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Mallapalli Lake Vision Document

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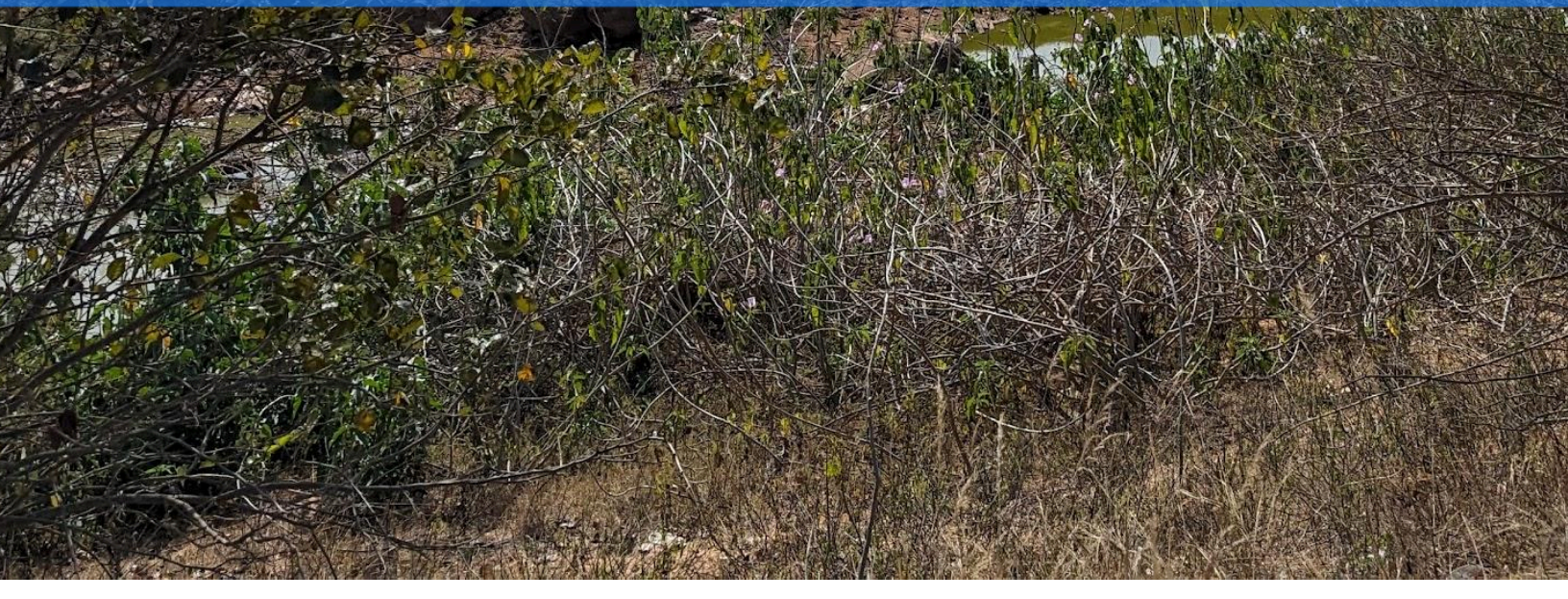
Chintamani, Karnataka



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About CLARE

CLARE is a UK-Canada framework research programme on Climate Adaptation and Resilience, aiming to enable socially inclusive and sustainable action to build resilience to climate change and natural hazards. CLARE is an initiative jointly designed and run by the UK Foreign, Commonwealth and Development Office and Canada's International Development Research Centre. CLARE is primarily funded by UK aid from the UK government, along with the International Development Research Centre, Canada.

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List of Abbreviations

BOD	Biochemical Oxygen Demand
BORDA	Bremen Overseas Research and Development Association
COD	Chemical Oxygen Demand
CMC	City Municipal Council
DO	Dissolved Oxygen
DPR	Detailed Project Report
FOL	Friends of Lakes
FTL	Full Tank Level
ft	Feet
Ha	Hectares
IUWM	Integrated Urban Water Management
KLD	Kilo Litres per Day
KTCDA	Karnataka Tank Conservation & Development Authority
L	Litres
LVD	Lake Vision Document
ML	Million Litres
MLA	Member of Legislative Assembly
MWL	Maximum Water Level
RWA	Resident Welfare Association
STP	Sewage Treatment Plant
sq.km.	Square Kilometre
TIDE	Technology Informatics Design Endeavor
TBL	Top Bund Level
VES	Vertical Electrical Sounding

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All photos and figures in this document are courtesy of WELL Labs unless mentioned otherwise.

1. Introduction to the Lake Vision Document

The Mallapalli Lake Vision Document (LVD) is a comprehensive documentation of the participatory process of consensus-building for lake rejuvenation, co-created by residents, farmers, fisherfolk, and civic agencies. It captures their shared vision for the scientific rejuvenation of the Mallapalli lake, located in the town of Chintamani, Karnataka, while also guiding the creation of a community-led lake management plan. The LVD serves as a working document, which will ultimately feed into the Detailed Project Report (DPR) and the Integrated Urban Water Management (IUWM) planning for Chintamani.

The visioning process was anchored by residents and technical partners, and began with identifying user groups and the benefits they derive from the Mallapalli lake. With this information, they articulated a collective lake vision, along with defining core rejuvenation activities and a monitoring and evaluation plan. These insights are intended to support future activities in and around the lake, and provide a sound plan to sustain these efforts. While the lake rejuvenation is a combined effort of local communities and civil society organisations, the long-term responsibility of upkeep and maintenance is intended to be community-led.

The LVD is divided into 5 sections. This first section introduces the objective of the document. Section 2 details Chintamani town's water balance through the findings of a technical study undertaken by WELL Labs, with support from Technology Informatics Design Endeavor (TIDE) India, Bremen Overseas Research and Development Association (BORDA), and the Chintamani City Municipality Council (CMC). Section 3 explains a study and analysis by WELL Labs of the Mallapalli lake's hydrology, biology, chemistry, and physical assets. Section 4 summarises the lake visioning workshop and the insights gained from it, along with illustrating the draft vision for Mallapalli lake and the proposed master plan. Section 5 details the next steps involved in translating the collective vision into concrete action, which will be undertaken by Friends of Lakes (FOL) and India Cares Foundation.

2. Understanding Chintamani's Water Landscape: Insights from the Water Balance Study

This section elaborates on the scientific study and analysis of water balance in Chintamani led by WELL Labs, with support from TIDE, BORDA, and the Chintamani CMC.

Chintamani is situated in the Deccan Plateau, about 75 kms north of Bengaluru, Karnataka. The town is located in the southeast part of the state, and is classified as a dry agro-climatic zone. Its current population is estimated to be 1 lakh (census2011, n.d.). It receives an average of 787 mm of rainfall every year (Figure 2.1), which is on the lower end of the state average of 1,153 mm. During the period of 2021 and 2022, the region experienced 50% above average rainfall. This is typical of the cyclical years of drought and surplus the region is documented to receive, pointing to a need to prepare for both extremes, particularly worsening water scarcity (Ramamoorthy et al., 2024). This is further exacerbated by the fact that the region does not have any perennial rivers.

