An integrated water management strategy for Bengaluru

March 2014

Confederation of Indian Industry

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Foreword

Water is increasingly in short supply in the urban world. India's "Silicon Valley", Bengaluru, faces the same problem. As the city urbanises at a breakneck pace, water availability is in danger of slowing to a trickle in the taps.

Recognising this urgency, the Confederation of Indian Industry (CII) Water Taskforce, Karnataka chapter, is organising its 2014 water conference around the theme "urban water management" — an initiative to visualise the linkages and interfaces between water supply management, waste water management and storm water management to take a "systems approach" to managing water.

This theme emerged as the Taskforce realised the need to move from the existing centralised, mega-scale approach in urban water infrastructure toward community action, working through clusters and zones for effective water management.

The CII is thankful to McKinsey & Company for studying the applicability of "Integrated Urban Water Management (IUWM)" in the context of Bengaluru's water requirements. Over the last six weeks, the team has done extensive research, fieldwork, and conducted interviews and meetings with all stakeholders to put together a true picture of the water situation in Bengaluru and how IUWM can help.

This report is an initiative to outline the urgency of the situation and propose a path towards a more secure water future. I sincerely hope that the interventions suggested in this report will help resolve the water situation in Bengaluru and also act as a template that be replicated in other Indian cities.

Hariprasad Hegde
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Executive summary

Bengaluru, "The Silicon Valley of India", has grown tremendously in the last 20 years. Bengaluru's infrastructure is already facing the pinch of this rapid urbanisation. With Bengaluru's population set to cross 1 crore by 2016, and conventional sources of water already falling short, the water situation in the city could reach alarming levels. While the government continues to invest in resolving the situation and pre-empting the crisis, the sheer pace of Bengaluru's growth makes it necessary to move in an accelerated fashion towards integrated urban water management.

WATER CRISIS IN BENGALURU

Bengaluru's water demand is increasing at a fast pace with its rapidly increasing population. The government has tried to meet this ever increasing demand by bringing more and more water from the Cauvery thorough several of its schemes in the past. But even after these efforts, Bengaluru's water demand-supply gap was estimated to be 750 million litres a day (MLD) in 2013, and is expected to increase to 1,300 million litres a day by 2026. Bengaluru's population is getting only 90 litres per capita per day (LPCD) of piped water supply against the urban standards of 150 LPCD as defined by Central Public Health and Environmental Engineering Organisation (CPHEEO).

To compensate for this shortage, Bengaluru residents are resorting to extraction of ground water as a result of which the ground water tables have sunk to record lows. At a few places in Bengaluru, people are not getting water even at a depth of 300 meters.

The city generates about 1,200 MLD of sewage out of which only 520 MLD gets treated while the rest flows into water bodies unchecked. Most of the lakes in the city are heavily contaminated due to the flow of untreated sewage. Construction activities too have had an adverse effect on several lakes.

CAN BENGALURU AFFORD TO IGNORE ITS WATER WOES

With the commencement of Cauvery Stage IV Phase 2 scheme, Bengaluru has already consumed almost its entire allocated Cauvery water quota. Relying on ground water is not a viable option in the long run as the water table has already hit dangerously low levels and 70 per cent of Bengaluru's ground water is either non-potable or not-recommended for use. The Government is considering investment heavy projects such as bringing water from Sharavatthi river and desalination schemes. It's high time to question whether large projects are the only solutions to the city's challenges and debate if there are alternatives which can not only ensure sustainable water supply but also do so in a less resource intensive manner. The concept of Integrated Urban Water Management (IUWM) - which looks at integrated, reuse oriented and self-sustainable methods of water management—is very relevant to Bengaluru, given this context.

WAY FORWARD – 6 INITIATIVES TO ADDRESS THE CHALLENGE

Six initiatives can yield an impact of up to 750 million litres a day to bridge the water demand–supply gap and also address the issue of ground water quality degradation.

1. Encourage recycling and reuse
2. Increase rain water harvesting
3. Restore and rejuvenate lakes

4. Design a complete solution to use tertiary treatment water

5. Stem leakages

6. Formulate a comprehensive strategy for the sustainable use of ground water

To ensure these initiatives deliver the full potential, a few fundamental changes are required in the institutional setup and policy framework along with commitment from all stakeholders involved.

Ward committees, a promising institution which is working successfully in many areas, can provide a powerful platform for the implementation of the recommended initiatives. The ward committees need to be empowered so that they can play an important role in identifying and prioritising community initiatives in the water sector. At the same time, they need to be structured in a manner that makes them accountable and effective institutions.

The onus of successful implementation does not lie on government bodies and functionaries alone. All stakeholders including builders, communities, NGOs and industries need to come together and play a critical part in making these initiatives fruitful and deliver the potential impact.

Given its short duration, the recommendations in the report should be treated as thought starters which need to be detailed into a firm action plan that can help Bengaluru realise the power of IUWM.

Chapter 1
Will the taps run dry?

Around 800 of Bengaluru's 1,000 lakes have disappeared in the past 200-odd years, sacrificed to the needs of the burgeoning population of the metropolis. The "city of a thousand lakes" in 1790,[1] Bengaluru today has looming residential complexes and new construction activity occupying the areas where serene lakes once stood. The city's population rose from 53 lakh in 2001 to 87 lakh in 2011, and at the present rate of growth, is likely to touch 1 crore by 2016. While the lakes have disappeared and the authorities have tried to supply more Cauvery water, the population's need far outpaces the increase in supply.

THE WATER CRISIS AROUND THE CORNER

A water crisis may be a possibility in the near future, precipitated by the consistent demand–supply gap of around 25 per cent, constant over the last two decades. This is further compounded by the degraded quality of ground water, heavy subsidies that distort water demand and several institutional challenges.

Uncontrolled demand–supply gap

An estimated 25 per cent of the water meant for Bengaluru is lost due to leakages, leaving residents with only about 90 litres per capita per day (LPCD), short of the government norm for metro cities by 60 LPCD. Bengaluru has faced a mismatch between demand and supply for over 20 years now, which will further intensify in the next decade (Exhibit 1.1).

Exhibit 1.1

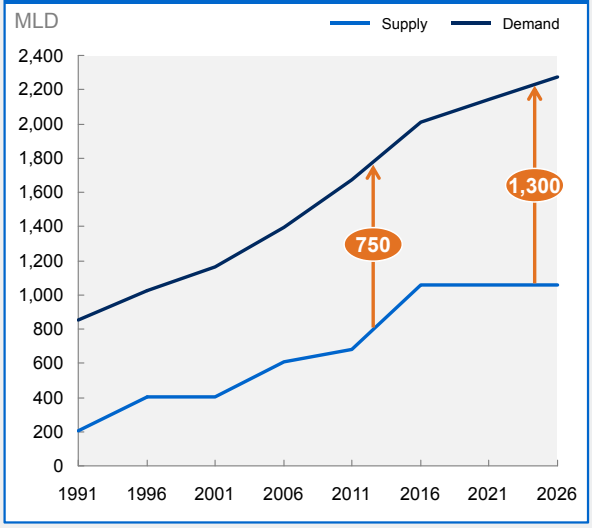
Bengaluru water supply cannot keep pace with growing demand; the gap will nearly double by 2026

Domestic water demand in Bengaluru[1]

MLD

Year	Supply[2]	Demand[3]	Shortage
1991	203	620	417
1996	405	755	350
2001	405	855	450
2006	608	1,040	432
2011	683	1,264	581
2016	1,058	1,537	479
2021	1,058	1,596	539
2026	1,058	1,644	590

Water demand supply gap in Bengaluru for all sectors



1 Suggested by Central Public Health and Environmental Engineering Organisation (CPHEEO)
2 After taking into account 25% water leakage
3 Demand for domestic sector is assumed to be 150 LPCD as recommended by CPHEEO
SOURCE: BWSSB; McKinsey analysis

1 As described by a British captain, see http://www.firstpost.com/india/will-Bengaluru-have-to-be-evacuated-by-2023-697649.html

To add to its woes, Bengaluru has fully used up its allocated Cauvery water quota of 1,450 million litres per day (MLD) and cannot increase water supply from Cauvery in the near future.

