds	Project	O9T9.1
2026-2030	Undertake fleet optimization and route rationalization to improve collection efficiency	CMC, Eng. Dept.	CMC	Plan	O8T8.2
2026-2030	Establish a monitoring and evaluation (M&E) system for legacy waste remediation at Kanisettyhalli and for diversion of 30 TPD of fresh waste	CMC, Service Provider	Municipal funds	Plan	O11T11
2026-2030	Implement climate-responsive work schedules to minimize heat exposure among sanitation workers	CMC, Health dept	Municipal funds	Plan	O12T12.1

Year	Action description	Lead agency	Scheme convergence	Category	Linked to Objective
2026-2030	Maintain five rest spaces across the town equipped with drinking water, shade, and seating facilities for sanitation workers and operators	CMC, Health dept	Municipal funds	Plan	O12T12.1
2026-2030	Prepare hazard-specific Standard Operating Procedures (SOPs) and conduct corresponding safety trainings	CMC, Health dept	Municipal funds	Plan	O12T12.1
2026-2030	Organize annual health check-ups for all sanitation workers	CMC, Health dept	Municipal funds	Plan	O12T12.1
2026-2030	Formulate green event guidelines & reward system in coordination with the town's 10 major event venues	CMC, NGOs, SHGs	Municipal funds	Polciy	O10T10.1
2026-2030	Draft and notify municipal C&D waste byelaw to ensure regulated collection, transport, and disposal	CMC	Municipal funds	Policy	O9T9.1
2026-2030	Draft and adopt CMC Solid Waste Management (SWM) byelaws applicable to all establishments, including Bulk Waste Generators (BWGs), to institutionalize compliance and enforcement	CMC	CMC	Policy	O8T8.1



5

WASH GHG ANALYSIS



This chapter outlines the greenhouse gas (GHG) emissions profile for Chintamani's WASH (Water, Sanitation, and Hygiene) sector, providing a baseline inventory, analysis of emission hotspots, and strategic pathways for mitigation.

5.1 Introduction and Scope

Despite being a small town, Chintamani's WASH emissions make up a significant share of its overall carbon footprint. The WASH CAP estimates these

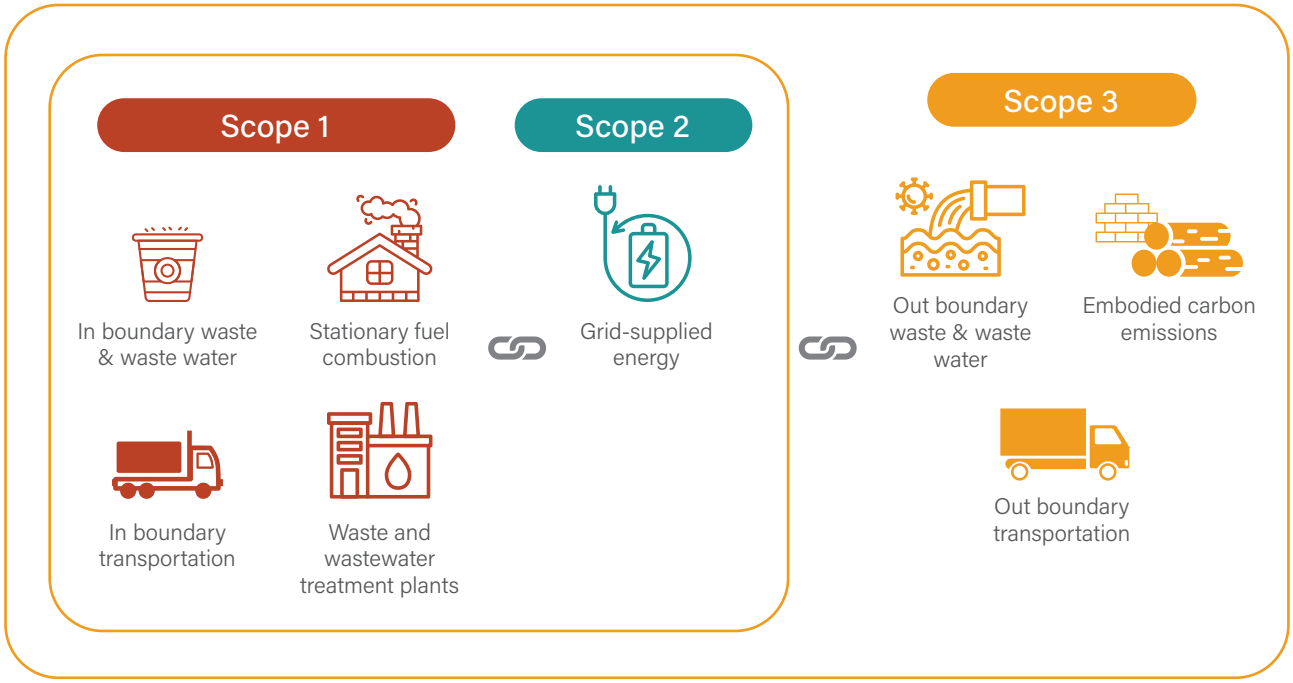
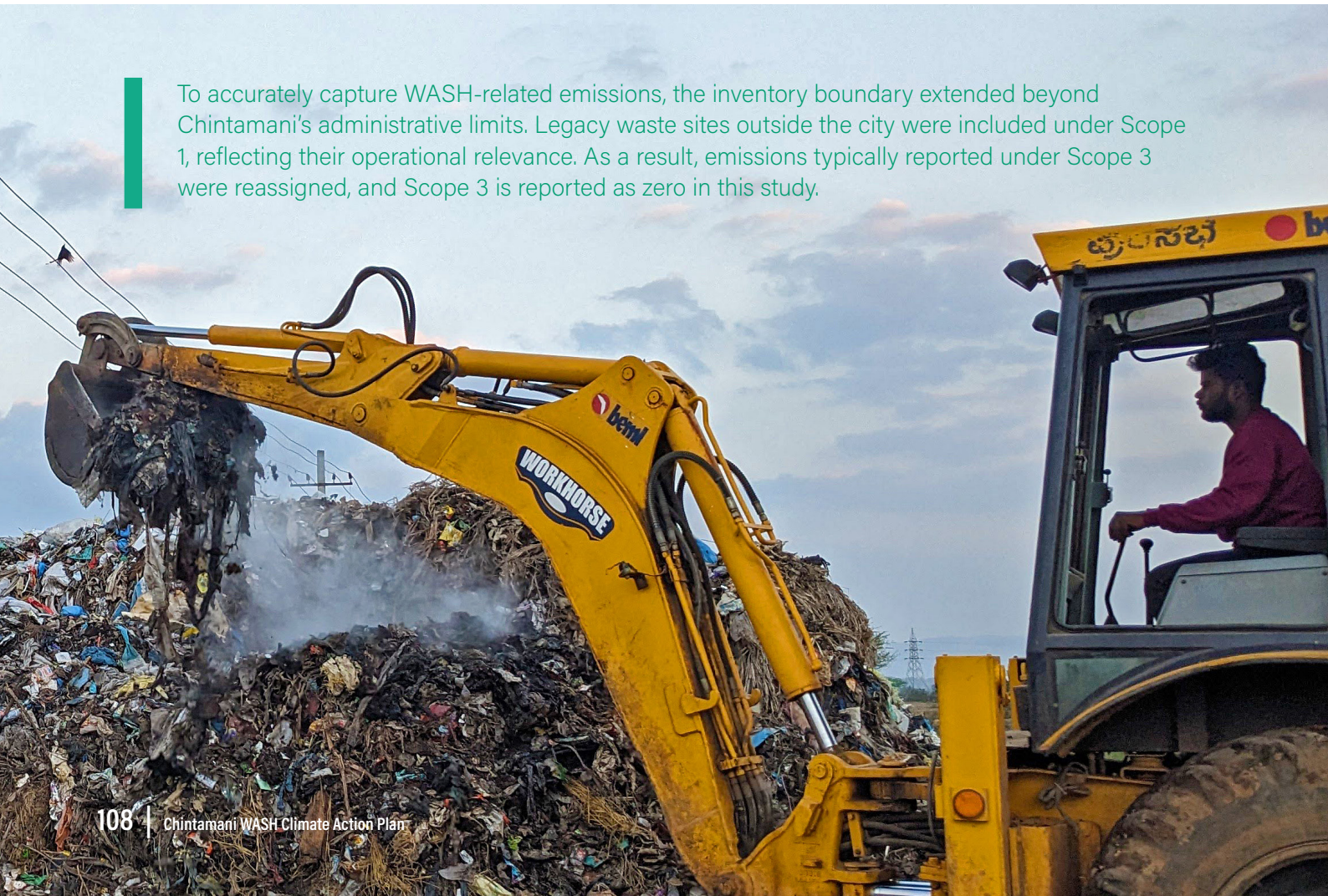


Figure 26 - Scopes of GHG emissions (Source - Global Protocol for Community Scale Greenhouse Gas Emission Inventories)

To accurately capture WASH-related emissions, the inventory boundary extended beyond Chintamani's administrative limits. Legacy waste sites outside the city were included under Scope 1, reflecting their operational relevance. As a result, emissions typically reported under Scope 3 were reassigned, and Scope 3 is reported as zero in this study.





emissions using the GHG Protocol (Figure 26)—Scope 1 (direct, in-city), Scope 2 (electricity use), and Scope 3 (indirect, outside-city). Estimates follow the 2019 IPCC refinement and the Global Protocol for Community-Scale GHG Inventories.

5.2 Base Year (2023) Emissions

The base year emissions on account of WASH and solid waste, total 23,099 tCO_2e, which constitutes for about 25% of all Chintamani emissions. As shown in the next page, solid waste management contributes the largest share (59%), followed by water services (40%) and wastewater (1%). Further it identifies the top five emission sources: the legacy waste site (9,028 tCO_2e; 39% of total), fresh waste (4,461 tCO_2e; 19%), water pumping via grid electricity (9,261 tCO_2e; 40%), transport fuel (110 tCO_2e; 0.5%), and sludge containment (216 tCO_2e; 1%).

Solid Waste Management: In solid waste management, emissions total 13,585 tCO_2e. The legacy waste stockpile of 53,220 metric tons contributes 9,028 tCO_2e per year, forming the majority of emissions in this category, while fresh waste generation at 30 tons per day presents a risk of an additional 4,461 tCO_2e if unmanaged. Within the SWM emissions, 66% is through legacy waste, 33% by fresh waste and transportation contributing to <1%.

It is important to note that all emissions from solid waste management fall under Scope 1, meaning they are directly within the municipality's control and thus a key opportunity for local climate action. Activities such as waste collection, transportation, and processing also add significantly to the solid waste sector's overall carbon footprint.

Water: Water-related emissions, estimated at 9,298 tCO_2e, arise primarily from energy-intensive groundwater pumping through 140 borewells (84 deeper than 1000 feet) and water supply systems (including water drawn from Bhakterehalli Asikere, located 15 km away). Infrastructure dating back to the 1980s–90s further exacerbates inefficiencies.

Wastewater: Emissions from the wastewater sector are low at 216 tCO_2e, largely due to Chintamani's modest population. With most wastewater flowing through centralized UGD network, direct GHG emissions remain minimal. However, untreated wastewater flowing into lakes presents significant non-GHG risks, including surface water pollution and ecological degradation from eutrophication.

Fuel Use across sectors: Across all the subsectors, over 38,000 liters of fuel were found to be used annually for various activities, resulting in over 110 tCO_2e.

