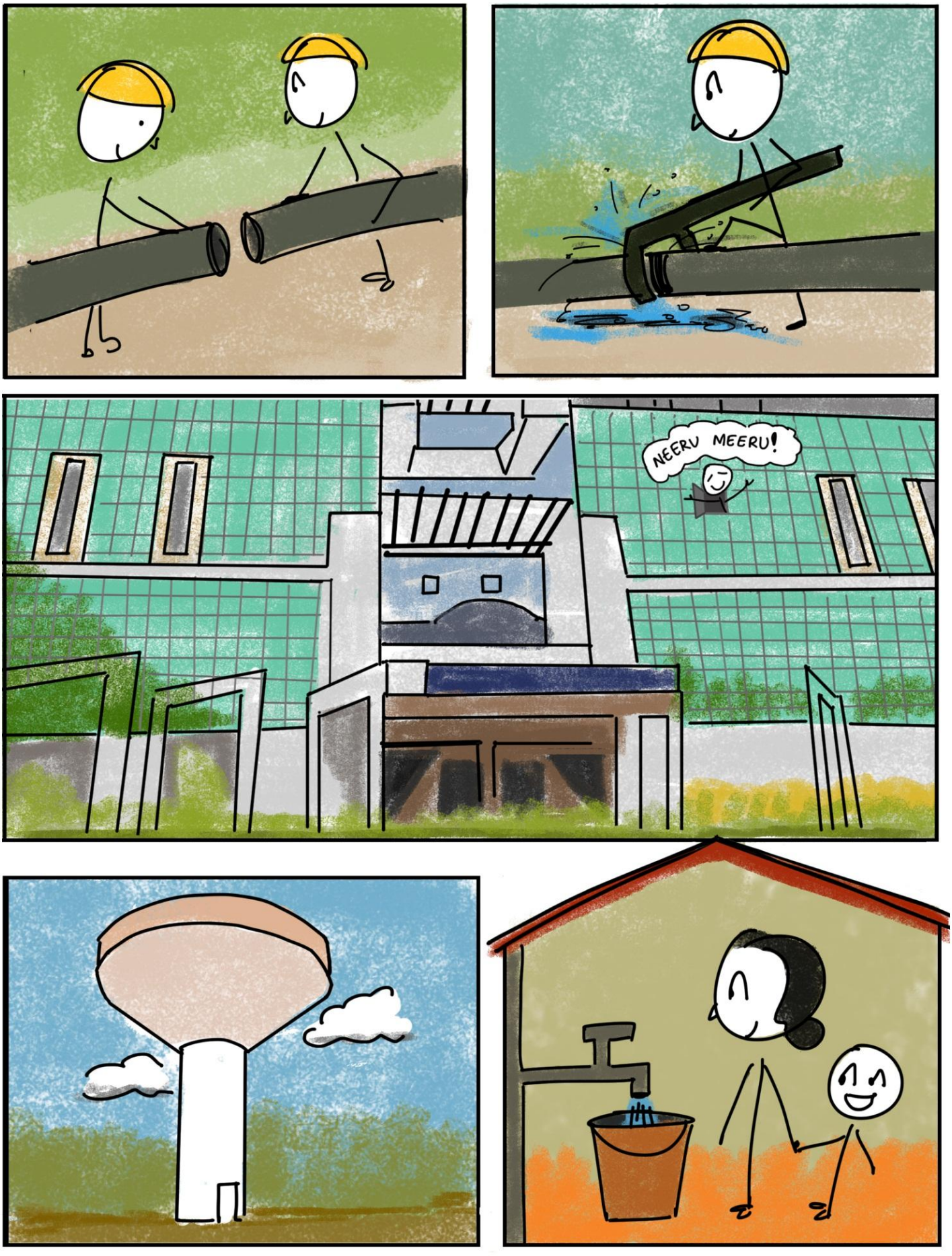
# Urban Water Supply & Sewerage Management in Andhra Pradesh