Ground water is over-exploited and of questionable quality

Bengaluru consumes around 1,700 to 1,800 MLD water, and about 700 to 800 MLD of this is ground water, the rest being surface water. However, this ground water is often over-exploited and dangerously contaminated with sewage and other effluents:

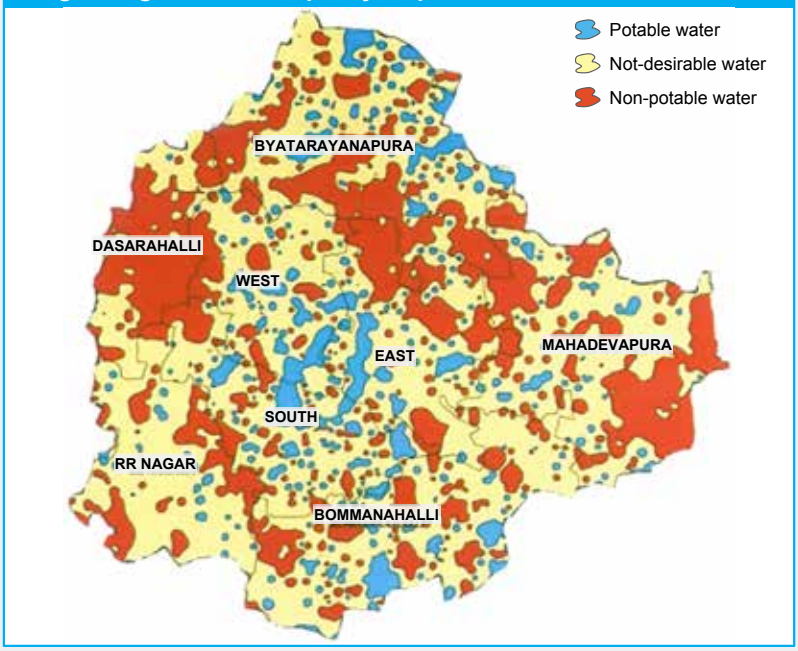
- Bengaluru has a high groundwater overdraft of around 142 per cent, especially in pockets such as Bengaluru South, Devanahalli and Hoskote.[2] Residents dig borewells because of lack of or erratic water supply and because of its low operating costs. But this is depleting water tables to a critical level; in some areas people fail to find water even at depths of 300 metres, leaving them fully dependent on tankers for their water supply.

- Only 25 to 30 per cent of the city has potable ground water (Exhibit 1.2). Not only does it contain various chemicals in unacceptable quantities, the water suffers due to Bengaluru's limited sewage-treatment capacity. Of the 1,200 MLD of sewage generated in the city, there is capacity to treat 721 MLD of sewage whereas only 520 MLD of sewage is actually getting treated, leaving around 57 per cent sewage untreated. Industrial effluents, too, are discharged without treatment.

Exhibit 1.2

Only 30% of Bengaluru has potable ground water

Bengaluru ground water quality map



SOURCE: Department of Mines and Geology, 2011

Urbanisation continues to destroy the city's lakes

As Bengaluru's population grows rapidly, lakes are shrinking further or disappearing entirely for three reasons:

- **Industrialisation:** The city is meeting its land development needs through landfills and reclamation of lakes and wetlands. Many industries dump waste that is high in chemicals, rendering the water useless and, indeed, dangerous.

2 Department of Mines and Geology, 2011 report.

- **Tampering with the hydrological balance:** Many of Bengaluru's lakes are inter-connected, so if one is contaminated with industrial waste, it has a cascading effect on all the interconnected lakes when water overflows in the rains. Even trying to clean a lake is a challenge, because it means cleaning all the lakes in one lake system.

- **Encroachments and commercial benefits:** Construction activities have affected a few lakes. In addition, commercial establishments such as food courts or amusement parks spring up around lakes, altering the original character of the water body.

In just the last 7 years, landfilling and encroachment have cost Bengaluru 42 of its remaining 212 lakes.[3]

INTERVENTIONS TO CONSERVE WATER HAVE SO FAR HAD LIMITED IMPACT

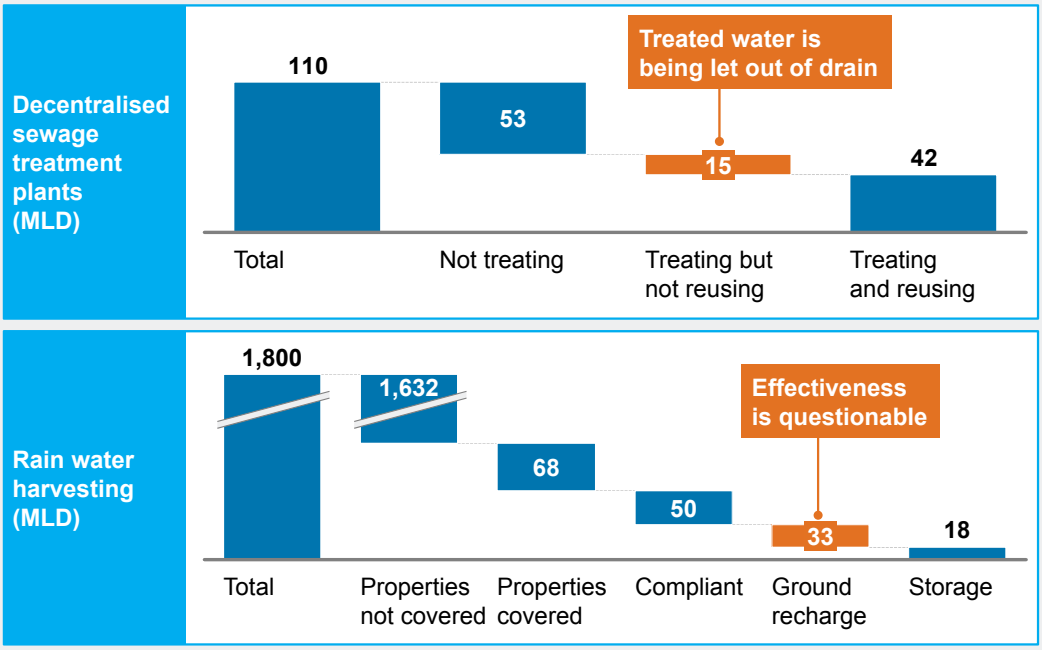
While the government had tried to mandate water recycling and conservation efforts in the city, the impact has been limited.