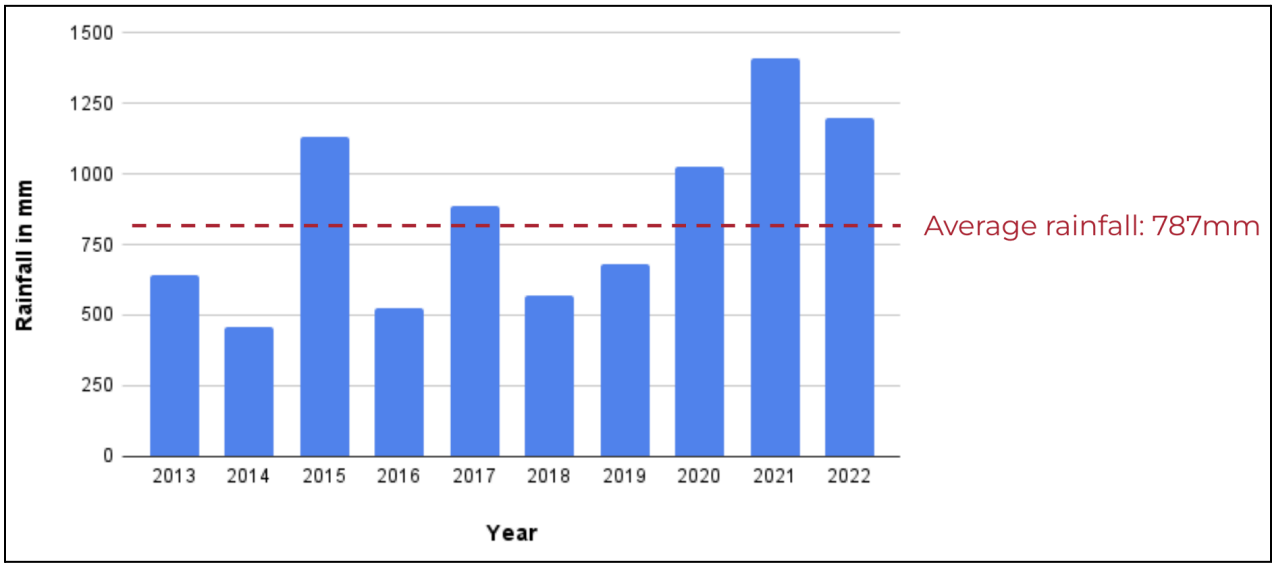

Figure 2.1: Annual rainfall in Chintamani

Source: KSNDMC

The town is divided into two major catchments: the Nekkundi-Bhukkanahalli catchment in the north, and the Mallapalli Gopasandra catchment in the south-east. A third minor catchment is that of the Kannampalli lake series, known as the Kannampalli catchment (Figure 2.2).

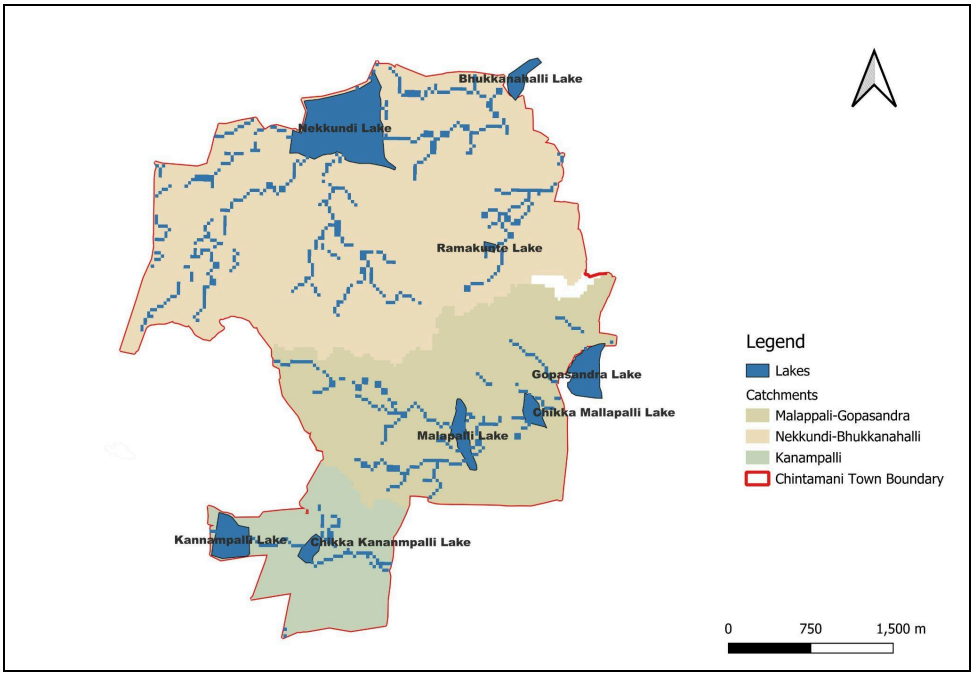

Figure 2.2: Lake catchments in Chintamani town

Source: WELL Labs

With a total population on 1 lakh, the water demand of Chintamani in 2024 is 8.13 MLD.Chintamani town's drinking water demand is met majorly by groundwater (~60%) and supported by two surface water sources: the Kannampalli lake and the Bhaktharahalli Arasikere lake (Table 2.1; Ramamoorthy et al., 2024).

Table 2.1: Percentage of supply from groundwater and surface water sources

Source type	Source	Supply	Total supply	Percentage of gross supply
Surface water	Kannampalli lake	1 MLD	3 MLD	37%
	Bhaktharahalli Arasikere	2 MLD		
Groundwater	Municipal borewells	3.5 MLD	5.13 MLD	63%
	Private borewells	1.63 MLD		
Total supply			8.13 MLD	

Note: MLD: Million Litres per Day

The town faces a dual challenge: that of depleting groundwater and surface water, and of poor water quality due to the discharge of largely untreated sewage and inadequate wastewater treatment (Figure 2.3). The Sewage Treatment Plant (STP) is located downstream of the Gopasandra lake, the last lake in the series. This makes the majority of the Mallapalli lake catchment and all of the Chikka Mallapalli and Gopasandra catchments exposed to a heavy inflow of sewage. Therefore, to ensure the lake's health and the effective functioning of the STP, the sewerage network needs to be planned keeping in mind the cascading lake system.

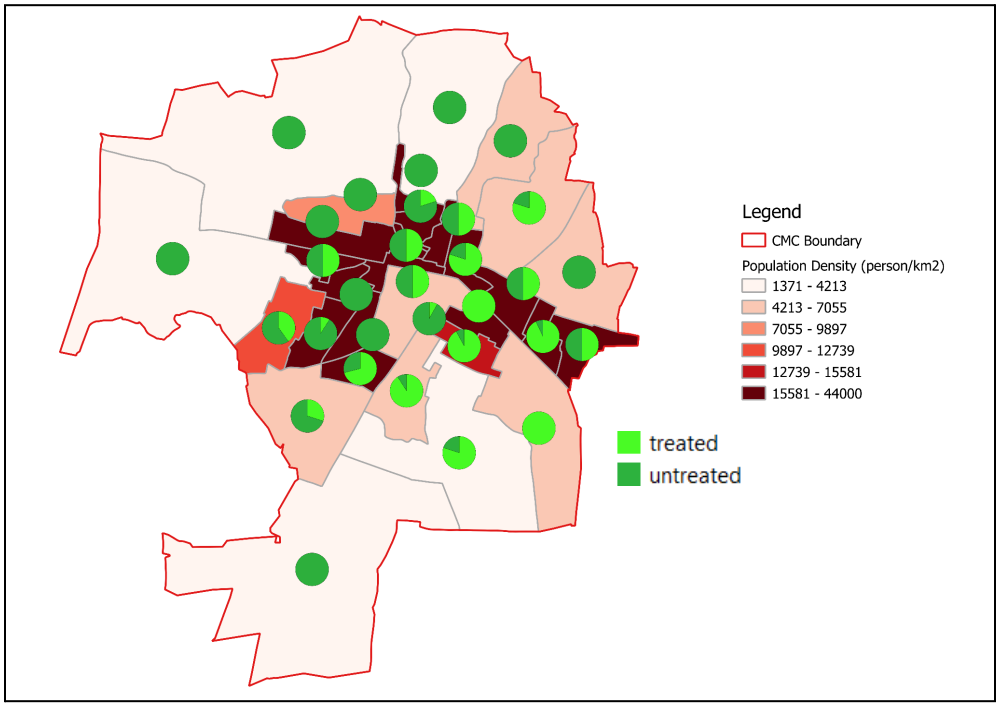

Figure 2.3: Ward-wise population density and status of wastewater treatment

Source: KGIS-KSRAC, base sewerage map by the Karnataka Urban Water Supply and Drainage Board

Considering these issues, there is an immediate need to recognise the benefits of lake rejuvenation as a way towards creating alternative sources of water for the town.