40%

WATER

38%

Electricity

Value (tCO_2e) 8,709

Scope 2

2%

Electricity in household pumping

Value (tCO_2e) 552

Scope 2

<1%

Fuel

Value (tCO_2e) 37

Scope 1

2%

WASTEWATER/FSM

<1%

Domestic Wastewater - Untreated

Value (tCO_2e) 84

Scope 1

<1%

Domestic Wastewater - Treated

Value (tCO_2e) 12

Scope 1

1%

CO2 Emissions from the consumption of electricity

Value (tCO_2e) 120

Scope 2

58%

SOLID WASTE MANAGEMENT

19%

Fresh Solid Waste

Value (tCO_2e) 4,461

Scope 1

39%

Legacy Waste

Value (tCO_2e) 9,028

Scope 1

<1%

Electricity

Value (tCO_2e) 24

Scope 2

<1%

Fuel

Value (tCO_2e) 72

Scope 1

Total emissions from WASH Sector 23,099 tCO_2e



Grid derived electricity is the 3rd highest contributor to GHG emissions

About 38,000 L of fuel is consumed in the WASH sector in Chintamani annually



Scenario	Name	Socioeconomic Characteristics
SSP 2-4.5	**"Middle of the Road"** Moderate challenges to mitigation and adaptation; development continues unevenly; no major shifts in policy	Grid decarbonization, renewable energy share reaches 100% by 2050 Waste treatment efficiency increases Improved treatment rates
SSP 5-8.5	**"Fossil-fuel Development"** Rapid economic growth, energy-intensive lifestyles, high fossil fuel use, weak climate policy	Proliferation of fossil fuel usage Legacy waste sites thrive. Existing practices continue without much change

Figure 27 - Shared Socioeconomic Pathways (Source - Sixth Assessment Report (AR6), IPCC, 2023)

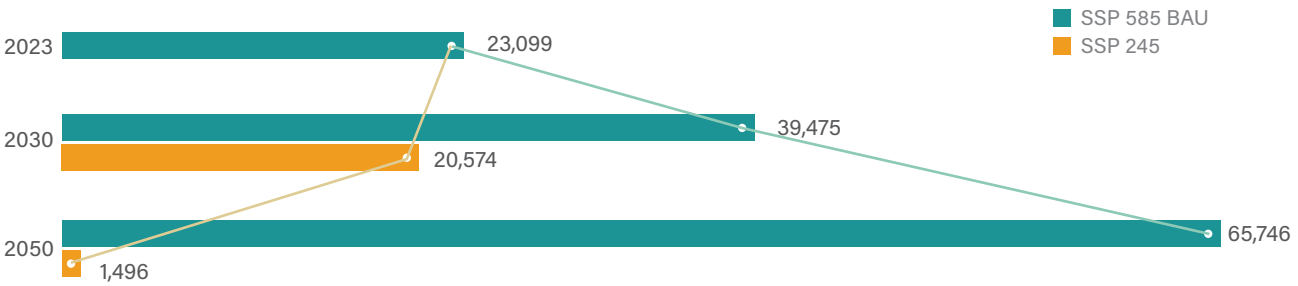


Figure 28 - Projected comparison between Business As Usual (BAU) and Middle of the Road scenarios for Chintamani WASH emissions

5.3 Future Pathways: SSP Scenarios

Shared Socioeconomic Pathways (SSPs) are five scenarios developed to describe how global society, demographics, and economics might evolve throughout the 21st century without new climate policies. They provide narratives about future population growth, economic development, technology, and energy use, helping to understand how these factors influence greenhouse gas emissions and climate change. SSPs are used alongside Representative Concentration Pathways (RCPs) to model different climate futures, combining socioeconomic trends with greenhouse gas concentration levels. The five SSPs range from sustainable development with low challenges to mitigation and adaptation (SSP1) to fossil-fueled development with high emissions and challenges to mitigation (SSP5), including scenarios of regional rivalry and inequality. Using Shared Socioeconomic Pathways, Figure 28 projects emissions trajectories to 2050. Under SSP 2-4.5, gradual improvements could reduce emissions by 94% to 1,496 tCO_2e. SSP 5-8.5, business-as-usual and fossil fuel intensification could see emissions soar by 184% to 65,746 tCO_2e. The cost of inaction is extremely high.

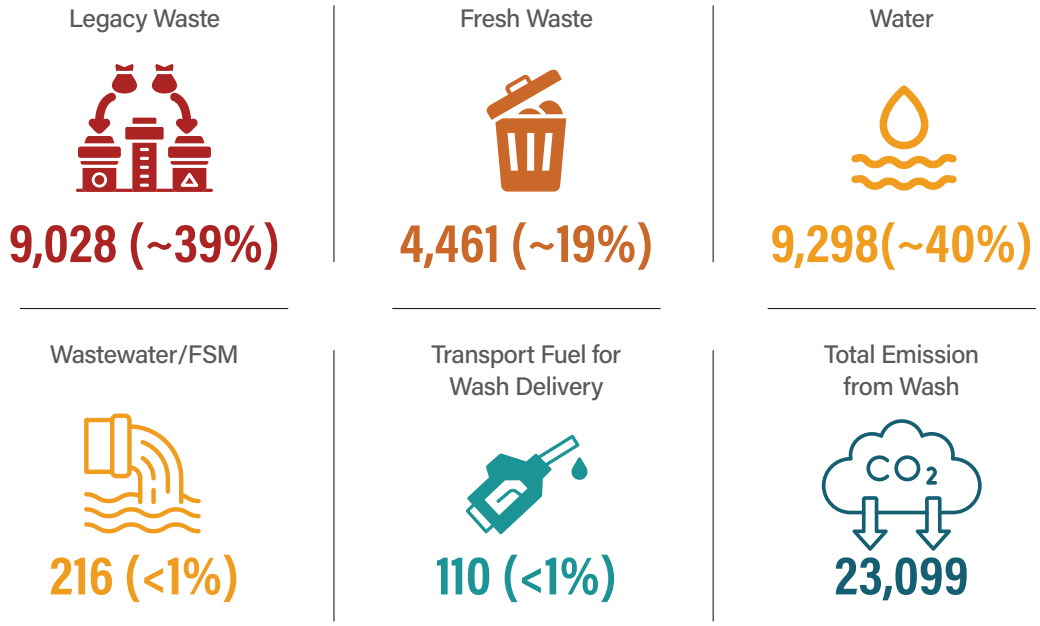
5.4 Drivers and Strategic Imperatives

Legacy Waste is the Dominant Driver: At 9,028 tCO_2e annually, legacy waste alone accounts for nearly 40% of total WASH emissions. This highlights the long-term climate burden of unmanaged waste stockpiles—a clear opportunity for high-impact, one-time remediation.

Fresh Waste is an Avoidable Future Burden: With fresh waste emissions at 4,461 tCO_2e, there's a real risk of adding significantly to future legacy waste emissions if current waste handling systems aren't upgraded.

Water Sector is Grid-Energy Dependent: Grid electricity used in municipal and household pumping

Summary of Emissions from WASH



contributes 9,298 tCO_2e—driven primarily by deep borewells. This makes the water sector both a major emitter and highly sensitive to energy price and reliability shocks.

Transport Fuel is a Low Share but a Visible Source: While waste transport accounts for only 0.5% of emissions, transitioning to electric vehicles or route optimization can further reduce this footprint and demonstrate visible green leadership.

Chintamani can reduce over 65%[1] of WASH emissions through targeted local interventions. Priority steps include tackling major GHG sources through legacy waste remediation, fresh waste treatment and safe disposal, and solarizing borewells.

These actions are indispensable to nudge Chintamani towards a sustainable and climate safe future.

[1] *Assuming 80% of the legacy waste is remediated, 80% of fresh waste processes and 50% of electricity is from green sources*



6

TOWN PREPAREDNESS



A comprehensive preparedness review evaluated Chintamani's institutional, financial, and operational capacity to manage climate related WASH risks by analyzing policies, stakeholder roles, budget records, and service delivery systems, supplemented with consultations and secondary data. This chapter explores the key financing and governance challenges, ranging from centralized fund design and inflexible guidelines to weak revenue mechanisms and limited local autonomy- that hinder the town's resilience.



Figure 29 - Assessment aspects of town WASH preparedness to climate hazards

6.1 Institutional and Regulatory Landscape

6.1.1 Institutional Roles and Coordination

Small towns like Chintamani face significant limitations in regulatory reach and monitoring capacity, especially for WASH services. Strengthening preparedness requires a clear understanding of the local policy landscape and coordination across institutions. Chintamani's institutional landscape reveals systemic coordination and governance gaps that constrain effective WASH service delivery and disaster response. The existing WASH institutions and their roles have been mapped in Figure 30.

Multiple stakeholders with overlapping roles: The Chintamani CMC is primarily responsible for operations, maintenance, and to some extent, planning. The policy formulation is mainly done at UDD/DMA across the WASH sector. However, major water supply, wastewater projects are planned and executed by DUDC/KUWSDB/KUIDFC. For long-term sustainability, these projects need to be formulated in conjunction with the CMC's on-ground insights. This calls for more coordinated planning, integration, and joint implementation across institutions.

Limited Autonomy: CMC lacks authority for rapid decision-making, often requiring external approvals, which delays emergency action.

	Policy	Planning	Implementation	O&M	Tariff & Revenue
Water					
Surface Water Resources	MI				
Ground Water Resources	MI	CMC			
Water Supply	UDD	DMA/KUWSDB/KUIDFC/CMC		CMC	
Storm Water	UDD	CMC/Highways Dept/PWD			
Wastewater & Sanitation					
Public Toilets	UDD	CMC			
Septage Management	UDD	DMA/KUWSDB/ KUIDFC/CMC		CMC	
I&D, Sewerage Network/STPs	UDD	DMA/KUWSDB/KUIDFC/CMC		CMC	
Solid Waste Management	UDD	DMA/CMC	DUDC/CMC		

DDMA: Overall planning, decision making and on-ground support for handling pre, during, and post disaster events

KSPCB- NGT: Monitoring and course correction for the service delivery across WASH sectors

** In limited capacity*

Figure 30 - Institutional mapping for WASH service delivery in Chintamani (Source - Consultations with Chintamani City Municipal Council)

6.1.2 Existing Policies and Plans

A review of existing policies and plans reveals that, although Chintamani CMC has access to several state-issued and locally relevant instruments to support climate-resilient WASH services, scope for improvement remain in implementation and enforcement. The assessment of major policies/plans in the WASH and ideal requirements are listed in table 10.

Table 10 - Analysis of climate relevant policies and plans

Policy/Plan	Climate Resilience Elements	Ideal Requirements
District Disaster Management Plan (DDMP), 2024-25	SOPs for climate hazards based on district's history and aligned with national and global agendas Defined departmental roles Pre/during/post-disaster protocols	Preparatory measures are taken, however further emphasize on long-term resilience and adaptation including local urban hazards like waterlogging Clear differentiation between urban and rural risks, responsibilities shall help in preparedness Incorporate geo-spatial mapping and attention to urban-specific vulnerabilities (e.g., migrant labor, urban poor, informal workers) Clear guidelines for translating district plans into local actions, coupled with progress monitoring, can empower ULBs to effectively implement adaptive measures.
Chintamani Masterplan 2031	Land parcels marked out for public utilities (STP marked out) 30m buffer around water bodies and 50m from SWM sites marked as no development zone (buffer zone) Rain water harvesting requirements have been detailed	The master plan should reflect ground realities and align with WASH plans and building byelaws. Regular updating and mandated for use in project planning, including buffer zone enforcement shall ensure better use o the master plan Consideration of flood-prone and low-lying areas in land allocation for WASH can help improve the town's climate adaptation.
SWM Byelaws, 2019 **Plastic Ban Rules, 2012** **Legacy waste advisory guidelines**	Promotes source segregation and management at source Mandates segregated Door-to-door collection with suitable vehicles, including exploration of electric vehicles Decentralised processing is advocated, reducing transport requirements Advocates integration of informal workers and overall sanitation workers occupational safety	Climate risk considerations to be integrated into SWM planning, site selection, worker safety, and resilient work practices. Establish a clear town-level roadmap with targets and monitoring mechanisms thereby supporting effective adoption of measures like plastic ban, Bulk Waste Generator (BWG) guidelines, and ward-level plans at CMC level. Operationalize state advisories, including legacy waste remediation, and align SWM charges with building byelaws for improved cost recovery
Model Building Byelaws, 2017 **Fines for Cleanliness (2019)**	Rainwater harvesting (RWH) is mandated along with detailed criteria based on space Onsite wet waste composting and onsite STP mandates are present for buildings with more than 5000 sqm area	Strengthen building byelaws to include climate-resilient provisions for hazard-prone areas and ensure effective enforcement of rainwater harvesting and wastewater norms Improve inspection and approval processes to prevent unauthorized connections. Extend SWM and wastewater disposal mandates to smaller buildings below 5,000 sqm for small towns.
Mapping Water in Small Towns Study (2023)	Study carries out full water system map from source to disposal Highlights need strengthening local water resources and wastewater management improved water security for the town	Prepare clear actionable plan from the extensive study and data collected Ensure utilisation of the report in informing future water resource planning and decision-making.

While the CMC adopts the state/district level plans/ policies, the contextualization of these byelaws to the small town is missing. Furthermore, the absence of an enforcement and monitoring plan often affects the long-term sustainability of the actions adopted. Additionally, most policies and plans are standalone documents that lacks climate and WASH integration.

6.1.3 Established SoPs and Guidelines

Despite the existence of multiple functional departments, standard operating procedures (SOPs) for normal and crisis scenarios are either undocumented or reactive, often based on complaints or politically driven. Below is a summary of SOPs/practices across key WASH and climate vulnerability areas.

Chintamani requires integrated, climate-sensitive WASH policies and enforceable SOPs tailored to small-town realities, without which there is high dependency on an informal, complaint-focused approach. Additionally, the lack of detailed town-level WASH and climate data limits effective planning, early warning, and resource allocation.

