

DRINK FROM TAP MISSION IN PURI CITY

(A Case Study of 24x7 Water Supply Project)



Central Public Health and Environmental Engineering Organisation (CPHEEO)
Ministry of Housing and Urban Affairs
Government of India
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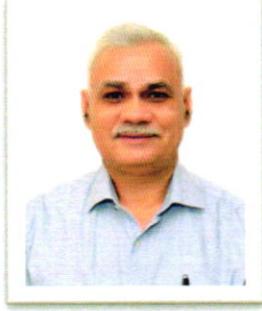
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दुर्गा शंकर मिश्र

सचिव

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Secretary



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आजादी का
अमृत महोत्सव



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Foreword

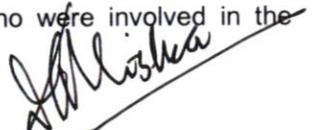
Hon'ble Prime Minister launched AMRUT 2.0 on 1 October, 2021 with an objective to make all cities water secure and to provide safe and adequate drinking water to all urban areas. It targets to provide 2.68 crore reliable new water tap connections to all 4,800 cities/statutory towns. Cities are mandated to undertake reforms such as water conservation, reducing non-revenue water to below 20%, PPP project, community involvement etc. 24x7 water supply is one of the admissible components under AMRUT 2.0 and these projects should cover at least one ward or DMA with at least 2,000 households in the contiguous manner. The projects costing up to 20% of the project fund allocation for water supply projects in AMRUT cities may be taken up for 24x7 water supply.

It is estimated that over 50% country's population will live in urban areas by 2050. It is a huge challenging task to provide safe and continuous water supply with required quantity and acceptable quality to the urban population. To meet this challenge, some cities are taking efforts towards converting their existing intermittent water supply system into continuous 24X7 water supply system to improve service levels. **Puri city has taken the lead and has implemented 24x7 water supply for the entire city under the "Drink from Tap Mission". This project has ensured safe & continuous water supply at the consumer tap that can be directly used for drinking and cooking purposes without any need for further treatment.**

This case study gives an insight about the 'Drink from Tap Mission' in Puri City. It emphasizes the efforts and policy interventions taken up by the Govt. of Odisha, Principal Secretary (H&UD) and Engineers of Water Corporation of Odisha (WATCO) towards the transition of intermittent water supply to pressurized 24x7 continuous water supply systems. It includes key challenges & learnings, use of latest technologies like GIS & SCADA, public/community participation, SMART Water Management solutions for monitoring & sustainability etc. On the similar lines, the Government of India aims to implement such successful 24x7 water projects across all the AMRUT cities in the country so as to provide safe and reliable water supply to all the urban households and match the service delivery standards of the developed country.

I am sure, this case study will provide confidence, motivation, encouragement and empower the State Governments/Parastatals/Urban Local Bodies (ULBs) to transform the current intermittent water supply system to 24x7 continuous pressurized piped water supply systems and guarantee quality to ensure 'Drink from Tap'.

I congratulate Shri Mathivathanan, Principal Secretary (H&UD), Govt. of Odisha & his team for their successful 'Drink from Tap Mission' in Puri city, Dr. M. Dhinadhayan, Adviser, CPHEEO & his team and members of Expert Committee for the Revision of Water Supply Manual, who were involved in the preparation of this report


(Durga Shanker Mishra)

New Delhi

23RD November, 2021

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Report on

DRINK FROM TAP MISSION IN PURI CITY

(A Case Study of 24x7 Water Supply)

1. INTRODUCTION

Intermittent water supply systems in developing countries like India, suffer from several deficiencies like inadequate & poor design, operation & maintenance problems, economic stress etc. At many places, water at consumer end has insufficient quantity and substandard quality.

Way back in 1949, Govt. of India aspired 24x7 continuous water supply systems by approving report of the “Environmental Hygiene Committee” of Government of India. The report states ‘It has been demonstrated recently at Lucknow that the water-works authorities can successfully supply water all the 24 hours, educate a community used only to intermittent supply to adapt themselves to continuous supply and reduce consumption’. This shows the long-lasting aim of improving service delivery of water supply by providing pressurised continuous water on 24x7 basis. The merits of 24x7 system and demerits of an intermittent system are shown in Box-1.