2.1 Relevance of Mallapalli Lake

Mallapalli lake was selected as the primary intervention site for several compelling reasons tied to Chintamani's water challenges, and the lake's unique potential. As discussed earlier, Chintamani town is located in a semi-arid region of Karnataka with erratic rainfall and no perennial rivers. There is heavy dependence on groundwater, which is depleting rapidly. In the face of acute water scarcity, rejuvenating the Mallapalli lake offers a strategic solution to augment surface water availability, either as a direct supply source or through groundwater recharge.

Ground surveys confirmed that the lake maintains proper hydrological connectivity through functional inlets and outlets, which is essential for effective water flow within the Mallapalli-Gopasandra cascade. The primary constraint identified was choking from solid waste accumulation that leads to stagnation and reduced water flow. However, this can be effectively addressed through lake cleaning drives.

Vertical Electrical Sounding (VES) resistivity surveys (Geovale Services Pvt Ltd, 2022) confirm the lake's bedrock is deeper than in other areas of the town, indicating strong recharge potential. Furthermore, Mallapalli lake is the first in the series of cascading lakes, making it the ideal starting point to begin rejuvenation efforts, since some of the impact will travel downstream. The lake bed is underlain by weathered and fractured hard-rock formations at shallow depths, which are highly suitable for supporting vertical percolation (downward seepage of water) and lateral groundwater movement. This is, of course, possible when surface water is retained for sufficient durations, and water quality and silt deposits are adequately managed. Further, with the presence of an active Resident Welfare Association (RWA) in the area, along with invested Ward councilors and a minister, there is good potential for community and government support and participation in the rejuvenation efforts, which are critical elements for sustainability.

Another reason this lake was selected is that there are no major industries operating in the vicinity, which eliminates point-source industrial effluents as a pollution vector. It also simplifies the lake rejuvenation process by enabling focus on domestic sewage and solid waste management. This cleaner inflow profile enhances the lake's viability for storage, recharge, and drinking water potential post-treatment.

The baseline study for Mallapalli lake was carried out between January and April 2024, by WELL Labs and VIMOS Technocrats Pvt. Ltd, a consultancy engaged to prepare the lake’s Detailed Project Report (DPR). Identification details and physical characteristic indicators were collected through a physical survey of the lake, either through visual observation or on-ground measurements. Water quality indicators and sediment quality were assessed by collecting samples at the lake, storing them, and sending them to the laboratory for analysis (refer to Annexure B for more details). Catchment characteristic indicators were evaluated using a combination of hydrological surveys, and GIS and remote sensing techniques.

For biodiversity indicators, a physical survey was conducted, and data from eBird (eBird, 2024) collected by the Foundation for Ecological Security team were utilised. Data for normative indicators were collected through social surveys of people living in nearby regions and stakeholders using the lake.

3. Mallapalli Lake: Hydrology, Chemistry, Biology, and Physical Assets

This section elaborates on the study and analysis of the Mallapalli lake's catchment, hydrology, biology, chemistry, and physical assets, led by WELL Labs.

3.1 Lake Context and Catchment Characteristics

Mallapalli lake is located in the south-east part of Chintamani town. It is situated in the Mallapalli Gopasandra catchment, and is the first lake in the Gopasandra series (Figure 3.1). The other two lakes in the cascading series are Chikka Mallapalli and Gopasandra. The catchment area spans across the south-west and south-east parts of the town, and the land use here and around the lake is predominantly residential and agricultural.

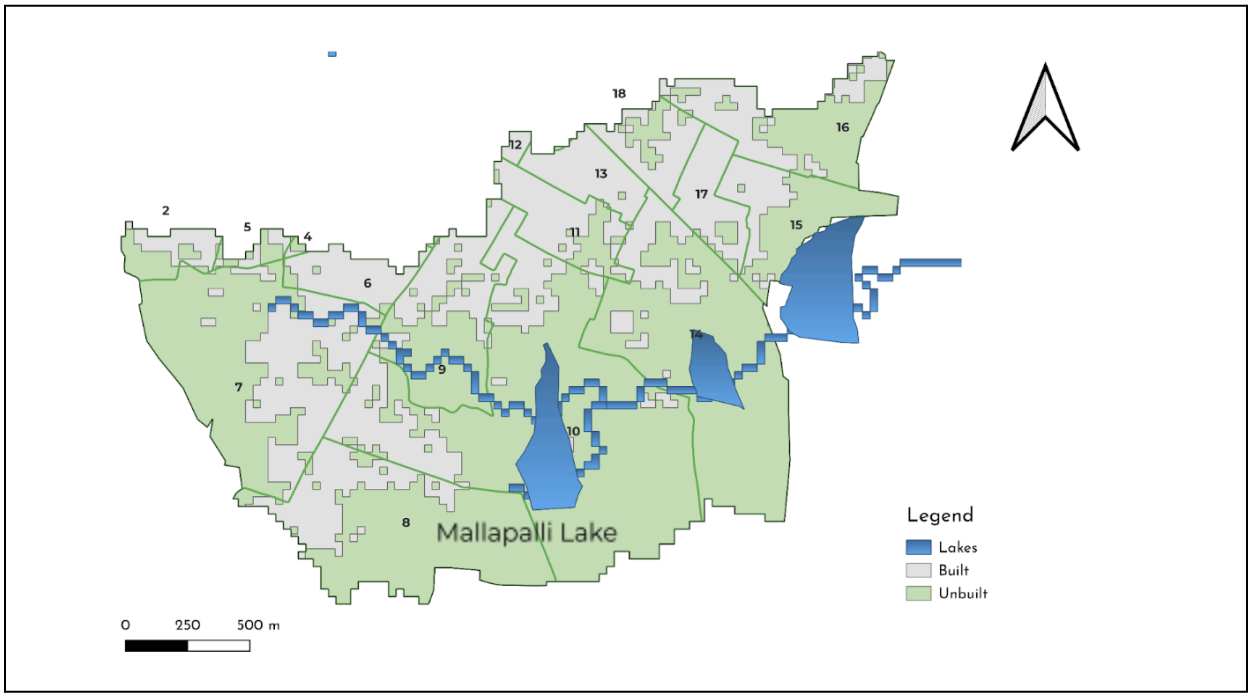

Figure 3.1: Gopasandra catchment area

Source: WELL Labs

The survey undertaken by WELL Labs and VIMOS Technocrats Pvt. Ltd established that the lake is spread over 17 acres and 13 guntas, with a major part being dry during the summer months and drought years. The lake has a dry bed (Figure 3.2), in which morning glory grows rampantly (Annexure A).

Figure 3.2: Water level during the time of the study (March 2024)

Source: WELL Labs

The areas within the catchment saw the most development in the late 2010s, with a significant increase in built-up cover (Figure 3.3). The 2031 Chintamani masterplan (Chintamani City Municipal Council, 2024) proposes developing the areas surrounding the lake as residential zones. The future growth of the town, especially within the catchment area, will have a significant impact on the lake's condition. Accordingly, the lake should be scientifically designed for multiple uses, such as groundwater recharge, recreation, and community commons.

