



Road Map towards 24x7 Water Supply in Class 'A' Municipal Councils in Maharashtra

CEPT University

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Executive Summary

The Government of Maharashtra (GoM) focuses on two areas of improvement in urban water supply and sanitation (UWSS): 24x7 Water Supply System and Open Defecation Free (ODF) cities. The GoM requested Performance Assessment System (PAS) Project to prepare Performance Improvement Plan (PIP) with the focus on implementing 24x7 water supply and attaining ODF status in 15 Class 'A' cities of Maharashtra. The support for preparing PIPs began in mid 2011 and included initial performance assessment using three years PAS data, data collection and field visits to cities, discussions with chief officer (CO), municipal staff and consultations with sector experts. The plans received guidance from GoM and drew from priorities shared by the city managers, political representatives, technical staff and citizen representatives across the 15 cities.

Why cities should deliver 24x7 Water Supply Services?

24x7 water supply system reduces outside contamination levels as the pipes are full and pressurised unlike intermittent supply systems. Intermittent use of water supply system leads to oversized pipe mains, underutilised reservoir, frequent wear and tear in valves and high doses of chlorine.

In this context, the GoM has already emphasised advantages of 24x7 water supply system in the MSNA reform agenda. Several cities like Malkapur, Nagpur and Navi Mumbai have already demonstrated the 24x7 water supply system. Based on earlier experiences, it is clear that developing and successful implementation of 24x7 water supply project would not only require technical skills but also a significant degree of communication and social skills within the organisation. Strong leadership is a vital requirement, especially at the government, political and official levels.

Situational Assessment in class 'A' cities

This note assesses the existing water supply situation in the 15 class A cities and based on it provides a road map to move towards 24x7 water supply. The total population of these 15 cities is 3.05 million (PAS data 2010-11) with Wardha being the smallest city with a population of 0.1 million and Latur having the highest population of 0.38 million. The situational assessment of all these cities found that most of the cities have data with low reliability. In most cities, there is no metering at source, water treatment plants (WTPs), water distribution stations (WDSs) and at consumer end level. Due to interconnectivity within distribution networks, there are no clear operational zones. The non-revenue water (NRW) levels are also high, which make 24x7 water supply unsustainable. Only six cities supplied water on a daily basis. To implement 24x7 water supply, therefore, the current water supply system should be improved.

Moving towards 24x7 water supply system

According to Ministry of Urban Development (MoUD), Government of India's (GoI) guidance note for continuous water supply system, technical, commercial and institutional improvements are required to implement 24x7 water supply system. While institutional changes require higher policy level decisions and are largely beyond the control of the ULBs, technical and commercial improvements need to be made at the ULB level.

Technical improvements require reforms in the water supply system such as development of hydraulic models, establishment of district metered areas (DMAs), installation of bulk and consumer meters and pressure management and leakage control. Commercial improvements include

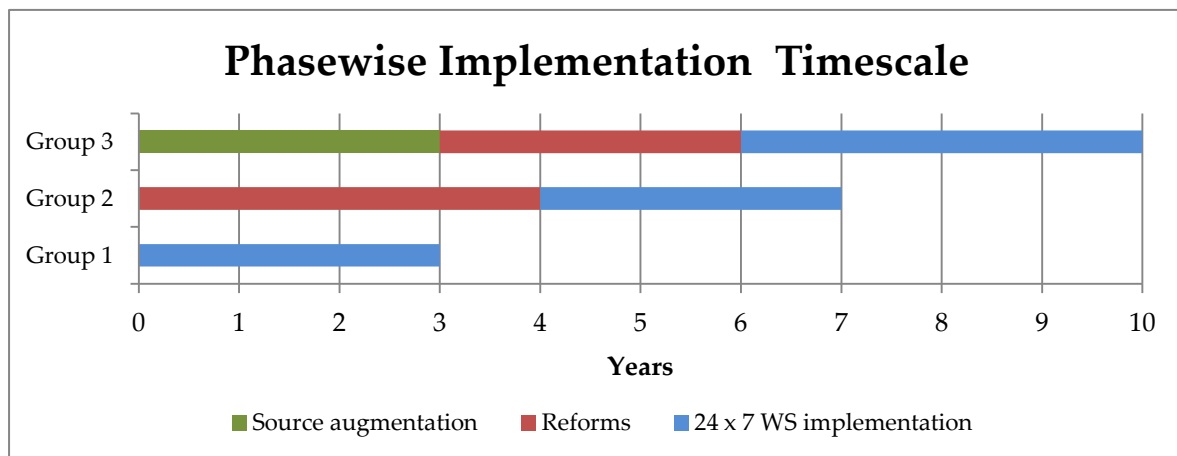
introduction of computerised billing and collection systems and introduction of volumetric tariffs to ensure cost recovery.

Four of the 15 cities already have ongoing projects towards achieving these technical and commercial improvements, while three others have sanctioned projects that address some of the improvement actions. These projects are funded under Maharashtra Sujal Nirmal Abhiyan (MSNA).

Proposed phase wise plan for 24x7 Water Supply

The road map categorised cities into three groups depending on the level of effort required to implement 24x7 water supply. Cities that are in the final phase of implementing reforms and in process of preparation of detailed project reports (DPRs) for achieving 24x7 water supply system are included in Group I¹. Cities that have just started implementation of reforms are covered in Group II. Group III cities are those that have not initiated any of the reforms and where source assurance for 24x7 water supply could also be an issue in implementation. The costs of implementing 24x7 water supply system have been built up based on current reform initiatives and actual costs of implementing continuous supply.

Based on the current progress of reforms for various groups, a phase-wise implementation timescale for 24x7 for class A cities is given below.



The table below summarizes the costs for implementing 24x7 across class A cities in Maharashtra. The costs related to reform measures have been separated out to suggest that cities can possibly look at seeking funding under MSNA to cover the reform based costs. Similarly, source augmentation work is already funded under Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT).

¹ Group I cities include Ambernath, Gondia, Satara and Yavatmal; Group II cities include Achalpur, Barshi, Beed, Bhusawal, Chandrapur, Ichalkaranji, Panvel and Wardha; Group III cities include Jalna, Latur and Parbhani

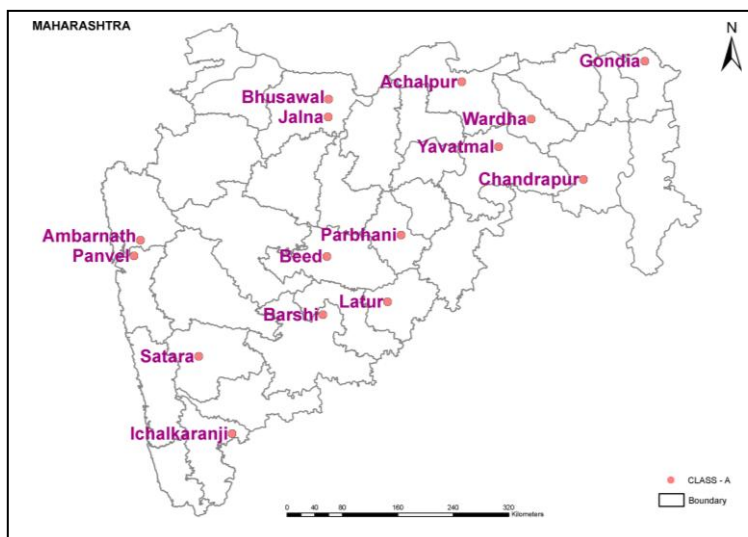
Total Cost for 24X7 Water Supply (Rs. in crores)			
	24x7 water supply Actual implementation costs	Low cost measures or Reform Measures	Source augmentation costs
Group 1	298		
Group 2	426	18	
Group 3	398	5	299
Total	1122	23	299

Funding for implementation of 24x7 water supply can be sought under the Maharashtra Swarna Jayanti Nagarothan Maha-Abhiyan (MSJNMA) which is a state funded project. During Financial Year 2011-12, Rs. 75 crores was allocated for the municipal corporations and Rs. 50 crores was allocated for the municipal councils. Another potential source of funding can be Jawaharlal Nehru National Urban Renewal Mission (JNNURM) plus, which focuses on small and medium towns.

1. Introduction

The Performance Assessment System (PAS) Project is about developing appropriate methods and tools to measure, monitor and improve delivery of water and sanitation in cities and towns in India. This action research is motivated by the current lack of reliable and updated information about operational and financial performance of urban water supply and sanitation services. The PAS Project aims to work with state and local governments to address these constraints in the two western states of Gujarat and Maharashtra in India. The Project includes three components of performance measurement, performance monitoring and performance improvement. It covers all the 419 urban local governments in Gujarat and Maharashtra.

Based on the findings from the PAS Project, in Maharashtra, major gaps in service levels were highlighted and reported during state level workshops. Subsequently Government of Maharashtra (GoM) in the workshops held with commissioners and chief officers of 23 corporations and 15 class A municipalities requested support of the PAS Project in two key areas: for implementing 24x7 water supply system and Open



Defecation Free (ODF) cities. The improvement areas suggested by GoM were in line with the Government of India's Service Level Benchmarking (SLB) initiative and GoM's Maharashtra Sujal Nirmal Abhiyaan (MSNA) programme.

The Ministry of Urban Development (MoUD) had initiated a service level benchmark to improve the service standards. One of the key areas of improvement in that initiative has been achieving 24x7 water supply system. Similar to the SLB initiative, the MSNA reforms by GoM also states implementation of continuous water supply system in all cities in Maharashtra.

The PAS Project has, as suggested by GoM, provided support to all 15 class A cities with the above two focus areas.

Using the three year performance measurement data recorded under PAS Project, the teams have helped cities prioritise improvement actions and plan for improvements in service delivery parameters. The support for preparing performance improvement plans (PIPs) for all class A cities began in mid 2011 and included initial performance assessment using three years PAS data, data collection and field visits to cities, discussions with chief officer (CO), municipal staff and consultation with sector experts. The plans have received guidance from GoM and draw from priorities shared by the city managers, political representatives, technical staff and citizen representatives across the 15 cities. The PIPs have been focused on state-wide priorities of GoM

related to making the city ODF and introducing the necessary reforms to move towards 24x7 water supply services in these 15 cities.

2. Why should cities deliver 24x7 water supply services

In the intermittent system, it is difficult to predict the actual behaviour of water supply systems. This intermittent use of the system leads to underutilised reservoir capacities and valves suffer frequent wear and tear. Since, water is supplied by zoning the distribution system, more manual interventions are required. During non-supply hours, pipes are empty and dirty water enters pipelines at vulnerable spots and water is contaminated. High doses of chlorine or other disinfectants are required to make water safe from microbial pollution. Due to limited hours, peak factor is often in the range of four to six in most of the systems. Varying pressures also lead to frequent failures in the water supply network.

Therefore, large sizes of pipe mains are required for strengthening the network to meet the hydraulic requirements. Also, large size of storage is required and consumers have to pay for pumping. Inconvenient supply hours affect poor people as they don't have sufficient storage facilities in their homes as the wealthy do. The lack of water leads to poor sanitation practices leading to increase in health risks and mortality. Due to intermittent water supply, often meters go out of order resulting in loss of revenue. Besides, due to uncertainty of supply, consumers store a large quantity of water and waste it before collecting fresh water again. This adds to huge undue wastage of precious treated water.

24x7 continuous, pressurised water supply overcomes shortcomings of intermittent supply and ensures customer convenience and benefits the poor. Continuous high quality water supply system reduces contamination level as the pipes are under positive pressure and entry of contaminants into the pipes is restricted. Life of distribution networks increases as steady pressure in the pipes causes less damage to the pipes. Better demand management is possible due to full metering and effective leakage control. 24x7 supply along with universal metering also results in less storage of water or none at all, which in turn reduces wastage of water.

The GoM considering the advantages of continuous water supply has already emphasised it in the MSNA reform agenda, which is currently under implementation in 66 cities in the State. The State emphasises that providing continuous water supply in cities will result in system efficiency and economic benefits to its citizens.

As part of its strategy to address the challenges of intermittent water supply, the GoM has demonstrated 24x7 water supply in several cities including Malkapur, Nagpur and Navi Mumbai. Based on earlier experiences, it is clear that developing a successful demonstration project would not only require technical skills but also a significant degree of communication and social skills within the water service provider's organisation. Strong leadership is an important requirement, especially at the government, political, and official levels; the support of decision makers in financing agencies, academic institutions, and engineering departments is also essential.

24 x7 Water Supply in Malkapur Town

The scheme for providing continuous water supply in Malkapur is unique and noteworthy as it has been implemented on a town wide basis by the Maharashtra Jeevan Pradhikaran (MJP) and Malkapur Nagar Panchayat (MNP). A range of systematic interventions, management processes, human resource development, new technologies, policy and financial measures, citizen friendly services, services to the poor, better coverage, communication were effectively employed and the process changes were institutionalised. The use of High-Density Polyethylene (HDPE) pipes in the distribution system has reduced water losses. Integrating geographical information system (GIS) based maps with household survey data and hydraulic model has been yet another innovative intervention thus making available spatial information for better decision-making.

The MJP has introduced financial innovations such as identification of all customers through consumer survey, regularisation of illegal connections, volumetric tariff structure, introduction of targeted subsidies, etc. Automatic Meter Reading (AMR) with high degree of accuracy has made the billing system transparent. A comprehensive information education and communication (IEC) campaign was also undertaken to reach out to all stakeholders and make them aware of the project objectives and benefits thus ensuring stakeholder involvement and support.

Continuous Water Supply in Kulgaon-Badlapur

Kulgaon-Badlapur switched to a continuous water-supply regime on a pilot basis, using a hydraulic modelling process, to successfully provide round-the-clock and reliable potable-water supply. Having successfully carried out leak management, upgradation of distribution network, efficient practices and financial reforms in the pilot zone, the efforts of the MJP are now focused on providing continuous water supply to the entire city.