Box-1: How Superior is pressurized 24x7 water supply system?	
Intermittent	24x7 System
1) High health risks	1) Stops contamination
2) Leakage control is passive	2) Reduction in medical bills
3) No demand management	3) Leakage control is active
4) Few meters	4) Demand management is possible
5) Flat water rates	5) 100% consumer metering
6) Wastage of treated water	6) Telescopic tariff or billing as per water tariff
7) Service level is poor and cannot be measured	7) Reduces consumption.
8) Inequitable distribution of water and inadequate pressure	8) Equitable distribution and sufficient pressure
9) Less financial sustainability	9) Better service level
10) Large doses of chlorine	10) Financial sustainability
11) Capacities underutilized	11) Life of network increases
12) Valves- wear and tear	12) Better demand management
13) More manpower- zoning	13) Consumer satisfaction
14) Large sizes of pipes	14) Water is accessible to poor
15) Supply hours affect poor	15) Willingness to pay- even in slums
16) Storage is required	16) Time for rewarding activities
17) Pay for pumping for roof top storages.	17) Attracts industries
18) Meters go out of order	18) System operates in quasi-steady state reducing wear and tear
19) Store and throw water	

Though the country has made significant progress after independence, the service level in water sector is not satisfactory. It is estimated that 50% population will live in urban areas by 2050. Providing safe and continuous water supply of required quantity and acceptable quality to the population is a formidable task and huge challenge to the administrators and engineers. Currently, all cities are providing intermittent water supply to its population. Some cities are making efforts towards converting their existing intermittent water supply system into continuous 24x7 water supply system to improve the service quality.

In the present scenario of intermittent water supply system, in most of the cities/towns, the NRW is about 45-55% and the water is bacteriologically contaminated due to entry of wastewater/ sewage into water supply pipelines during non-supply hours. The NRW can only be controlled with the application of continuous (24x7) water supply in the cities in a phased manner. NRW reduction is only possible by creating number of District Metered Areas (DMA)s and operational zones under continuous (24x7) water supply system.

2. THE CHALLENGE

Drinking Water Supply in Urban Odisha had been facing severe challenges since decades and the water supply infrastructure could not cope up with the pace of increasing urbanization. Poor service coverage, poor water quality, intermittent supply and high-water losses were the predominant water supply challenges that were required to be addressed to solve perennial water woes.

To ensure a more qualitative, equitable, efficient and sustainable urban water supply system, the Principal Secretary of Government of Odisha has put more thrust on improving the level of urban drinking water services in the state for universal coverage with adequate quantity and acceptable quality of drinking water supply, with easier and equitable access of the services to all categories of people in the society.

Strong Leadership and committed mandate at all levels, right from the top level of Hon'ble Chief Minister, to provide piped drinking water to each home round the clock, enabling policy interventions and dedicated execution of works resulted in transformation in the Drinking Water Supply Scenario in Odisha and especially in the Puri city.

Upon achieving the universal coverage across the state, the Government of Odisha moved into higher orbits in the Drinking Water Supply with the Mission Drink from Tap. The Mission is a dream project of the Hon'ble Chief Minister, Government of Odisha, Shri Naveen Pattnaik.

3. MOTIVATION BY STRONG LEADERSHIP

As per constitution of India, water is the subject under the state list. After adoption of 73rd & 74th constitutional amendments, the local bodies have been empowered by decentralization,

hence the State Governments have taken up number of schemes entrusted to Municipal Councils or Corporations which are financed under Central Assistance.

Odisha is one of the pragmatic states, implementing the “Drink from Tap Mission.” 24x7 continuous water supply schemes, are being contemplated under this program under the “5T” Governance Mantra of Government of Odisha, which takes Transparency, Technology, Teamwork and Time, and combined them to bring about Transformation.

To accelerate this program, the Principal Secretary of Odisha strengthened and deployed his State Government’s water wing. In line with the requirements of 74th Amendment Act, Water Corporation of Odisha (WATCO) a ‘not-for-profit’ company has been established by the visionary and dynamic Principal Secretary, UD with the mandate to provide water and wastewater related services on sustainable basis in many municipal areas including Puri. Gradually, the services of WATCO are being extended to other Urban Local Bodies (ULB)s of Odisha. The objective of creating the corporate entity (WATCO) is to encourage corporate governance & efficiency, functional autonomy and customer centric service culture in the Water Supply Service Delivery.