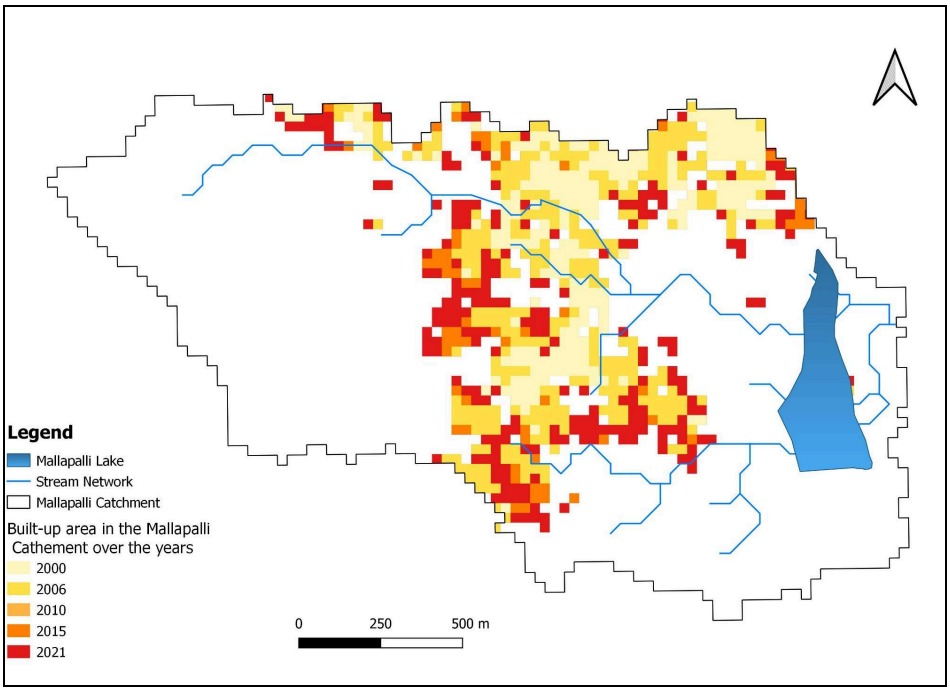

Figure 3.3: Evolution of the Mallapalli catchment over the years

Source: Landsat 8, USGS

The lake presently remains under the jurisdiction of the Zilla Panchayat, even though the rejuvenation efforts involve the Chintamani City Municipal Council (CMC), which is the primary urban local body responsible for service delivery. This issue of ownership split limits regular maintenance, creates institutional ambiguity, and results in weak accountability for the lake's management and long-term sustainability.

3.2 Hydrological Characteristics

The GIS study carried out by WELL Labs revealed that when the lake is full, the volume of water is 186.40 million litres, considering a depth of 1.2 m and a surface area of 88,791 sq.m. Furthermore, the lake is rock-lined (Figure 3.4).

It is filled primarily by rainwater and seasonal runoff collected in the stormwater drains (locally known as *kaluves*) flowing into the lake at three inlet points as shown in Figure 3.7. There are two outlets that ought to take water to the next lake in the series; however, at the time of the study, one of them were either closed or blocked. About 20% of the sewage generated by two adjacent wards in the catchment enters the lake during monsoon. The Mallapalli flood plain extends to about 45.4 Ha till the Chikka Mallapalli lake (Figure 3.5).

Figure 3.4: Extent of the lake as observed during the time of the study (March 2024)

Source: VIMOS Technocrats Pvt. Ltd.

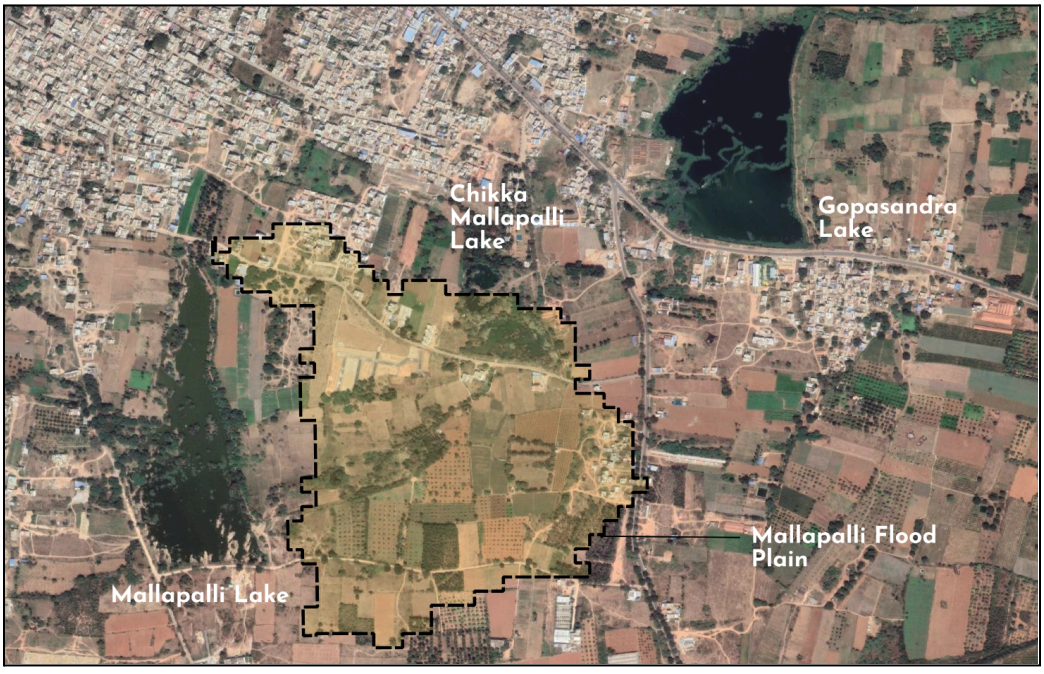

Figure 3.5: Mallapalli floodplain delineated on the map

Source: WELL Labs

3.3 Chemical Characteristics

Laboratory analysis of the water and sediment samples revealed that the Mallapalli lake falls under the medium pollution level category, owing to sewage and waste. This was further confirmed by the elevated Biochemical Oxygen Demand (BOD), the Chemical Oxygen Demand (COD) levels, and low Dissolved Oxygen (DO) levels, all of which are indicative of pollution. Low DO levels specifically indicate high microbial activity and oxygen depletion from sewage/runoff inputs.

Nutrient levels in the sediments indicate eutrophication risk from internal loading. Eutrophication refers to a condition where too many nutrients present in a water body lead to the rapid growth of algae and a subsequent decline in water quality. In the Mallapalli lake's case, the lake sediments contain high levels of nutrients, such as nitrogen and phosphorus, which may leach into the water over time and cause eutrophication. These conditions make the lake water unsuitable for recharge or indirect potable supply. Details of the tests are available in Annexure B.

3.4 Biological Characteristics

The Mallapalli lake and its surroundings are home to several tree, plant, bird, and fish species. The most common tree species are *Tamarindus indica* (tamarind), *Pongamia pinnata* / *Millettia pinnata* (Pongamia), *Vachellia nilotica* (Indian Babul), *Sphaeranthus indicus* (East Indian Globe Thistle), and *Persicaria minor* (Pygmy Smartweed).

Among birds found near the lake, 46 species have been documented so far. Some of them are *Anas zonorhyncha* (Indian Spot-billed Duck), *Columba livia* (Rock Pigeon or Feral Pigeon), *Streptopelia tranquebarica* (Red Collared-Dove), *Spilopelia chinensis* (Spotted Dove), *Spilopelia senegalensis* (Laughing Dove), and *Eudynamys scolopaceus* (Asian Koel). Fish species observed in the lake include *Catla catla* (Catla) and *Cirrhinus mrigala* (Maral).

The lake has become a habitat for a few invasive species as well, such as *Ipomoea obscura* (Obscure Morning Glory), *Ipomoea congesta* (Clustered Morning Glory), *Ipomoea carnea* (Bush Morning Glory), *Senna uniflora* (One-flowered Senna), and *Stachytarpheta urticifolia* (Nettleleaf Porterweed). Refer to Annexure C for more details.

During the study period, the lake was covered with algal bloom resulting from excess nutrients present in the water, giving it a green hue (Figure 3.6).

Figure 3.6: Lake scenario as on February 2024

Source: WELL Labs

3.5 Lake Assets

There is a ~5 m-wide dirt road that leads to the lake (Figure 3.7) and is used by farmers, fisherfolk, and those who wash clothes at the lake. There is also a tarred road along the side of the inlets. A fence has been constructed on the south-west portion of the lake by owners of the adjacent private lands. Two hectares of the 271 ha of the catchment area, that is, 26%, are paved. This means that these areas have hard, impermeable surfaces, such as concrete or tar roads, which are unfavourable for water flow and recharge.

The lake has three inlets and two outlets (Figure 3.8). Inlet 1 is a channel connected to the stream network (*kaluves*) and the open drainage lines (Figure 3.9); inlet 2 comprises a set of pipes that lead to the lake (Figure 3.10); inlet 3 is a channel exclusively connected to the stream network (*kaluves*). Inlet 1 has become a site for garbage dumping, adversely impacting water flow and quality. Outlet 1 had dry weir during the time of the study, indicating low water levels (Figure 3.11). Outlet 2 is a channel that is blocked by rocks (Figure 3.12).