The water distribution pipe network of the city was reorganised into 10 operational zones (OZs). Each OZ was further divided into three or four district metered areas (DMAs) with about 1,000 connections in each DMA. A property survey was carried out to determine the total number of people residing in 28,000 houses. This survey recorded the demand at the nearest node, which was then compared with the population figure computed by the density method. Using DMA methodology, non-revenue water (NRW) for each OZ and DMA was worked out. Eight out of 34 wards were selected in the first phase for the 24x7 water supply system, and the remaining wards were to be covered in two phases.

The 24x7 water supply also increased the accessibility of water to poor consumers. With the implementation of this initiative, MJP states that the overall health of people (especially in slums, which constitute 5 percent of the population) has improved dramatically.

From Intermittent to Continuous Water Supply in Amravati City

In Amravati, MJP implemented 24x7 water supply on a pilot basis in two zones - Sai Nagar and Arjun Nagar, through a holistic approach that addressed policy, technical, organisational and financial aspects. A key feature of this initiative was to adopt a 'whole to part' approach by first developing a hydraulic model for the whole city, implementing 24x7 water supply in two pilot zones (Sai Nagar and Arjun Nagar) and then extending it to the rest of the city.

DMA's were created, bulk meters were installed and a hydraulic model covering 2,900 nodes and pipelines was built. The initiative employed tools such as GIS maps and household surveys and hydraulic modelling quite effectively. Along with technical improvements, financial improvements such as identification of illegal connections, removal of public stand posts (PSPs), revision in tariffs and adoption of block tariffs have resulted in full operation and maintenance (O&M) cost recovery with a surplus. The benefits exceeded the costs in terms of better access and water quality and increased cost recovery.

The initiative has resulted in significant reduction in NRW. The NRW has reduced from 51 percent to 33 percent in Arjun Nagar and from 37 percent to 25 percent in Sai Nagar. The water consumption has also reduced from 1.98 MLD to 1.48 MLD in Arjun Nagar and 1.81 MLD to 1.61 MLD in Sai Nagar. It has also resulted in removal of PSPs in Arjun Nagar and around 60 slum households were given individual connections.

3. Situational Assessment in Class A cities

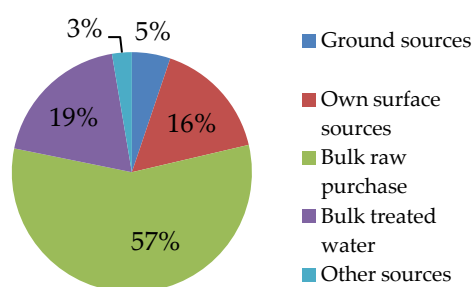
Demographic context: As per provisional population figures for 2011, the 15 class A cities have a total population of 3.05 million which is around 6 percent of total urban population of Maharashtra. Wardha is the smallest city with a population of 0.1 million and Latur has the highest population of 0.38 million.

Current Situation: Currently, none of the class A cities are supplying continuous water supply. Pilot 24x7 supply zones have been attempted in Ambarnath Municipal Council and plans are underway to extend 24x7 supply to the entire city. This note explores the possibility of continuous water supply in class A cities considering the current service levels, progress in implementing water reforms and projects currently under implementation.

Water supply in Gondia and Yavatmal is fully managed by Maharashtra Jeevan Pradhikaran (MJP) whereas in Ambarnath 75 percent and in Satara 25 percent water supply is managed by MJP. In rest of the cities, water supply responsibilities are with the municipal councils.

Sources of water supply: Looking at the water supply sources across the class A cities, around 57 percent of water supply is procured in bulk as raw

Figure 1: Proportion of various water sources



water. As shown in figure below, the second predominant source is bulk purchase of treated water, followed by own water sources. Interestingly the dependency on ground water sources is limited to only 5 percent of the total water quantity extracted in the 15 class A cities. Jalna pumps water from the farthest distance (130 kms) followed by Barshi and Latur that pump water from 65 km and 60 km respectively. For each of the 15 cities, the approximate distance from the farthest water source is given in table 1.

Table 1: City wise approximate distance from farthest water source

Cities	Approx. distance from farthest water source (km)	Cities	Approx. distance from farthest water source (km)
Achalpur*	Groundwater	Jalna	130
Ambarnath	3.5	Latur	60
Barshi	65	Panvel	16
Beed	nd	Parbhani	17
Bhusawal	1.5	Satara	6.5
Chandrapur	22	Wardha	11
Gondia	16	Yavatmal	25
Ichalkarinji	18		

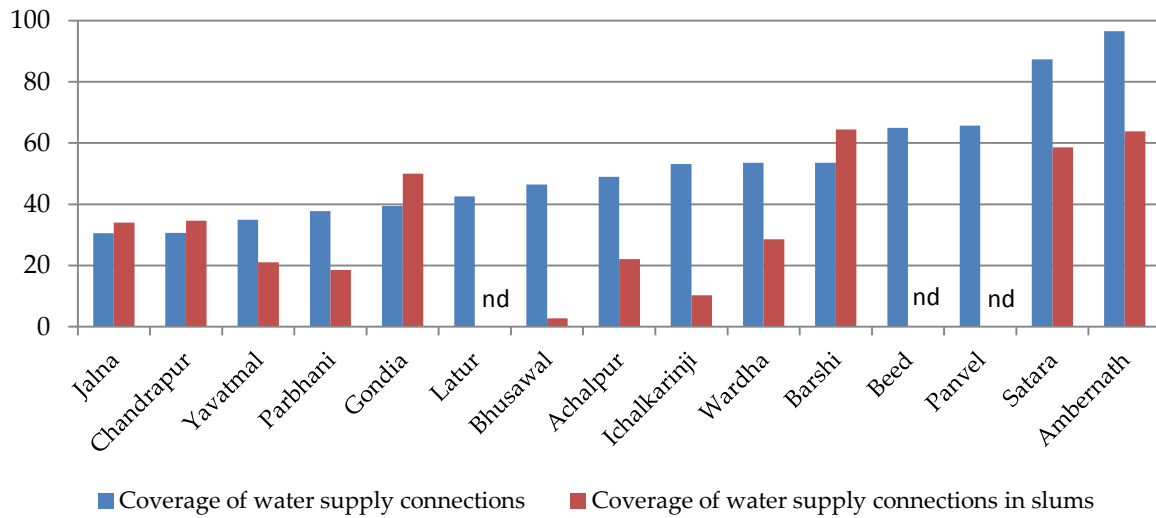
* City is dependent on Groudwater sources within the municipal boundary
nd= no data

Coverage of water supply services: For successful implementation of 24x7 water supply, household (HH) level coverage of water supply should be 100 percent. The task of expanding coverage to 100 percent of the population still remains a challenge for class A cities. As shown in Figure 2, eight cities out of 15 report less than 50 percent coverage. Satara and Ambarnath report higher water supply coverage at 87 percent and 96 percent respectively, which means that MJP has been able to provide for individual water supply connections across the user groups. However, water supply coverage in slum settlements is only 59 percent and 64 percent in both cities respectively.

However, when it comes to coverage of water supply connections in slums, data from three cities (Latur, Beed and Panvel) was not available. Lower coverage is reported by Bhusawal, Ichalkaranji, Parbhani, Achalpur and Yavatmal.

Jalna, Chandrapur, Barshi and Gondia, in spite of lower coverage at city level, depict higher coverage of water supply in slum settlements. All the urban local bodies (ULBs) have a large number of slum settlements, with the lowest in Yavatmal (27 settlements) and the highest in Chandrapur (80 settlements).

Figure 2: Coverage of water supply connections at city and slum level across Class A cities



Across the class A cities, Jalna and Chandrapur report the lowest water coverage indicators at 30 percent. Both the cities show higher coverage of distribution network, which can be used to improve individual connections, in case there is enough water availability in the city. Jalna reports abysmally lower litres per capita per day (lpcd) (ex treatment) at 62; however lpcd indicator for Chandrapur is 164, which indicates availability of sufficient water for the city.



Open well source in Jalna

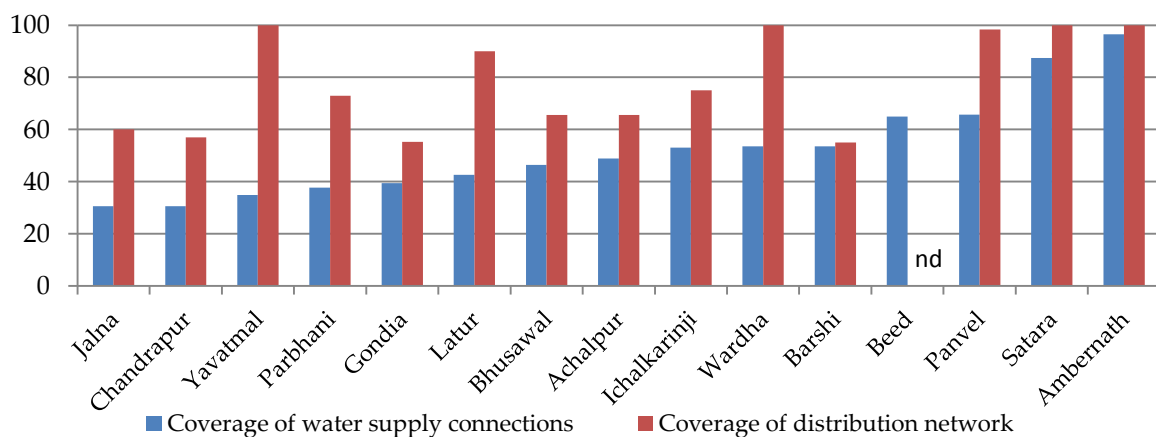


Ghanewadi lake source Jalna



Hand pump source in Achalpur

Figure 3: Coverage of water supply connections and distribution network across Class A cities



Quantity of water supply: Quantity of water supply should be enough to run the water supply network 24x7. In terms of water availability (at consumer end), as shown in figure below, six cities report more than 100 lpcd at consumer end. Ichalkaranji has the highest lpcd at 138 and Parbhani and Jalna are the lowest in the group with less than 30 lpcd at consumer end. This is also reflected in continuity of water supply in Jalna and Parbhani. It is interesting to compare the lpcd ex treatment and at consumer end for the class A cities as represented in the graph above. It is clearly evident that efforts towards minimising losses in the transmission and distribution network can help improve lpcd at consumer end drastically.



Public tap at water distribution station in Jalna



Water distribution network in slum settlement in Satara



Public Standpost in Yavatmal



Public Standpost in Panvel

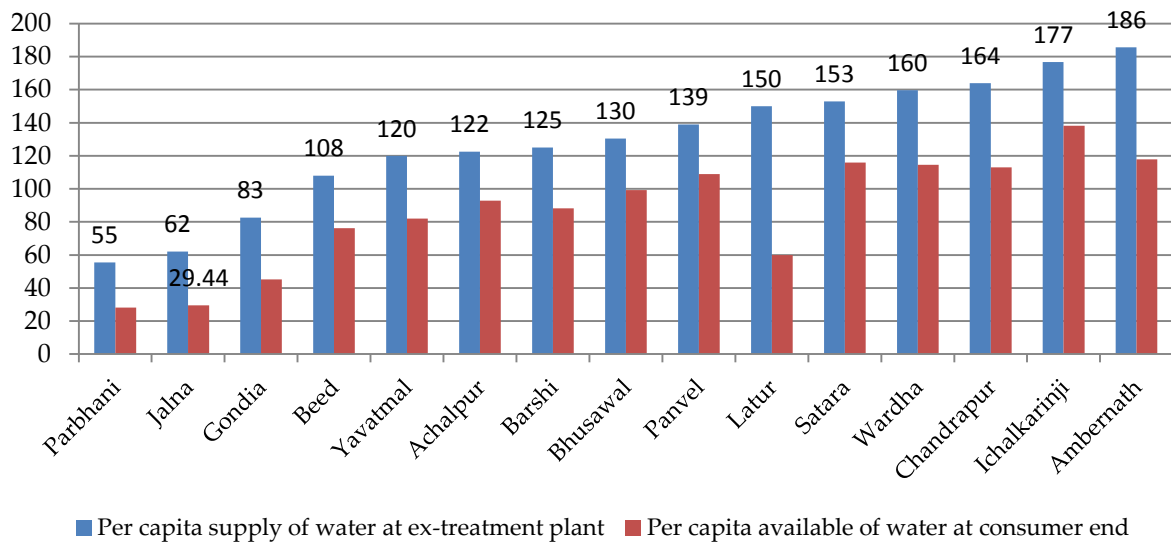


Water pressure issues in Gondia



Water pressure issues in Yavatmal

Figure 4: Per capita supply of water at ex treatment plant and at consumer end across Class A cities



Continuity of water supply: All the 15 class A cities report intermittent water supply. Only six cities (Satara, Panvel, Chandrapur, Achalpur, Ambarnath, Gondia) out of 15 report daily water supply. Jalna represents the most extreme case with water being supplied only once in a fortnight. The continuity of water supply is represented in terms of hours of water supply and days in a month during which water is supplied. Six cities with daily supply report anywhere between 1 to 4 hours of water supply per day. Among the rest nine cities, Yavatmal performs better as it supplies water on alternate days for 1.5 hours per day.