With motivation and inspiration from the Principal Secretary, WATCO initiated new ideas, innovative techniques, latest technology, GIS mapping, hydraulic modelling etc. WATCO is successful in completing project in Puri, especially proudful to create third Party Quality surveillance, reducing NRW from 55% to 15%, and self-help women group for public participation. Puri being a famous pilgrimage centre where Lord Jagannath temple is situated, WATCO got prepared Preliminary Report, DPR, BOQ tender etc. within 14 months (costing Rs. 46 Crores) and then converted the prevailing intermittent water supply system into 24x7 Water Supply in record time of only 9 months with driving force of the Principal Secretary.

It is pertinent to mention that Puri has already implemented 24x7 water supply for the entire city. The Members of the Expert Committee of CPHEEO for the revision of water supply manual visited (Figure 1) Puri during 21-22 Oct 2021 to understand the successful implementation of 24x7 water supply.



Figure 1: Visit of Expert Committee members

Besides Puri, Pune, Coimbatore and Nagpur are also implementing 24x7 water supply projects for covering 100% urban population. Ministry has also introduced continuous (24x7) water supply in 500 AMRUT cities in the recently released operation guidelines of AMRUT 2.0 as part of reforms so as to achieve the reform of NRW below 20% and also to ensure drinking water quality as per Indian Standards IS:10500. The 24x7 continuous water supply will attract more PPP funding, financially sustainable and also improve service level in the cities.

Objective of this report is to highlight the efforts taken by the Principal Secretary, Odisha and Engineers of WATCO towards the transition of intermittent water supply to pressurised 24x7 continuous water supply system so as to drink water directly from the tap by the population of Puri city.

4. DRINK FROM TAP MISSION

The 'Drink from Tap' Mission, launched by the Government of Odisha during October 2020, is an aspirational and ambitious, first of its kind program in the country. This program is undertaken by the Govt of Odisha to supply 'Drink from Tap' Quality piped drinking water to citizens on a 24x7 basis.

'Drink from Tap' aims to ensure that the water received at the consumer tap can be directly used for drinking and cooking purposes without any need for further filtration/boiling/treatment. With this Mission, Govt of Odisha aims to match the service delivery standards of the developed country to make piped drinking water available at the household level across the state.

The Mission aims at availability of quality water round the clock (24x7) in each house, elimination of household level storage (sump), efficient pumping and treatment, water conservation through metering, reduction in NRW & cost of production, quick resolution of issues/complaints, and above all real-time data sharing on water quality levels to enhance public perception and trust in the service delivery of WATCO. The Mission objectives are:

- 1) Drink pure water straight from the Tap: Conversion of intermittent water supply systems to continuous (24x7) water supply systems to reduce the health risks for users that are likely to be caused due to contamination of water pipelines through joints and damaged segments in intermittent supplies when a system is not under pressure.
- 2) Equitable, sustainable and people-centric service provision with focus on the urban poor.
- 3) Water Supply Management through Community Partnership (Self Help Groups) - "Jalsaathi" (Figure 2).
- 4) 100% coverage of households with piped drinking water in adequate quantity and with quality as per recommended standards.
- 5) 100% metering of house connections to eliminate non-revenue water (NRW) due to leakages and wastage for full cost recovery.

- 6) Adoption of innovative, state-of-the-art technology & management techniques, both during construction and operation & maintenance.
- 7) Quality Assurance through Third Party Quality Monitoring & PPP Laboratories (Figure 3).



Figure 2: Interaction with Jalsaathis



Figure 3: Mobile Laboratory for Water Quality monitoring

5. MISSION IMPLEMENTATION IN PURI

The water supply infrastructure in Puri was mainly augmented under JNNURM and AMRUT schemes until 2019. The water was supplied from groundwater sources on intermittent basis.

Under the 'Drink from Tap' Mission, comprehensive assessment of infrastructure gap was carried out and zone wise Detailed Project Reports (DPR)s were prepared for conversion of Intermittent Water Supply into Continuous Water Supply and migration to surface water source (Bhargavi River) followed by execution of work, installation of household connections and meters.

6. PROJECT BRIEF

After successful running of 24x7 in pilot zones for about a year, especially supply to slum/low income group areas, WATCO upscaled it to entire Puri city covering a population of 2.5 lakhs and having 32,300 house connections spread across 32 wards including 64 slum areas covering 66,000 slum populations. All these are spread over an area of 16.84 Sq. Km. In addition to this, Puri being a world-famous pilgrimage city has been visited by nearly 2 crore people annually adding to the challenge of supplying drinking water to this large population.