## A Guidebook for Urban Local Bodies

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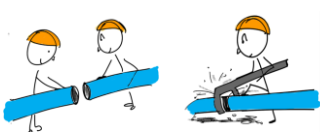
# Contents







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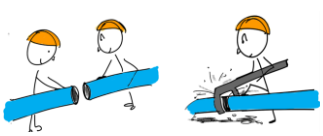



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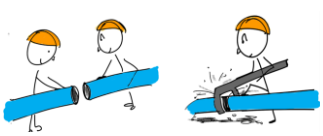
# List of Exhibits







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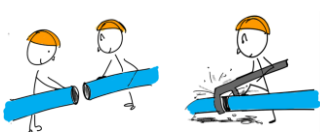
# List of Boxes







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## Foreword

The 74th Constitutional Amendment in 1992 has mandated the devolution of select rights and responsibilities to Urban Local Bodies (ULBs) – the third tier of governance. A number of schemes and initiatives, by both state and central governments, have been launched since then to fulfill the objective of creating empowered and financially sustainable ULBs. The Jawaharlal Nehru Urban Renewal Mission, (JNNURM) is an initiative introduced by the Ministry of Urban Development, in 2005, to strengthen urban service delivery in towns and cities. With an outlay of Rs. 66,000 crore spread over a 7 year period, it remains a far-reaching initiative undertaken by the government to empower ULBs.

Despite this increased emphasis on empowering ULBs to deliver efficient, sustainable and affordable urban services, the status of urban infrastructure and service delivery in Indian cities remains far from satisfactory. Government of India statistics reveal that water supply is grossly inadequate with only 64% of the urban population being covered by individual water supply connections. The duration of water supply is observed to range from 1 to 6 hours for a majority of the households. Due to inefficiencies in distribution, 50% of water production is non revenue water. This poses a serious threat to the financial viability of water utilities. The level of water recycling and reuse is extremely low; only 21% of the waste water generated is treated and over 94% of the cities/towns in India do not have even a partial sewerage network. With respect to solid waste, while waste collection coverage ranges from 70% to 90% in major metropolitan cities, less than 30% of the waste is segregated and scientific disposal is almost never practiced.

The High Powered Expert Committee on Indian Urban Infrastructure and Services identifies the lack of capacity among ULBs to design, implement and govern projects as being a critical contributor to the persistence in the infrastructure and service delivery gaps.

This recognition has created a renewed focus, among governments and within policy circles, on the need for targeted capacity building interventions at the ULB level. Several initiatives such as the creation of regional capacity building hubs and promotion of centres of excellence/innovation in urban policy are being designed and implemented by state and central governments alike to empower ULBS to respond to the rising demands of urban infrastructure creation and service delivery.

This guidebook seeks to contribute to the ongoing process of building capacities among ULBs and provides a set of simple tools and guidelines to enable ULBs to fulfil their functions more effectively. It seeks to provide municipal representatives, specifically the commissioners, with a set of actionable strategies to improve service delivery and enhance participatory decision making.

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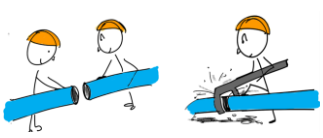
President, Athena Infonomics



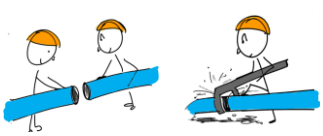
# Preface

This guidebook is the outcome of an ongoing engagement with the British High Commission that seeks to explore the potential of Public Private Partnerships to fulfil the investment and innovation gaps in the delivery of critical urban services and empower urban local bodies to deliver their responsibilities more effectively. A number of surveys and workshops were held across the country as a part of the engagement to understand existing gaps in urban service delivery and identify suitable policy responses.

The insights generated from the primary surveys, stakeholder interviews and secondary research have been consolidated and presented here in the form of a set of tools and processes to enable municipal representatives to make effective decisions on different aspects of urban service delivery starting from estimating demand to identifying the mode of procurement, managing stakeholder expectations, engaging community representatives and monitoring project outcomes.