Figure 5: Hours and Days of water supply across Class A cities

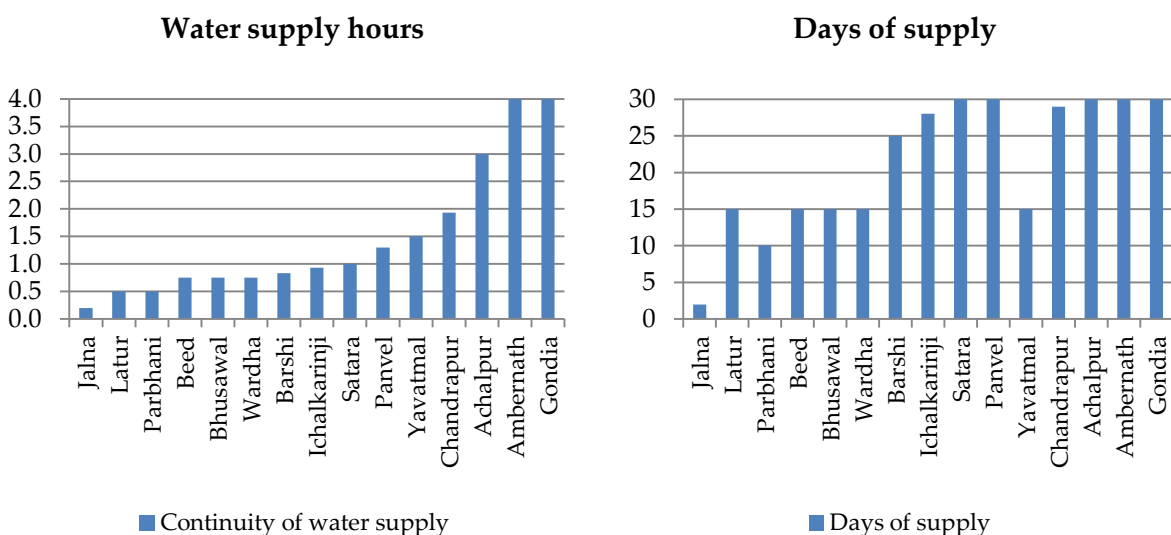
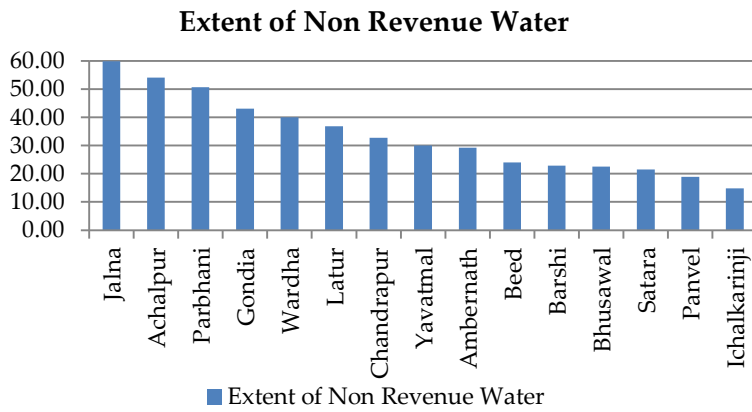


Figure 6: Extent of NRW across Class A cities



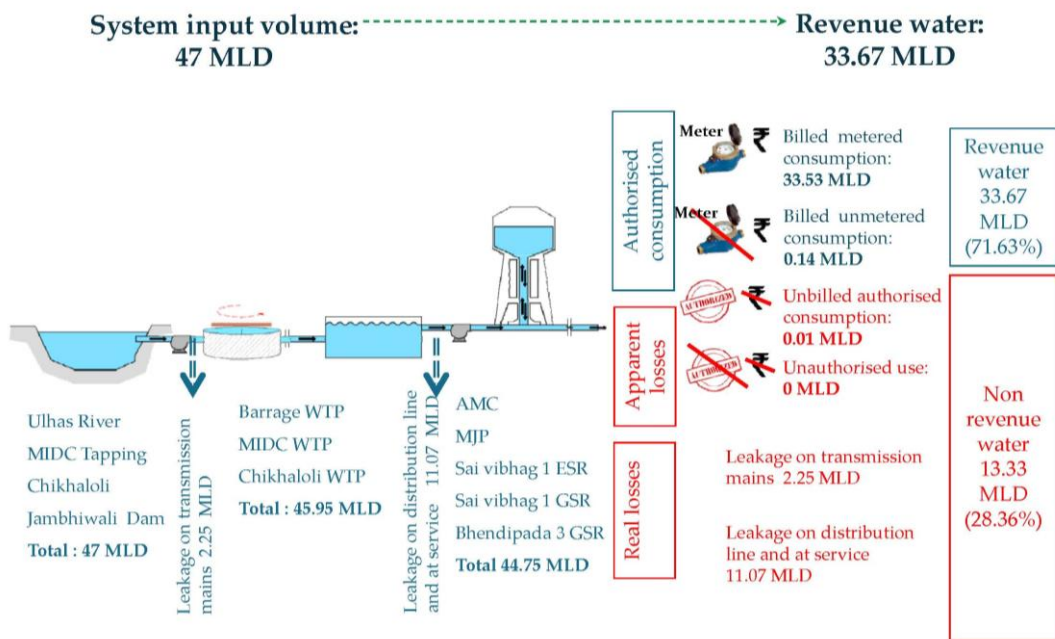
Non-revenue water: The extent of NRW remains a pertinent issue in order to address coverage and lpcd issue. To ensure proper functioning of 24x7 water supply network, losses should be minimum. However in absence of reliable measures to quantify water losses, the NRW values are less reliable. For all the cities,

except for Panvel (B grade) and Ambarnath (A grade), the NRW values for rest of the cities are of reliability grade D, which reflects that there is no means to measure bulk flow measurements at source, treatment, distribution and consumer ends. In the class A group, Ichalkaranji and Panvel report lowest NRW at 15 percent and 19 percent respectively. Parbhani, Achalpur and Jalna report more than 50 percent NRW. Only seven cities report consumer water metering, the highest percentage of metering is found in Achalpur, Gondia, Yavatmal and Ambarnath; except for Achalpur rest of the cities are MJP managed cities. Beed and Satara report around 24 percent metering. Along with metering, telescopic charging is necessary to conserve water in 24x7 water supply system.

Eight cities have volumetric tariffs - Gondia and Yavatmal have the highest volumetric tariff at Rs. 11.2 per kilo liter (KL) and Ichalkaranji has the lowest tariff at Rs. 5.2 per KL for domestic purpose. Of these eight cities, six also have flat tariffs ranging from Rs. 88 to Rs. 300 per month. Among the class A group, Jalna has the lowest fixed tariff of Rs. 27 per month, which also can be attributed to lower service levels in the city.

Due to the lack of meters at supply and consumer end in many cities, it is difficult to accurately measure NRW. However, to address these issues, the PIP teams have attempted a “Water balance diagram” for all the class A cities. An illustration of the water balance diagram for Ambarnath is given below.

Schematic diagram of water supply system: Ambarnath



Through the above water balance diagram, the PIP teams tried to record the bulk water quantity at each end including all sources, treatment points and distribution stations. The teams have arrived at consumption per connection by considering total connections and existing ferrule sizes along with the supply hours to the HHs. Similarly, the estimated unauthorised connections have been used to account unbilled unauthorised connections. Free supplies to municipal buildings, fire fighting services and public gardens have been accounted under unbilled authorised consumption.

4. Moving towards 24x7 Water Supply System

From the situational assessment of class A cities, it has been found that most of the cities have data of low reliability. In most class A cities in Maharashtra, there is no metering at source, water treatment plant (WTP), water distribution system (WDS) and at consumer end level. Due to interconnectivity within distribution networks, there are no clear operational zones. NRW levels are also high which make 24x7 water supply unsustainable. To implement 24x7 water supply, therefore, the current water supply system should be improved.

While steps towards achieving 24x7 water supply require substantial efforts, certain actions related to skill up gradation of human resources and improved management information systems are easier to implement. The technical guidelines suggested by MoUD towards 24x7 systems provide an approach based on institutional, technical and commercial improvements required. Efficient and effective operation of urban water supply services is impossible without these improvements.

Technical aspects: Current water supply systems are operated in constrained conditions and shortcomings have to be rectified for the conversion from intermittent to a continuous supply system. A summary of key technical shortcomings are:

- Reliable data on distribution networks and customers do not exist;

- There is virtually no metering of bulk water produced, transmitted or distributed at any point in the network;
- Pipelines within the distribution system are totally interlinked;
- Control of leakage on a routine, planned basis is impossible;
- It is unusual for a water utility to routinely measure or assess adequacy of system pressure; and
- Customer meters do not function with any predictable accuracy under intermittent supply conditions.

Commercial aspects: Commercial improvements are also required along with technical improvements to ensure financial sustainability of the water utility. The conversion to 24x7 water systems requires advanced commercial systems and procedures including computerised billing and collection system with updated consumer records and implementation of volumetric tariff system.

Institutional aspects: To move towards 24x7 water systems, the city has to significantly improve and supplement its managerial and technical skills. Some of the technical aspects that will require improved skills and automation are

- Planning and designing of water supply infrastructure from source to distribution to customer for 24x7 system, including the concept and establishment of DMAs;
- Restructuring of existing systems, presently operated under intermittent conditions, to continuous supply at minimal cost and simultaneously, maintaining supply throughout the conversion process;
- Appropriate hydraulic models and their application to planning, design and operation;
- All aspects of pressure management including specification of pressure valves;
- Design and specification of flow and pressure measurement and control devices for management of continuous supply.

The operational skills required to plan and implement these measures would include operation under continuous supply, pressure management, proactive detection and repair of leaks, proactive detection and regularisation/disconnection of illegal connections, mapping of water service infrastructure on GIS and linking of operational, maintenance and customer services to GIS. These can be achieved by recruiting skilled staff and capacity building of existing staff of water supply system.

Some of the technical and commercial constraints mentioned in the MoUD guidelines can be resolved through the implementation of GoM's reform program of MSNA. The MSNA programme was launched as an initiative fund for ULBs in Maharashtra to invest in the sector of water supply and sanitation by ULB in Maharashtra. These reforms are aimed at improving the efficiency of water supply operations, among other areas. Below are listed some of the water supply related reforms. As part of these reforms the state aims to implement 24 x 7 water supply.

- **Reduce NRW and increase water supply hours**
 - The unauthorized connections shall be identified and be regularised. Also stand-posts shall be converted into group connections.
 - Programme of water audit, energy audit and rehabilitation shall be undertaken
 - Visible leakages shall be removed.

- Detailed project report regarding the rehabilitation and necessary augmentation of the water supply network shall be prepared.
 - To increase the coverage of water supply and the service hours.
- **Metering**
 - To install flow meters at various places to measure the bulk water supply.
 - Meterisation entirely with ULB's own funding or with partial private participation or through complete privatisation.
- **Cost recovery**
 - 100 percent billing and collection system shall be developed.
 - To levy water tariff in order to cover the complete expenditure towards O&M and depreciation.
 - Private Sector Participation in billing and recovery, pumping stations and overall management.
 - To participate in New Revised Nirbhay Yojana to repay arrears towards water bills and loans.

The section below describes how each of the above three main themes can be addressed to move towards 24x7 water supply. The table 2 below presents city wise status of implementation of reforms towards 24x7 water supply.

- **Reduce NRW and increase water supply hours**
 - Consumer end survey to achieve reliable data: 100 percent consumer survey will help in the identification and then regularisation of illegal connections. Consumer survey will also provide consumer details and required demand of water. This data will be used to calculate required quantity of water demand at consumer end. This data will also help in assessment of source availability and sustainability. GIS mapping and hydraulic modeling to achieve reliable data on distribution network: GIS mapping and hydraulic modelling will be used for the preparation of rehabilitation and augmentation plan to improve existing water supply network. Equitable distribution of water can be achieved with the help of hydraulic modeling.
 - Water audit and leak detection survey and energy audit study: Water audit and leak detection survey will help in identifying and then repairing existing leakages in system whereas energy audit study will be helpful for the optimisation of electricity use.
- **Metering**
 - DMA demarcation and installation of bulk flow meters to restructure interlinked network: GIS mapping and hydraulic model will be used for DMA demarcation, once DMAs are demarcated, bulk flow meters are installed to form DMAs in the existing water supply network.
 - Introduced metering and volumetric tariff: Above reforms like regularisation of illegal connections, implementation of suggestions from water audit and energy audits and formation of DMAs will reduce the operation and maintenance expenditure. After reduction in O&M expenditure, the city should introduce metering and volumetric tariff in order to recover full O&M cost.
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- **Cost recovery**
 - Computerised water billing and collection system: This reform will help in computerisation of water billing and collection records. Linking of consumer survey results with the billing and collection system will improve the billing efficiency.

Table 2: Status of implementation of water supply reforms

Cities	Reduce NRW and increase water supply hours			Metering		Cost recovery
	Consumer survey	Water audit & leak detection and Energy audit	GIS mapping and hydraulic modelling	DMA demarcation & installation of Bulk flow meters	Introduce metering and volumetric tariff	Computerised water billing and collection system
Amarnath						
Gondia						
Satara						
Yavatmal						
Latur						
Chandrapur						
Barshi						
Beed						
Parbhani						
Achalpur						
Bhusawal						
Ichalkaranji						
Jalna						
Panvel						
Wardha						

	<i>Projects in progress</i>		<i>Sanctioned projects</i>		<i>No existing projects</i>
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5. Proposed Phase-wise Plan for 24x7

This section proposes a phased approach to implement 24x7 water supply in class A cities in Maharashtra. Cities have been grouped into three categories based on the existing performance of their water supply system, status of implementation of reforms and ongoing capital investment projects. As discussed in section 3, existing performance of service delivery will consider adequacy and sustainability of available water supply sources, parameters of water supply network like coverage & connections and condition of the water supply network in terms of level of leakages & losses.