Table 11 - Existing SOPs, guidelines and practices for WASH services
(Source - Consultations with Chintamani City Municipal Council)

Key Aspect	Normal Scenario	During Crisis	Ideal Requirement
Water Supply **Frequency and supply hours**	As per the Engineering dept standards -once a week on average	Supply frequency and hours are reduced based on the borewell yield/water in the storage tanks. Low yield areas are identified based on ground observations Additional funds are requested from taluk Hiring of borewells/water tankers are carried out through formal arrangements Bhaktharahalli-Arsikere backup source activated	SOP for deciding water supply frequency and hours Mapping high-risk/vulnerable zones and service prioritisation Demand assessment backing for the supply hours Seasonal water planning to address water stress Plan for hazard preparedness fund
Wastewater	Desludging and blockage removal based on complaints Irregular drain cleaning schedules	Blockage removal based on complaints	Preventive and regular desludging plans Mapping of regular choke points and prior actions Equipment and HR for emergency overflow management
Public Toilets	Health Inspector-random checks	Health Inspector random checks	Regular checks Structured O&M contracts or logs Service continuity during crisis - Missing
Stormwater	Partial or inadequate Pre-Monsoon checks and cleaning	Complaint-based stormwater drain cleaning	Pre-monsoon action plan On ground monitoring for enforcing buffer zones
Sanitation Worker Safety	Only basic PPE is provided Fixed work schedules	No additional safety measures No change in work schedules	Hazard-specific training Reduce the heat impact, such as work hour shift
Rainwater Harvesting	RWH structures are mandated in building permits Lacks a follow-up check on functionality	No functionality checks	Inspections or incentives for having RWH Trainings and guidelines on how to maintain the RWH

Key Aspect	Normal Scenario	During Crisis	Ideal Requirement
Groundwater Usage	Permits required for digging a borewell No monitoring or groundwater usage	No demand regulation or monitoring measures for groundwater usage	Groundwater extraction and usage monitoring
WASH and climate data monitoring	Monthly taluk GW level and quality check Monthly STP treated water quality check	Need frequent surface water level check especially in summers Legacy waste leachate quality and emissions check are to be done during heavy rains and heat waves	Town level data to be collected at regular intervals for effective planning and preparedness Clarity on how the collected data is to be read and utilised is to be ensured

6.2 Responsive to Climate Risk

In small towns like Chintamani, climate risk response depends on coordination across state, district, taluk, and municipal levels. This section reviews institutional roles, coordination mechanisms, and operational challenges in responding to the key hazards impacting the town such as droughts and heatwaves.

6.2.1 Identifying Key Stakeholders and their Roles

Despite a layered institutional framework, the absence of a central coordinating authority at town level and clear protocols severely limits Chintamani's ability to respond effectively to climate risks. Key insights from the analysis are discussed below.

Centralized Decisions, Local Execution: KSDMA lead hazard declaration and response planning, but implementation is routed through district-level DDMA and taluk task forces, with the CMC handling last-mile delivery.

WASH Integration Missing: Agencies responsible for WASH services are not systematically embedded in disaster preparedness frameworks-despite their critical role in climate response and recovery.

6.2.2 Communication and response to hazards

In Chintamani, town-wide hazards like droughts and heatwaves depend on IMD and KSNDMC data, with KSDMA issuing official alerts at the taluk level. Unlike visible disasters, these hazards trigger slower responses and lack long-term adaptation plans at ULB and district levels. In drought situations, communication flows both ways: a top-down declaration process via DDMA and towns also alert taluk and district authorities when local water stress escalates, enabling coordination and support. Social media platforms like WhatsApp and Facebook are also used to convey alerts with people during hazards.

Table 12 - Stakeholder mapping for disaster management in Chintamani

Level	Agencies Involved	Roles in Disaster Response
State	KSDMA, KSNDMC, Health Dept, IMD, State Emergency Operation Centre WRD and KUWSDB (during emergencies)	Issue hazard declarations, guidelines, funding, and monitoring
District	DDMA	Fund allocation, hazard communication and field coordination, oversee taluk and ULB implementation
Taluk	Tahsildar, Taluk Task Force, Taluk PWD, Taluk Health Dept, Fire and Police departments	Manage funds and approval for local logistics (tankers, borewells), route funds, support implementation, allocate additional manpower
ULB (CMC)	Commissioner, Executive Officer, Zonal Engineer, Sanitation Inspector, Ward-level staff	Execute on-ground relief (water, sanitation, safety infrastructure) and community outreach, provide reports, and requests for additional funds based on ground scenario



Case Study: Lessons from Chintamani's 2019 Drought

In 2019, Chintamani faced a severe drought. Borewells and lakes, including the main Kanampalli water source, dried up. Only 15% of borewells were functional. DDMA directed the Taluk Task Force to hire private borewells and arrange water tankers in coordination with the CMC. Tankers were sourced from surrounding areas and payments were made by the Tahsildar using DDMA-managed relief funds. However, multiple issues emerged:

- **Monitoring Failure:** No system existed to track tanker movements or verify delivery, leading to irregular supplies and increased complaints.
- **Inequity:** Low-income areas faced disproportionately poor service.
- **Cost Escalation:** Poor planning led to prohibitive costs and inefficient tanker routing.

Post-Crisis Response: The CMC decided to stop using tankers in future droughts. It plans to link hired borewells directly to existing sumps, reducing dependence on road tankers.

The existing multi-tiered response system activates mainly after a crisis is declared, with limited emphasis on ongoing local adaptive planning or prevention, which is especially critical for slow-onset hazards like droughts. Towns depend largely on top-down directives, lacking autonomy and proactive decision-making capacity at the local level.

6.3 Institutional Capacity and Support Systems

This section evaluates the ULB's capacity to deliver effective WASH services during routine and crisis periods, focusing on grievance redressal systems and the adequacy and efficiency of its workforce.

6.3.1 Grievance Redressal

Chintamani CMC manages complaints through a manual register and Integrated Public Grievance Redressal System (iPGRS) system, with complaints typically assigned to relevant departments and resolved within 1–3 days. However, during periods of drought or excessive rainfall, the volume of complaints increases significantly, but as the available workforce remains unchanged, there are delays in responding.

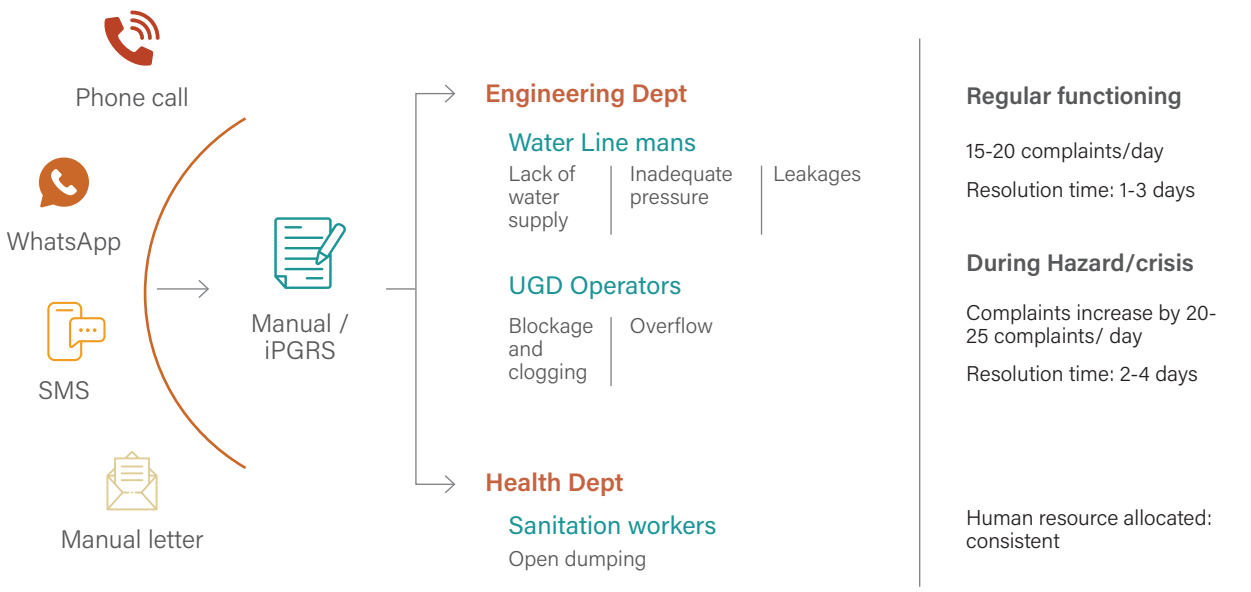


Figure 31 - Complaint registration and response mechanism (Source - Chintamani City Municipal Council)

Table 13 - Compliant Redressal System (Source - Chintamani City Municipal Council)

Feature	Current Practice	Ideal Requirement
Registration	Manual logbook as well as iPGRS	Integrated digital complaint logging system with common municipal helpline
Response Time	1–3 days (normal); longer in crisis	Escalation matrix and system for delayed complaint redressal and auto-alert mechanisms.
Follow-up	Irregular, informal	Establishing feedback loop or verification mechanism for resolved complaints
Crisis-Specific SOPs	Not available	Establish a system or plan in place for handling surge complaints along with HR allocation to support quick resolution.

6.3.2 Human Resource Adequacy

Chintamani's WASH service delivery is severely hampered by chronic understaffing, outdated workforce norms, and overdependence on outsourced labor lacking formal training or crisis readiness.

Pertinent issues include:

» **Vacant Technical Posts**: Only three out of twelve sanctioned positions are filled, creating a technical oversight vacuum.

» **Outdated Staffing Norms**: Staffing structure is based on 2011 population, despite over 30% growth.

» **Untrained Outsourced Staff**: Temporary workers manage core services like UGD and STPs but lack standardized training and safety protocols.

» **Reliance on Approvals causing delays**: Emergency hires require DUDC approval, slowing responsiveness.



Figure 32 - Inadequacy in the frontline workers for WASH (Source - Chintamani City Municipal Council)

» **Climate Exposure Risks**: Frontline workers face health and productivity impacts during heatwaves and droughts, compounded by lack of protective protocols and Standard Operating Procedures (SoPs), leading to inefficiencies.

6.3.3 Capacity Building

The municipal officials undergo training and capacity building exercises organized by State Institute of Urban Development at the Administrative Training Institute, Mysuru. Training topics include WASH infrastructure and services, Disaster Management, etc. Municipal officials attend 2–3 non-mandatory training sessions yearly, mostly on routine WASH topics. Even though, the officials learn new initiatives in the trainings, there is no system to evaluate learning outcomes or application on ground. Sanitation workers receive no formal training; rely on verbal instructions and past experiences on hazard related issues.

6.4 Financial capacity

This section presents a concise overview of Chintamani's municipal finances-covering total budget trends, funding sources, WASH allocations, capital and revenue expenditures, and the town's limited ability to recover costs through own-source revenues such as taxes and user charges.

Table 14 - Current capacity building trainings for climate (Source - Chintamani City Municipal Council)

Category	Frequency/Provider	Details
Class I/II Officers	Ad-Hoc (KSDMA/ DDMA); 2–3 SBM/AMRUT/ATI	A week long trainings have been initiated recently which covers a debrief on the Disaster Management Plan, general preparedness, and a fire hazard demonstration. However, it lacked integration of climate change and WASH and did not address region-specific hazards.
Frontline Sanitation Staff	None	No mandates, ad-hoc trainings are being carried out by NGOs on the segregation process, work safety etc.
Informal Workers	None	No mandates, no trainings on awareness of safety, or hazard impact etc

Manual processes and unclear workflows delay crisis response and reduce accountability, while understaffed and overstretched WASH workers remain vulnerable and ill-prepared due to irregular, generic training. These combined challenges weaken the overall effectiveness of emergency management.



6.4.1 Budget Overview

This analysis draws on Chintamani CMC's annual budget data over eight financial years (2018–19 to 2025–26), including actual receipts, planned outlays, revenue and capital expenditures, and breakdowns of internal (own-source) and external (grant-based) funding. The data was sourced from official municipal budget documents, supplemented by consultations with municipal officials to understand contextual shifts such as post-COVID arrears, mission-linked capital inflows (e.g., AMRUT, SBM 2.0), and changes in fund utilization patterns. Key insights from the review include:

- **Unreliable Revenue Forecasting**: Over the last eight years (2018–2026), the Chintamani CMC's budget has fluctuated widely-from ₹15.6 Cr in 2018–19 to ₹88.7 Cr in 2025–26. However, own-source revenue consistently falls short of projections by an average of 64%, pointing to poor estimation, especially of property taxes and user charges.
- **Dependency on External Transfers**: Between 52% and 80% of the town's revenues come from external sources (SFC/FFC grants, mission-based allocations).
- **Underperformance in Own Revenues**: Own-source income (taxes, fees, charges) covers only 12–54% of revenue expenditure, falling far below the benchmark needed for financial sustainability.
- **Impact of COVID-19:** FY 2020–21 saw a revenue dip due to lockdowns; though arrears were recovered in subsequent years, the volatility distorted budget forecasting and delayed payments**.** Property tax collection efficiency dropped below 30% post-COVID, particularly affecting the core revenue base of the municipality.