Figure 3.7: Entrance of the Mallapalli lake

Source: WELL Labs

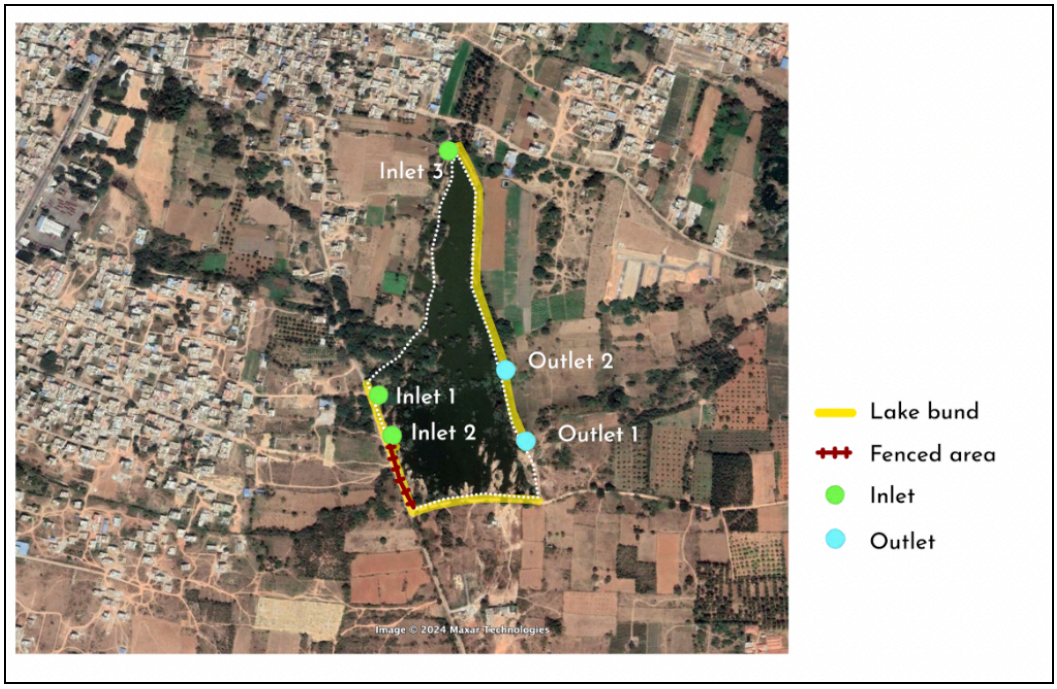

Figure 3.8: Mallapalli lake surroundings, inlets, outlets, and lake bund

Source: WELL Labs

Figure 3.9: Garbage at inlet 1

Source: WELL Labs

Figure 3.10: View of inlet 2

Source: WELL Labs

Figure 3.11: View of outlet 1

Source: WELL Labs

Figure 3.12: View of outlet 2

Source: WELL Labs

3.6 Lake-dependent Activities

Despite the reduced quality and quantity of water in the Mallapalli lake, people depend on the lake and its surrounding areas for a number of activities (Figure 3.13).

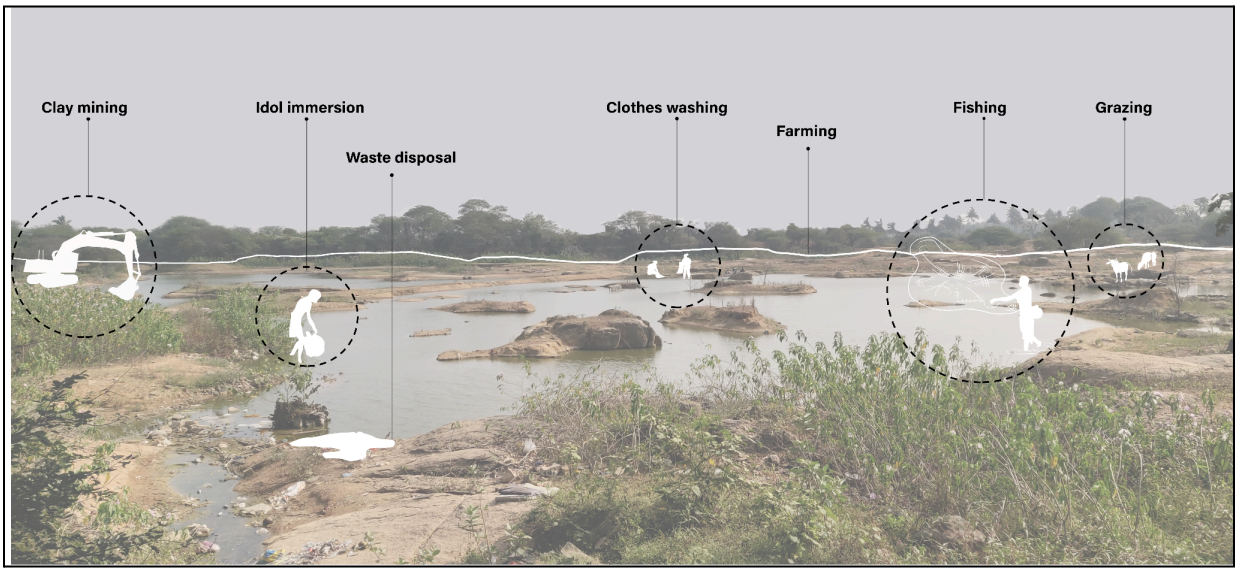

Figure 3.13: Activities observed near the Mallapalli lake

Source: WELL Labs

1. **Washing:** A few households wash their clothes in the southern part of the lake; the residents are largely migrant workers engaged in the rampant construction activity in the area.

2. **Farming**: Agricultural fields are spread on the east and west bank of the lake; however, farmers here primarily use borewell water for irrigation (Figure 3.14).

Figure 3.14: Farming activities around the lake

Source: WELL Labs

3. **Livestock grazing:** Some residents living near the lake supplement their income by rearing livestock, such as cows, buffaloes, goats, and hens. They take their livestock to graze around the lake, but do not encourage them to consume the lakewater because of an apparent odour (Figure 3.15).

Figure 3.15: Grazing and livestock barns around the lake

Source: WELL Labs

4. **Religious practices**: Many communities in the town use the lake for their daily prayers. During Ganesha Chaturthi, idol immersion is carried out in the Mallapalli and Chikka Kannampalli lakes,

if they have sufficient water. Residual flowers, *kalashas* (pots), and immersion structures were also observed near the lake (Figure 3.16).

Figure 3.16: Crates for idol immersion and *kalashas* (pots) observed in the lake

Source: WELL Labs

5. **Fishing:** The lake is home to the Catla and Marwa species, and draws people from neighbouring areas, who fish primarily for their daily consumption. This is, however, done without any lease or permission from the government.

4. Draft Vision for Mallapalli Lake and Proposed Master Plan

This section captures insights from conversations with residents living within the Mallapalli lake catchment, as well as those from the lake visioning workshop organised after. During the workshop, information and local knowledge gathered over the course of two months was consolidated, and a master plan for rejuvenation was proposed.

4.1. Insights from Field Visits and Dialogues

Once the Mallapalli lake was collectively finalised to be rejuvenated, starting January 2024, key areas within the lake catchment were identified and further examined. Concurrently, conversations with residents were initiated to understand the existing needs, expectations, and views on the rejuvenation process[1].

Holding structured, meaningful dialogues between the project team and local communities associated with the lake was an important part of the visioning process. As detailed in the previous sections, studies and analyses were conducted between January and February 2024 to establish the foundation for the visioning process. Aspects, such as existing water and sanitation vulnerabilities of the Mallapalli lake catchment area and lake-dependent activities, were mapped to understand the benefits of rejuvenation for all user groups.