Implementation of reforms is the foundation work for 24x7 water supply projects in the city. Section 4 has already discussed the ongoing, sanctioned and proposed projects of water supply reforms. Ongoing capital investment projects like source augmentation and replacement/extension of distribution network under Urban Infrastructure Development Scheme for Small and Medium Town (UIDSSMT) have also been considered for grouping of cities. Completion of these projects will bring improvements to the existing water supply system.

Based on the above criteria, the 15 class A cities have been grouped as shown in table 3 to consider implementation of 24x7 water supply.

Table3: Grouping of cities for 24x7 water supply

Group	Cities included	Criteria for the Group	Remarks
Group I cities (Advance phase) (24 x 7 water supply possible in short term)	Ambarnath, Gondia, Satara, Yavatmal	Class A cities which have already started implementing reforms related to water supply and detailed project reports (DPRs) for continuous water supply have been completed in three out of four cities	<ul style="list-style-type: none"> Wide ranges of water supply reforms are already under implementation in the selected cities and there is a possibility to shift immediately to city wide 24x7 water supply. Some of the issues that may be essential to address will include: aiming for 100 percent coverage including urban poor, awareness related to metering, consensus for telescopic tariff, political buy in etc.
Group II cities (Middle phase) (24x7 water supply possible in medium term)	Achalpur, Barshi, Beed, Bhusawal, Ichalkaranji, Panvel, Wardha	Class A cities that have just started or plan for implementation of reforms for water supply.	<ul style="list-style-type: none"> DPRs for few components of water reforms proposed in Barshi, Beed and Chandrapur. Rest of the cities need to initiate reforms as first step towards 24x7. Other cities can attempt initiating low cost measures like consumer survey, regularising illegal connections, simplifying process for slum connections, reducing visible leakages etc. These measures can be initiated immediately.
Group III cities (Inception phase) (24 x 7 water supply possible in long term)	Jalna, Latur and Parbhani	Class A cities that haven't initiated any of the reforms and source assurance for 24x7 may also be an issue in	<ul style="list-style-type: none"> Jalna and Parbhani in this group need to assure water source before initiating 24x7, current DPRs under implementation aim for 70 lpcd in this group of cities. In Latur, augmentation of

Group	Cities included	Criteria for the Group	Remarks
		implementing continuous water supply	<p>distribution network is going on.</p> <ul style="list-style-type: none"> After completion of source and distribution network augmentation, MSNA reforms should be initiated for further improvement in water supply system.

Costing for 24x 7 Water supply

The costing for implementing 24x7 water supply for cities has been segregated into costs of several reform initiatives and actual costs of implementing continuous supply component. Wherever the cities already had DPRs, the costs have been arrived at by referring to the DPRs. In some cases, costs were arrived at from consultations with city officials. In the absence of inputs from city officials, costs were arrived at using MJP schedule of rates for reform components and by referring to actual implementation costs in cities.

- Ambarnath has already prepared a DPR for 24 x 7 water supply system. Major components of DPR contributing to the costs includes raising the height of the existing Chikloli dam, replacement of pumping machinery, construction of WTP at Chikloli, construction of elevated service reservoirs (ESRs), installation of bulk meters and laying of rising mains and ductile iron (DI) K7 pipelines for distribution network.
- Gondia has also prepared DPR for 24x7 water supply system. The current augmentation of Gondia water supply project aims to achieve 24x7 water supply. DPR is already approved and work is going on, major cost components include raw water pumping machinery, rising lines, an 18 MLD WTP, master balance reservoir (MBR), transmission lines, three reinforced cement concret (RCC) ESRs having capacity of 21.9, 19.5 and 12.9 lakhs liter, laying of pipelines for distribution network and flow meter installation.
- In Yavatmal, MJP has prepared draft estimates for 24x7 water supply.
- In Satara, costs were calculated with the consultation of ULB officials, which includes Kas source augmentation, replacement of distribution network and metering and replacement of service connections.

Except Ambarnath, all cities in this group are covered under UIDSSMT. Cost for 24x7 water supply in Group 1 cities is given in table 4 and details of each component are given in annexure 1.

Table 4: Cost for 24x7 water supply in Group 1 cities

Group I Cities	Cost for 24x7 Water Supply (Rs in crores)
Ambarnath	77.0
Gondiya	61.0
Satara	119.5
Yavatmal	40.2
Total Cost	297.7

Costs for undertaking energy audits and water audits have been sanctioned under MSNA in Barshi and Beed. In Achalpur, Barshi, Beed, Ichalkaranji, Panvel and Wardha, the costs of implementing water reforms and the total cost of 24x7 water supply projects were estimated through consultation with city officials. Detail costs for reforms are given in annexure 2.

- Main components of 24x7 water supply for Achalpur town are construction of two ESRs, replacement of service connection and rehabilitation & expansion of the distribution network to serve currently unserved areas.
- In Barshi, the renovation of existing water supply network and expansion of distribution network in unserved area will lead to 24x7 water supply.
- In Beed, costs have been calculated considering replacement of service connection and by increasing the service connections
- Costs for Bhusawal have been calculated based on the unit cost of Malkapur project, Rs. 5000 per person.
- Costs for Chandrapur have been calculated based on proposals submitted under MSNA and Nagar Utthan. Major components include replacement of trunk line, laying raw and treated water transmission line, construction of WTP, reservoir and distribution lines.
- Major components of 24x7 water supply for Ichalkaranji town are identification and regularization of unauthorized connections, commercial and domestic metering, replacement of raw water transmission line and augmentation of storage reservoirs and pumping machinery.
- In Panvel, cost have been calculated considering construction of GSR and ESR, rehabilitation of distribution network, installing consumer end meters, replacement of pumps and panes etc.
- Wardha cost is calculated based on the assumption of 20 percent network needs to be replaced, 20 percent service connection needs to be replaced, improvement in Panwar and Yelkari Water Works, improvement in Hanuman Tekdi filter unit and addition of new distribution network.

Cost for 24x7 water supply in Group 2 cities is given in table 5 and details are given in annexure 3. The total cost of Group 2 cities assuming the above costs amounts to approximately Rs. 426 crores. This amount is comparable to the figure (Rs. 590 crore) based on the GoI's High Powered Expert Committee's (HPEC). The HPEC's estimation for 24x7 replacement/upgradation of water supply distribution works out to be Rs. 3,855 per capita for the class A cities and is listed below.

Table 5: Cost for 24x7 Water Supply in Group 2 Cities

Group II Cities	Reform cost	Cost (24 x 7 water Supply) in Crores	Total cost	Total cost as per HPEC*
Achalpur	3.5	33.9	37.4	43.3
Barshi		26.3	26.3	45.7
Beed	1.6	18.1	19.7	85.5
Bhusawal	1.1	93.2	94.3	72.4
Chandrapur	4.9	149.1	154	123.9
Ichalkaranji	5.0	24.9	29.9	110.9
Panvel	1.5	23.6	25.1	69.4
Wardha	0.8	38.5	39.3	41.0
Total cost	18.4	407.6	426	592.1

*HPEC report on Indian Urban Infrastructure and Services

- In Jalna and Parbhani, source augmentation work is going on and estimated cost are Rs. 145 and Rs. 140 crore respectively. These projects will be completed in 3 years.
- In Latur, augmentation of distribution network is ongoing and project cost is around 14.05 lakh, water audit study was conducted in 2006 and after that network has been augmented.

After completion of augmentation work, cities will carry out reform work and assess the improvement of water supply scheme. Details of reform cost are given in annexure 2. Then cities will implement 24x7 water supply project.

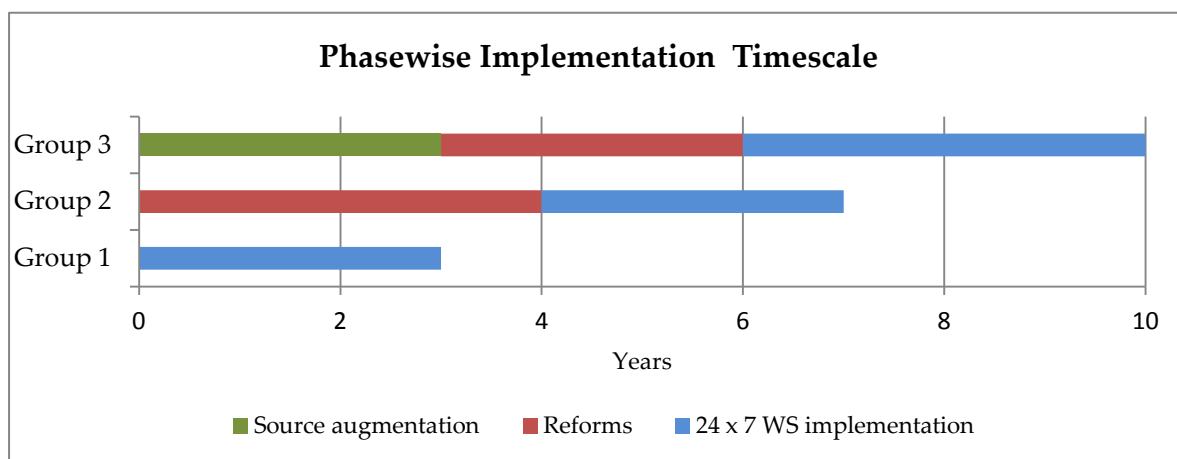
- Main components of 24x7 water supply for Jalna town are replacement of service connection, 100 percent rehabilitation of the distribution network and 20 percent distribution network needs to be added.
- In Latur, costs have been calculated considering replacement of service connection and 50 percent distribution network needs to be replaced.
- In Parbhani, cost have been calculated considering replacement of service connection, 100 percent distribution network needs to be rehabilitate and 20 percent distribution network needs to be added.

Costs for 24x7 water supply in Group 3 cities are given in table 6 and activity wise cost details are given in annexure 3. The total cost of Group 3 cities assuming the above costs amounts to approximately Rs. 701 crores. HPEC estimates only include the replacement/rehabilitation of distribution network for Group 3 cities total cost is Rs. 382.6 crore as compared to Rs. 397.6 crore.

Table 6: Cost for 24x7 water supply in Group 3 cities

Group III Cities	Augmentation cost	Reform cost	Cost (24x7 water supply) in Crores	Total cost	Total cost as per HPEC*
Jalna	145	1.6	103.9	250.5	110.0
Latur	14.05	1.66	110.5	126.2	154.2
Parbhani	140	1.4	183.2	324.6	118.3
Total	299	4.7	397.6	701.3	382.6

Based on the current progress of reforms for various groups, a phase wise implementation timescale for 24x7 for class A cities is given below. A conservative time period of four years is estimated for implementation of continuous water supply project in Group 1 Cities. Given the fact that all the four cities have an array of reforms underway, the cities can be picked up as demonstration cities for other class A cities. Group 2 has the highest number of cities which may lead to larger implementation time period. As shown in the diagram below, source augmentation has been prioritised for Group 3 cities.



The table 7 summarises the costs for implementing 24x7 across class A cities in Maharashtra. The costs related to reform measures have been separated out to suggest that cities can possibly look at seeking funding under MSNA to cover the reform based costs. Similarly, source augmentation costs for Group 3 cities can be considered for funding under State level grant programmes.

Table 7: Overall cost for 24x7 water supply in class A cities

Total Cost for 24x7 Water Supply (Rs. in crores)			
	24x7 water supply Actual implementation costs	Low cost measures or Reform Measures	Source augmentation costs
Group 1	298		
Group 2	426	18	
Group 3	398	5	299
Total	1122	23	299

Funding Pattern

Source augmentation work is already funded under UIDSSMT and the low cost reform measures can be funded under MSNA. Over the past six years, a total of Rs. 448.6 crore has been spent and Rs. 213 crore has been allocated for the Financial Year (FY) 2011-12 by the state as part of the implementation of MSNA reforms. Year wise allocation and estimates of these grants are given in table 8. Implementation of 24x7 water supply can be funded under Maharashtra Swarna Jayanti Nagarothan Maha-Abhiyan (MSJNMA) which is a state funded project. In the two years 2009-10 and 2010-11, Rs. 88 crore has been spent by the GoM. For FY 2011-12, Rs 75 crore was allocated for the municipal corporations and Rs. 50 crore was allocated for the municipal councils. Chandrapur, Latur and Parbhani can be funded under municipal corporation grants. Potential source of funding can be a JNNURM plus, which will be focused on small and medium town.

Table 8: State level allocations and Estimates of Grants

Sr No	Grants/ Schemes	Actuals 2005-06	Actuals 2006-07	Actuals 2007-08	Actual 2008-09	Actual 2009-10	2010-11 (Revised Estimate-RE)	2011-12 (BE)	Total
1	(02) (02) Grant-in-aid for Water Supply and Drainage Schemes of Municipalities (Local Bodies)- (2215 16 47) MSNA	409	335	629	1019	1168	926	2130	6617
2	(00) (57) Grant to Municipal Corporation in the State Under Maharashtra Nagarothan Maha-Abhiyan (2217 802 1), 31, Grant-in-aid (Non- Salary)	0	0	0	0	199	681	750	1630
3	(00) (61) Grants to Municipal Councils in the State under Maharashtra Nagarothan Maha Abhiyan. (2217 812 8)	0	0	0	0	0	0	500	500

(Rs in Millions)

Way Forward

Based on the analysis of existing situation and improvement measures to implement a 24x7 water supply in 15 class 'A' cities of Maharashtra, it is suggested that the Government of Maharashtra need to focus on three aspects, namely, technical financial and public awareness.

The technical aspects include focussing on assessing the existing capacities of the ULB staff, exploring external expertise and capacity building of the staff wherever needed. The financial aspects include assessment of available grants and exploring options for public private partnership. Public awareness would include partnering with NGOs and elected representatives to convince citizens on need for tariff revision, and water conservation measures.