These tools and processes have been customized for four project states namely Karnataka, Andhra Pradesh, Madhya Pradesh and Tamil Nadu, with a focus on urban water supply in the first two and municipal solid waste management in the other two states.

This guidebook focuses on informing and empowering ULBs in the state of Andhra Pradesh to improve the effectiveness of service delivery in the urban water supply and sewerage sector. The information presented here was developed over a period of six months and in two phases. In the first, a number of interviews and discussions were held with senior state government representatives, ULB functionaries, citizen groups, private concessionaires and academics on challenges and concerns in urban water supply within the state. The information generated from this process was analysed, key areas of concern in the state were identified and a set of policy and operational responses were developed in the form of a set of guidelines. These guidelines were presented to diverse stakeholder groups, at a workshop in Hyderabad in the second stage and were further deliberated upon. The rich discussions and suggestions emanating from the workshops were then incorporated into the final framework, which is presented here.



## Acknowledgements

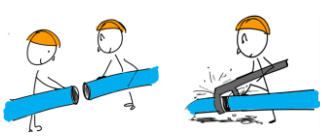
This guidebook would not have been possible without the cooperation of experts and practitioners in the Urban Water Supply and Sewerage Sector of India. Their willingness to share their experiences has helped us ground this book in practical insights.

In particular we would like to thank Sri Maheedhar Reddy, Honorable Minister, Municipal Administration & Urban Development Department, Government of Andhra Pradesh for delivering the key note at the Capacity Building Workshop titled 'Strengthening Participatory Approaches in Urban Water Supply & Sewerage in Andhra Pradesh', held in Hyderabad on 8th February, 2013. We thank Sri Busi Sam Bob, Principal Secretary, Ministry of Administration & Urban Development Department, Government of Andhra Pradesh for all the warm support extended to us in organizing and delivering the workshop. We are also grateful to Dr. Janardhan Reddy, Commissioner, Commissionerate and Directorate of Municipal Administration, and Mr. S.A. Abdul Khadar Saheb, Joint Director, O/o the Director of Municipal Administration, Government of Andhra Pradesh for attending the workshop and providing key inputs on the guidebook.

We are also grateful to Mr. Shalem Raju, PPP Expert (Asian Development Bank), and all the municipal commissioners and engineers for attending the workshop and providing their insights and feedback on the structure and content of the guidebook

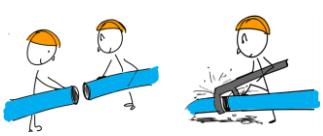
We owe a special thanks to our advisor Dr. Ashwin Mahalingam, Professor, IIT Madras for having guided us in developing the idea. We are also grateful to Dr. S Narayan, our President and Mentor, Ms. Revathy Ashok, CEO and Founder, Iris Consulting and Mr. S. Parthasarathy, Former Director, ICRISAT for their constant advice and support throughout the assignment and in making this Guide Book possible.

We would also like to extend a special thanks to the British High Commission for their support for carrying out this study. In particular we thank Ms. Aarti Kapoor, Programme Manager, BHC, New Delhi for her continuous encouragement and support during the project.



## List of Abbreviations

| | |
|---|---|
| APMDP | Andhra Pradesh Municipal Development Project |
| APUFIDCo | Andhra Pradesh Urban Finance and Infrastructure Development Corporation |
| BOT – Annuity | Build – Operate – Transfer Annuity |
| BOT – Toll | Build – Operate – Transfer Toll |
| BPL | Below Poverty Line |
| CapEx | Capital Expenditure |
| CBO | Civil Body Organisation |
| CPHEEO | Central Public Health & Environmental Engineering Organisation |
| DBFOT | Design – Build – Finance – Operate – Transfer |
| EPC Contract | Engineering Procurement Construction Contract |
| ESR | Elevated Service Reservoir |
| FGD | Focused Group Discussions |
| GIS | Geographical Information System |
| GoTN | Government of Tamil Nadu |
| HMWSSB | Hyderabad Metropolitan Water Supply and Sewerage Board |
| IBT | Increasing Block Tariff |
| I&CAD | Irrigation & CAD Department |
| IEC | Information Education Communication |
| IUWM | Integrated Urban Water Management |
| KLD | Kilo Litres per Day |
| LMC | Latur Municipal Corporation |
| lpcd | Litres per Capita per Day |
| MIS | Management Information System |
| MJP | Maharashtra Jeevan Pradhikaran |
| MLD | Million Litres per Day |
| MNP | Malkapur Nagar Panchayat |
| MoUD | Ministry of Urban Development |
| NGOs | Non - Government Organizations |
| NRW | Non Revenue Water |
| O&M | Operations & Management/ Maintenance |