A comprehensive survey/ planning was conducted before embarking upon the mammoth task of converting intermittent supply system to 24x7 supply with arduous task of achieving 'Drink from Tap', thus ensuring drinking water quality at all times and in all places in Puri City.

6.1 The key Information

Key Information of Puri city is as follows:

- Population: 2.5 Lakh (approx.)
- Source: River Bhargavi
- Slum Population: 66,000
- No. of Households: 32,017
- Water Treatment Plant (WTP): 42 MLD
- Total Water Demand: 38 MLD
- No. of Ground Service Reservoirs (GSR)s: 5
- No. of Elevated Service Reservoirs (ESR): 19
- No. of Water Testing Laboratory: 1
- Operational zones (OZ): 19
- No. of DMAs: 19 Nos, one per operational zone with 1000 to 2000 connections
- Length of Water Distribution Pipelines: 275 Kms
- Clear Water Rising Main: 46 Kms
- Raw Water Rising Main: 800 Meter

6.2 Distribution System

There are 19 District Metered Areas (DMA)s in Puri city as shown in Figure 4. The jurisdiction of each service tank has been considered as the service area of the DMA. This means one tank serves one OZ/DMA, thus making the decentralized control of supply and demand. Thus, there are 19 tanks and 19 OZ having 1 DMA each (19 DMAs) in the entire city. Peak factor of 2.5 has been considered in the design of distribution system.



Figure 4: Total 19 DMAs in Puri

6.3 Project Cost

Project cost of schemes under various programs is shown in Table 1. As can be seen, the State Government has judiciously built up the required infrastructure over many years using both Central as well as State funds.

Table 1: Project cost of schemes (Crores)

Program	Centre	State	Total	Remarks
JNNURM	72	18	90	Centre: State- 80:20
AMRUT	44	44	88	Centre: State- 50:50
Sujal (Drink from Tap)	0	46	46	State Funding (House Connection plus metering, control valves, Bulk flow metering & Ultrafiltration - WTP)
Total	116	108	224	

The per capita cost for formation of DMAs, flow control valves, bulk flow meters, pressure reducing valves and replacement of house service connections (HSC) with water meters (mechanical meters) is Rs. 1840/-. The overall per capita cost considering the project cost incurred for creating infrastructure under JNNURM and AMRUT with all DMAs formation is about Rs. 8,960/-

6.4 Duration: It took about 14 months for survey, investigation, planning, design and tendering for the implementation of “Drink from Tap Mission” to convert from intermittent to 24x7. But execution for 24x7 WS was carried out in just 9 months, indicating that a very detailed survey and careful planning is essential in faster implementation of the project. It also needs to be noted that once the planning was done, there was no deviation thus ensuring proper and successful implementation of the scheme. Earlier to this, JNNURM and AMRUT schemes funds were used to build the basic infrastructure for over a period of 5 years.

7. VISIT

On 21st Oct 2021, the Expert Team visited three DMAs (Figure 5).



Figure 5: Vist of the team to DMA & ESR.

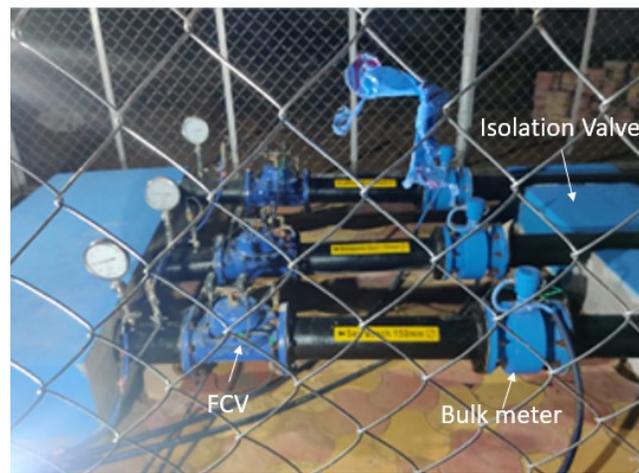


Figure 6: Outlet arrangement of ESR

7.1 Equitable Distribution of Water

The Team observed at site of DMA that on the outlet of ESR, isolation valve is installed followed by bulk meter and then the Flow Controlling Valve (FCV). This arrangement is shown in Figure 6. The proposed guideline on 24x7 proposed the similar arrangement that “all DMAs need to be fed by exclusive pipeline from outlet of ESR with branches and consumer connections should not be given from these pipelines. Each DMA should have only one inlet. This arrangement provides equitable distribution of water as per designed nodal demands with designed residual head.” It was also explained that in case of emergency, there are mechanisms to let in water into DMAs which are isolated either by neighbouring DMAs or by supplying water through tankers. The Team expressed satisfaction on these arrangements.