Annexures

Annexure 1: Details of 24x7 cost for Group 1 cities

Activity	Cost Estimate (Rs in crore)
<i>Cost Estimations For 24 X 7 Water Supply In Ambarnath Municipal Council</i>	
Working survey	0.02
Raising height of existing Chikloli Dam	8.53
Providing lowering laying and joining 700 mm dia gravity main from dam outlet to inlet chamber	1.97
Construction of RCC wire across wall for arresting dam leakage	0.98
Providing and construction RCC pump house at Bhendipada and Amberbath	0.23
Providing installing testing and commissioning of pumping machinery at Bhendipada and Ambarnath booster pumping station and Chikloli WTP	4.28
Providing and construction WTP of 7.2 MLD capacity at Chikloli	1.58
Providing lowering laying and jointing raising mains of various diameter in Ambarnath	5.99
Providing lowering laying and jointing leading mains for Bhendipada and Ambarnath Booster Sump	5.03
Designing providing and constructing RCC ESR Of various sizes in Ambarnath Town	9.53
Providing lowering laying and jointing DI K7 pipe lines for distribution system	29.32
Land acquisition, barbed wire, fencing	1.41
Bulk meters PRV	3.91
Modifications in computer receipts and spot billing meters	1.00
Special repairs and strengthening of Old MBR 7 GSR	0.25
Construction of consumer redresser centre	0.30
3.77% PMC Charges	2.82
Total Estimated Expenditure for Ambarnath Municipal Council	77.13
<i>Cost Estimations For 24x7 Water Supply in Gondia Municipal Council</i>	
Raw water pumping machinery 4 sets, 200 HP	1.49
Line to existing raising main	0.90
500 mm dia DI raw water raising main	10.37
WTP capacity 18 MLD	2.55
Pure water pumping machinery 3 sets, 75 BHP from WTP to MBR	0.28
Pure water rising main 300 to 450 mm dia. DI- K9	0.11
MBR capacity 7.4 lakh litres 25 m staging height	0.67
Pure water gravity mains 700 mm to 350 mm dia DI- K7 pipe length 9829 m	6.33
Pure water pumping machinery 2 sets, 50 BHP for online boosting arrangement to Vajpayee ward ESR	0.12
RCC ESR's Civil lines cap 21.35 lakhs St. Ht. 21 mt	0.95
RCC ESR's Vajpayee cap 19.50 lakhs St. Ht. 16 mt	0.76

Activity	Cost Estimate (Rs in crore)
RCC ESR's Suryatola cap 12.90 lakhs St. Ht. 18 mt	0.62
Distribution system 160 mm to 450 mm dia DI K-7. Length 273.94 Km	35.0
Miscellaneous work – meter room, flow meter, existing structures repairs	1.16
Gross Cost of UIDSSMT project sanctioned	61.38
<i>Cost Calculation for 24 X 7 Water Supply in Satara Municipal Council</i>	
GIS digitisation and mapping and consumer survey	1.80
Water Audit	
Energy Audit	
Hydraulic Modelling	
Computerised billing system	
Installation of bulk flow meters (10 Number)	
Rehabilitation of Distribution Network - 120 km to be replaced and improvement in transmission network	47.12
Converting 6 km open canal into closed pipeline	8.32
Storage reservoirs	5.88
Systems improvement and up-gradation of WTPs	2.53
Connecting Kas MBR to Urmodi MBR	0.48
Pumping works	2.70
Water head works	0.80
Kas Source Augmentation (increasing dam height)	43.0
Consumer metering, replacement of house service connection (Total 18769 connections of these 4,970 metered connections, 13,799 unmetered connections) Block cost – Rs. 5,000 per connection with electromagnetic meter	6.9
Total estimated cost for 24x7 WS in Satara Municipal Council	119.5

Annexure 2: Details of reform cost

GROUP II CITIES	Consumer survey	Water audit and leak detection	Energy audit	GIS mapping	Hydraulic modelling	DMA demarcation and installation of bulk flow meters	Reform cost (Rs in crores)
Achalpur*	0.10	0.50	0.30	0.04	0.10	2.50	3.54
Barshi*							
Beed*	0.17	0.56	0.36	0.16	0.23	0.09	1.57
Bhusawal**	0.12	0.45	0.04	0.08	0.11	0.28	1.1
Chandrapur*	0.2	0.6			0.07	3.40	4.9
Ichalkaranji*		5.00					5.0
Panvel*				0.35	0.29	0.84	1.48
Wardha*	0.10	0.35	0.12	0.07	0.05	0.07	0.77

Group III Cities	Consumer survey	Water audit and leak detection	Energy audit	GIS mapping	Hydraulic modelling	DMA demarcation and installation of bulk flow meters	Reform cost (Rs in crores)
Jalna*	0.20	0.60	0.30	0.21	0.25	0.08	1.6
Latur**	0.18	0.74	0.07		0.11	0.56	1.66
Parbhani*	0.2	0.5	0.3	0.1	0.2	0.1	1.4

* Block costs derived through city consultation

Block costs arrived at through referring existing DPRs

** Block costs arrived at through MJP Schedule of rates; Implementation costs derived through MJP estimates for Malkapur

Annexure 3: Details of 24x7 cost for Group 2 and 3 cities

Activity	Rs. in crore
Cost Calculation for 24x7 Water Supply in Achalpur Municipal Council	
Cost of preparing DPR	1.7
Replacement of House Service Connections (Rs. 5000 / connection with mechanical meter)	6.3
New ESRs	1.5
Billing Software + 1 year maintenance	0.1
Cost of 100 percent coverage	4.0
Rehabilitation of Distribution Network- 100 percent (102 km) to be replaced and around 20 percent to be added (Rs. 73,00,000 / sq. km)	14.0
Contingency (20 percent)	6.23
Total estimated cost for 24x7 Water Supply in Achalpur municipal council	33.9
Cost Calculation for 24x7 Water Supply in Barshi Municipal Council	
Lowering and laying of new distribution network	6.02
Renovation of water supply scheme	11.13
Replacement of 60 HP VT pump @ 19 MLD WTP and new distribution for extended area and renovation of Pathri scheme (includes meter costs)	7.91
5 percent PMC and contingency charges	1.25
Total estimated cost for 24x7 Water Supply in Barshi municipal council	26.31
Cost Calculation for 24 x7 Water Supply in Beed Municipal Council	
Replacement of House Service Connections (metering existing unmetered connections) (Rs 3500/connection with mechanical meter)	8.6
Cost of 100 percent coverage (Rs 7000/connection with mechanical meter)	9.4
Modification in billing system/Installation of new software	0.1
Total estimated cost for 24x7 Water Supply in Beed municipal council	18.1
Cost Calculation for 24 X 7 Water Supply in Bhusawal Municipal Council	
Implementation of 24x7 water supply (Assuming Rs. 5,000 per capita) for the population of 1,86,444	93.2

Activity	Rs. in crore
Total estimated cost for 24x7 Water Supply in Bhusawal municipal council	93.2
<i>Cost Calculation for 24 X 7 Water Supply in Chandrapur Municipal Council</i>	
For areas of Jagannath Baba Nagar (west) and Normal School Ward (South) Replacement of existing PSC feeder main by 500 mm & 400 mm dia DI K-7 pipes	1.7
Construction of additional RCC sump of 1 ML in addition to existing sump of 0.2 ML capacity. The increased additional capacity is proposed keeping in mind the current load shedding problems.	0.39
Pumping machinery to be installed on sump to feed ESR of 2 ML, 0.5 ML and 0.4 ML.	0.28
Laying of pure water rising main of 400 mm dia of DI K-7 pipe	0.1
RCC ESR of 0.2 ML to distribute water to Normal School ward.	0.8
Distribution network of HDPE pipe in Normal School ward and J. Baba Nagar	1.8
Other Miscellaneous costs (working survey, project management, etc.)	1.3
Laying of raw water transmission mains	54.8
Construction of WTP of capacity 60 MLD, including pure water sump of 2.8 ML and pumping machinery	7.2
Laying of treated water transmission mains	17.4
Storage capacity including MBR of 2.6 ML and 7 additional ESRs of 24.6 ML	12.8
Laying distribution network of 142 km	51.5
Total estimated cost for 24x7 Water Supply in Chandrapur municipal council	149.1
<i>Cost Calculation for 24 X 7 Water Supply in Ichalkaranji Municipal Council</i>	
Identification and Regularization of unauthorized connections	0.05
Reducing leakages (changing pipelines for raw water transmission)	16.42
Additional Storage Reservoirs and pumping machinery	7
Household metering (to be completed by consumers by 1st April 2012)	1.38
Total estimated cost for 24x7 Water Supply in Ichalkaranji municipal council	24.85
<i>Cost Calculation for 24 X 7 Water Supply in Panvel Municipal Council</i>	
Consumer metering	15.09
Intake well	0.25
Construction of New ESR	0.66
Backwash Water Treatment	0.1
Construction of New GSR	0.43
Rehabilitation of distribution network	4.28
Replacement of Pumps & Panels	1.32
Pump accessories	0.27
Dosing system	0.30
Billing and recovery software	0.10
Contingencies 3%	0.68

Activity	Rs. in crore
Administrative charges 0.5%	0.12
Total estimated cost for 24x7 Water Supply in Panvel municipal council	23.60
<i>Cost Calculation for 24x7 Water Supply in Wardha Municipal Council</i>	
Replacement of House Service Connections (Rs. 3000 / connection with mechanical meter)(Assuming 20% connections to be replaced)	0.74
Billing Software + 1 year maintenance	0.1
Rehabilitation of distribution network, assuming 20 percent network needs to be replaced/added (Rs. 26 lakh per km)	7.28
Pawnar Water works: Replacing motor pump, repairing clarifier, civil work, electrification rising main repairing, air valve replacement, compound to site.	7
Yelakeli water works: Repairing of existing pump, civil work, valve replacement for rising main.	2
At Hanuman Tekdi filter unit: GSR, sump, Wash water treatment plant.	6
New Distributor network: Providing new M.S. pipe line, 2 E.S.R. for new area for distribution by gravity.	9
Contingency (20 percent)	6.42
Total estimated cost for 24x7 Water Supply in Wardha municipal council	38.54
<i>Cost Calculation for 24x7 Water Supply in Jalna Municipal Council</i>	
Replacement of House Service Connections (Rs. 5000 / connection with mechanical meter)	4.3
Billing Software + 1 year maintenance	0.1
Rehabilitation of Distribution Network- 100 percent (102 Km) to be replaced and around 20 percent to be added (Rs. 73 lakh per sq. km)	81.9
Contingency (20 percent)	17.6
Total estimated cost for 24x7 Water Supply in Jalna municipal council	103.9
<i>Cost Calculation for 24x7 Water Supply in Latur Municipal Council</i>	
Replacement of House Service Connections (Rs. 5000 / connection with mechanical meter)	19.06
Rehabilitation of Distribution Network- 50 percent (351 Km) to be replaced (Rs. 26 lakh per km)	91.4
Total estimated cost for 24x7 Water Supply in Latur municipal council	110.5
<i>Cost Calculation for 24x7 Water Supply in Parbhani Municipal Council</i>	
Replacement of House Service Connections (Rs. 5000 / connection with mechanical meter)	6.3
Billing Software + 1 year maintenance	0.1
Rehabilitation of Distribution Network- 100 percent to be replaced and around 20 percent to be added (Rs. 73,00,000 / sq. Km)	146
Contingency (20 percent)	30.7
Total estimated cost for 24x7 Water Supply in Parbhani municipal council	183.2

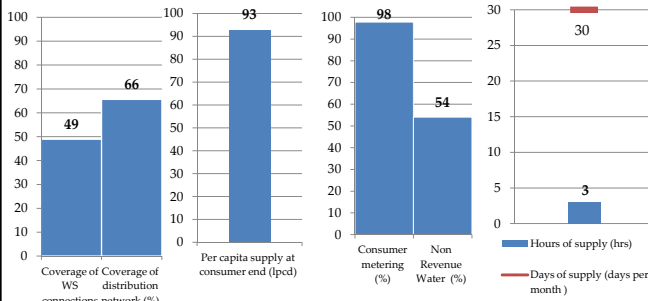
Annexure 4: Overview of Class 'A' Cities in Maharashtra

Achalpur: Existing Situation

Background Information

- Area (sq. km): 16.04
- Population: 1,12,293
- Slum population: 53.7% of total population
- Number of slums: 27 notified and 5 non-notified
- Number of wards: 38

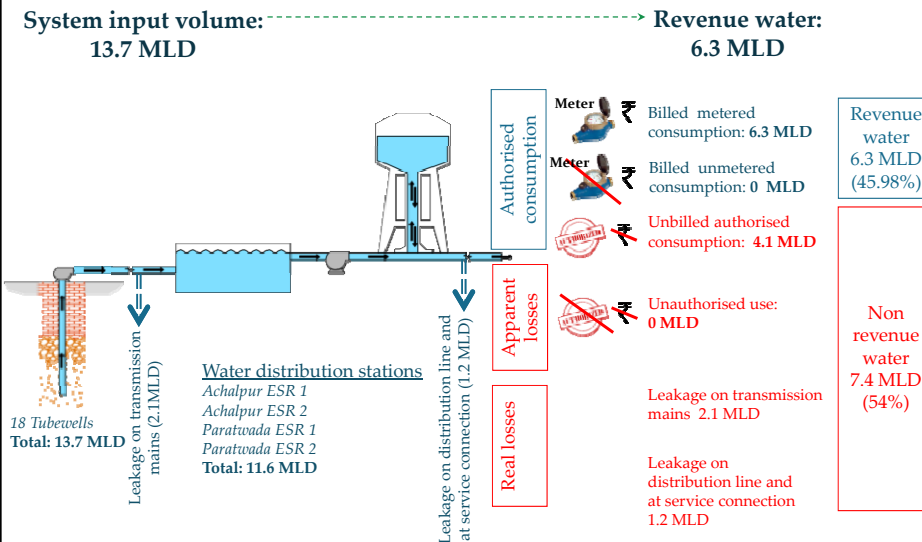
Performance of Water Supply System



Source: Compiled from PIP Reports of Class 'A' Cities of Maharashtra developed under PAS Project