Efforts so far

- **Decentralised sewage treatment plants:** The Karnataka State Pollution Control Board (KSPCB) has made sewage treatment plants (STPs) mandatory for all individual residential complexes with 50 or more dwellings, or those generating more than 50 cubic metres of sewage daily. They are to reuse the treated water to flush toilets (this requires dual plumbing), wash cars, or for irrigation. Properly treating sewage is mandatory before it is discharged into water bodies. However, these STPs are actually treating and reusing only about 42 MLD compared to overall treatment capacity of 110 MLD (source: KSPCB survey 2013). In fact, these STPs let out about 15 MLD of treated water through drains, and do not treat nearly half (53 MLD) of all the generated sewage (Exhibit 1.3).

Exhibit 1.3

Impact of recent initiatives to conserve water is limited to 3–15 per cent of the potential



SOURCE: Expert interviews; press articles; McKinsey analysis

3 A report by the Institute of Social and Economic Change states that only around 180 lakes survive in Bengaluru due to rapid urbanisation.

- **Rain-water harvesting:** Introduced in 2009, section 72A of the Bengaluru Water Supply and Sewage Act, 1964, provides for rain water harvesting structures in existing buildings with a floor area of 2,400 sq. ft. or more, and in new buildings with a floor area of 1,200 sq. ft. or more. However, of the existing 18 lakh properties in the city, only 68,000 buildings were identified for rainwater harvesting and only 50,000 have complied till date. The majority of buildings opted for pit-based rain water harvesting for ground water recharge. The effectiveness of the method, however, is questionable, as it is not possible to measure how much water is actually seeping into the ground.

Why impact is limited

Three factors are limiting the impact:

- **Rapid urbanisation is outpacing government's efforts:** Bengaluru's urbanisation rate has been growing consistently over 4 per cent for the last 20 years and GDP growth rate has been in 10 to 12 per cent range for large part of last decade. While the government has invested in multiple Cauvery water schemes and projects, it has always played catch-up with urbanisation, so water supply levels never reached the urban consumption standard of 150 LPCD (as recommended by CPHEEO).

- **Interventions to ensure self-sustenance are sub-scale:** The authorities are focusing either on large-scale investment projects such as attempts to bring water from the Sharavatthi river or targeting mainly households. The policies on sewage treatment and rain water harvesting ignore ward-level planning, which would have transformed the whole effort to a community-level initiative.

- **The laws aimed at water conservation such as water harvesting and reuse had limited impact because:**

  — They cover only a small percentage of the population. For example, the rain water harvesting scheme covers only 68,000 properties, compared with a total of 18 lakh properties in Bengaluru.

  — The stringent standards discourage participation, which results in very poor compliance levels.

  — The price of available water is so low (domestic users pay INR 6 per kilo-litre for BWSSB water and INR 4 to 15 per kilo-litre for ground water) that residents do not feel compelled to look for alternatives. The costs of rain water harvesting (INR 70 per kilo-litre) and recycled water (INR 40 per kilo-litre) seem very high in comparison. Convincing people to adopt these alternatives will take much more work.

AN INTEGRATED APPROACH TO WATER MANAGEMENT IN BENGALURU

Dealing with the current water situation calls for an approach integrated across four themes (Exhibit 1.4):

- **All users** could be integrated through a strategic and inclusive plan to manage water-related challenges for competing water users—domestic, industrial, agricultural, etc.—in a given catchment on the river basin.

- **Sources and sectors:** This would be a two-pronged approach that:

  a. Optimises the water supply network to add water capacity through all available resources—ground, surface, storm and waste water.

  b. Integrates water supply with other sectors (land, housing, etc.) to avoid any fragmentation or duplication in policy- and decision-making.

- **Stakeholders:** This would make optimal use of institutional interfaces such as BWSSB, Bengaluru Development Authority, Lake Development Authority and Karnataka State Pollution Control Board, including formal and informal actors and at the same time encourage residents, developers and urban local bodies (the municipality) to participate.

- **Maximum self-sufficiency:** The approach would ensure the greatest possible reuse and recycling at each level (city, ward, neighbourhood, etc.) through education, awareness and training programmes at each planning stage.

Exhibit 1.4

To deal with existing water challenges, Bengaluru needs an integrated approach to water management

Principles of integrated urban water management (IUWM)

	From…	…to
Integrating all users	▪ Capital intensive initiatives to augment one source of supply	▪ Optimise existing resources through reuse and self sufficiency
Integrating sources and sectors	▪ Various water networks, users and resources treated independently	▪ Integrated approach and planning for water, sewage, storm water, lakes and river basin
Integrating stakeholders	▪ Institutional architecture siloed ▪ User involvement is need based and infrequent	▪ Institutional structure geared to deliver an optimal integrated urban water solution ▪ Explicitly includes users
Maximising self-sufficiency	▪ Maximum dependency on freshwater ▪ Ecological impact not explicitly measured	▪ Close the water loop by recycling and reusing at various levels ▪ Environmental impact ingrained in the model

SOURCE: World Bank; McKinsey analysis

INTEGRATED WATER MANAGEMENT IN SINGAPORE

Four decades ago, Singapore was facing severe water related challenges mainly related to

- Lack of natural water resources in the country
- Pollution in water bodies due to flow of untreated sewage
- Little open space available for any major project
- Regular flooding conditions in the city

To deal with existing challenges, Singapore started "Four National Taps" program comprising

- Reclamation of water — High grade reclaimed water produced from treated waste water
- Rain water harvesting — Rain water collected through networks of drains, canals, rivers and storm water before it is treated for drinking water supply
- Desalination — Installed one of Asia's largest reverse osmosis plant
- Imported water — Water imported from Johor, Malaysia

In the last four decades Singapore reduced its dependency on imported water considerably and has increased water catchment area to two-third of Singapore's land surface area.

* * *

Bengaluru could be headed toward a serious water crisis. Existing resources are only going to shrink, and more water from the Cauvery is not an option. The city therefore needs to think very carefully about the future. An integrated approach that considers all stakeholders and aspects is essential in this regard. In subsequent chapters, we talk about the possible options before the government of Karnataka.

Chapter 2
Six initiatives for an IUWM strategy for Bengaluru

The Garden City's water woes can be mitigated by an integrated urban water management (IUWM) strategy to address the main issues: demand–supply gap, subsidised water price structure and depleting and low quality of ground water. This chapter outlines six initiatives that together form a comprehensive plan to address Bengaluru's water crisis before it deteriorates further.