6.4.2 WASH budget analysis

This assessment was carried out based on audited municipal budgets (2018–2024), disaggregated WASH expenditure records, supplemented by consultations with municipal accounts and engineering staff. Key insights that emerged include:

- **High Share in Budget:** From 2018–2024, WASH accounts for 56–84% of revenue expenditure and 48% of capital expenditure-indicating its criticality to municipal operations. (Figure 34)
- **Electricity and Fuel Drain the Budget**: On average, 61% of WASH revenue spending goes to electricity and fuel-primarily for pumping, STPs, and water tankers-leaving limited scope for infrastructure upgrades or contingency investments. (Figure 36)
- **Human Resources Underfunded**: Despite sanitation workers forming the bulk of the workforce, only 17% of the WASH operating budget is spent on HR, limiting recruitment and welfare schemes.
- **Capital Growth, Limited Autonomy**: Though WASH capital investment has grown, these are mostly routed through state agencies (KUWSDB**,**

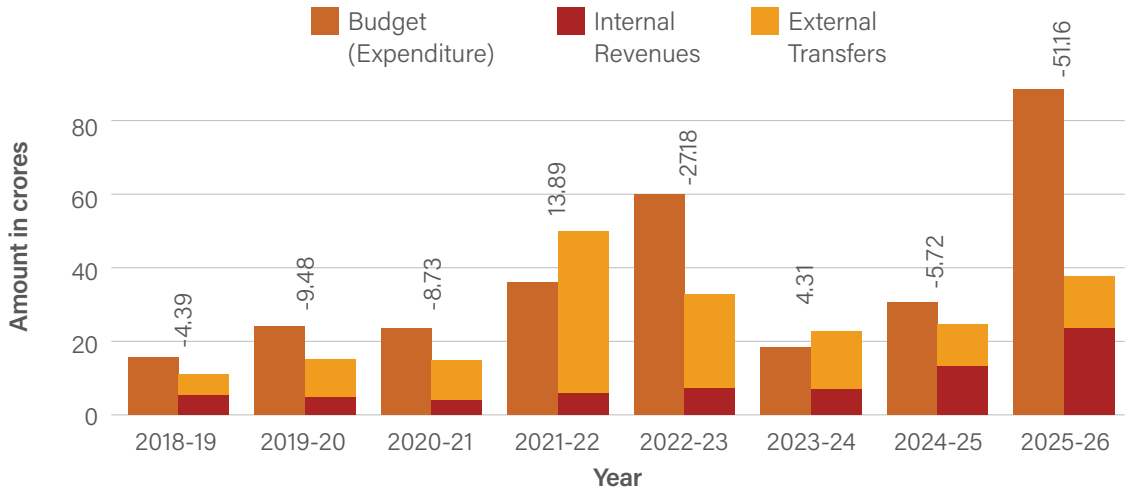


Figure 33 - Municipal budget trends, 2018-26, highlighting annual gaps in revenue and expenditure (Source - Chintamani municipal budget)

An overstretched budget, driven by overestimated revenues and high external dependency, leaves limited space for local resilience.

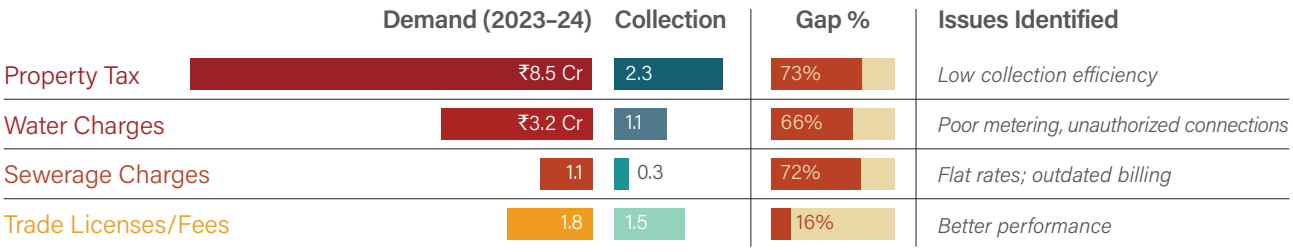


Figure 34 - Own source revenue, demand and collection gap (Source - Chintamani municipal budget)

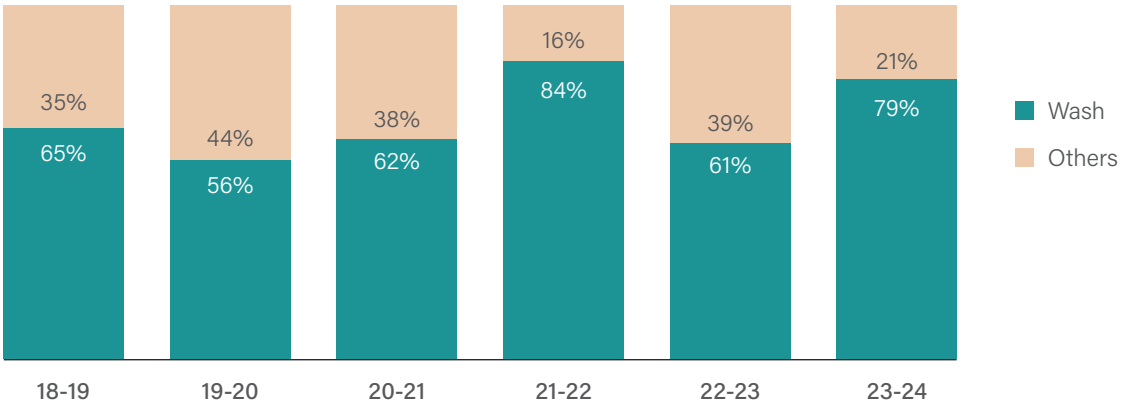


Figure 35 - Share of WASH in overall expenditure (Source - Chintamani municipal budget)

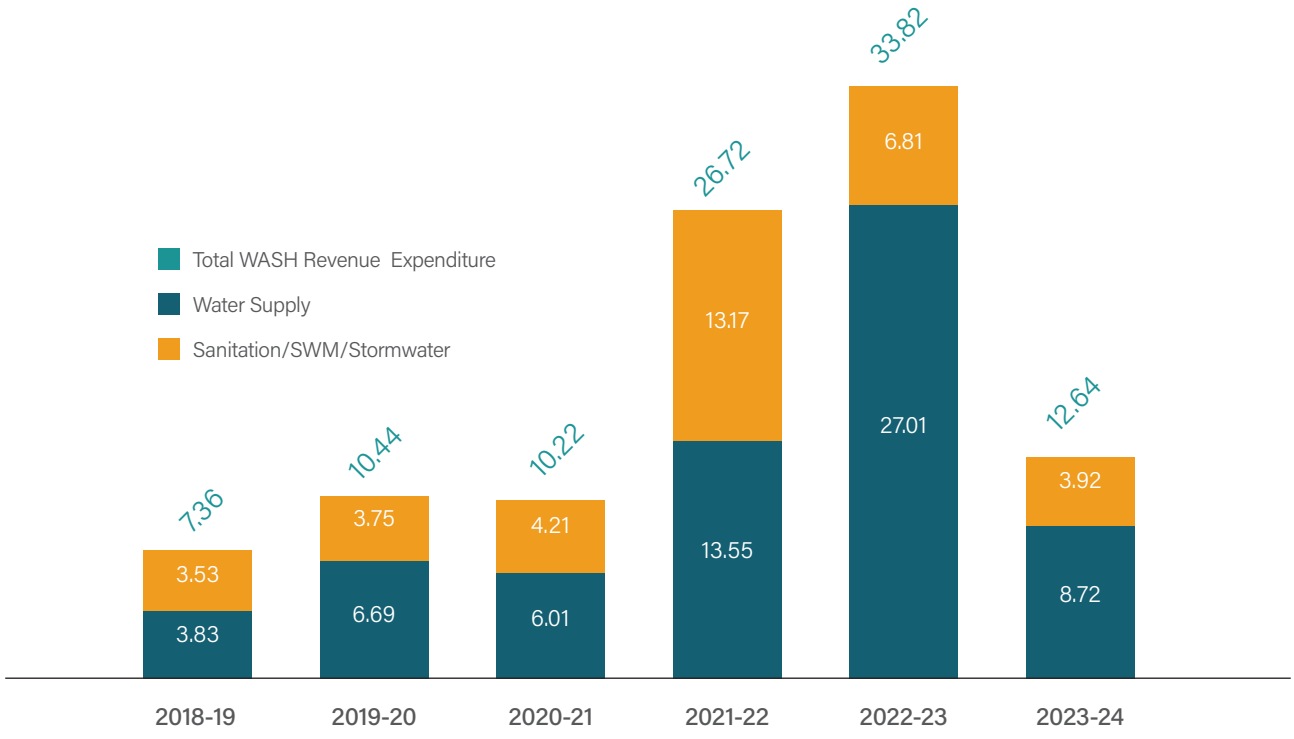


Figure 36 - WASH Revenue Expenditure (INR Cr) (Source - Chintamani municipal budget)

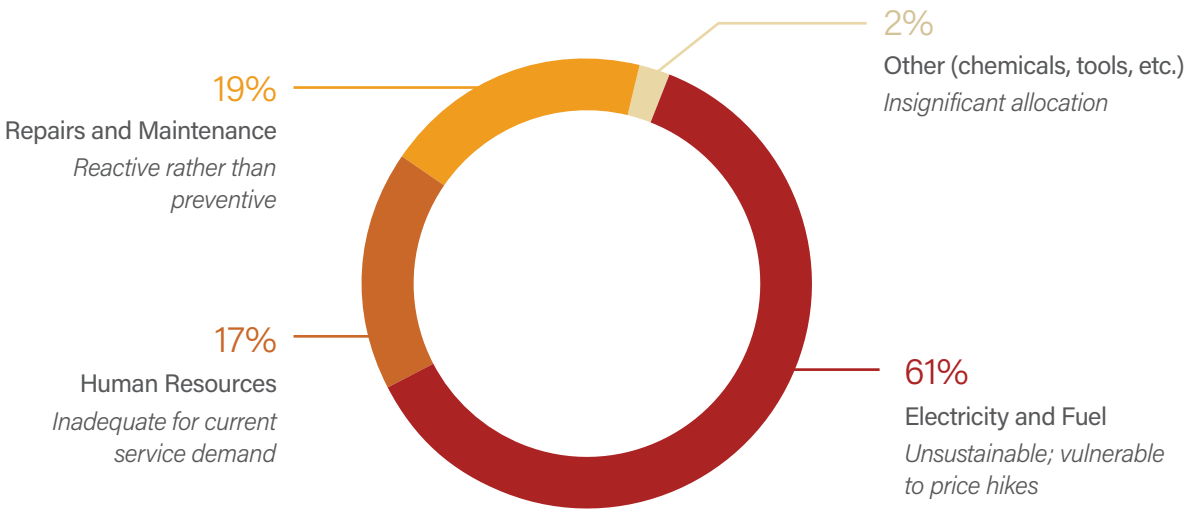


Figure 37 - Nature of WASH Revenue Spending (6 Yr Average) (Source - Chintamani municipal budget)

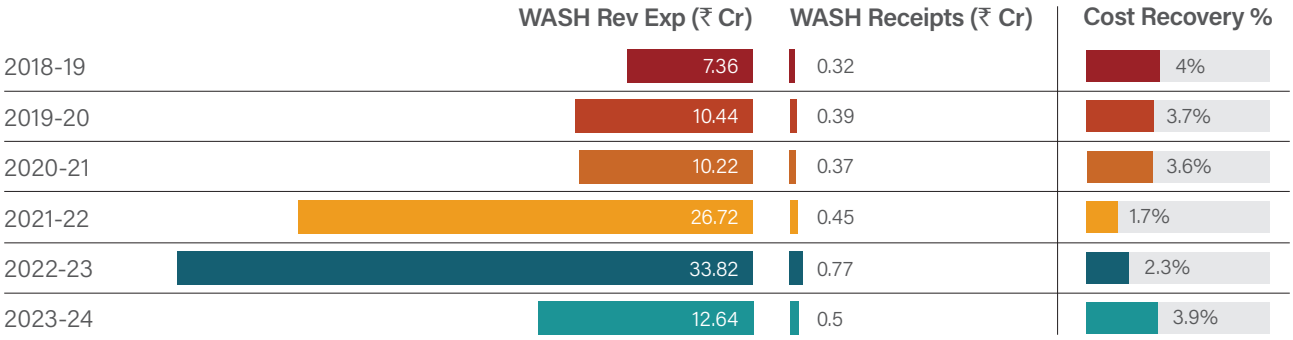


Figure 38 - Comparison between WASH revenue expenditure and WASH revenue receipts (Source - Chintamani municipal budget)

High Spend, Low Recovery: WASH takes up most of the budget, but poor cost recovery and uneven allocations weaken long-term sustainability

KUIDFC), with limited ULB control over planning, design, or execution-diluting local ownership and accountability.

- **Unviable Cost Recovery**: User charges for water and sewerage cover less than 15% of actual WASH operational costs. Reasons include:
  - Unrevised tariff since 2018
  - Flat rates for all users
  - Unauthorized connections (only 33% registered)
- **Dependency on Grants:** SFC grants cover 80% of operating costs; without them, WASH operations would be financially unsustainable.