Schematic Diagram of Water Supply System: Achalpur

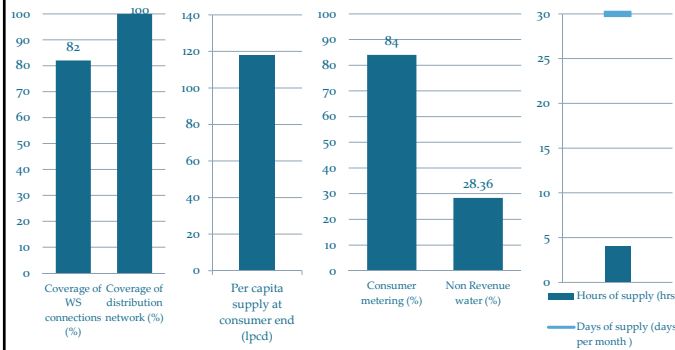


Ambernath: Existing Situation

Background Information

- Area (sq. km): 38
- Population: 2,59,023
- Slum population: 57% of total population
- Number of slums: 52
- Number of wards: 50

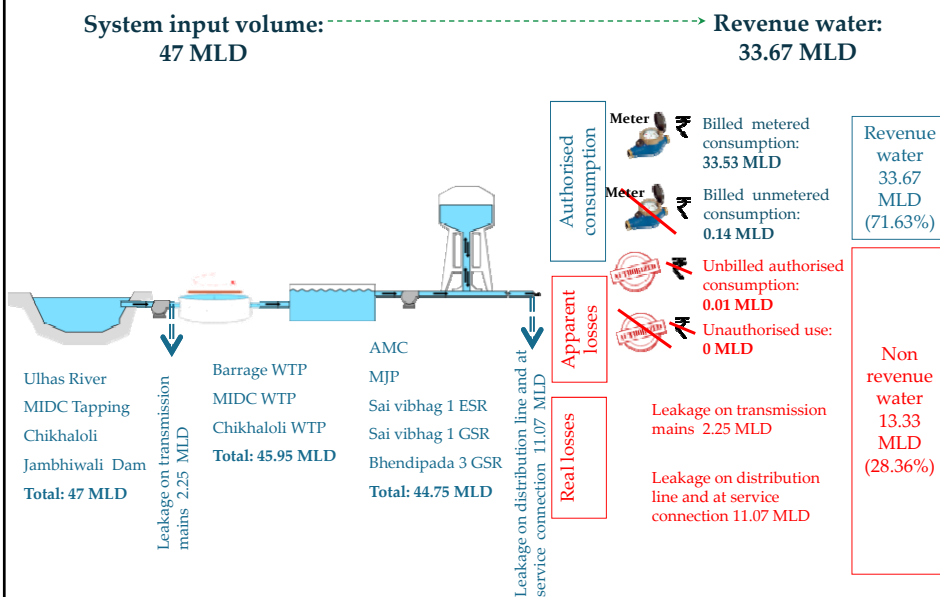
Performance of Water Supply System



Source: Compiled from PIP Reports of Class 'A' Cities of Maharashtra developed under PAS Project



Schematic Diagram of Water Supply System: Ambernath

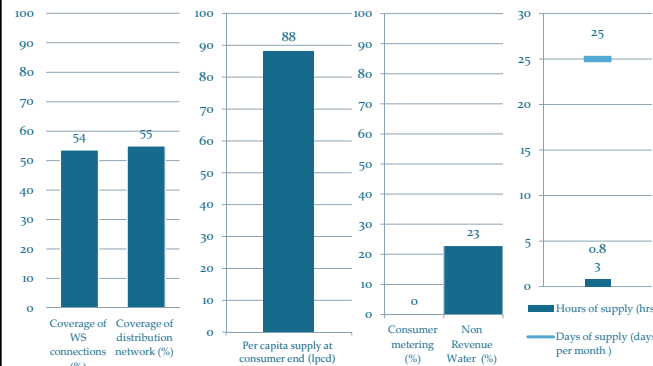


Barshi: Existing Situation

Background Information

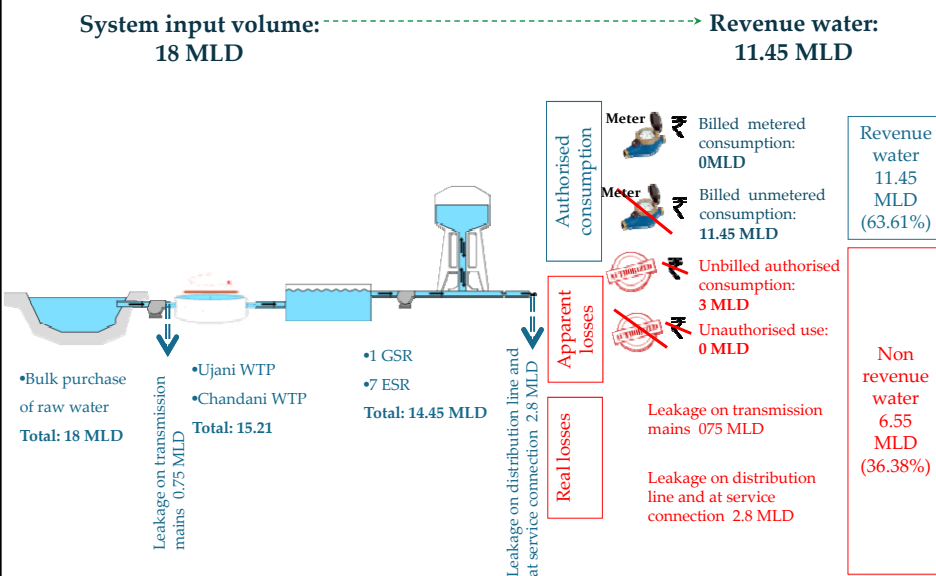
- Area (sq. km): 36.26
- Population: 1,18,475
- Slum population: 41.02% of total population
- Number of slums: 32
- Number of wards: 38

Performance of Water Supply System



Source: Compiled from PIP Reports of Class 'A' Cities of Maharashtra developed under PAS Project

Schematic Diagram of Water Supply System: Barshi

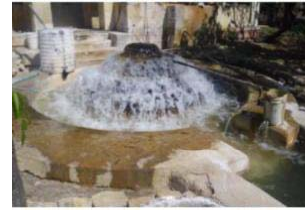
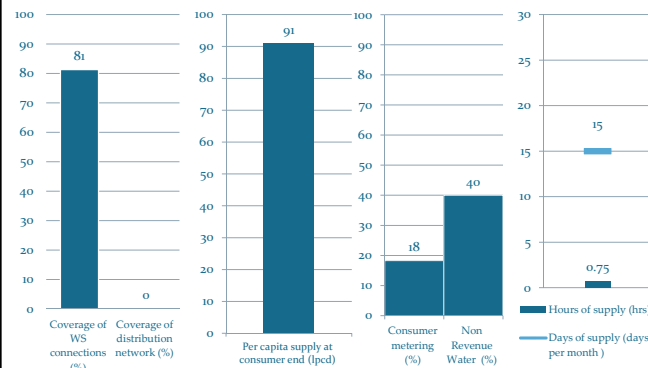


Beed: Existing situation

Background Information

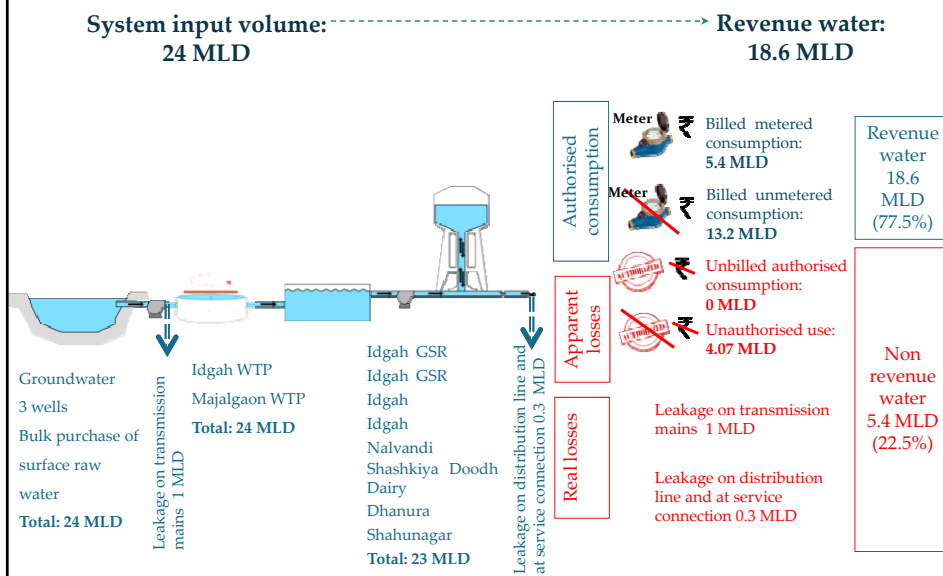
- Area (sq. km): 8.29
- Population: 1,86,000
- Slum population: 39.14% of total population
- Number of slums: 20
- No. of wards: 42

Performance of Water Supply System



Source: Compiled from PIP Reports of Class 'A' Cities of Maharashtra developed under PAS Project

Schematic Diagram of Water Supply System: Beed

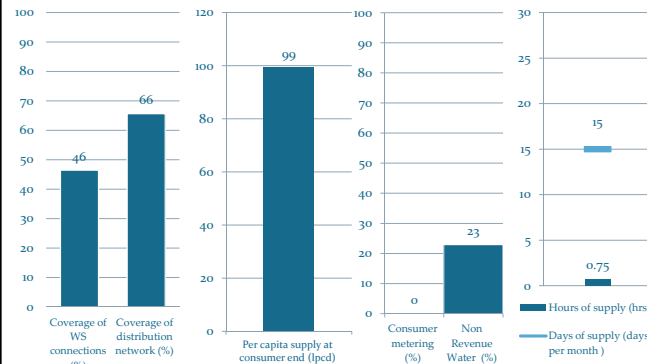


Bhusawal: Existing situation

Background Information

- Area (sq. km): 13.38
- Population: 1,86,444
- Slum population: 11.33% of total population
- Number of slums: 17
- Number of wards: 47

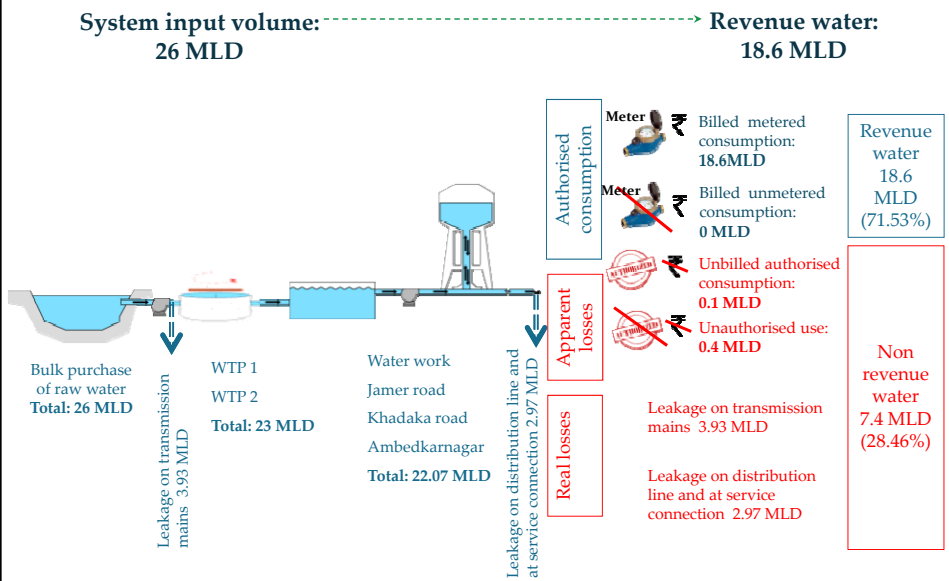
Performance of Water Supply System



Source: Compiled from PIP Reports of Class 'A' Cities of Maharashtra developed under PAS Project



Schematic Diagram of Water Supply System: Bhusawal

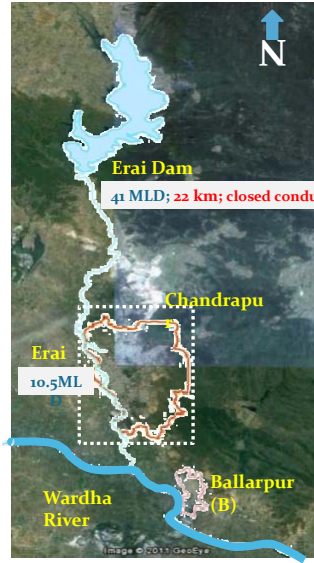
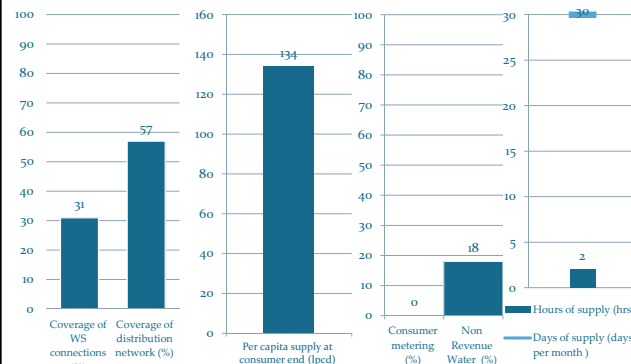