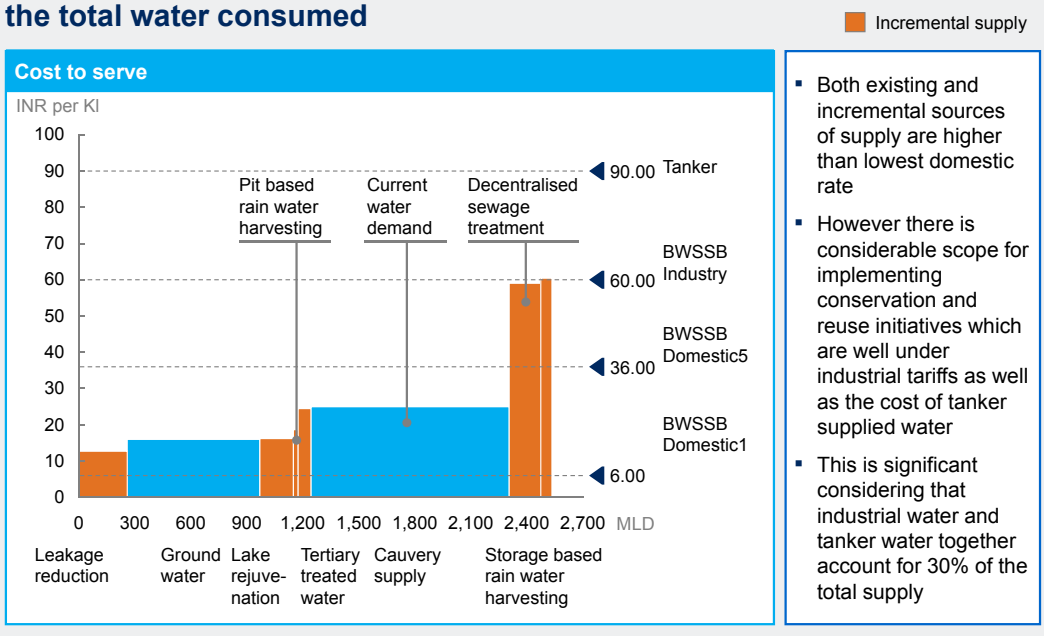
These six initiatives were derived from McKinsey's proprietary cost curve tool, an analytical framework that has been successfully employed across a range of resources industries including energy and metals. The cost curve attempts to quantify and rank sources of supply according to their true cost. It also examines the volume of each source of supply. Incremental sources of supply—in this case, new initiatives to conserve water—are then measured against the current supply sources in terms of both cost and volume to evaluate their economic feasibility of implementation.

The cost curve, along with extensive consultations with stakeholders in the Bengaluru water sector as well as McKinsey's internal and external experts, was used to produce a long list of demand management and supply augmentation levers. Six levers were shortlisted after evaluating them for size of impact, resources required and ease of implementation.

The cost curve for water demand-supply in Bengaluru in 2013 is shown in exhibit 2.1. The cost curve shows that both the existing and incremental sources of supply are higher than the lowest domestic BWSSB rates which accounts for 50 per cent of the total consumption. However, there is still considerable scope for industries and the tanker water users to implement conservation and reuse initiatives. This is significant, considering that industries and tanker supply together account for 30 per cent of total water demand.

Exhibit 2.1

Cost curve for Bengaluru demand supply-2013: Cost to serve is significantly higher than domestic tariffs which accounts for ~50% of the total water consumed

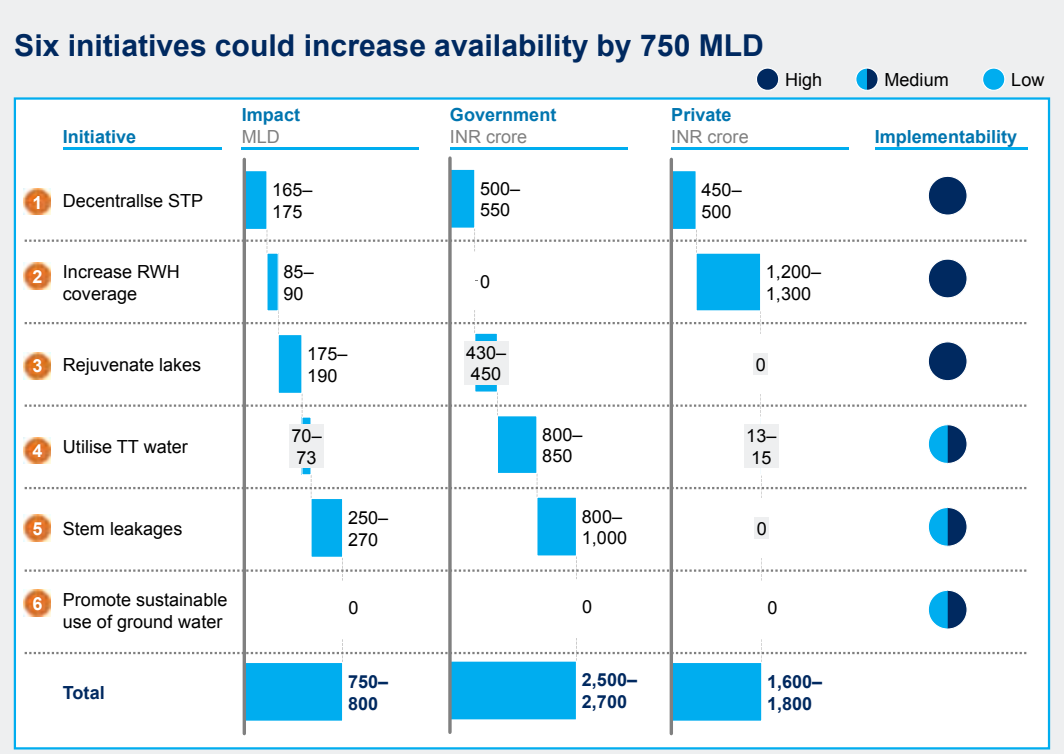


SOURCE: McKinsey analysis

The six prioritised initiatives have the potential to increase the availability of water by 750 MLD (Exhibit 2.2) in Bengaluru. Some of these initiatives such as rain water harvesting, decentralised sewage treatment plants require investment from communities and households while others such as leakage reduction and lakes rejuvenation would be required to be funded by the government. The six initiatives are as follows:

1. Encourage recycling and reuse especially through decentralised Sewage Treatment Plants (DSTPs)
2. Increase rain water harvesting (RWH)
3. Restore and rejuvenate lakes
4. Design a complete delivery and pipeline solution to use tertiary treatment water
5. Reduce leakages and distribution losses
6. Formulate a comprehensive strategy for the sustainable use of ground water

Exhibit 2.2



SOURCE: McKinsey analysis

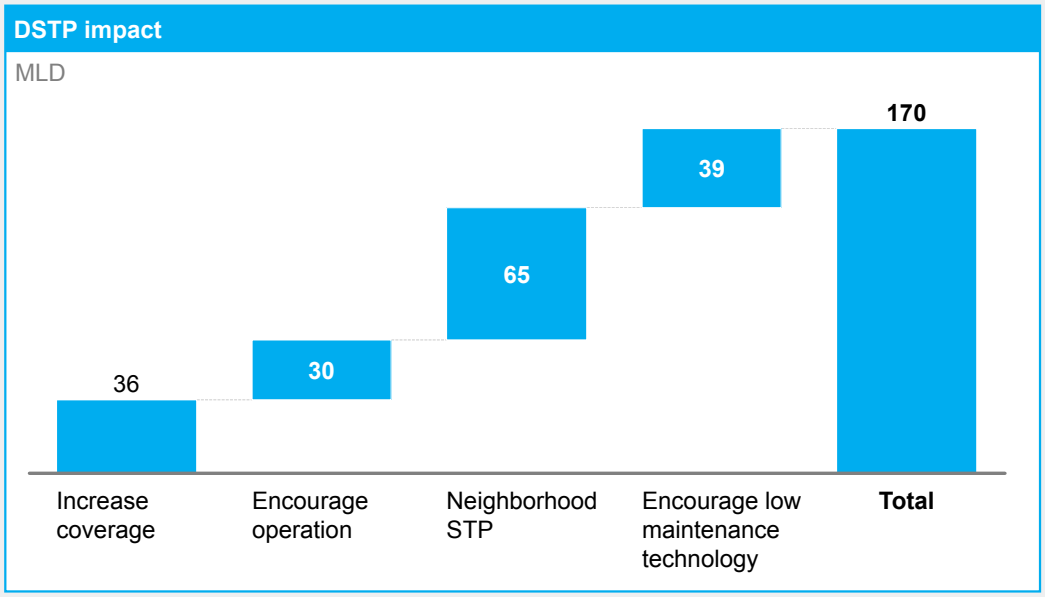
1. ENCOURAGE RECYCLING AND REUSE

Even though Bengaluru has mandated private sewage treatment plants (STPs) in apartments, most of the apartments either do not run the treatment plant due to lack of technical knowledge or do not use the treated water due to lack of infrastructure. The current decentralised STP (DSTP) capacity stands at 110 MLD, of which 52 MLD is domestic and 58 MLD is commercial. While almost 80 per cent of commercial establishments treat the water, the number is as low as 20 per cent for domestic users.