Subsequently, multiple discussions were held with the residents of Mallapalli, Prabhakar Layout, and the Chintamani CMC to understand their needs, and obtain local knowledge about the lake and its surroundings. The councillors from Wards 10 and 2 were open to bringing their residents together for discussions; during one such meeting, the councillor for Ward 10 expressed that apart from rejuvenating the lake, the surrounding areas also required collective maintenance. He suggested bringing this aspect into the purview of the lake rejuvenation process.

Farmers with land adjacent to the lake mentioned that the lake water used to be suitable for drinking around 50 years ago. Through the interactions, it became clear that local communities and authorities have limited-to-no involvement in the management of the lake. Consequently, the lake faces several issues, such as pollution, low water quality, and little to no groundwater recharge. While the lake supports various flora and fauna, it is not indicative of a thriving wetland ecosystem.

4.2. Insights from the Lake Visioning Workshop

Following the studies and initial discussions with the community, a lake visioning workshop was organised in Mallapalli on March 2, 2024, with support from the MLA's office. The workshop brought

[1] As part of ongoing activities in Chintamani, World Wetlands Day 2024 was celebrated at the periphery of Padiganakunte lake at Dhanamittnahalli village, on the outskirts of Chintamani town, together with Janapara Foundation, TIDE, and SEEDS Karnataka (Annexure D)

together 35 participants from different parts of the Mallapalli catchment, most of whom were farmers (Annexure E).

The project team of WELL Labs, Friends of Lakes, and India Cares Foundation introduced themselves to the group, and presented the catchment observations and the proposed rejuvenation process (Figures 4.1 and 4.2).

Figures 4.1 and 4.2: Presenting observations at the lake visioning workshop

Source: WELL Labs

Once the workshop participants were briefed on the findings, they discussed the lake's current situation. They shared how, despite the poor quality of the water, people are forced to use it for washing; they also mentioned that the lake and surrounding areas are being treated as dumpyards. When shown posters of rejuvenation benefits (Figure 4.3), they agreed with the process and impact, but raised valid concerns about the budget.

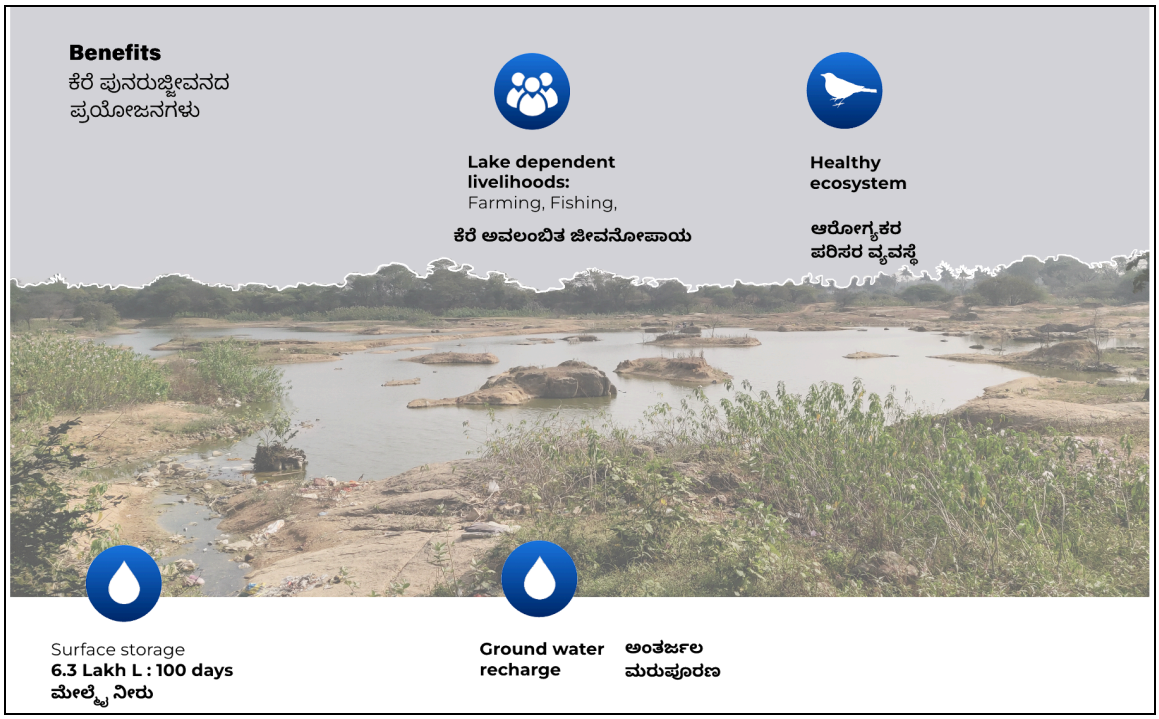

Figure 4.3: Benefits of rejuvenating Mallapalli lake: Poster shared during the workshop

Source: WELL Labs

Some important observations/ suggestions that emerged during the visioning workshop are listed below:

- Prioritise the removal of invasive species, including stretches where bunds are currently in place.
- Fence the lake to establish it as a public property and prevent antisocial and illegal activities (such as consuming alcohol near the lake, and dumping solid and construction waste).
- Address sewage ingress during monsoon to prevent water body contamination.
- Regulate illegal clay and sand mining by brick-making factories around Chintamani.
- Treat the lake as a common space for the community, and construct a walking path, as agreed during the discussions.

Finally, a list of prioritised activities was finalised: fencing, followed by desilting and bunding. The facilitators then clustered these ideas in the plenary discussion and articulated the shared vision statements that reflected everyone's priorities.

4.3. Draft Vision for Mallapalli Lake

The draft vision, as articulated by the people of the Mallapalli catchment area is presented below:

As Mallapalli lake is the first in the cascading series of lakes, any change done here will influence the health of the connecting lake systems. Subsequently, once the linked streams and flows are rejuvenated, its effects will cascade to the Chikka Mallapalli and Gopasandra lakes as well.

a) The Mallapalli lake will be a model for lake rejuvenation in Chintamani, and act as the first step towards building awareness on IUWM practices in small towns.
b) The lake will supplement current drinking water sources of the town, initially through increased recharge and later through potable lake water, thus helping with drought mitigation in the area.
c) The lake and its surroundings will be transformed into a flourishing wetland ecosystem, with habitat restoration resulting in visibly improved local biodiversity.
d) The lake area will serve as an active urban commons for the residents of the town, fostering community interest in the revival, rejuvenation, ownership, and maintenance of the town's water bodies for long-term sustainability.

4.4. Proposed Lake Rejuvenation Master Plan

The master plan for the Mallapalli lake was drafted on the basis of the findings and insights gained both through the studies and community dialogues. It maps the final lake boundaries as identified through surveys, existing assets, and the proposed changes (Figure 4.4). It outlines the structural interventions required, including strengthening structures (such as the bunds); cleaning and repairs (such as inlets and outlets); and new constructions (such as inlets, drains, sedimentation ponds, and other lake-bed improvements). It also specifies the engineering designs and levels for each asset, along with key hydrological parameters such as Full Tank Level (FTL), Maximum Water Level (MWL), Top Bund Level (TBL), and tank storage capacity. In essence, this plan reflects all the goals that the community identified for the lake's ecological health, water security, and public use.