8. POLICY INTERVENTIONS

- a. Inclusivity Approach: Water Supply Services to the Urban Poor: The State Urban Water Policy envisions “RIGHT to WATER” for everybody. Providing Water & Sanitation Services to the Slums is one of the top priorities of the mission. It is mandated to cover the entire slum households/populations across the state under the mission in a phased manner. Convergence of the Mission with the various ongoing urban poor development programs of Government such as JAGA Mission ensured greater reachability.
- b. Government of Odisha implemented enabling policy interventions which are as follows:
 - 1) Right to water
 - 2) Execution of connection by PHED/WATCO as public works
 - 3) Household need not bother to obtain road cutting permission for connection
 - 4) Easy instalment on connection charges
 - 5) Explicit component of community participation now with 100% coverage
- c. The administration has relaxed house connection norms for the poor which are as below:
 - Water connection with indemnity bond
 - Waiver of connection fee
 - Providing house connection with two taps at Govt. cost under AMRUT for the slums
 - Covering all uncovered slums under AMRUT and now under State Plan
 - Shift from hand pump, tube wells to Piped Water Supply - equity in water distribution

9. COMMUNITY LED WATER DISTRIBUTION

In 2019, with inspiration from state level administration, the City Administration and WATCO started community lead novel water supply management by partnering with Self Help Groups (SHG)s, called as “Jalsathi.” Jalsathi (Figure 7). The ‘Jalsathis’ have acted as

bridge between customers and WATCO. Their partnership is based on incentives for women of SHGs.

The Jalsathi's get 5% of water supply revenue collected from the consumers, Rs. 100 for new domestic house connections, Rs. 300 per new commercial connections and Rs. 20 for each water quality tests at consumer end.

The roles and responsibilities of Jalsathi are as below:

- 1) Facilitating new connections, identifying illegal connections and regularizing them
- 2) Reading water meters, distributing water bills, and collecting user charges
- 3) Field water quality testing
- 4) Support in consumer complaint redressal
- 5) Sensitizing people on water conservation



Figure 7: Jalsathi women group at Puri

Currently, 32 Jalsathis are working on the mission in Puri, achieving 97% efficiency in revenue collection.

10. SALIENT FEATURES

Some of the salient features of the scheme are as below:

10.1 24x7 Interactive Voice Response (IVR)s based Customer Care

The Centralised Customer care centre is provided with the facility of IVRS based automatic complaint logging, transfer to concerned staff for action and online real-time tracking of redressal.

10.2 GIS Mapping of Assets and Consumers

Both assets and consumers in the entire city including slums pilot areas have been Geo Mapped on the GIS platform and real time data is obtained from the PLC (Programmable Logic Controller) /SCADA (Supervisory Control and Data Acquisition) to a central server.

10.3 SMART Water Management

To achieve real-time data capture, analysis, decision making and public reporting, the “Smart Water Management System under “Drink from Tap Mission” was conceived and has been implemented initially in 4 pilot zones of Puri City. Some of the unique aspects of this project include.

- Real-time Quality Surveillance (Figure 8) to ensure Drink from Tap Quality Water at every home
- Real-time data analysis and decision making (Figure 9) resulting in uninterrupted and consistent water supply service delivery
- Data capture for preventive maintenance of Water Supply Assets
- Reduction of Non-Revenue Water through leakage detection and control
- Efficient Incidence Management (Figure 10) and quick resolution of problems
- Efficient consumer complaint redressal for enhancing consumer satisfaction