Increasing the coverage of DSTPs, encouraging operations, mandating the use of low-maintenance technology, and promoting neighbourhood STPs can result in 170 MLD of additional recycled water which can be reused (Exhibit 2.3).

Exhibit 2.3

Close the water loop by increasing DSTP coverage, encouraging operation by enforcement and technical support, implementing neighborhood STPs and promoting low maintenance technology



SOURCE: Expert interviews; McKinsey analysis

Four initiatives in the DSTP space could help ease Bengaluru's water woes:

- Increase coverage of DSTPs by mandating sewage treatment for all old properties (pre-2006). This can help save 36 MLD of water.
- Encourage reuse of treated water by the following, can potentially save about 30 MLD of water:
  - Mandating dual pipeline for all buildings with STPs
  - Mandating the use of recycled water for flushing and gardening
  - Increasing community awareness and engagement
- Implement DSTPs at the ward levels in areas without access to an underground sewage connection
- Encourage the operation of STPs by promoting low-maintenance technology among builders, prospective property buyers and STP consultants, and providing guidelines for the recommended technology. This can save 39 MLD of water.

2. INCREASE RAIN WATER HARVESTING

Rain water harvesting, though much debated and discussed in public forums, continues to lag in actual implementation. Increasing it through greater awareness and impactful legislation could help save 115 to 125 MLD of water.

Three key challenges limit the level of rain water harvesting:

- **Limited coverage of the law:** The current law covers only 68,000 properties for rain water harvesting out of the existing 18 lakh. Further, the law is enforced only in areas covered by BWSSB piped supply.

- **Low level of compliance:** Most rain water harvesting structures do not meet the minimum structural requirements as required by law.

- **Lack of awareness:** Lack of education among households regarding regulations and benefits of rain water harvesting, and about groundwater levels and quality has resulted in low impact.

It is possible to harvest more rain water by:

- **Increasing coverage of rainwater harvesting:** Making it mandatory for all properties measuring over 1,200 sq. ft. can result in an additional 25 MLD of harvested water

- **Enforcing compliance even in areas where the BWSSB does not supply piped water:** The Bruhat Bengaluru Mahanagara Palike (BBMP) can support BWSSB in this initiative. This can provide 60 MLD of harvested water

The effectiveness of rainwater harvesting can be further increased by promoting storage-based harvesting. Although storage-based harvesting is expensive compared to pit-based harvesting, it provides water for immediate use.

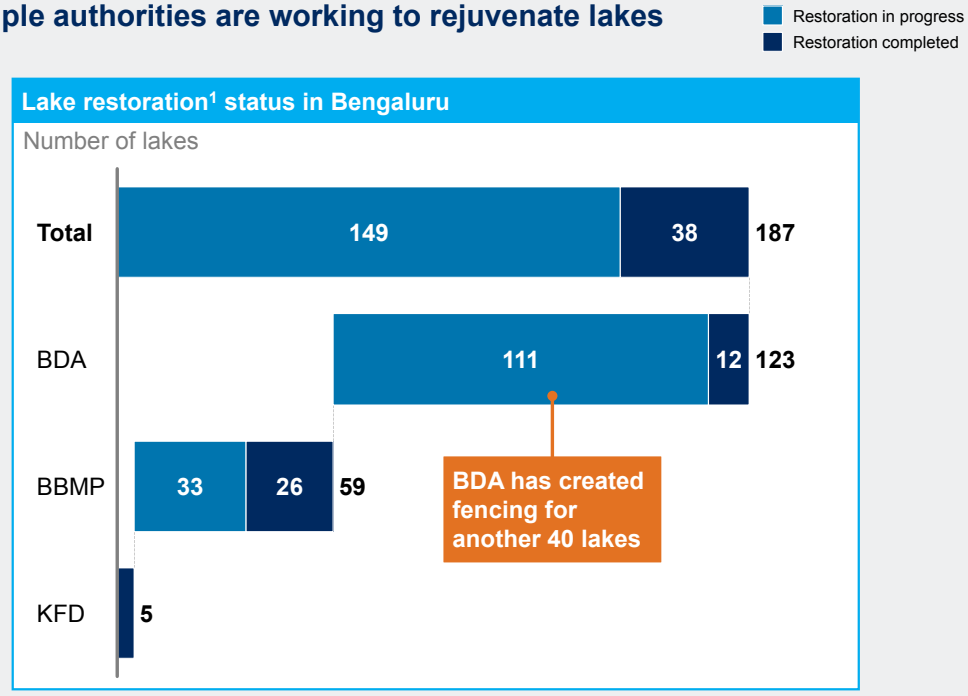
3. RESTORE AND REJUVENATE LAKES

Around 187 lakes in Bengaluru require restoration. Although efforts are already in progress, these need to be sustained and focused to succeed. Multiple authorities are working to rejuvenate lakes (Exhibit 2.4).

While rejuvenation work has been completed for 38 lakes; work is either under progress or yet to start on the rest.

Exhibit 2.4

Multiple authorities are working to rejuvenate lakes



1 Encroachment removed and fencing created
SOURCE: Expert interviews; McKinsey analysis

Jakkur lake – A success story

Jakkur Lake was one of the 20 lakes adopted for rejuvenation. Over the years, effluent discharge, illegal sand mining, dumping of debris and idol immersion had polluted it beyond recognition. Construction activity also caused numerous encroachments on the lake.

In early 2000, a comprehensive rejuvenation project for Jakkur Lake was undertaken at the cost of INR 21.5 crore. The lake was de-watered, de-silted and a bund and STP of 10 MLD were created. To stop the flow of untreated sewage into the lake, all sewage lines were diverted to the STP. Treated water was passed through a wet land before it was let into the lake.

After its rejuvenation, the water quality in the lake has markedly increased. It helped recharge ground water, leading to an increase in the water table and filling up of open wells.

Replicate Jakkur restoration model

Out of Bengaluru's 187 lakes, 38 which have already been cleared of encroachment can be prioritised for restoration and rejuvenation. Lakes with an area of over 30 acres can have a local STP to stop the inflow of sewage; smaller lakes can be restored by routing the flow of sewage to the nearest STP. These 38 lakes can potentially increase Bengaluru's water availability by 180 MLD.