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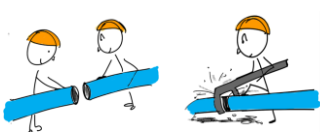
| OpEx | Operations Expenditure |
| PCMC | Pimpri – Chinchwad Municipal Corporation |
| PPP | Public Private Partnership |
| PSU | Public Sector Undertaking |
| RWA | Residential Welfare Association |
| SCADA | Supervisory Control and Data Acquisition |
| SICS | Social Intermediation and Communications Strategy |
| SLB | Service Level Benchmark |
| SPV | Special Purpose Vehicle |
| STP | Sewage Treatment Plant |
| ToR | Terms of Reference |
| TMC | Town Municipal Council |
| TNUDF | Tamil Nadu Urban Development Fund |
| TSTP | Tertiary Sewage Treatment Plant |
| TUFIDCO | Tamil Nadu Urban Finance & Infrastructure Development Corporation |
| UFW | Unaccounted for Water Losses |
| ULB | Urban Local Bodies |
| WtP | Willingness to Pay |



## Glossary

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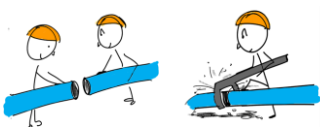
| Accountability | The obligation of an agency to account for its activities, accept responsibility and disclose results in a transparent manner. As for this guidebook, it refers to the water utility being answerable to the citizens and other stakeholders involved in the project, for its own actions |
| Annual Maintenance Contracts | An agreement between two or more agencies outlining the terms and conditions of quality control and functioning of the infrastructure assets |
| Billed Authorised Consumption | Amount of water that is consumed and accounted for and is also billed |
| Biological Oxidation | Process in which domestic and industrial sewage consisting of biochemical decomposition is purified by emulsifying micro-organisms such as bacteria that feed on them to discharge energy |
| BOT Annuity | Build - Operate - Transfer - Annuity<br>A type of a public private partnership model in which the private player builds and operates the infrastructure assets as agreed upon and mentioned in concession agreement. The private player also finances a minimal amount of the project cost. In return to the services provided, the contracting authority pays an annual lump sum amount. These cash flows determine the number of years required for the private player to recover its investments. Upon completion of the project, the assets are transferred to the contracting agency. |
| BOT Toll | Build - Operate - Transfer - Toll<br>A type of a public private partnership in which the roles of the private player and contracting agency are the same as that of BOT Annuity. The difference between the two models is that the private player recovers its investment via generating revenue from user charges collected. These user charges are regulated over the time period of the project by a regulating body. |
| Bulk Water Connection | A water connection at the level of transmission, distribution or others which is not at the end user/ consumption level |
| Revenue Collection Efficiency | Current annual revenue collected, expressed as a percent of the potential operational revenue |
| Commercial Establishments | Non - residential consumers/ customers such as hotels, schools, hospitals, etc |
| Commercial Losses | Amount of water that is consumed but is not accounted for due to poor audits, illegal consumption, etc |
| Comparative Advantage | Ability of the agency/ body to produce a set of outcomes at a lower marginal or opportunity costs than the other |
| Continuity of Water Supply | Average number of hours of pressurised water supply per day. It excludes the hours of water supply where the pressure is below the minimum requirements. |