Chandrapur: Existing Situation

Background Information

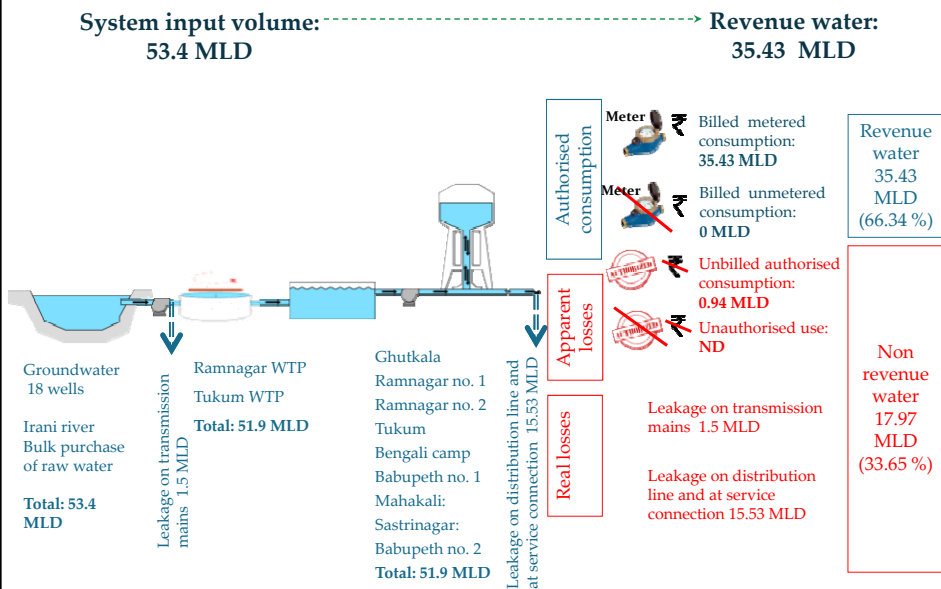
- Area (sq. km): 56.28
- Population: 3,21,436
- Slum population: 11.33% of total population
- Number of slums: 80
- No. of wards: 61

Performance of Water Supply System



Source: Compiled from PIP Reports of Class 'A' Cities of Maharashtra developed under PAS Project

Schematic Diagram of Water Supply System: Chandrapur

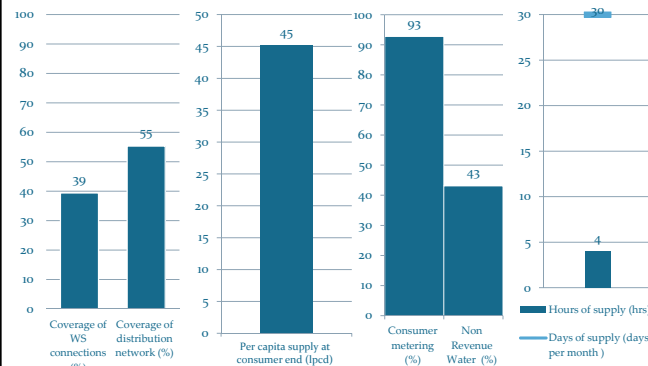


Gondia: Existing situation

Background Information

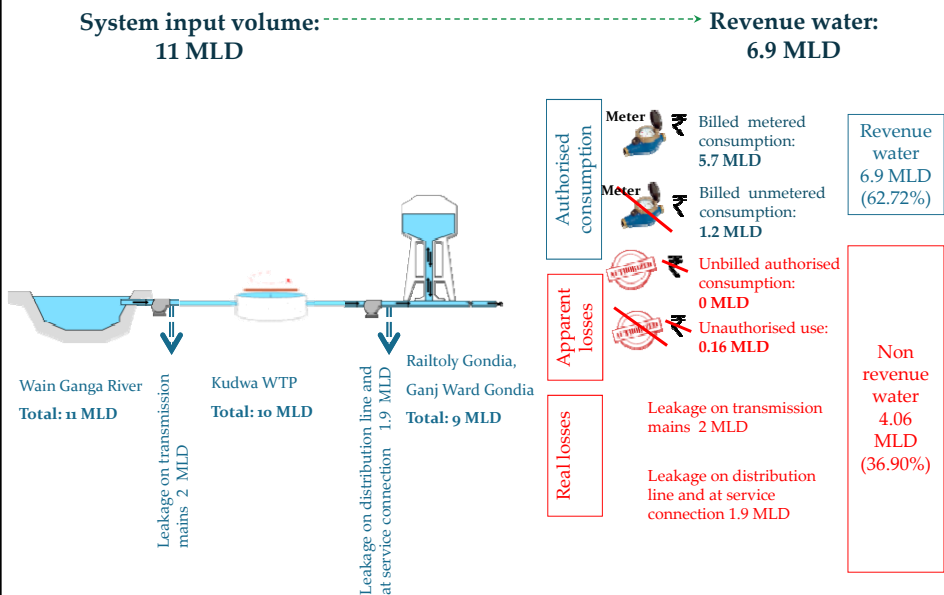
- Area (sq. km): 18.08
- Population: 1,32,889
- Slum population: 33.97% of total population
- Number of Slums: 58
- Number of wards: 39

Performance of Water Supply System



Source: Compiled from PIP Reports of Class 'A' Cities of Maharashtra developed under PAS Project

Schematic Diagram of Water Supply System: Gondia

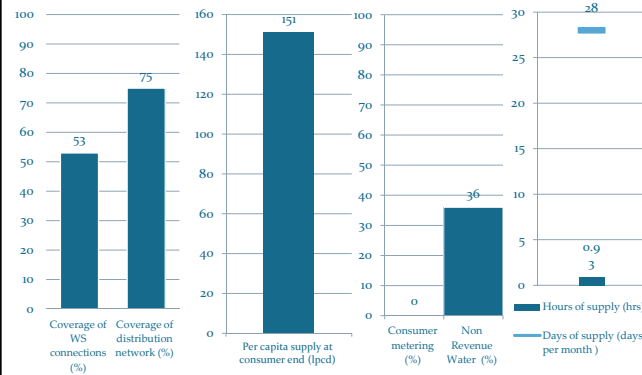


Ichalkaranji: Existing situation

Background Information

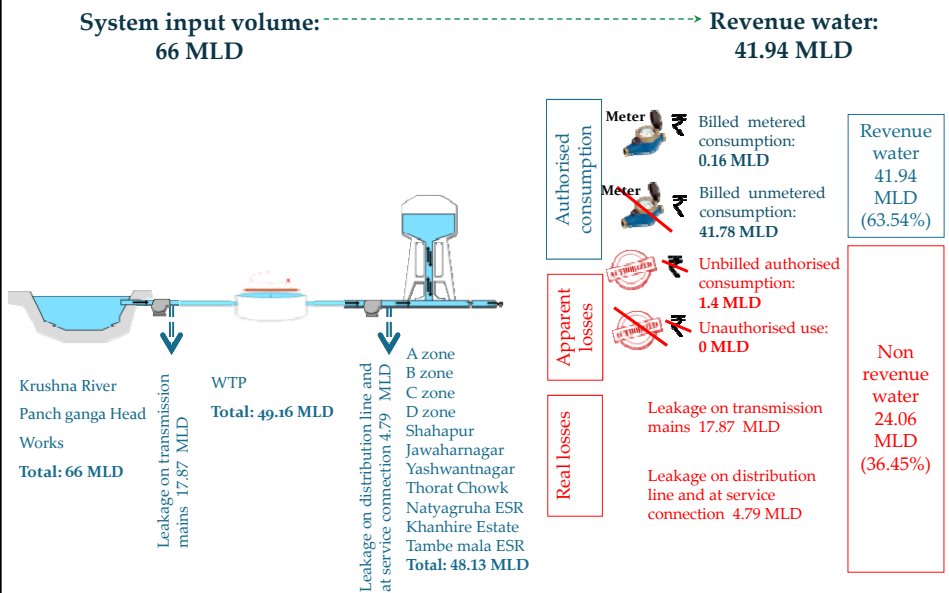
- Area (sq. km): 29.84
- Population: 2,87,695
- Slum population: 9.79% of total population
- Number of slums: 19
- Number of wards: 57

Performance of Water Supply System



Source: Compiled from PIP Reports of Class 'A' Cities of Maharashtra developed under PAS Project

Schematic Diagram of Water Supply System: Ichalkaranji

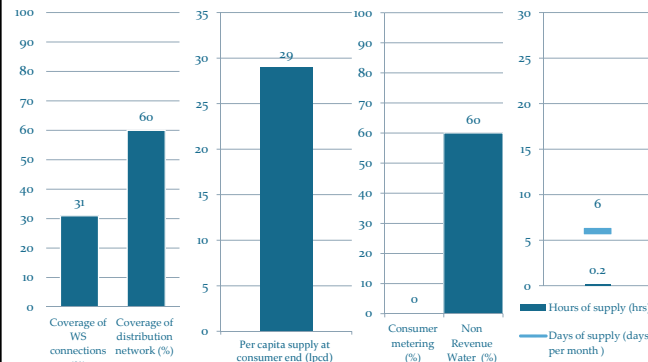


Jalna: Existing Situation

Background Information

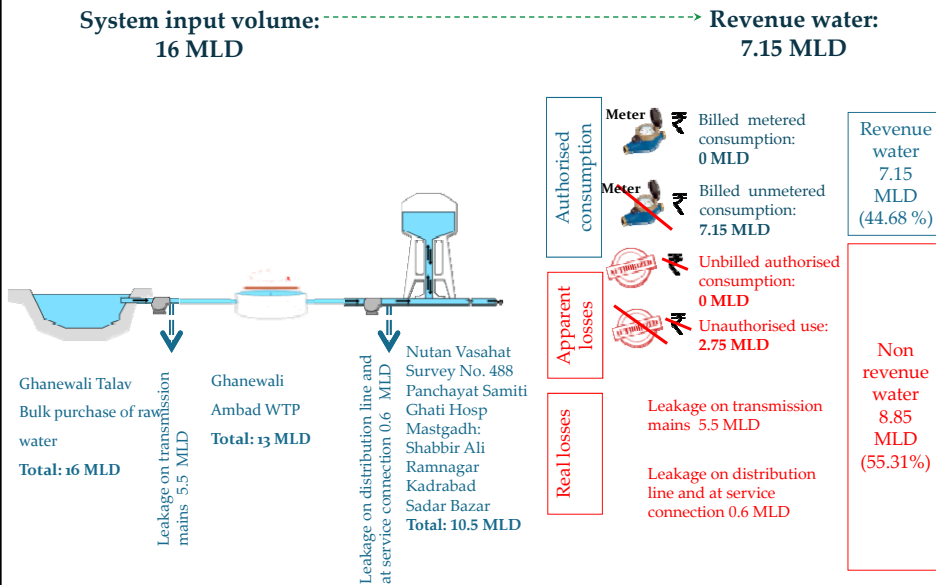
- Area (sq. km): 81.86
- Population: 2,85,349
- Slum population: 25.74% of total population
- Number of slums: 53
- Number of wards: 18

Performance of water supply system



Source: Compiled from PIP Reports of Class 'A' Cities of Maharashtra developed under PAS Project

Schematic Diagram of Water Supply System: Jalna



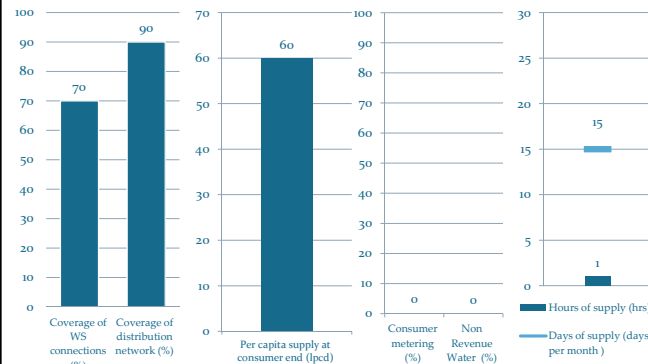
Latur: Existing situation

Background Information

- Area (sq. km): 33
- Population: 3,82,754
- Slum population: 34% of total population
- Number of slums: 73
- Number of wards: 22

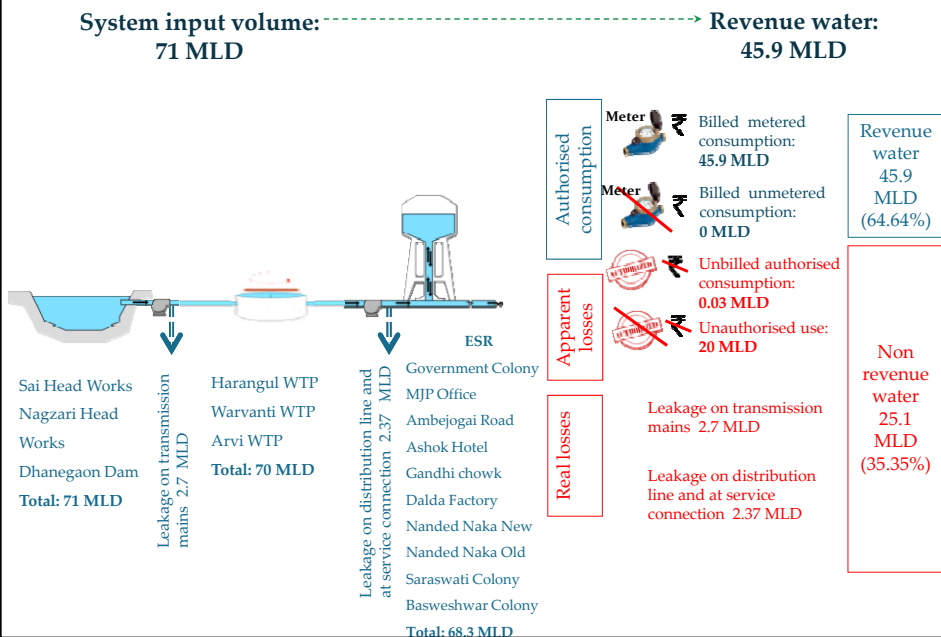


Performance of Water Supply System



Source: Compiled from PIP Reports of Class 'A' Cities of Maharashtra developed under PAS Project