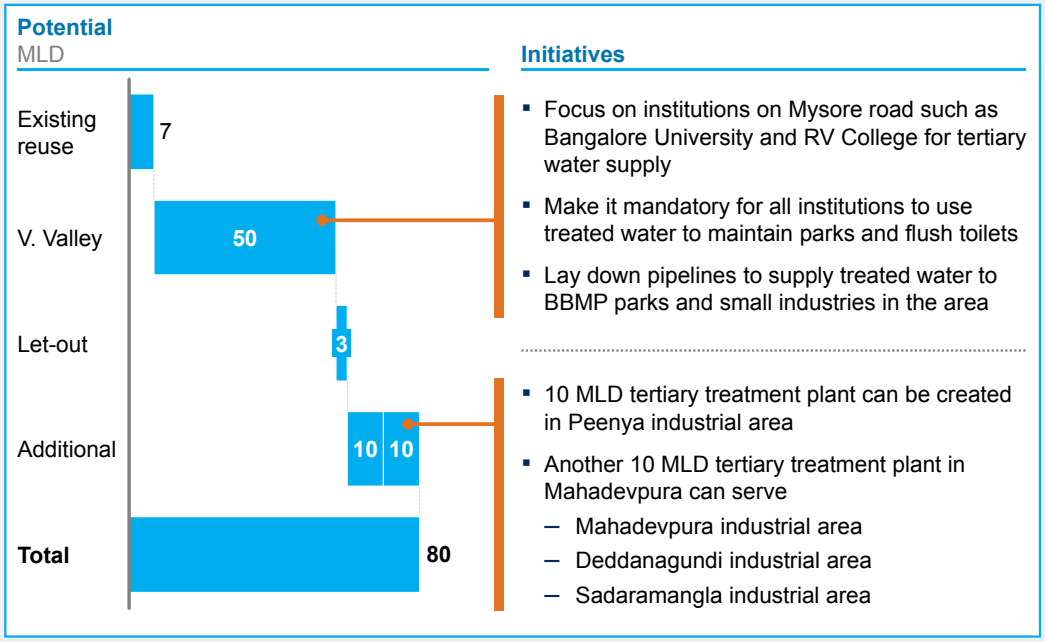
Resident welfare associations and NGOs play a key role in creating awareness about the lakes' conservation. Many similar efforts have failed in the past due to limited community support. Working with the community can ensure an even more effective rejuvenation effort.

4. DESIGN A COMPLETE DELIVERY AND PIPELINE SOLUTION TO USE TERTIARY TREATMENT WATER

Bengaluru has 73 MLD of tertiary treatment capacity through four plants—Vrishabhavathi Valley (60 MLD), Yelahanka (10 MLD), Cubbon Park (1.5 MLD) and Lalgarh Park (1.5 MLD). However, it uses only 7 MLD of recycled water. This is primarily due to the lack of buyers, lack of pipeline infrastructure to supply water to industries and institutions, and the availability of cheaper alternative sources. The use of tertiary treated water can be increased to 80 MLD (Exhibit 2.5) by:

Exhibit 2.5

Industrial clusters and institutions can increase use of tertiary treated water to 80 MLD



SOURCE: Expert interviews; McKinsey analysis

- Focusing on institutions and colleges to invest in dual plumbing so that treated water can be used for flushing and gardening
- Investing in pipeline infrastructure to supply water to small industries in the area, institutions and Bruhat Bengaluru Mahanagara Palike (BBMP) parks
- Letting out additional treated water in nearby lakes
- Creating additional tertiary treatment capacity in Peenya and Mahadevpura industrial areas.

5. STEM LEAKAGES

BBengaluru loses about 25 per cent of its daily water supply to leakage alone. Plugging this can help save 250 to 270 MLD of water. The BWSSB has already allocated projects to reduce leakage in Bengaluru from 40 per cent to 16 per cent.

Phase 1 was launched as a pilot project in 1999 to tackle leakage. The pilot project reduced 14 MLD in leakage at the cost of INR 48 crore. The project was implemented between 2003 and 2006.

Work in Phase 2 has been allocated to external agencies for Bengaluru's west and central zones. The work, which began in November 2013, will take 3 years to implement. These external agencies will provide 5 years of operations and maintenance in both these zones.

The authorities can bring in learning from other leakage reduction programmes such as:

- Undertaking sectional unaccounted-for water analysis using insertion probes
- Creating district metering areas, consumer metering, step test and metering checks using ultrasonic flow meters to reduce leakage
- Eliminating illegal connections by regularisation through partnership models
- Installing meters at all existing connections
- Installing meters for all bulk and commercial consumers
- Resolving incorrect measurement by meters
- Recording public consumption through sample meters at public stand posts.

Once the projects are completed and handed over to the BWSSB, the key challenge would be to maintain the leakage at that level. BWSSB could consider either investing in resource and skill building for this purpose, or handing over the operations and maintenance to a third party.

6. FORMULATE A COMPREHENSIVE STRATEGY FOR THE SUSTAINABLE USE OF GROUND WATER

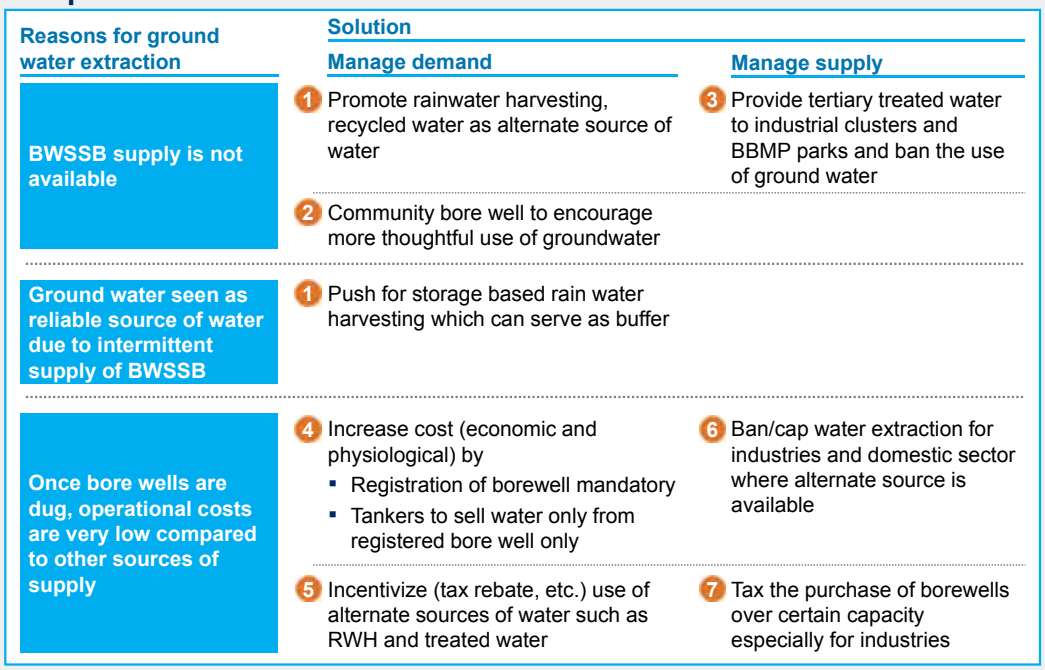
Increasing demand for water and a deficient public water supply system heavily strains the city's ground water, depleting the ground tables. The solution lies in managing both demand and supply and promoting alternative sources of water.