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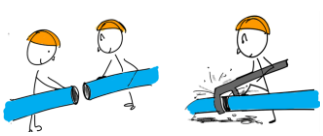
| Contract | An agreement in which two or more parties voluntarily enter into a legal obligation with certain terms and conditions mentioned in it |
| Conventional Sewerage | An underground sewerage system, where waste water is collected at the source of generation via sewage connections, is further transported to a treatment facility where in after treatment, the re-cycled water is transmitted to the respective consumers for further re-use |
| Cost Recovery | Annual operations revenue collected as a percent of total annual operations expenditure |
| Coverage of Water Supply | Households with individual tap connections as a percent of total households in the city. The emphasis here is on the tap connection and not other sources of water such as tube wells, hand pumps, public stand posts, etc. |
| Coverage of Sewage Generation | Number of individual properties with a sewerage connection as a percent of total individual properties in the city |
| Cross - subsidisation | Differentiated tariff structure in which one type of consumer subsidises the tariff paid by the other through a higher tariff payment |
| Customer Connection | A water connection in the form of tap connection provided on an individual/ group basis to customers of all types, including residents and non - residents |
| Customer Service Centre | A customer service unit within the water utility that is responsible for managing relations with all the customers for water supply and sewerage facilities. It receives complaints and applications for services from the customers via a certain media, such as online forms, telephonic registrations, kiosks, etc. and ensures that reliable services are provided. |
| DBFOT | Design - Build - Finance - Operate - Transfer<br>A type of public private partnership model similar to a BOT. The private player is allocated an additional risk of design. |
| District Metered Areas | Discrete area of a distribution system usually created by the closure of valves or complete disconnection of pipe work in which the quantity of water entering and leaving the area is metered |
| Energy Audit | An activity performed to understand the consumption of energy in a given time period and assess energy saving opportunities so as to reduce costs |
| EPC Contract | Engineering - Procurement - Construction Contract<br>A type of public procurement in which the public sector contracts out the construction works to a private engineering firm and pays a fee upon completion |
| Extent of Metering | Total number of functional meters as a percent of total meters in the water supply system. These meters include the ones installed at the bulk and customer level irrespective of the type of connection |
| FGD | Focus Group Discussion<br>An activity that gathers together a group of people from similar backgrounds or experiences to discuss a specific topic of interest. It is guided by a moderator |



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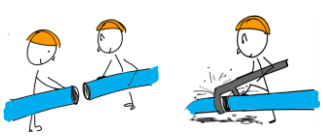
| Flat Tariff/ Uniform Tariff | A type of tariff which is a single fixed fee charged to all users/ beneficiaries in return for a service provision |
| GIS | Geographical Information System<br>A system designed to collect and capture information of all geographical locations. It provides details of the location of infrastructure assets and properties and also helps in spatial designing of construction works. |
| Grit Removal | A process in which inorganic material such as sand and gravel is removed |
| Hydraulic Modelling | A computer program/ software that regulates flow of water and sewage |
| IEC | Information - Education - Communication<br>Strategies or tools used by an agency to interact with the community to inform, create awareness and educate them about the project |
| Illegal Connections | Customer connections in the water supply system through which water is consumed without the knowledge and approval of the water utility |
| Implementing Agency | An agency that is implementing a project. Examples include state water board, urban local body that may either self - implement the project or contract it to another party. |
| Management Contract | An agreement between two parties, (in this case, between the implementing agency and the private player) where the government is responsible for policy regulation and monitoring and the private operator is mandated to operate and manage the water works to provide services as agreed upon and mentioned in the contract |
| Marginal Cost of Water | Incremental production cost of per unit of water |
| NRW | Non - Revenue Water<br>Total amount of water produced and distributed for consumption purposes that does not generate any revenue to the water utility. It is measured as the difference between the total volume of water entering the system after treatment and the amount of water for which revenue was collected |
| On - site Decentralized Sewage Treatment | A sewerage system in which sewage is collected and treated at the source of generation. The operations and management of the system is heralded with the local citizens or a private contractor. The treated sewage is then reused by the same citizens for gardening, flushing toilets, car – washing, etc. |
| OpEx | Operations Expenditure<br>Total annual cost incurred by the water utility for operating and maintaining the water supply and/or sewerage works. These include salaries to staff, costs incurred on power, chemicals, repairing leakages, etc. |
| Participatory Urban Appraisal | Appraisal of urban projects through participatory approaches, i.e. upon consultations with the community |
| lpcd | Litres per capita per day supply of water<br>Ratio of total water supplied at the consumer end and the total population served |