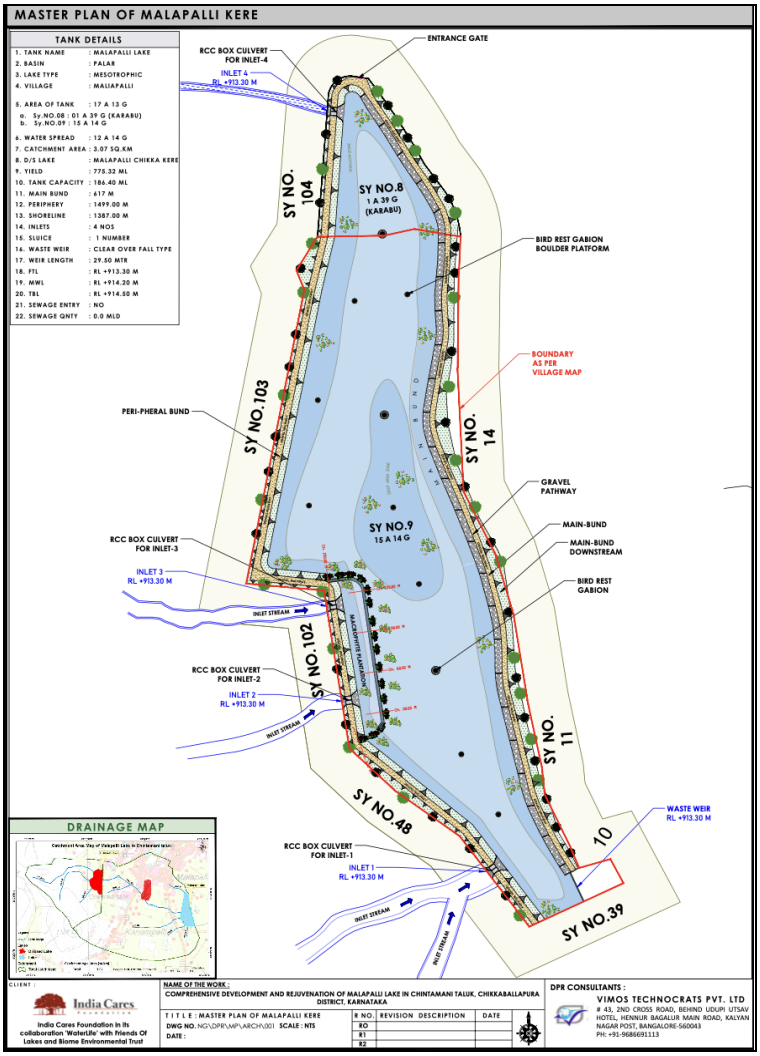

Figure 4.4: Proposed master plan for Mallapalli lake

Source: VIMOS Technocrats Pvt. Ltd.

5. Next steps

This section focuses on immediate action steps to implement the rejuvenation plans, and long-term recommendations for sustainability of efforts.

The lake rejuvenation plan is broadly divided into five phases: Diagnosis and Visioning, Design, Implementation, Operations and Maintenance and Monitoring and Evaluation (Figure 5). This document summarises the first phase of the process(Diagnosis and Visioning), which ends with the visioning workshop. It also provides some details required to initiate the Design phase, including this LVD, and the master plan. The DPR, data collection and preparation, was undertaken by VIMOS Technocrats Pvt. Ltd as part of the Design phase. The implementation phase will be led by Friends of Lakes and India Cares Foundation. The Operations and Maintenance, and Monitoring and Evaluation phases will focus on community ownership, routine upkeep, and tracking long-term lake health and sustainability.

Figure 5.1: Workflow for Mallapalli lake rejuvenation

Source: WELL Labs

5.1 Immediate Action

Immediate recommendations to rejuvenate the Mallapalli lake are two-fold. The first set of activities include surveying the existing boundaries and obtaining approval for the implementation of works from the Karnataka Tank Conservation & Development Authority (KTCDA). Once the DPR is reviewed and approved, the next set of physical implementation activities can begin.

Some of the activities currently planned include:

- Desilting the lake
- Creating a ring bund and strengthening the existing bund
- Constructing a 10 ft walking path

- Installing silt and garbage traps
- Constructing inlet and outlet weirs
- Constructing a sedimentation pond and a wetland to treat sewage inflow and other pollutants
- Constructing a toilet, guardroom, and a small park (depending on availability of budget in this phase)

5.2 Long-term Recommendations

Once the works are implemented, the focus will shift towards transitioning the monitoring and maintenance of the lake to the residents of Mallapalli and other users. The following are a few recommendations that can support this objective, and make the lake rejuvenation meaningful and sustainable:

1. One of the major issues is the sewage flow into the lake. Ensuring all households are connected to the sewerage network can efficiently direct sewage to the STP, enabling better water quality in the lakes.
2. The *kaluves* are currently blocked in multiple places, either by garbage or construction. Local residents observed that during monsoon, water doesn't flow into the lake as it ought to. Thus, the *kaluve* / stormwater drains connected to the lake must be maintained and cleaned periodically to remove the blockages.
3. The linkage between the Mallapalli series of lakes and the Gopasandra series of lakes has been obstructed over time due to several reasons such as the blocking of outlets and changes in administrative jurisdiction. Restoring connectivity between the Mallapalli, Chikka Mallapallii and Gopasandra lake series would benefit the watershed as a whole, creating an extended wetland for the town and beyond.
4. Regular maintenance and timely monitoring will help establish the lake as a definitive source of drinking water for the town. This is critical, given the current water landscape in the area.
5. There are various livelihood related activities linked to the lake and its surroundings. Depending on budget availability, supporting these livelihood activities through measures such as creating a designated area for washing, a dock for fisherfolks, and a fodder berm for grazing, would be helpful. For instance, if alligator weeds are grown in the wetland, it can ensure fodder for local livestock.
6. The construction of a smaller tank for immersion of idols during festivals would largely benefit the lake's overall health. This can be integrated at later stages depending on the availability of funds.

Rejuvenation of any urban water body is a challenging task, but one that promises integrated water management solutions to build water security for the local community. The rejuvenation of the Mallapalli lake aims to foster strong engagement across government, communities, local NGO/ CSOs, and elected representatives, who can all collectively work towards a long-term vision for the town.

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Annexure A: Particulars of the Lake from the WELL Labs-VIMOS Survey

Particulars	Details
Lake name	Mallapalli lake
River basin	Palar
Lake type	Mesotrophic
Area of tank	17 acres 13 Guntas
Area of water spread	12 acres 14 Guntas
Lake capacity	186.40 million litres
Main bund length	617 m
Perimeter	1499 m
Shoreline	1387 m
Number of inlets	3
Sluice (no.)	1
Waste weir type	Clear overfall

Annexure B: Findings from the Water and Sediment Testing (Study Period: January–May 2024)

	Parameter	Value	
Lake water quality	pH	7.01	
	Electrical conductivity	887 us/cm	
	Dissolved oxygen	1 mg/L	
	Biochemical oxygen demand	50 mg/L	
	Chemical oxygen demand	160 mg/L	
	Total nitrogen, nitrate, ammonium	0.2 mg/L	
Sediment quality	Total phosphorus	13°23'16.1"N 78°03'17.3"E	4.57 mg/g
		13°23'20.1"N 78°03'20.9"E	25.12 mg/g
	Total nitrogen	13°23'16.1"N 78°03'17.3"E	0.13 mg/g
		13°23'20.1"N 78°03'20.9"E	0.03 mg/g
	Total organic carbon	13°23'16.1"N 78°03'17.3"E	0.35 mg/g
		13°23'20.1"N 78°03'20.9"E	0.39 mg/g

Annexure C: Notable Tree, Plant, Bird, and Fish Species

Notable tree species	*Tamarindus indica* (Tamarind) *Millettia pinnata* (Pongamia) *Vachellia nilotica* (Indian Gum Arabic tree-Babul) *Sphaeranthus indicus* (East Indian Globe Thistle) *Persicaria minor* (Pygmy Smartweed)
Major invasive plant species	*Ipomoea obscura* (Obscure Morning Glory)
	Ipomoea staphylina (Clustered Morning Glory)
	Ipomoea carnea (Bush Morning Glory)
	Senna uniflora (One Leaf Senna)
	Stachytarpheta urticifolia (Blue Snakeweed)
Notable bird species	*Anas zonorhyncha* (Indian Spot-billed Duck)
	Columba livia (Rock Pigeon)
	Streptopelia tranquebarica (Red Collared-Dove)
	Spilopelia chinensis (Spotted Dove)
	Spilopelia senegalensis (Laughing Dove)
	Eudynamys scolopaceus (Asian Koel)
	Apus affinis (Little Swift)
	Amaurornis phoenicurus (White-breasted Waterhen)
	Amaurornis phoenicurus (Red-wattled Lapwing)
	Anastomus oscitans (Asian Openbill)
	Microcarbo niger (Little Cormorant)
	Nycticorax nycticorax (Black-crowned Night Heron)
	Egretta garzetta (Little Egret)
	Ardeola grayii (Indian Pond-Heron)
	Ardea coromanda (Eastern Cattle Egret)
	Ardea intermedia (Medium/Intermediate Egret)
	Threskiornis melanocephalus (Black-headed Ibis)
	Milvus migrans (Black Kite)