The city of Tokyo successfully dealt with its ground water overdraft challenge in the 1970s by strictly monitoring and regulating ground water extraction for industrial, air conditioning and toilet flushing purposes.

In Bengaluru, a comprehensive list of measures is required to plug the over-extraction of ground water (Exhibit 2.6).

Exhibit 2.6

A comprehensive strategy is required to curb ground water extraction and promote alternate sources of water



SOURCE: Expert interviews; McKinsey analysis

* * *

Bengaluru can pre-empt an aggravated water crisis through these six initiatives. The resources and legislations are within its reach. Public awareness and the will to work collectively can make these initiatives a success.

Apart from these prioritised 6 levers, a number of demand management levers can be implemented. These include

- Low flow showers
- Efficient toilets
- Waterless urinals
- Water efficient home appliances

The exact quantum of the impact and the applicable technologies require to be studied in more detail. In particular the real estate developer community needs to be actively engaged to ensure that these technologies are adopted as standards in all residential constructions.

Chapter 3
Mobilising institutions and stakeholders

Driving Bengaluru to adopt new ways of saving water and embrace the consumption of various types of water (such as treated water) could be possible through the six initiatives outlined in Chapter 2. The success of such initiatives depends, however, on mobilising institutions and stakeholders through a comprehensive approach of decentralisation, changing and enforcing policies, building stakeholder commitment and experimentation through pilot projects.

DECENTRALISED PLANNING AND EXECUTION THROUGH WARD COMMITTEES

Planning at the city level helps to optimise resources, while planning at the household level increase self-sufficiency and closes the water loop down to the last unit. A neighbourhood or zone level planning and execution would strike the right balance between these two ends of the spectrum. In particular, wards can be particularly effective vehicles as units of decentralised planning given their appropriate size and constitutional status.

The advantage is that a ward-level institutional structure already exists in Bengaluru. The 74th constitutional amendment mandated all metropolitan bodies to create ward committees, which Bengaluru implemented in January 2013 after a directive of the high court. Using the existing institutional structure would be more effective than creating a completely new institution.

Ward-level institutions have proved effective in India and other developing countries. In Brazil, over 80 cities follow the decentralised approach of planning and execution. And the Indian state of Kerala implemented ward committees in 1996 to well-documented success.

Kerala: A participatory approach to planning and execution[1]

Kerala has a head start in the decentralised planning approach. The state implemented Ward Sabhas in each ward in 1996–97. The Kerala Municipality Act of 1999 mandated the formation of Ward Committees in each ward in every municipality with a population over 1 lakh. The ward committee is structured to include the councillor of the ward, representatives from residents associations, neighbourhood groups, heads of all recognised educational institutions, a nominee from each political party and 20 people nominated by the chairperson and councillor. Between 2007 and 2011, around 24 per cent of the total state development fund was allocated for participatory level planning. Decentralised planning at the ward level helps to understand people's needs and identify potential areas of intervention

Ward committees play an important role in Kerala:

- Decentralised planning begins at ward level to understand people's needs and identify areas of intervention
- Elected representatives, officials and experts meet at a one-day seminar to discuss identified projects and develop reports for dissemination of information
- Local bodies prioritise projects within their resource limit
- The District Planning Committee and Technical Planning Committee review and approve the projects
- Local body supervises each project's implementation

1 The Kerala example is collated through various press articles.

- The ward committee also monitors the progress of previous year's development programme

This approach has had significant impact in Kerala in eradicating poverty at the local level by increasing local production, income and employment. The state can boast of many success stories, such as creating a rainwater harvesting structure at ward level to tackle water scarcity—a step that wards in other states have followed as a model initiative.

Improving ward committee effectiveness in Bengaluru

An ideal ward-level institution would have the following features:

- Water system design and infrastructure to promote ward-level planning
- Adequate budget allocation
- Empowered independent functioning
- Capable committee members
- Transparency and accountability

Measured against these parameters, however, Bengaluru's performance leaves room for improvement. Ward committees have limited powers while sanctioning funds, enforcing compliance, etc.; members are often not experts in the subject, having been nominated rather than elected; and there is very little transparency in the nomination process (Exhibit 3.1).

Exhibit 3.1

Bengaluru has a long way to go to improve effectiveness of ward committees

	Challenges for ward committee in Bengaluru
Water system design to promote ward-level planning	▪ System is not designed to keep ward-level planning in mind ▪ All the decisions are taken at city level
Budget allocation	▪ Ward committees have power to give administrative approval to work not exceeding INR 1 lakh ▪ These funds were also rarely made available to ward committees
Empowering independent functioning	▪ Wards do not have powers to initiate project in the area as investment decisions are made at BBMP level ▪ Corporator remained the single window to take the concerns of committee members to council ▪ Limited powers to enforce compliance of polices
Capable committee members	▪ Except corporator all other members are nominated members ▪ Though nominated members are expected to be experts in their areas, reality seemed to be otherwise
Transparency and accountability	▪ Limited transparency on the nomination of committee members ▪ As escalation forums are non-existent, accountability is also missing

SOURCE: McKinsey analysis

1. In order to improve its ward committee performance, Bengaluru could specifically focus on these five parameters: Water system design and infrastructure to promote ward-level planning: The infrastructure would support and promote ward-level decision-making, e.g., individual wards have sewage treatment plants and storm water harvesting provisions. In Bengaluru's case, this will fall into place once the remaining four are achieved.

2. Adequate budget allocation:

   a. A significant proportion of city-level development funds) could be allocated to ward-level planning

   b. Wards can also explore other sources of funds such as IFAs, collections from residents, etc.

3. Empowered independent functioning: Ward committees should be given power to:

   a. Select projects to invest at ward level

   b. Monitor quality and progress of on-going projects

   c. Facilitate the policy enforcement at ward level

4. Capable committee members: Experts and respected figures from neighbourhoods should be part of committees

5. Transparency and accountability:

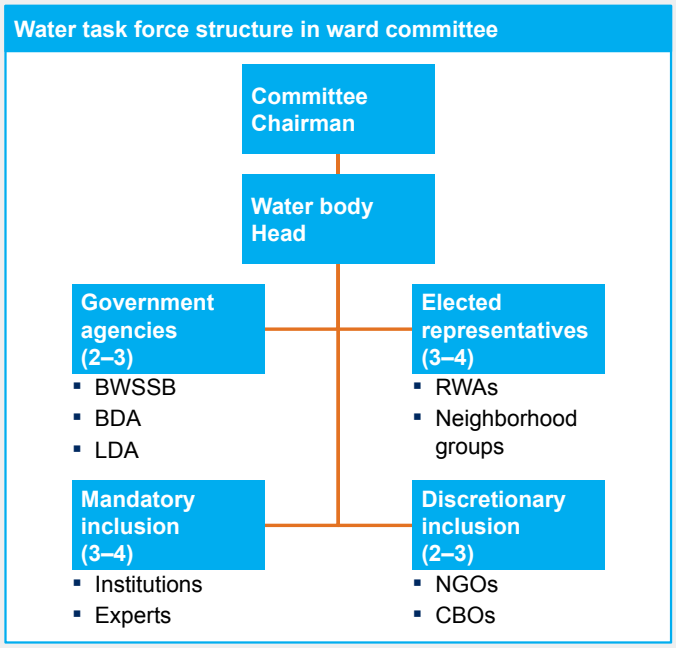
   a. Good mix of elected and nominated members in committee (Exhibit 3.2)

   b. Publish quarterly public statements and have accounts audited by third party

An illustrative ward committee water task force structure is shown in Exhibit 3.2