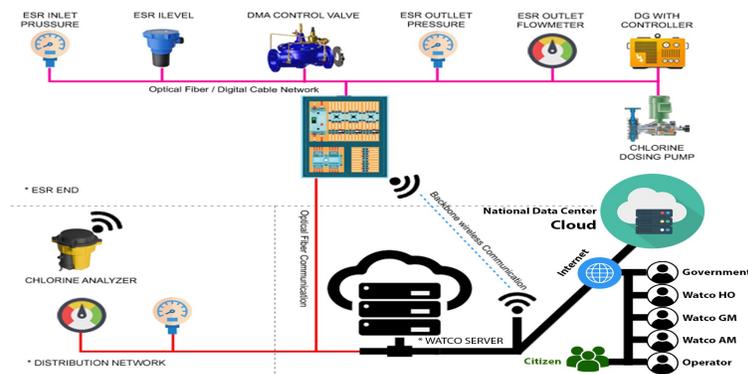


Figure 8: System Architecture of Smart Water Management System In Puri

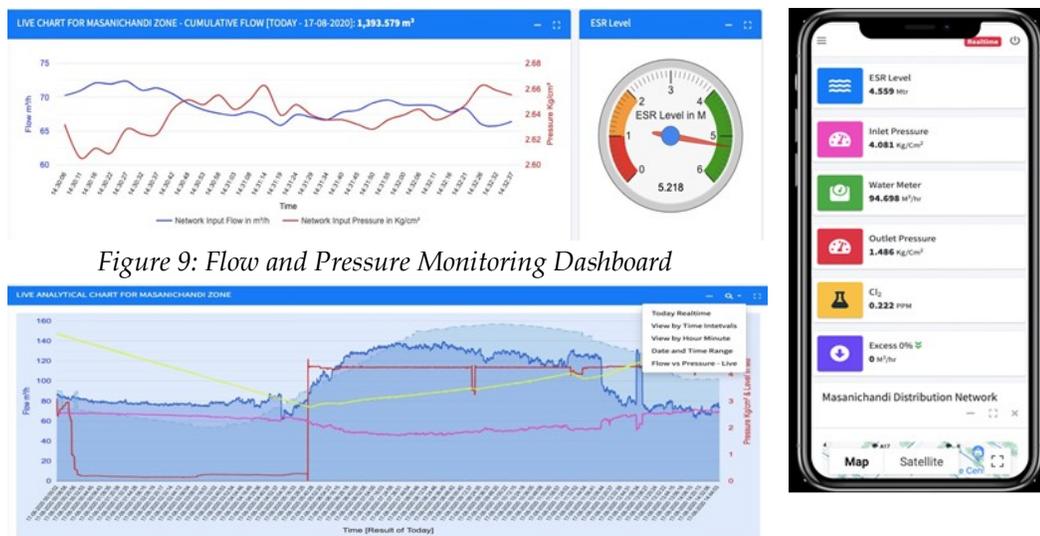


Figure 9: Flow and Pressure Monitoring Dashboard

Figure 10: Abrupt Changes in Supply & Pressure (Pipe Burst/Leakage)

10.4 Quality Assurance through Third Party Quality Monitoring Laboratories

The State Government has established one State Level and 8 Divisional Level Laboratories on PPP mode for continuous testing and monitoring of water and wastewater quality. The highlight of testing is that it is fully independent of WATCO and is carried out by independent laboratories. Following programs have been initiated-



Figure 11: Digital display board at public places

(1) 'Pure for Sure' Campaign: This IEC exercise has been started to create public confidence in public water supply system, so that people can drink from tap rather than relying on existing supply systems. Real-time online water quality data displayed in public places on LCD screens (Figure 11), in order to build confidence in users.

(2) Empanelment of Plumbers: Plumbers are being empanelled (including returning migrant workers) and are trained for installation of household connections as per pre-defined standards to avoid faulty connections and leakages.

(3) Lab on Wheels: Mobile van laboratories have been deployed (Figure 12) for on the spot quality testing for improved water quality surveillance of vital parameters and efficient incident management.



(a) Lab assistants in van



(b) Turbidity apparatus in van



(c) pH meter and DO apparatus in van

Figure 12: Lab on wheel in Puri city

(4) NRW Control Cell: Non-revenue water reduction has been the major challenge. An exclusive cell has been created with dedicated crew members for leakage reduction. With focused implementation on NRW reduction. The NRW has come down to less than 15% compared to previous 54%.

(5) Quick Response Team: Exclusive Mobile Crews (Figure 13) have been set up for immediate maintenance of the leakages and quick response to water supply related incidence management.