Schematic Diagram of Water Supply System: Latur

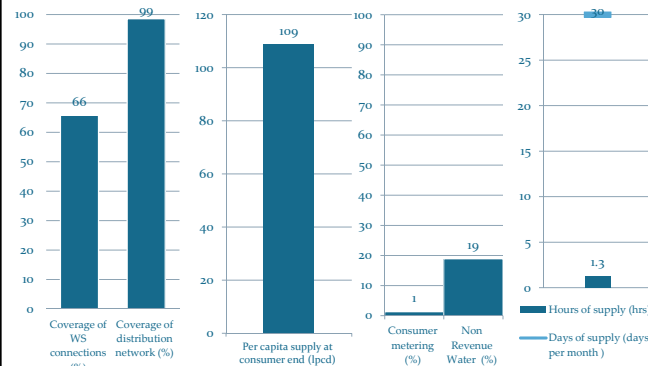


Panvel: Existing Situation

Background Information

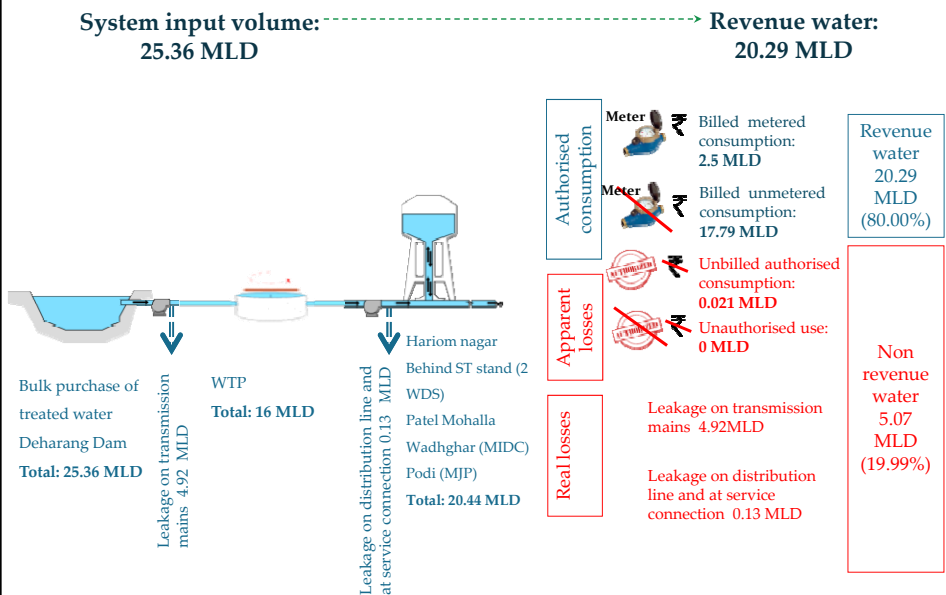
- Area (sq. km): 12.17
- Population: 1,90,000
- Slum population: 5.76% of total population
- Number of slums: 15
- Number of wards: 38

Performance of Water Supply System



Source: Compiled from PIP Reports of Class 'A' Cities of Maharashtra developed under PAS Project

Schematic Diagram of Water Supply System: Panvel



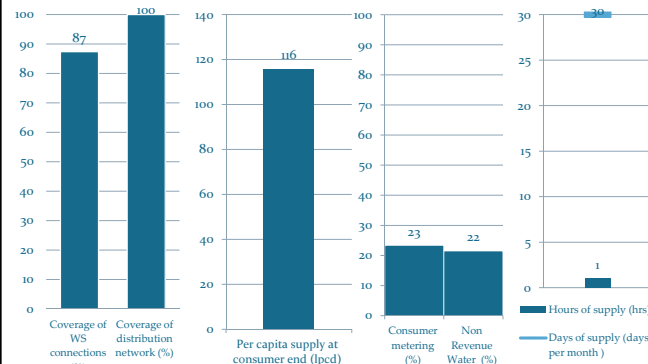
Satara: Existing Situation

Background Information

- Area (sq. km): 8.15
- Population: 1,20,079
- Slum population: 9.16% of total population
- Number of Slums: 21
- Number of wards: 39

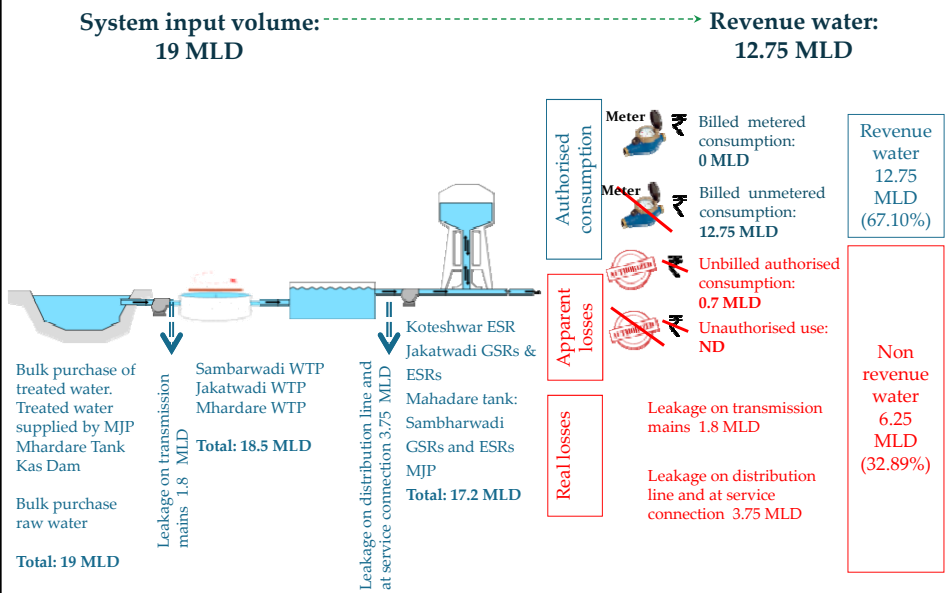


Performance of Water Supply System



Source: Compiled from PIP Reports of Class 'A' Cities of Maharashtra developed under PAS Project

Schematic Diagram of Water Supply System: Satara



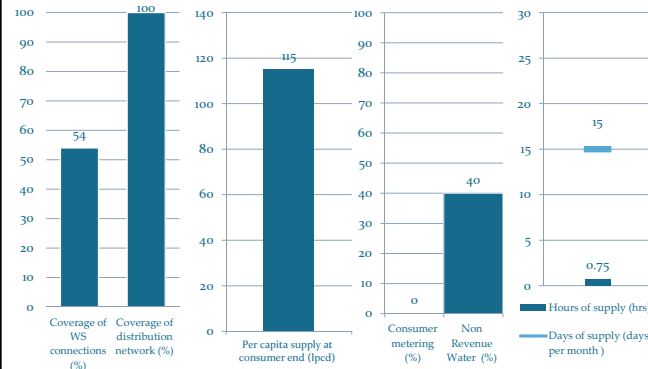
Wardha: Existing Situation

Background Information

- Area (sq. km): 7.44
- Population: 1,06,439
- Slum population: 17% of total population
- Number of Slums: 17
- Number of wards: 13

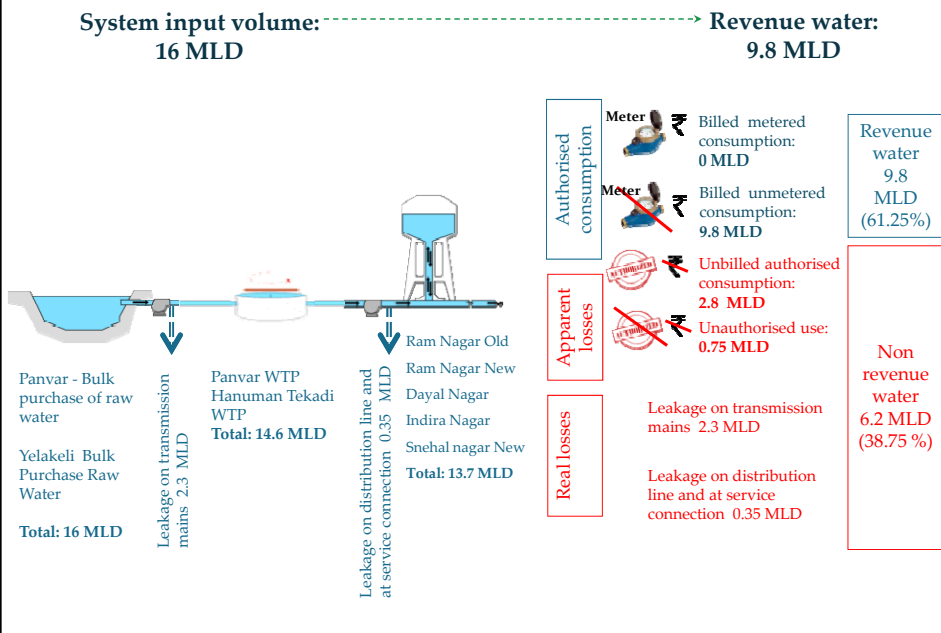


Performance of Water Supply System



Source: Compiled from PIP Reports of Class 'A' Cities of Maharashtra developed under PAS Project

Schematic Diagram of Water Supply System: Wardha

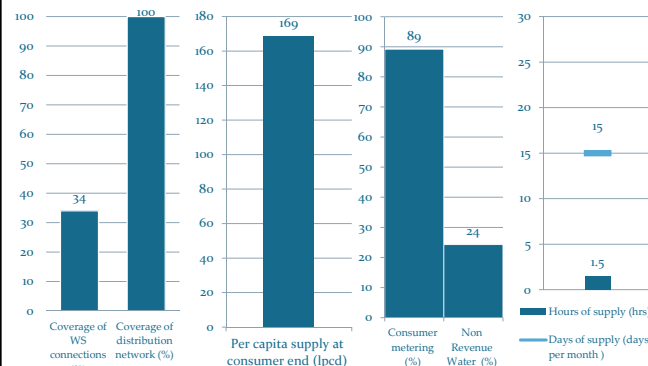


Yavatmal: Existing situation

Background Information

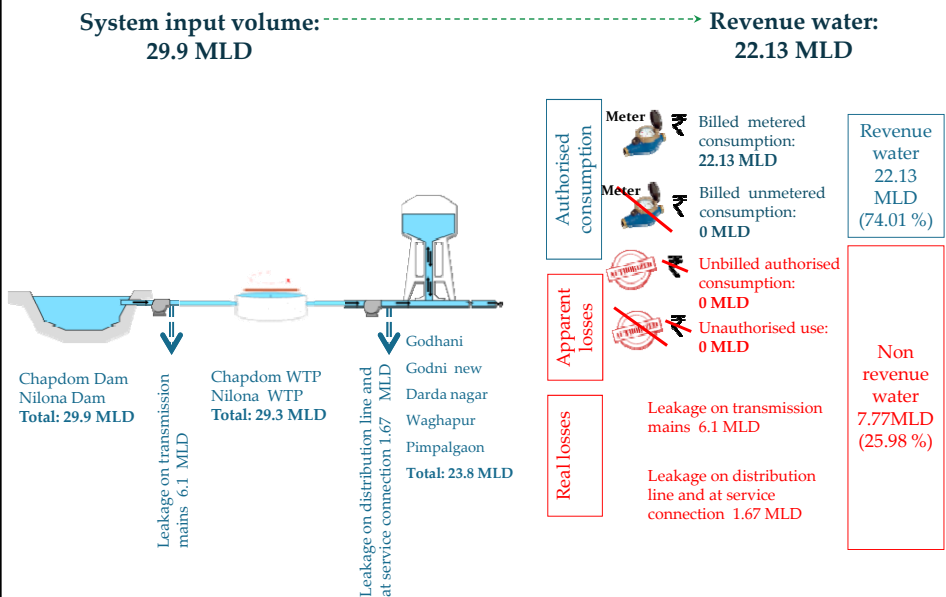
- Area (sq. km): 10.17
- Population: 1,16,714
- Slum population: 38% of total population
- Number of alums: 25
- Number of wards: 40

Performance of Water Supply System



Source: Compiled from PIP Reports of Class 'A' Cities of Maharashtra developed under PAS Project

Schematic Diagram of Water Supply System: Yavatmal



The Performance Assessment System (PAS) Project

The Performance Assessment System (PAS) Project supports development of appropriate tools and methods to measure, monitor and improve delivery of urban water and sanitation services in the states of Gujarat and Maharashtra. The PAS Project includes three major components of performance measurement, performance monitoring and performance improvement. It covers all the 400+ urban local governments in Gujarat and Maharashtra.

CEPT University has received a grant from the Bill and Melinda Gates Foundation for the PAS Project. It is being implemented by CEPT University with support of Urban Management Centre (UMC) in Gujarat and All India Institute of Local Self-Government (AIILSG) in Maharashtra.

PAS Project

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