6.4.3 Climate responsive emergency preparedness fund

This subsection evaluates dedicated funds available for climate and disaster response, based on a review of financial allocations from CMC's budget books and disbursement records between 2018–2024. It focuses on the Calamity Relief Fund and SFC Drinking Water Security Grants, examining their utilization, control mechanisms, and effectiveness. Effective climate-resilient WASH service delivery in Chintamani is constrained not only by institutional coordination challenges but also by rigid financing structures and weak revenue systems. This section highlights key bottlenecks in fund access, utilization, and local resource mobilization that undermine timely and equitable action. Key observations include:

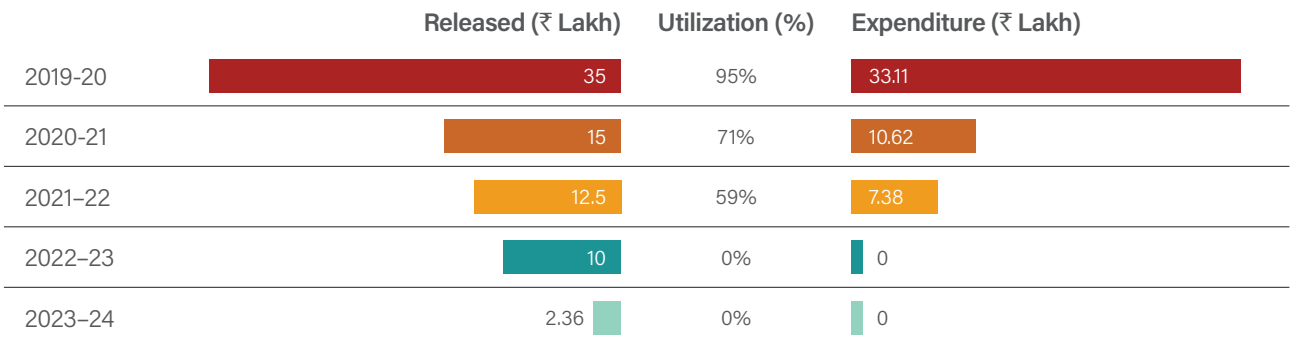


Figure 39 - Utilization of SFC Drinking Water Security Grant (Source - Chintamani municipal budget)

- **Infrequent Utilization**: Although ₹1.0 Cr is allocated annually for Calamity Relief, funds were accessed only during the 2018–19 and 2019–20 droughts- for tanker and borewell hiring-revealing a lack of proactive or diversified use.
- **Control Lies Elsewhere**: Calamity Relief funds are routed through the District Disaster Management Authority (DDMA), limiting the municipality's autonomy and speed in emergency deployment.
- **No Local Buffer**: CMC lacks dedicated resilience or contingency fund for early action.
- **Funds Go Unused Due to approval delays:** Water security fund utilization dropped to 0% in 2022–23 and 2023–24 due to delayed approvals.

Overcoming these systemic bottlenecks requires greater fiscal flexibility, targeted revenue reforms, and streamlined coordination. These actions are essential to deliver timely, equitable, and sustainable climate risk responses.

Strategic Town Preparedness Actions: Policy, Plan, and Project Pathways to 2030

The following represent priority and high-impact initiatives identified under town preparedness, categorized into Policy, Plan, and Project actions to guide systematic implementation toward 2030 targets. Projectization and sequencing will be determined based on municipal priorities, technical feasibility, and budget availability.

Please refer to page 134 for detailed objectives and targets.

Year	Action description	Lead agency	CSategory	Linked to objective
2026-2030	Introduce a structured annual hazard preparedness training cycle for all WASH related stakeholders to strengthen municipal and town level preparedness	CMC	Plan	O13
2026-2030	Develop clear, operational SOPs for key climate-linked WASH hazards such as water crisis response, heatwave management, and water logging	CMC	Plan	O14
2026-2030	Establish a Municipal-level Climate WASH Task Force to coordinate hazard preparedness and response for WASH services	CMC	Plan	O14
2026-2030	Develop plan to recover outstanding arrears- Property Tax, Rental fee, SWM and Water Charges of last 3-4 years. Cover Demand Gap UGD charges (44%-> 90%) Water Charges (28% -> 80% Property tax (27% -> 75%)	CMC	Plan	O16
2026-2030	Regularize unauthorized water and UGD connections Water connections (8939 to 13000) Sewer connections (8324 to 14000)	CMC	Plan	O16
2026-2030	Assess and allocate emergency preparedness funds to address crisis such as water shortages, Heat response activities	CMC	Plan	O16



7

ACTION PLAN





7.1 Vision for Climate Resilient WASH in Chintamani

Climate Ready and Resilient Chintamani

7.2 Sectoral WASH - Climate Visions

Water

'A town that has safe and dependable drinking water for every resident'

Waste Water Sanitation

'Reliable inclusive and safe sanitation services for a dignified, healthier Chintamani'

Solid Waste

'Achieve a Garbage Free Chintamani'

Town Preparedness

'A town that is always prepared, with clear and smarter systems to respond to any hazards'

7.3 Approach of the Chintamani WASH CAP

This action planning process is structured to be practical, inclusive, and climate-responsive to the town. It recognizes the small-town governance structures, financial, and service delivery challenges of small towns and offers a framework that bridges immediate actions with long-term resilience. This WASH CAP is grounded in the foundational principles of the ICS WASH framework which prioritizes access, equity, inclusivity, and sustainability as cornerstones for ensuring preparedness against future climate hazards and for building climate resilient WASH systems.

To make action planning truly effective in small towns, we focused on what's actionable, relevant, and sustainable. The approach balances urgency with feasibility, ensuring that plans are not just visionary but implementable with the capacities and constraints that Chintamani faces on the ground.

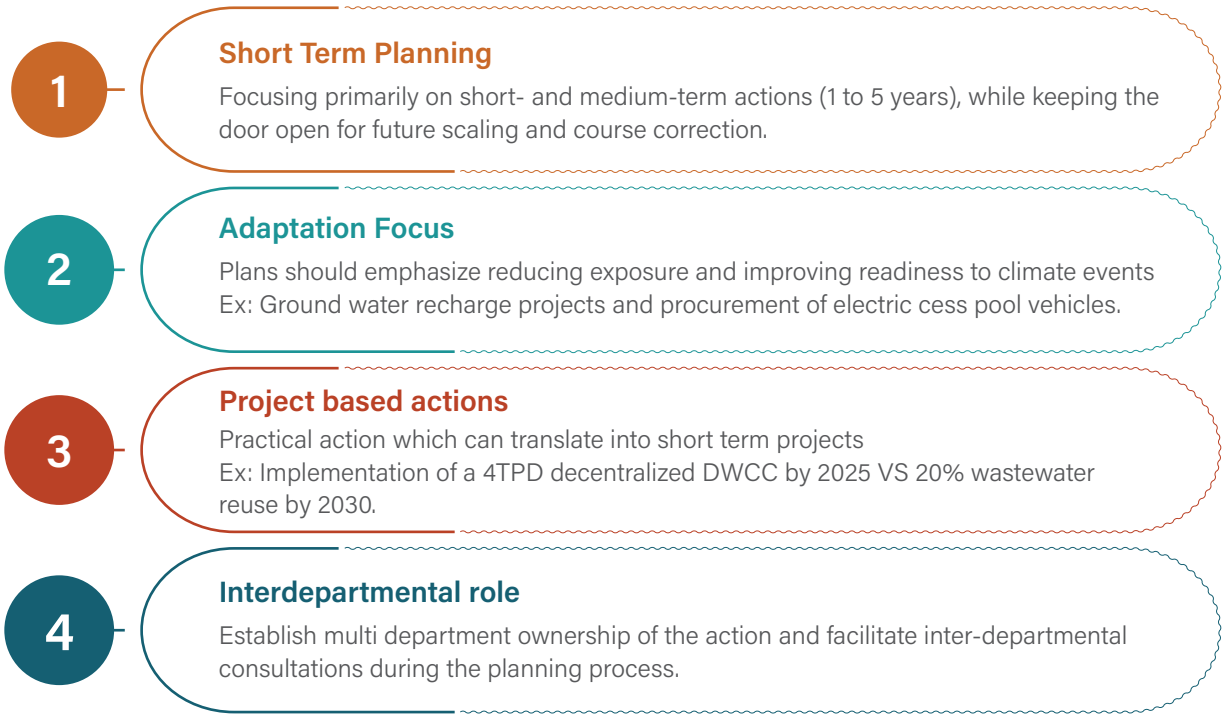


Figure 40 - Key consideration for action planning process

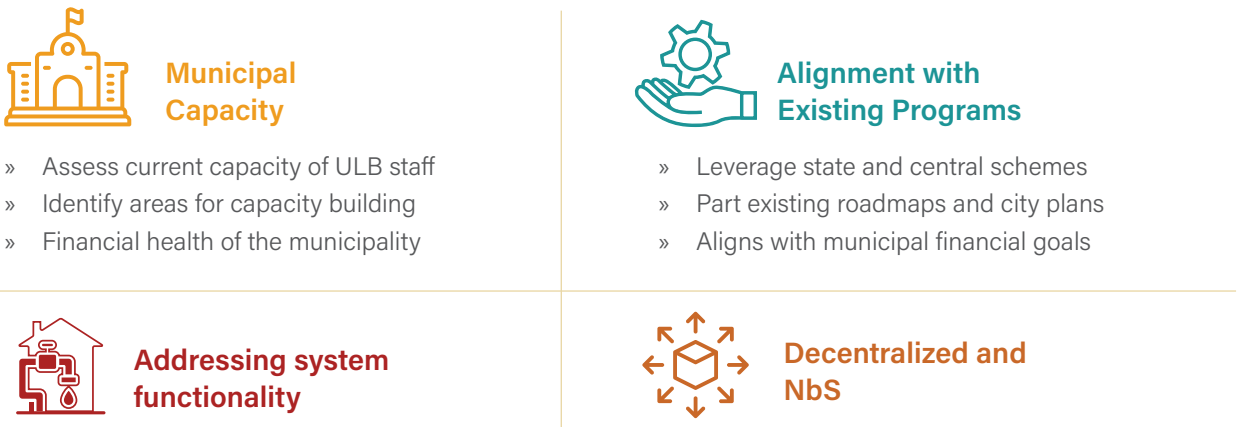


Figure 41 - Selection criteria of prioritising actions

7.4 Sector- Wise Action Framework

This section includes specific Objectives (O), Targets (T), and priority Actions (A) that should be undertaken from 2025 to 2030 for each Sector and overall Town Preparedness. The suggested timelines, responsible agencies, and scheme convergence should be evaluated and finalized through the institutional mechanisms developed to implement and enforce this WASH Climate Action Plan.



The table below outlines the vision and objectives for each sub-sector: water, wastewater and sanitation, solid waste, and town preparedness. These objectives outline the foundation of Chintamani's Climate-WASH Action Plan while aligning with the overarching pillars of the ICS-WASH Framework ensuring Access, Sustainability, Resilience, and Inclusivity across the value chain/systems

	Sectoral visions	Objectives
	Water "A town that has safe and dependable drinking water for every resident"	O1: Safe and pollution-free Surface water O2: Improve groundwater levels and climate resilience O3: Clean and equitable water supply for all O4: Improve storm water management and Reduce waterlogging
	Wastewater & Sanitation "Reliable inclusive and safe sanitation services for a dignified, healthier Chintamani"	O5: Reliable sewerage services for all O6: Clean inclusive and universal access to public toilet O7: Improve wastewater treatment and Reuse
	Solid Waste Management "Achieve a Garbage Free Chintamani"	O8: Ensure source segregation & efficient solid waste collection O9: Improve waste processing O10: Minimize waste at source O11: Remediate legacy waste site O12: Improve safety / satisfaction of sanitation workers
	Town preparedness "A town that is always prepared, with clear and smarter systems to respond to any hazards"	O12: Build a trained, responsive and well-networked stakeholder base from DDMA to last-mile residents O13: Establish a clear, coordinated system with defined roles and fast decision-making for effective WASH hazards O14: Establish early warning and communication for real-time risk detection & last-mile outreach O15: Strengthen financial resilience via optimized revenue streams and equitable, conservation-oriented user payments

As a next step, each sectoral objective has been translated into specific and measurable targets to guide implementation and assess progress over time. These targets serve as performance indicators for the Climate-WASH Action Plan, ensuring that interventions remain outcome-oriented and evidence-based.

The indicators are aligned with the ICS-WASH Framework pillars: Access, Sustainability, Efficiency, and Inclusivity and are designed to capture both service delivery improvements (such as coverage, quality, and reliability) and climate outcomes (including emission reduction, water security, and adaptive capacity.

To operationalize these sectoral objectives, the Climate-WASH Action Plan identifies a set of immediate and priority actions that serve as the first step towards building climate resilience in Chintamani.