Figure 13: Quick response team and Lab on Wheels

11. IMPACTS AND BENEFITS

- 1) 100% household level coverage has been achieved.
- 2) The consumers have water in their taps round the clock directly coming from the public distribution network.
- 3) Absence of the need for personal storage of water (sump) which is a boon in the urban poor settlements.
- 4) Lifting the water to roof level storage tanks as well as need of installation of further treatment/filtration systems at home such as RO is eliminated.
- 5) 100% metering and volumetric billing have helped to reduce the leakages and wastages in water supplies. WATCO has replaced the house service connections (HSC) with compression fittings with saddles and household meters (mechanical meters). This cost is included in the project cost.
- 6) Hassel free execution of household water supply connections for the consumer with the service at doorstep.
- 7) Quick resolution of issues and complaints of the consumers enhanced the confidence of the public/communities in WATCO.
- 8) Use of Technology and tools helped better service delivery.
- 9) Jalsathis helped in transformation of field situation with enhanced confidence of the people in public water supply system.
- 10) Each Jalsathi's woman is earning between Rs. 10,000/- to Rs. 12,000/- per month as incentives.

12. KEY CHALLENGES AND LEARNINGS

The WATCO overcome following challenges:

- 1) Non-availability of existing infrastructure assets information (digitally) and creation of the same
- 2) Non-availability of consumer information (digitally) and creation of the same
- 3) Achieving 100% House Connections including 100% Metering
- 4) Ensuring adequate Raw & treated Water Source to achieve 24x7 supply
- 5) Data collection,real time monitoring and control
- 6) Ensuring quality of water supplied is as per IS: 10500
- 7) Turning around the lack of public confidence and distrust into highly dependable one
- 8) Substantially reducing the lag in complaint redressal
- 9) Eliminating power interruptions
- 10) Huge manpower required for meter reading, bill distribution and revenue collection was handled through highly reliable and efficient Jalsathis
- 11) Overcoming Public resistance in eliminating public stand posts, household pumping and storage
- 12) NRW rate was more than 50% which affected the sustainability of 24x7 Water Supply, which was a challenge. Activities for reduction of NRW was taken on a mission mode. House connection ferrule points were observed as the potential leaking points and almost all house connection ferrules are replaced with saddle and compression fittings. NRW equipments were procured and continuous training of staff for carrying out NRW activities were carried out. An exclusive Non-Revenue Water (NRW) Cell was established in WATCO. All these actions led to reduction of NRW to 15%
- 13) Interdepartmental coordination
- 14) Execution of works in concrete roads
- 15) Executing the works in slums

13. COMPARISON WITH PUNE, COIMBATORE AND NAGPUR

Pune, Coimbatore, and Nagpur have restricted the terminal pressure to 10 m, 7m and 2 m respectively. It means, water will not reach to third floors in Pune. In Coimbatore, water will not reach to 2nd floor and Nagpur is using sumps. These cities will continue with sumps whereas Puri WS system was designed with a pressure 14m. Comparison is made in Table 2.

Table 2: Comparison of Puri with Pune, Nagpur and Coimbatore 24x7 Projects

SN	Parameter	Puri	Pune	Nagpur	Coimbatore
1	Population (Lakhs)	2.5	40	30	15.95
2	PPP model	WATCO Govt. owned company	Concessionaire agreement	Concessionaire agreement	Concessionaire agreement
3	Name of SPV	WATCO	L&T	Nagpur Environmental Services Ltd.	Suez
4	O&M period	WATCO will continue	10	25	25
5	Project cost for 24x7 WS	Combined cost of JNNRUM + AMRUT + Sujal = Rs 224 Crores. (GoI: Rs 116 Cr; State: Rs 108 Cr)	Rs.3,000 Crores	Rs.387.86 Crores (GoI: 194.93; State: 77.57; Corporation: 116.78)	Rs.646.71 Crores
6	Base line NRW value	54% brought down to 15%	40% to 50% which Concessionaire must bring down to 20%	45% - The agency categorically confessed that they cannot reduce to even to 20% in 20 years	Base line NRW level has not been measured by Corporation/ Concessionaire. (This is big lapse in tender)
7	Minimum residual nodal pressure	14 m	10 m	2 m (This is big lapse in tender)	7 m
8	Replacement of existing pipelines	Most of the pipes have been laid new since 2015	1618 kms new pipes being added	20% (688 kms to be replaced out of 3400 kms). 20% has been adopted arbitrarily without conducting any condition assessment survey. This is a big lapse.	1744 Kms
9	Customer meters	32,017+ (471 in slum)	3.15 lakhs AMR meters 100%	376,329 water connections, and 100% consumer	150,000 new meters 100% consumer