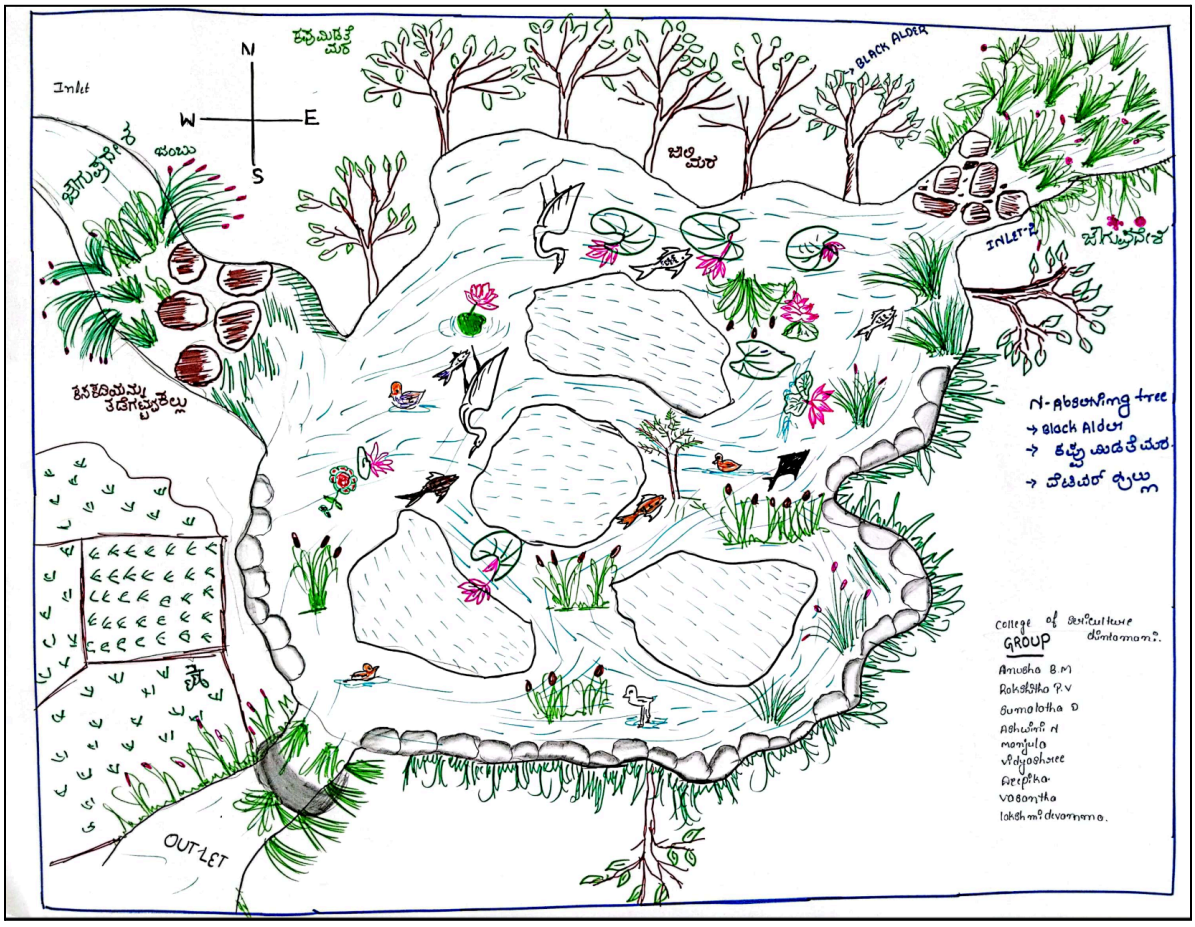
	Haliastur indus (Brahminy Kite)
	Upupa epops (Eurasian Hoopoe)
	Alcedo atthis (Common Kingfisher)
	Merops orientalis (Asian Green Bee-eater)
	Falco tinnunculus (Eurasian Kestrel)
	Psittacula krameri (Rose-ringed Parakeet)
	Dicrurus macrocercus (Black Drongo)
	Corvus splendens (House Crow)
	Corvus macrorhynchos (Large-billed Crow / Jungle Crow)
	Prinia socialis (Ashy Prinia)
	Prinia inornata (Plain Prinia)
	Acrocephalus dumetorum (Blyth's Reed Warbler)
	Pastor roseus (Rosy Starling)
	Acridotheres tristis (Common Myna)
	Acridotheres fuscus (Jungle Myna)
	Copsychus fulicatus (Indian Robin)
	Copsychus saularis (Oriental Magpie-Robin)
	Saxicola caprata (Pied Bushchat)
	Dicaeum erythrorhynchos (Pale-billed Flowerpecker)
	Dicaeum erythrorhynchos (Pale-billed Flowerpecker)
	Cinnyris asiaticus (Purple Sunbird)
	Passer domesticus (House Sparrow)
	Motacilla alba (White Wagtail)
	Himantopus himantopus (Black-winged Stilt)
	Orthotomus sutorius (Common Tailorbird)
	*Hirundo rustic*a (Barn Swallow)
	Pycnonotus jocosus (Red-whiskered Bulbul)
	Euodice malabarica (Indian Silverbill)

Notable fish species	*Labeo catla* (Catla)
	Channa marulius (Maral)

Annexure D: World Wetlands Day 2024 Celebration

Allied to our visioning activities, World Wetlands Day 2024 was celebrated at the periphery of a waterbody called Padiganakunte at Dhanamittanahalli village, Chintamani. Conducted together with the Janapara Foundation, TIDE, and SEEDS Karnataka, the event saw good participation from the students of the College of Sericulture and the Government Girls Junior College in Chintamani. In addition, community members from the nearby villages of Nagasandragadde and Dhanamittanahalli participated in the programme.

The event included talks highlighting the role of wetlands and how students can be involved with the rejuvenation and management of water bodies in their neighbourhoods. A group activity where students drew how they imagined wetlands was conducted.



A cultural troupe called *Bevu Bevru* also participated in the programme, and sang about how the larger Kolar-Chikkaballapur region used to historically be a land of tanks and lakes, and how people today have collectively lost their connection with water bodies. The programme was a good precursor to the Mallapalli lake visioning workshop, helping them think about why it is important for local communities to anchor lake rejuvenation and management efforts.

Annexure E: Participant List for the Lake Visioning Workshop

Name	Place
Akshay Raj	Mallapalli
B Venkata Ramana	Mallapalli
Basavaraj	Mallapalli
Byreddy	Mallapalli
Byreddy N	Mallapalli
C Monjusha	Mallapalli
Gopal Reddy	Mallapalli
Jayanama	Mallapalli
Krishna Reddy	Mallapalli
Mahesh MS	Mallapalli
MC GopalaKrishna Reddy	Mallapalli
MC Nagaraja	Mallapalli
MC Srinivas Reddy	Mallapalli
MH Gopal Reddy	Mallapalli
M Shivanna	Mallapalli
M SriRama Reddy	Mallapalli
MN Venkataswamy	Mallapalli
MR Krishna Reddy	Mallapalli
MS Prabhakar	Mallapalli
MS Naresh G	Mallapalli
N Anjanaya Prasad	Mallapalli
N Subba Reddy	Mallapalli
Nagesh MN	Mallapalli
Nagesh N	Mallapalli
Rajanna BV	Mallapalli

Rajesh Babu MN	Mallapalli
S Srinivasa	Mallapalli
Sahashiva N	Mallapalli
Sanjay Reddy MV	Mallapalli
Srinivas Reddy	Mallapalli
Suresh	Mallapalli
Venkat Reddy	Mallapalli
Venkatesh T	Mallapalli
YG Gowatam Reddy	Mallapalli