Sub-Sector	Objective	Target
I. Water Resources	O1: Safe and pollution-free surface water	T1.1: Lake Rejuvenation for Water Security: Rejuvenate 3 priority lakes by 2028 to enhance groundwater recharge and augment local water supply T1.2: Lake Protection and Ecological Restoration: Protect and monitor 5 major lakes by 2028 to ensure ecological balance, pollution prevention, and flood management
	O2: Improve groundwater levels and climate resilience	T2.1: Groundwater recharge infrastructure: Convert ≥50% defunct bore wells and establish 100 recharge sites by 2028 T2.2: Policy & Regulation - Achieve ≥50% citywide Rainwater Harvesting (RWH) compliance by 2027 through strengthened regulation and enforcement
II. Water Supply	O3: Clean and equitable water supply for all	T3.1: Access, Equity & Network Expansion: Achieve significant improvement in town-wide and slum-level Functional Household Tap Connection (FHTC) progressing toward full coverage by 2030 T3.2: Emergency Reserve Planning – 1000 ML (@12 MLD for 3 Months of critical period) reserve by 2028 T3.3: Resource Augmentation – 900 ML by 2030 T3.4: Water Reuse: Replace 20% fresh and 50% horticulture water with treated wastewater by 2030
III. Storm Water	O4: Mitigate waterlogging risks & enhance storm water management	T4.1: Storm water network protection: Remove encroachments, secure buffers by 2030 T4.2: Monitoring and maintenance: Improve drain mapping and O&M
IV. Wastewater and Sanitation	O5: Reliable sewerage services for all	T5.1: Sewer Network Coverage: Increase from 75% to 100% coverage in high-ednsity zones and 90% town-wide by 2030 T5.2: Transition from onsite to offsite sanitation for at least 25% households
	O6: Clean inclusive and universal access to public toilets	T6.1: Ensure 75% functional inclusive public toilets that are gender-sensitive and climate-adaptive by 2027; 90% by 2030
	O7: Improve wastewater treatment and reuse	T7.1: 60% wastewater to be diverted and treated T7.2: Achieve 80% treatment capacity by 2030
V. Solid Waste Management	O8: Ensure source segregation and efficient solid waste collection	T8.1: Achieve At-source Segregation of 60% by 2028, 100% by 2030 T8.2: Increase collection efficiency from 43% to100% by 2028
	O9: Improve waste processing	T9.1: Ensure 80% waste to be processed with less than20% waste being sent to landfill by 2030
	O10: Minimize waste at source	T10.1: Single Use Plastic-free town by 2030 with special focus on reducing unrecyclable and hazardous wastes
	O11: Remediate legacy waste site	T11.1: 100% waste remediation by 2028
	O12: Improve safety / satisfaction of sanitation workers	T12.1: >80% satisfaction score improvement by 2030
Town Preparedness	O13: Build a trained, responsive and well-networked stakeholder base from DDMA to last-mile residents	
	O14: Establish a clear, coordinated system with defined roles & fast decision-making for effective WASH hazard response	
	O15: Establish early warning & communication for real-time risk detection and last-mile outreach	
	O16: Strengthen financial resilience via optimized revenue streams and equitable, conservation-oriented user payments	

Framing the phases of action

The priority set of actions of Chintamani's Climate-WASH Action Plan is strategically designed to align with the typical five-year cycle of state and central government development schemes such as AMRUT, SBM and the like as well as the tenure of municipal leadership. The plan identifies projects that are feasible for the municipality to initiate and support within the current term, given the typical horizon of funding commitments, administrative continuity, and political priorities.

These interventions envisioned for the short-term, strengthen essential systems, improve service reliability, and deliver visible impact addressing existing vulnerabilities while laying the foundation for long-term resilience. They reflect priorities validated through extensive consultations with municipal officials, line departments, and community stakeholders, ensuring both institutional ownership and local relevance of the town.

Building on these priority actions, the next stage of Chintamani's Climate-WASH Action Plan emphasizes deepening and sustaining resilience through system-level transformation. The focus shifts from short-term service improvements to structural changes strengthening infrastructure, embedding climate considerations into policies and operations, and mobilizing sustainable financing. Over time, these measures aim to ensure that adaptation and mitigation are not treated as standalone projects but become integral to the municipality's planning, budgeting, and service delivery processes.

Further, the longer and the more comprehensive list of recommended actions on page XX be implemented progressively, guided by the town's officials, in accordance with the town's capacities, institutional readiness, and access to schemes and resources.

Sector: **WATER**
Sectoral Vision: A town that has Safe and dependable drinking water for every resident

Objective(O1): Safe and Pollution-Free Surface Water

T1.1: Lake Rejuvenation for Water Security: Rejuvenate 3 priority lakes by 2028 to enhance groundwater recharge and augment local water supply

No	Action description	Climate relevance	Category	Key agencies	Funding sources
A1*	Lake Restoration Plans: Scientific restoration for Malapalli, Nekkundi & Gopasandra to improve recharge capacity to ensure sustainable water supply. Time frame: 2028	Adaptation	Project	KUWSDB, MI, PRED, CMC	AMRUT, MI

T1.2: Lake Protection and Ecological Restoration: Protect and monitor 5 major lakes by 2028 to ensure ecological balance, pollution prevention, and flood management

No	Action description	Climate relevance	Category	Key agencies	Funding sources
A1	Implement eco-sensitive beautification and landscape restoration of Gopasandra and Malapalli lakes to enhance public access zones, integrating green buffers and bio diversity enhancement Time frame: 2028	Adaptation	Project	KUWSDB, MI, PRED, CMC	AMRUT, MI

Objective(O2): Improve Groundwater Levels and Climate Resilience

T2.1: Groundwater recharge infrastructure: Convert ≥50% defunct bore wells and establish 100 recharge sites by 2028

No	Action description	Climate relevance	Category	Key agencies	Funding sources
A1*	Develop a comprehensive Groundwater Management and Recharge Master Plan for Chintamani including mapping of defunct bore wells and delineation of recharge zones Time frame: 2026	Adaptation	Plan	CMC, GW Dept, DUDC	Explore funds
A2*	Identify, plan and operationalize groundwater recharge measures across at least 50 prioritized locations Time frame: 2027	Adaptation	Project	CMC, GW Dept, DUDC	Explore funds

* Indicates high-priority plans/projects/policies identified for immediate implementation within the next 2–3 years.

T2.2: Policy & Regulation - Achieve ≥50% citywide Rainwater Harvesting (RWH) compliance by 2027 through strengthened regulation and enforcement

No	Action description	Climate relevance	Category	Key agencies	Funding sources
A1*	Conduct a rapid citywide assessment and GIS mapping of existing RWH structures to evaluate condition, functionality capacity and recharge potential Time frame: 2027	Adaptation	Plan	CMC, GW Dept, DUDC	Explore funds
A2	Establish systematic O&M protocols and regulatory mechanisms to ensure sustained functionality of all RWH systems, including annual maintenance checks, certification, and integration with building permit compliance. Time frame: 2028	Adaptation	Plan	CMC, PWD, TPA	Explore funds

Objective(O3): Clean & Equitable Water supply for all

T3.1: Access, Equity & Network Expansion: Achieve significant improvement in town-wide and slum-level Functional Household Tap Connection (FHTC) progressing toward full coverage by 2030

No	Action description	Climate relevance	Category	Key agencies	Funding sources
A1*	Provide individual Functional Household Tap Connections (FHTCs) to 3500 households in 17 slums Time frame: 2026	Adaptation	Project	KUWSDB, CMC, SDB	AMRUT
A2*	Increase Supply Frequency: Increase supply in slums from once/week to twice/week Time frame: 2026	Adaptation	Project	CMC	AMRUT
A3*	Bore well Integration: Integrate 35 direct-supply bore wells into the Central WTP network through distribution system remodeling to ensure uniform water quality and efficient management. Time frame:2026	Adaptation	Plan	CMC	Explore funds
A5*	WTP Upgrades: Expand 1.6→3.0 MLD WTP at Ashraya layout & 1.5→3.0 MLD WTP at Agrahara layout with process and mechanical improvements Time frame:2026	Adaptation	Project	KUWDSB	AMRUT
A6*	Undertake a feasibility study to identify and pilot water meter connections for approximately 3,000 households located in high water pressure zones. Time frame:2026	Adaptation			
A1	Replan and remodel existing water supply network to replace the current ad-hoc layout with holistic and efficient design to ensure reliable and equitable distribution Time frame:2027	Adaptation	Plan	KUWDSB, CMC	AMRUT

* Indicates high-priority plans/projects/policies identified for immediate implementation within the next 2–3 years.

No	Action description	Climate relevance	Category	Key agencies	Funding sources
A2	New Thimmasandra WTP & Lifting Infra: Construct 3.5 MLD WTP to treat Nekkundi Dodda Kere water; develop raw water lifting & distribution infra Time frame:2026	Adaptation	Project	KUWDSB	CMC/ AMRUT
A3	Pump Station Assessment: Conduct electromechanical condition assessment of 11 pumping stations to replace / upgrade components Time frame:2026	Mitigation	Plan	CMC	Municipal funds

T3.2: Emergency Reserve Planning – Plan 1000 ML (@12 MLD for 3 Months of critical period) reserve by 2028

No	Action description	Climate relevance	Category	Key agencies	Funding sources
A1*	Bhaktharahalli–Arasikere Tank Upgrade: Increase tank capacity 35 mcft → 100 mcft via deepening, bund strengthening (200 m), sluice upgrades which serves as strategic emergency reserve Time frame:2026	Adaptation	Project	KUWSDB, MI	AMRUT
A2*	Identify and earmark bore wells in proximity to lakes as emergency reserve sources for use during water scarcity periods Time frame:2026	Adaptation	Project	CMC	AMRUT

T3.3: Resource Augmentation – 900 ML by 2030

No	Action description	Climate relevance	Category	Key agencies	Funding sources
A1*	Kanampalli and Nekkundi Desilting: Increase storage to Kanampalli: 12→30 mcft, Nekkundi: 30→75 mcft via desilting, embankment strengthening. Time frame:2026	Adaptation	Project	KUWSDB, CMC	AMRUT
A2*	Smart Bore Well Automation: Automate 10 Chelur Road bore wells for real-time flow control. Time frame:2026	Mitigation	Project	CMC	Explore funds
A3	Catchment Improvement Plan: Prepare comprehensive catchment management plans for Kanampalli & Nekkundi Lakes to enhance recharge and water inflow. Time frame:2027	Adaptation	Plan	KUWSDB, CMC	Municipal funds
A4	Feasibility Studies – Gopasandra/ Malapalli: Assess streamflow & storage and link to existing infra for decentralized supply potential Time frame:2027	Adaptation	Plan	KUWSDB, CMC	CMC, Explore funds
A5	Conduct a GIS-based water audit to identify high-loss zones, low pressure zones and implement phased NRW reduction measures through leak detection, pipeline rehabilitation, and pump optimization. Time frame:2027	Mitigation	Plan	CMC	Explore funds

* Indicates high-priority plans/projects/policies identified for immediate implementation within the next 2–3 years.

T 3.4: Water Reuse: Replace 20% fresh and 50% horticulture water with treated wastewater by 2030

No	Action description	Climate relevance	Category	Key agencies	Funding sources
A1	Prepare and operationalize a comprehensive city wide water reuse master plan targeting 20% for non-potable uses. Time frame: 2030	Mitigation	Plan	CMC, KUWDSB	Explore funds

Objective(O4): Mitigate waterlogging risks & enhance storm water management

T4.1: Storm water network protection :Remove encroachments, secure buffers by 2030

No	Action description	Climate relevance	Category	Key agencies	Funding sources
A1*	Buffer Zone Protection: Identification and demarcate & secure 9 m buffer along Raja Kaluve, 3 m along minor drains with fencing/ signage. Time frame:2026	Adaptation	Plan	CMC,TPA	Explore funds
A2	Prepare an effective storm water management plan for high dense and huge encroachment zones to mitigate flooding and improve drainage efficiency Time frame:2027	Adaptation	Plan	CMC,TPA	Explore funds

T4.2: Monitoring & maintenance – Improve drain mapping and O&M

No	Action description	Climate relevance	Category	Key agencies	Funding sources
A1*	Drain Network Digitization: Digitize entire storm water & roadside drain network by 2026, prioritizing high-risk zones (Tippunagar, Vinobha Colony). Time frame:2026	Adaptation	Plan	CMC,TPA	Explore funds
A2*	Slum Drain Maintenance: Pre/post-monsoon inspections for drains in 15 high-risk slums Time frame:2026	Adaptation	Plan	CMC,TPA	Explore funds

* Indicates high-priority plans/projects/policies identified for immediate implementation within the next 2–3 years.

Sector: **SANITATION & WASTEWATER**
Sectoral Vision: A town that has Safe and dependable drinking water for every resident

Objective(O5): Ensure access to safe, reliable, and well-maintained sewerage

T5.1: Sewer Network Coverage: 75% → 100% in High Density zones & 90% town-wide by 2030

No	Action description	Climate relevance	Category	Key agencies	Funding sources
A1*	Replan and lay 40 km of new UGD pipelines in Kanampalli and other priority zones by 2028, addressing current network gaps and ad-hoc linkages. Time frame: 2026	Adaptation	Project	KUIDFC	NGT compen-sation scheme, SBM2.0, CMC
A2*	Digitize and map 120km of the UGD network by 2026 prioritizing flood prone and pollution impacted areas such as Tippu Nagar, Vinobha colony followed by 20 km of systematic network updates each year thereafter. Time frame: 2026	Adaptation	Plan	CMC	CMC
A3*	Ensure timely maintenance to cut downtime and reduce repair time from 3 days to under 24 hours. Time frame: 2026	Adaptation	Plan	CMC	CMC
A1	Add 30 km of UGD pipelines in Kariapalli and identified future growth corridors by 2030 to ensure full coverage and system connectivity	Adaptation	Project	KUIDFC	SBM2.0, CMC

T5.2 –Transition to onsite sanitation for at least 25 households

No	Action description	Climate relevance	Category	Key agencies	Funding sources
A1*	Pilot greywater diversion system in Sriramnagar colony Time frame :2026	Adaptation	Project	KUWSDB	SBM 2.0
A2	Enable a phased transition from onsite to network-based sanitation through systematic UGD expansion, household integration, and compliant treatment systems aligned with SBM-U 2.0 and CPHEEO guidelines Time frame :2030	Adaptation	Plan	KUWSDB, CMC, KUIDFC	SBM2.0
A3	Greywater diversion for 17 slums to UGD | Time frame :2028	Adaptation	Project	KUWSDB	SBM 2.0

* Indicates high-priority plans/projects/policies identified for immediate implementation within the next 2–3 years.