SN	Parameter	Puri	Pune	Nagpur	Coimbatore
			consumer metering is being done	metering is being done	metering is being done
10	DMAs	19 DMAs (19 OZ)	328	68 operational zones, but no. of DMAs not known	99
11	House service connections to be added	32,017 work already done	3,15,000	321,327	150,000
12	GIS maps	GIS adopted	Not seen	GIS adopted	GIS adopted
13	Hydraulic model	Prepared	Prepared in pieces	Prepared in pieces	Prepared in pieces
14	Peak factor	2.5	2.5	Not informed	2.5
15	Customer's underground sumps	Many customers removed sumps	Almost all the houses have sumps	Almost all the houses have sumps	Almost all the houses have sumps

14. SCOPE FOR FURTHER IMPROVEMENT

- 1) Pipe network with GIS needs strengthening
- 2) Hydraulic model should be recreated with GIS and should not be in bits and pieces
- 3) STEP test shall be carried out for NRW computation
- 4) In field it was demonstrated as 14 meters with water reaching the third floor without pumping.

15. CONCLUSIONS

The concluding recommendations are as under.

- 1) 24x7 water supply project has been implemented successfully in Puri City and has been declared as World Class city. The case study may be replicated in other cities so as to have more such world class cities in the country.
- 2) Motivation from the administration, especially from the Principal Secretary is one of the important reasons of success. Therefore, administrators heading water supply departments may be proactive and lead the 24x7 water supply projects in their respective states as mandated under AMRUT 2.0 Guidelines.
- 3) The 'Drink from Tap' Mission is initiated and water received at the consumer tap could be directly used for drinking and cooking purposes without any further need for filtration/boiling/treatment. The water quality has been maintained as per BIS standards (IS:10500) in Puri city. NRW has been reduced from 54% to 15% which clearly demonstrates that the water required in 24x7 water supply is less than that of intermittent supply systems.
- 4) A multi-pronged, people-centric approach with conversion of intermittent water supply to continuous (24x7) water supply, 100% household coverage with piped water

supply and metering, focus on the urban poor, NRW reduction, innovative, state-of-the-art technology & management techniques, third-party quality monitoring and quality assurance was key to success of the program.

- 5) Community partnership in water supply management through women SHGs (Jalasathis) have bridged the gap between the communities and WATCO.
- 6) GIS Mapping of Assets and Consumers etc. are some of the key components of this program.
- 7) Building institutions like WATCO under the Companies Act helped achieve the desired goal.
- 8) All Class I & II Cities are required to plan and design the water distribution network with the recommended terminal pressure of 17m as prescribed in the water supply manual so that water will reach up to 3rd floor which will result in gradual delinking of ground level sumps by the households as these sumps are sources of contamination. For residential or commercial building having more than three storeys, sumps may be permitted with frequent cleaning of sumps. Small towns (population up to 50,000) having two storeyed buildings predominantly may adopt 12m as residual head during planning and design of water distribution network.
- 9) Cities should mandatorily replace the house service connections (HSC) with compressor fittings and household meters (mechanical meters). This cost may be included in the project cost.
- 10) Cities should start community led water supply management by partnering with Self Help Groups (SHG)s, called as "Jalsathi" The 'Jalsathis' shall act as bridge between customers and ULB. Their partnership is based on incentives for women of SHGs.
- 11) Availability of quality water round the clock (24x7) in each house, elimination of household storage, pumping and treatment, hassle-free house connections, water conservation through metering, reduction in NRW and cost of production, quick resolution of issues/complaints, and above all end-to-end services delivered at the doorsteps have enhanced the confidence of the public/communities in administration as well as WATCO.
- 12) In Puri, the per capita cost for providing 24x7 continuous water supply is around Rs.8960 by considering the project cost incurred for creating infrastructure which was funded under JNNURM & AMRUT. The cost also includes the per capita cost for formation of DMAs, flow control valves, bulk flow meters, pressure reducing valves and replacement of house service connections (HSC) with water meters (mechanical meters), i.e., around Rs. 1840. Therefore, 24x7 continuous water supply system can be implemented in all Class-I cities where infrastructure has already been created under JNNURM & AMRUT.

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