Exhibit 3.2

A proposed water task force structure for Bengaluru's ward committee



SOURCE: McKinsey analysis

The major responsibilities of waster taskforce would be:

- Plan for water infrastructure required in the ward
- Prioritise investment based on resource constraint
- Oversee and monitor quality and progress of public work in the ward
- Facilitate policy compliance at ward level

To achieve this, the ward committee should:

- Encourage public participation in committee meetings by publishing meeting schedule, location and agenda well in advance
- Reach out to residents for inputs on interventions required
- Invite agencies (BWSSB, council members and contractor, etc.) to share update on progress of on-going projects
- Facilitate account review by external agency and publicly publish audited results
- Facilitate policy compliance by conducting awareness programmes and providing technical support
- Appoint external agency to gather ward-level information and publish annual ward index based on water infrastructure and availability, sewerage system and the conditions of lakes and parks.

Performance of ward committees should be measured regularly against a set of clearly defined outcome-based metrics at the ward level, such as the level of ground water extraction, level of policy compliance and the number of hours BWSSB supplied water is available in the ward.

Underlying all these efforts, Bengaluru must also invest in developing a comprehensive communication strategy to reach out to all stakeholders—residents as well as other regulatory authorities in Bengaluru such as BWSSB, LDA, KSPCB and BDA. Involving all constituents is the key to successfully operating at ward level. These efforts by the government to streamline the functioning of ward committees are critical to better water management.

GOVERNMENT INTERVENTION — POLICY CHANGE AND ENFORCEMENT

Conducive policies from the government, an institutional framework and a phase-based approach could be a powerful driver for integrated water management in Bengaluru. These government interventions across four areas can be rolled out in 3 phases (Exhibits 3.3a, 3.3b and 3.3c).

Exhibit 3.3a

Interventions and support – Phase 1

	Phase 1 (1 year)
Legislation	1 ▪ Mandatory RWH for all 1200 sq. or above properties ▪ Mandatory registration of bore-well and self-reporting of ground water extraction ▪ Cover pre-2006 properties under DSTP ▪ Tax purchase of borewells over certain capacity especialy for industries
Institutional	2 ▪ Strengthen ward committee structure and allocate budget for bottom up planning
Further studies	3 ▪ BWSSB org structure to support ward committee functioning ▪ Detailed mapping of ground water extraction for local policy designing ▪ Technology for DSTP ▪ Ward committee structure
Financial commitments and initiatives	4 ▪ Financial assistance for lake rejuvenation and storage based rain water harvesting ▪ Launch city wide awareness progress and provide technical help for RWH and operation of DSTP

SOURCE: McKinsey analysis

Exhibit 3.3b

Interventions and support – Phase 2

	Phase 2 (2–3 year)
Legislation	1 ▪ Mandatory dual plumbing for all commercial and institutional buildings covered under DSTP ▪ Put a limit for water extraction for industries and commercial buildings
Institutional	2 ▪ Roll out bottom up planning for ward committees
Financial commitments and initiatives	3 ▪ Tertiary treated water for industrial areas such as Peenya ▪ Financial initiatives for using alternate source of water and reducing ground water extraction

SOURCE: McKinsey analysis

Exhibit 3.3c

Interventions and support – Phase 3

	Phase 3 (3–5 year)
Legislation	1 ▪ Put a limit on ground water extraction for domestic sector ▪ Revised tariff to improve the viability of alternate water sources
Institutional	2 ▪ Align BWSSB structure with ward committee functioning

SOURCE: McKinsey analysis

The organisation structure of all regulatory bodies, especially the BWSSB, should support the functioning of ward committees. The BWSSB currently does not have ward-level representatives. As seen from the functioning of ward committees so far, most complaints and issues that committee members respond to are related to water. So, it makes sense to reorganise BWSSB keeping the ward-level functioning in mind. Further studies can be conducted to come up with a suitable BWSSB structure for ward committee functioning.

A comprehensive strategy to regulate and restrict ground water extraction is required. This would include a detailed mapping of ground water extraction in the city, legislation to cap or ban ground water use for industries and other non-domestic sectors, and incentivising the use of alternate water sources.

STAKEHOLDER COMMITMENT FOR GREATER SUCCESS

While the earlier sections describe ways in which the government can enable ward-level planning for a safe water future in Bengaluru, the onus does not lie on government bodies and functionaries alone. All stakeholders must also come together and commit to the success of the initiatives for integrated water management.

How communities can participate

- Manage and operate existing DSTPs to comply with the law
- Maximise use of recycled water by investing in dual plumbing
- Buy tanker water only from registered bore-wells
- Implement storage-based rain water harvesting
- Actively participate in ward committee meetings

What developers could do

- Incorporate water planning in the initial stages of project plan development
- Use best practices for RWH and STP as recommended by BWSSB and KSPCB
- Adopt demand management devices such as water efficient taps and showers as standard in all new projects

How industries could cooperate

- Use rain water harvesting and recycled water to reduce reliance on ground water
- Self-report ground water extraction data to government
- Use tertiary treated water to maximum extent possible

PILOTS THAT PROVE EFFECTIVENESS

To implement the initiatives suggested in Chapter 2 and prove the effectiveness of ward committees, the Government should actively consider pilot projects. It could select 5 wards (a mix of residential and industrial) for the pilots and incorporate the policy and institutional changes in a phased manner as described earlier. This would help residents to realise the true potential of various water saving and reusing techniques.

One such pilot project is already underway in Electronics City, and the government could consider replicating it at larger scale.

The Electronics City story

While Electronics City is spread over 900 acres with 158 companies and a total population of 1.25 lakh, its total water availability is a mere 85 LPCD. This despite the fact that the area receives average annual rainfall of nearly 6,400 ML.

The BWSSB fulfils only 33 per cent of the total fresh water need, and the rest comes from bore-wells and tankers. There is no sewage collection network and untreated sewage is released into storm drains, which is killing the local lakes. Sewage from the surrounding villages also reaches lakes in Electronics City.

The Electronics City Industrial Township Authority (ELCITA) which is responsible for services related to water and waste management and maintenance, is in the process of creating a 3-year master plan using an integrated water management approach to develop a water sustainable zone in Electronics City. The programme aims to adopt a zero-waste policy and reduce reliance on BWSSB and ground water. The plan goes beyond the boundaries of Electronics City and considers the ecological impact of neighbouring villages as well.

The main levers of the plan are:

- Neighbourhood-level rain water harvesting
- Ten clusters for waste water treatment
- Separate STPs for neighbouring villages
- New policies and guidelines for companies in the area
- Rejuvenation of lakes in the area

The plan also involves getting commitment from individual industries to support the above listed initiatives. The success of such a plan would encourage more efforts toward water saving, recycling and reuse.

* * *

Everyone needs water, and so everyone is a stakeholder in Bengaluru's water future. The city can alter its water scenario for the better. The key lies in tackling the challenge head on and supporting the many initiatives through strong policy and execution. This would be possible only through involvement and ownership on the part of government and all stakeholders.

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Confederation of Indian Industry

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