O6: Universal access to clean, gender- sensitive, climate adaptive public toilets

T6.1: 75% functional inclusive PTs by 2027 and 90% by 2030

No	Action description	Climate relevance	Category	Key agencies	Funding sources
A1*	Develop gender-inclusive, universally accessible public toilets in high-footfall areas (NH69, Chelur–Chintamani Road, Hoskote–Chintamani Road, Doddapete), expanding coverage from 8 to 10 by 2026 and 12 by 2030, ensuring access within 500 m of all commercial zones	Adaptation	Plan	CMC	SBM2.0, CMC
A2*	Upgrade all 8 PTs to full inclusivity by 2026 and Improve signage & auxiliary facilities and Redevelop 2 defunct PTs (Gajanand Circle & Sriramnagar	Adaptation	Plan	CMC	SBM 2.0, CMC

O7 – Strengthen wastewater treatment & surface water protection

T7.1 - 60% wastewater to be diverted and treated

No	Action description	Climate relevance	Category	Key agencies	Funding sources
A1*	I&D works for Nekkundi & Gopasandra by 2026	Adaptation	Project	KUIDFC	AMRUT
A2	Stop Wastewater inflow to Malapalli lake via ink fixes and interception and diversion Time frame : 2026	Adaptation	Project	KUIDFC	AMRUT

T7.2: Achieve 80% treatment capacity by 2030

No	Action description	Climate relevance	Category	Key agencies	Funding sources
A1*	Construct a 7 MLD Nature-based STP at Chokkareddihalli with 2,950 new household connections, 800 household system rejuvenations, and 40 km of sewer network to ensure full catchment connectivity Time frame :2026	Adaptation and Mitigation	Project	KUIDFC, KUWDSB	SBM 2.0, AMRUT, PPP
A2*	Regular quarterly checks and maintenance for STP	Adaptation	Policy	CMC, KUWDSB	CMC
A3*	STP effluent quality tests every 60 days	Adaptation	Policy	CMC, KUWDSB	CMC
A4	Upgrade Booragamakalahalli STP from 2→4.5 MLD by 2028	Adaptation and Mitigation	Project	KUWDSB, KUIDFC	SBM 2.0, AMRUT, PPP
A5	Increase treatment capacity from 24%→55% (2028) & 80% (2030)	Adaptation and Mitigation	Project	KUWDSB, KUIDFC	SBM 2.0, AMRUT, PPP
A6	Mandatory enforcement sewerage NOC for new buildings	Adaptation	Project	KUIDFC	AMRUT

* Indicates high-priority plans/projects/policies identified for immediate implementation within the next 2–3 years.

Sector: **SOLID WASTE MANAGEMENT**
Sectoral Vision: Achieve a Garbage free Chintamani

O8: Ensure source segregation & efficient waste collection

T81: Achieve at source segregation by 60% by 2028, 100% by 2030 with 100% vehicles equipped

No	Action description	Climate relevance	Category	Key agencies	Funding sources
A1*	Pilot 100% waste segregation in Wards 5, 6, 10, and 11 specifically in Malapalli, Kanampalli, Prabhakara Layout, and Ashwini Layout through SHG-led door-to-door collection initiatives. Time frame : 2026	Adaptation	Project	CMC, SHGs, NGOs	SBM 2.0, BMZ, CSR
A2*	Draft and adopt CMC Solid Waste Management (SWM) byelaws applicable to all establishments, including Bulk Waste Generators (BWGs), to institutionalize compliance and enforcement. Time frame : 2027	Adaptation	Policy	CMC	CMC
A3	Introduce dedicated wet and dry waste collection trips in high-volume market areas including APMC Market, Chintamani Road, Bamboo Bazaar, and the Fruits and Flower Market near the bus stand to ensure efficient and timely waste management. Time frame : 2026	Adaptation and Mitigation	Plan	CMC, SHGs	CMC
A4	Develop an IEC and school-based awareness plan with clear timelines and ward-wise prioritization, focusing on slum pockets and vulnerable communities. Time frame : 2027	Adaptation	Plan	CMC, SHGs, Schools	CMC
A5	Establish Ward-level SWM Committees and Green Cells to enable community-based monitoring through active engagement of ward members, NGOs, and educational institutions. Time frame : 2028	Adaptation	Plan	CMC, SHGs, NGOs	CMC

* Indicates high-priority plans/projects/policies identified for immediate implementation within the next 2–3 years.

T8.2: Collection efficiency: 43% → 100% by 2028

No	Action description	Climate relevance	Category	Key agencies	Funding sources
Immediate actions(2025–2027):					
A1*	Undertake fleet optimization and route rationalization to improve collection efficiency | Time frame :2026	Mitigation	Plan	CMC, Eng. Dept.,	CMC
A2*	Procure 34 pushcarts for primary waste collection in 17 slums and 2 compactors for efficient waste management in commercial areas. Time frame : 2026	Adaptation and Mitigation	Project	CMC, Eng. Dept.,	CMC
A3*	Establish a transfer station at Ashreya Layout to facilitate waste transfer to the MRF and landfill site, with a handling capacity of approximately 2 TPD Time frame :2026	Adaptation and Mitigation	Project	CMC,	SBM 2.0
A4	Implement GIS-based route optimization and a GPS tracking dashboard to enhance operational efficiency and reduce GHG emissions. Time frame :2026	Adaptation	Project	CMC,	CMC
A5	Implement phased elimination of 93 open dumps, coupled with long-term monitoring and community surveillance to prevent their re-emergence. Time frame :2030	Mitigation	Project	CMC	SBM2.0, CMC
A6	Develop and implement a preventive maintenance and quality check plan for vehicles, with increased inspection frequency during summer months	Adaptation	Plan	CMC	CMC
A7	Plan and conduct capacity-building sessions for sanitation workers on safe waste handling and effective segregation practices.	Adaptation	Plan	CMC, NGOs	CMC

* Indicates high-priority plans/projects/policies identified for immediate implementation within the next 2–3 years.

O9: Enhance waste processing, prioritizing decentralized methods

T9.1: 80% processed, <20% to landfill by 2030

No	Action description	Climate relevance	Category	Key agencies	Funding sources
Immediate actions(2025–2027):					
A1*	Operate proposed 12 TPD MRF at Kanisettyhalli & revive 2 TPD DWCC at Ashraya Layout with a robust O&M plan and financial model Time frame : 2026-2030	Mitigation	Project	CMC, TIDE. BORDA, KSPCB	SBM 2.0
A2*	Establish DWCCs (1–2 TPD) in the North and East zones, along with decentralized, community-led 1 TPD composting units at Sriramnagar Colony Time frame : 2026-2030	Adaptation and Mitigation	Project	CMC, TIDE. BORDA, KSPCB	SBM 2.0
A3*	Upgrade and operate the sanitary landfill at Kanisettyhalli for safe disposal of inerts and rejects, with an estimated capacity of ~10 TPD by 2040	Mitigation	Project	CMC, TIDE. BORDA, KSPCB	CMC
A4*	Draft and notify municipal C&D waste byelaw to ensure regulated collection, transport, and disposal Time frame : 2028	Adaptation	Policy	CMC, KSPCB	CMC
A5*	Utilise existing 3 tractors for collection and procure crusher, tippers, JCB for C&D waste (6 TPD) & site Time frame : 2025	Mitigation	Project	CMC	CMC
A6	Identify and integrate informal waste workers into collection/processing and enable them to for SHG like modalities Time frame : 2028	Adaptation	Plan	CMC, NGOs, SHG	CMC
A7	Divert 10 TPD wet waste from BWGs to compost/coprocessing Time frame : 2028	Mitigation	Project	CMC	CMC TIDE/ BORDA
A8	Install 1 TPD sanitary waste incinerator by 202	Mitigation	Project	CMC	

O10: Minimize unrecoverable & non-recyclable waste at source

T10.1: Single Use Plastic-free town by 2030

No	Action description	Climate relevance	Category	Key agencies	Funding sources
A1	Conduct barrier analysis on single-use plastic ban compliance	Adaptation	Plan	CMC, NGOs, SHGs	CMC
A2	Designate schools, colleges, and government offices as plastic-free model zones to demonstrate and promote sustainable practices. Time frame : 2028	Adaptation	Project	CMC, NGOs, SHGs	CMC, Edu Dept, Dist Admin, NGOs
A3	Formulate green event guidelines & reward system in coordination with the town's 10 major event venues Time frame : 2027	Adaptation	Policy	CMC, NGOs, SHGs	CMC

* Indicates high-priority plans/projects/policies identified for immediate implementation within the next 2–3 years.

O11: Remediate legacy waste & repurpose site

T11.1: 100% remediation by 2028

No	Action description	Climate relevance	Category	Key agencies	Funding sources
Immediate actions(2025–2027):					
A1*	Establish a monitoring and evaluation (M&E) system for legacy waste remediation at Kanisettyhalli and for diversion of 30 TPD of fresh waste Time frame :2028	Adaptation	Plan	CMC, Service Provider	CMC
A2	Develop a site utilization plan for the 10 acres of remediated land. Time frame :2030	Adaptation	Plan	CMC, service provider	CMC

O12: -Improve sanitation workforce safety & satisfaction

T12.1: >80% satisfaction score by 2030

No	Action description	Climate relevance	Category	Key agencies	Funding sources
Immediate actions(2025–2027):					
*A1	Implement climate-responsive work schedules to minimize heat exposure among sanitation workers	Adaptation	Plan	CMC, SKWB, Health Dept	CMC
*A2	Maintain five rest spaces across the town equipped with drinking water, shade, and seating facilities for sanitation workers and operators	Adaptation	Plan	CMC, Health dept	CMC
*A3	Prepare hazard-specific Standard Operating Procedures (SOPs) and conduct corresponding safety trainings	Adaptation	Plan	CMC	CMC
*A4	Organize annual health check-ups for all sanitation workers	Adaptation	Plan	CMC	CMC
A5	Conduct annual satisfaction surveys covering both permanent and contractual sanitation workers	Adaptation	Project	CMC	CMC

* Indicates high-priority plans/projects/policies identified for immediate implementation within the next 2–3 years.

Sector: **TOWN PREPAREDNESS**
Sectoral Vision: A town that is always prepared, with clear and smarter systems to respond to any hazards

O13- Build a trained, responsive and well-networked stakeholder to deliver un-interrupted WASH services in the town

A1: Introduce a structured annual hazard preparedness training[1] cycle for all WASH related stakeholders to strengthen municipal and town level preparedness.

Stakeholder	Business-As-Usual (BAU) trainings	Preparedness trainings	Training level	Proposed Responsible agency & Frequency (TBD)
DDMA Officials	Orientation on the Urban and WASH specific disaster management, institutional roles, responsibilities, and coordination protocols	Coordinating multi-departmental hazard response drills; municipal contingency planning exercises integrating WASH system disruptions	District	KSDMA (Annual)
KUWSD/ KUIDFC, Chikkaballapur	Planning and designing and implementation of hazard-resilient WASH infrastructure, including Nature-Based Solutions (NBS) and water-efficient network systems.	Emergency water augmentation planning, and long term drought mitigation planning inclusion and water resource optimization	District/ Town	KUWSDB/DDMA (Bi-Annual)
DUDC	Strengthening WASH service delivery mechanisms; planning and monitoring infrastructure performance under normal conditions	Rapid infrastructure restoration and emergency support coordination during hazard events	District	DMA/DDMA/ATI (Annual)
Municipal officer level (Commissioners, officials(Eng./ Health)	Orientation on WASH service standards, operations, and Service Level Benchmarks (SLBs); monitoring and reporting protocols	Rapid response decision-making during service disruptions; resource prioritization; activation of inter-departmental coordination mechanisms and Standard Operating Procedures (SOPs)	Town	DMA/DDMA/ DUDC/AIT (Bi- Annual)
Ward councilors	Ward-level mapping, citizen engagement, and grievance redressal processes	Basic Climate and disaster risk awareness; door-to-door advisories; development of vulnerable household priority lists, facilitation of IEC dissemination and community coordination role	Town/ Ward	DDMA/CMC (Quarterly)
WASH operators/ Water supply staff	Routine water quality monitoring (source-to-tap), leak detection and repair, basic O&M of treatment plants and network systems	Emergency repairs during water logging, prioritizing tanker deployment to vulnerable areas, bore well monitoring and rotation scheduling	Town	KUWDSDB/CMC (Quarterly)

[1] The training calendar integrates both Business-As-Usual (BAU) and Preparedness-oriented trainings, linking them with the relevant institutions, operational levels, and responsible agencies to ensure accountability and continuity.

Stakeholder	Business-As-Usual (BAU) trainings	Preparedness trainings	Training level	Proposed Responsible agency & Frequency (TBD)
Sanitation workers	Core training on safe WASH service delivery, PPE use, confined space entry, drain and desludging machinery operations, and worker safety	WASH hazard-specific drills (Waterlogging, heat stress, sewage overflow); infection prevention, vaccination, and first aid; heat stress mitigation measures (shift rotation, hydration breaks) drills, rapid De-clogging methods, Infection risk management during sewage overflows, vaccination first aid	Town	CMC/DDMA (Bi-Annual)
Accounts/ Finance	Financial management systems for WASH service operations and reporting	Emergency fund mobilization and financial recovery processes during disasters	Town	DUDC/ CM (Annual)
Residents (esp. slum)	IEC programs on hygiene, water conservation, and safe sanitation practices	Awareness and preparedness drives for flood, heat, and drought events; dissemination of early warnings; community-led monitoring	Town	CMC/ SHGs/ Ward councilors (continuous)
SHGs/NGOs/ Youth volunteers	Community awareness on hygiene promotion, water efficiency, and climate literacy	Door-to-door mobilization before hazard events; special support to vulnerable groups (elderly, disabled); hotline assistance, rumor control, and IEC campaigns	Town	CMC/ DDMA/ Local NGOs (Quarterly)

O14- Establish up a clear, coordinated system with defined roles and fast decision-making for effective WASH hazard response

A1: Develop clear, operational SOPs for key climate-linked WASH hazards such as water crisis response, heatwave management, and water logging
A2: Establish a Municipal-level Climate WASH Task Force[2] to coordinate hazard preparedness and response for WASH services.
The functions of the Climate rescue task force are as follows: Inter Departmental coordination – Crisis coordination for immediate operational bottlenecks Resource Allocation: Urgent allocation of tankers, repair crews, pumps, generators and manpower based on hazard priority Rapid Hazard Assessment: Rapid on site assessment of immediate hazard impacts on WASH services and Infra Public Communication – Issue hazard specific alerts through ward level WA networks, media, radio for timely alerts to residents

[2] The proposed Municipal Climate–WASH Task Force will build on the Taluk-level Disaster Task Force model and be anchored at the municipal level.

Recommended composition: Chairperson – Commissioner; Co-Chairs – President, Vice President, and PD–DUDC; Members – DDMA, Health Officer, Engineering Department (CMC), Engineer–KUWSDB, and representatives from local NGOs/institutions. Composition may be adapted based on municipal capacity and available resources.

O15- Establish an early warning and communication system for real time risk detection and last mile information outreach to all stakeholders

A1: Set up a Municipal Climate-WASH Communication System with clear protocols for who communicates what, to whom, through which channels, and when

Stakeholder group	Information Type	Channel/Medium	Frequency	Responsible dept.
WASH operators/ Sanitation workers	Heat advisories, shift schedule changes, safety protocols	WhatsApp groups, verbal briefings at WASH facilities	During events - Daily	Health+CMC
Residents/General public	Heatwave alerts, water shortages, flood warnings, supply disruptions	Public loudspeakers; announcements during orange/red alert days (one day prior and on forecast day); SMS alerts; IEC posters; radio broadcasts; WhatsApp groups	As and when required	CMC
Ward councilors	Hazard response tasks+ ward level complaints and tasks	WhatsApp groups, weekly coordination meetings	Real time+ weekly	CMC+ Ward councilors
Local volunteers	Grievance redressal updates, citizen assistance coordination	WhatsApp groups, briefing meetings at ward levels	During events and as required	CMC+ Ward councilors
Institutional stakeholders (Schools, PHC, commercial etc)	Early warnings and Preparedness actions	Official letters, SMS notifications, circulars	Pre-monsoon and prior to forecasted events	CMC+DDMA

O16- Strengthen financial resilience via optimized revenue streams & equitable, conservation-oriented user payments

A1 Increase own revenue share to match revenue expenditure 60% by 2028, 70% by 2030 and atleast 80% average as long term goal

No	Actions	Category	Timeline	Lead agency
A16*	Develop plan to recover outstanding arrears- Property Tax, Rental fee, SWM and Water Charges of last 3-4 years Cover Demand Gap UGD charges (44%-> 90%) Water Charges (28% -> 80% Property tax (27% -> 75%)	Plan	2026	CMC
A17*	Regularize unauthorized water and UGD connections Water connections (8939 to 13000) Sewer connections (8324 to 14000)	Plan/Policy	2030	CMC
A18*	Assess and allocate emergency preparedness funds to address crisis such as water shortages, Heat response activities.	Plan	2026	DUDC, CMC
A19*	Develop comprehensive plan to increase own revenue streams through all potential source – 80% average recovery	Plan	2030	CMC
A20*	Accelerate E-Khata drive to maximise coverage – 80% by 2028	Plan	2026	CMC
A21*	Assess and allocate yearly WASH maintenance budget to rectify sub optimal assets	Plan	2026	CMC

* Indicates high-priority plans/projects/policies identified for immediate implementation within the next 2–3 years.

Closing the loop - Building Climate + WASH Resilience in Chintamani

Laying the Climate + WASH Foundation	**Focus:** Strengthened foundational WASH systems to address immediate vulnerabilities related to droughts. **Key Priority Actions:** Shift reliance from groundwater to surface water sources through tank rehabilitation (+65 mcft) and recharge interventions; expand Functional Household Tap Connections (FHTCs) in slums and UGD coverage for equitable access; and pilot source segregation and decentralized waste processing at the household level to reduce localized pollution and service stress. **Resilience Outcome:** Improved water security especially in the event of a climate hazard, enhanced recharge, and safer sanitation systems.
Building Circular and Adaptive Systems	**Focus:** Transition from reactive infrastructure creation to a circular management model. **Key Priority Actions:** Undertake STP upgradation and expansion (2 -4.5 MLD), advancing toward a comprehensive treated-water reuse plan for non-potable applications; implement city-level waste remediation and composting initiatives to close material loops and reduce landfill dependency; and strengthened regulatory and operational frameworks for sustainable systems. **Resilience Outcome:** Increased resource efficiency, reduced carbon footprint, and establish operational systems capable of managing climate variability while sustaining service quality.
Strengthening Preparedness and System Integration	**Focus:** Build institutional capacity for proactive climate response and continuous service reliability. **Key Priority Actions:** Integrat regular training and capacity-building programs for ULB officials and frontline workers on climate hazards and emergency protocols; develop citizen information and awareness systems for real-time updates during extreme events; and initiate early warning mechanisms to support rapid municipal response. **Resilience Outcome:** WASH systems became climate-responsive and are able to anticipate, absorb, and adapt to shocks while maintaining operational continuity and safeguarding citizens.
Looking Ahead	**Focus:** Sustaining resilience through financial stability, data systems, and participatory governance. **Key Priority Actions:** Enhance municipal revenue base through improved billing, user-fee rationalization, and PPP-based O&M models; institutionalize real-time climate and service monitoring systems; and strengthen inter-departmental coordination with active citizen participation. **Resilience Outlook:** A financially empowered and data-driven Chintamani capable of continuous learning and adaptive planning ensuring long-term sustainability, inclusivity, and efficiency in service delivery

7.6 Implementation Framework- Roles of Stakeholders

The table below sets out who does what across three levels of governance – Town (CMC), District (DUDC, KUWDSDB/KUIDFC, DDMA), and State (UDD/DMA) – for implementing the Chintamani WASH CAP and these roles outline how municipal, district, and state-level institutions will embed additional climate-sensitive responsibilities within their existing mandates.

Table 15 - Roles of key stakeholders

Level	Department	Key Role
Town	CMC	» Lead implementation of WASH CAP in coordination with support department/Agency » Facilitate formulation of annual municipal budget in alignment to the action plan. » Interdepartmental coordination to regularly assess climate risk and sensitize all line departments » Engineering department/Health section to cross-check and align the DPRs and project documents for town-specific climate vulnerabilities
District	DUDC	» Ensure alignment of actions with state/central urban schemes (AMRUT, SBM) » Facilitate inter departmental coordination for hazard risk mitigation » Facilitative pre-summer and pre-monsoon preparedness reviews considering town specific hazards » Ensure municipal fund allocation adequately addresses vulnerabilities in the town » Monitor compliance with climate actions » Facilitate development of a WASH CAP for all urban centres in the district
State	Karnataka Urban Water Supply & Drainage Board(KUWSDB) / Karnataka Urban Infrastructure Developemnt and Finance Corporation (KUIDFC)	» Conduct mandatory climate risk assessments for all water and wastewater management » Embed risk assessments into feasibility studies, design approvals, and budgeting processes » All upcoming infrastructure plans and designs must integrate climate resilience elements » Prioritization of Sustainable Solutions such as NBS, low maintenance and energy efficient technology » Implement targeted upgrades to address identified climate vulnerabilities » Provide technical support and training on resilient technology and practice to municipality
District	District Disaster Management Authority (DDMA)	» Integrate urban WASH planning as one of the key elements under DDMP » Town level focus on analysing and addressing climate risk and vulnerabilities » Provide urban WASH linked climate risk data and its implication on services- training » Review actions taken by municipality to mitigate risk
State	Urban Development Department(UDD)/D Directorate of Municipal Administration(DMA)	» provide overarching guidance, policy alignment, and support to ensure that the measures listed above are mainstreamed into ongoing urban development processes.

8

WAY FORWARD



To improve WASH services for residents and make Chintamani more resilient, three key actions need to be undertaken aligned with this Action Plan.

1. Set up an active and empowered Climate Resilience Steering Committee (CRSC)

The CRSC's role is to implement this WASH CAP and further, ensure that all planning activities and subsequent projects/ interventions in Chintamani are aligned with climate resilience and adaptation goals. The CRSC should consist of 10-12 members. A tentative list of suggested members is as follows:

a. Member of Parliament representing Chintamani
b. Member of Legislative Assembly representing Chintamani
c. Chief Officer of Chintamani Municipality
d. District Commissioner
e. Representative of Directorate of Municipal Administration (DMA), Govt of Karnataka
f. Health Officer, Chintamani Municipality
g. 2 Ward Officers
h. 1 Officer representing KUWSDB, Chikkaballapura
i. 2 citizens from the city (RWA representative/ civic society member and the like)
j. 1 academician with subject-matter expertise in urban planning and climate action

Tenure: Each member who does not represent a specific position, i.e. (e), (f), (g), (h), (i) and (j), will have a 3 year term.

Meetings must compulsorily be held a minimum of four times a year, during the first fortnight of every quarter, to review all projects and proposals and plan future budgets and projects. Additional Special Meeting may be called if needed. Each organization shall take the responsibility of ensuring their representatives attend. The Minutes of the Meeting shall be publicly circulated within one week of the meeting.

This WASH CAP must be updated every 2 years to capture new data, risks and solutions, under the guidance and supervision of the CRSC. This action plan must be a living, relevant guide for the city.

2. Develop systemic and holistic detailed project plans

Based on the priorities laid out in the action plan, suitable agencies must be identified, through due procurement process, to create Detailed Project Plans and Budgets for the next three years.

Each DPR must seek synergies across existing and future infrastructure and projects, and must be actively guided and evaluated by the CRSC and State-level authorities who have the requisite technical and financial competence.

Further, the WASH CAP must be integrated with the Municipal Budget process and the benefits being received from National-level and state-level, ensuring adequate funding for identified critical projects. This will make town-level planning more integrated, seamless, and cost-effective.

Citizen and Multi-stakeholder Involvement: NGOs and technical experts who have relevant expertise should be invited to review the DPRs. The CRSC shall be responsible for ensuring suitable citizen outreach and conducting open information sessions for citizens so they can learn more about the project, make observations, seek clarifications and offer suggestions. A Citizen-Participation and Feedback System should be developed to ensure such multi-stakeholder involvement.

3. A WASH CAP should be developed at the District Level

In addition to sharing ecological ecosystem and administrative structures with each other in the vicinity, small towns can also share infrastructure and services. They may even share the same with gram panchayats, aligning with the cluster approach to drive better outcomes and cost efficiency.

Improved Disaster Response: Climate disasters usually affect large scale areas and are not restricted to the area of a small town. Hence disaster responses will be improved with District-level planning. Integrating the WASH Sectoral Plans from this action plan into the Disaster Management Plan will strengthen the disaster plan, and responses and rebuilding when such events strike the region.

Better Planning: The institutional power to drive convergence across departments, allocate resources, and mainstream climate considerations into ongoing programs, often resides at the District level. Districts have resources and human capabilities that towns may lack and therefore, planning and coordination of development works can be strengthened if managed at the district level. Therefore, a Climate Action Plan for Chikkaballapura District will be more impactful and also resource efficient as It will allow greater institutional coordination, economies of scale and better coverage. Scientifically, this will also be more robust as many of the climate factors that influence WASH systems, and indeed urban systems, are best understood and addressed at the larger district scale than smaller town-scale.

As we move forward, the goal is to institutionalize climate-sensitive planning at the Town, District and State level, and strengthen implementation and monitoring mechanisms to ensure that WASH services evolve beyond reactive fixes and towards long-term resilience, equity, and sustainability across the district.

The need of the present time is to make Chintamani and other small towns more prosperous, safe and sustainable in the future, so that Quality of Life and Well-Being can be improved for all residents.

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Access to Annexures
(Scan the QR code below to view all annexures and supporting documents.)

NOTES

NOTES

FISH

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BORDA SA

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