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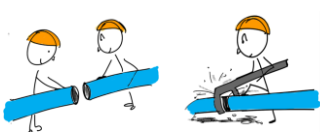
| Performance based Management Contract | A Management Contract where payments to the private operator are linked to achievements, with (not always) an application of penalties and bonuses |
| Physical Losses | Loss of water due to leakages or bursts in transmission and distribution mains, pipelines, reservoirs, water tanks |
| PPP | Public Private Partnership<br>Government of India defines Public Private Partnership as '*An arrangement between a government / statutory entity / government owned entity on one side and a private sector entity on the other, for the provision of public assets and/or public services, through investments being made and/or management being undertaken by the private sector entity, for a specified period of time, where there is well defined allocation of risk between the private sector and the public entity and the private entity receives performance linked payments that conform (or are benchmarked) to specified and pre-determined performance standards, measurable by the public entity or its representative*[i]' |
| Procurement | Process of acquisition of assets and services by an agency |
| Public Procurement | Process in which the acquisition of goods and services remains with the public sector/ government |
| Quality of Sewage Treatment | Percent of sewage samples that meet or exceed the specified waste water treatment standards, as defined by the CPHEEO. |
| Quality of Water | Percent of water samples that meet or exceed the specified potable water standards, as defined by the CPHEEO. The samples include those drawn at both points – after treatment and at the consumer end. |
| Raw Sewage | Fresh sewage at the source of generation |
| Redressal of Customer Complaints | Total number of water supply and/or sewerage related complaints that are redressed within 24 hours of receipt of complaint, as a percentage of total number of complaints received in the given time period |
| Respondent | Individual interviewed by the surveyor |
| Reuse & Recycling | Process of treating/ recycling sewage to the extent possible for reusing it for industrial purposes, gardening, flushing toilets, etc. |
| Revenue Water | Amount of water for which revenue is generated |
| Risk Allocation | Process of allocating roles and responsibilities to the stakeholders of the project, each bearing a minimal amount of risk |
| SCADA | Supervisory Control and Data Acquisition<br>Computer controlled system that collects and monitors data on the services of the water supply and sewerage system |
| Screening | Process of removal of large solid objects from the sewage using a screening bar |
| Secondary Sedimentation | Filtration of solids in the sewage after biological oxidation and before the liquid is discharged for tertiary treatment |
| Sewage Collection | Measured as the quantum of sewage collected by the sewerage system as a |



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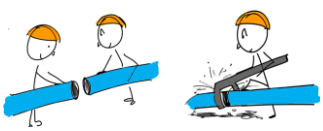
| Efficiency | percent of the total sewage generated in the city |
| Sewage Treatment Adequacy | Measured as the capacity of the STPs to treat sewage as a percent of total sewage collected |
| Skilled Moderator | An individual within the implementing agency or the local partner with a certain set of skills such as communicative skills, knowledge of the sector, etc and is responsible for moderating the FGDs |
| SPV | Special Purpose Vehicle<br>A subsidiary company with an asset/liability structure and legal status that makes its obligations secure even if the parent company goes bankrupt |
| Sustainable Livelihoods Approach | An approach that addresses and identifies the complexities of poverty, the inter linkages in the factors affecting it and creates action plans to overcome it |
| System Input Volume of Water | Amount of water entering into the water supply system after treatment |
| Technical Proposal | A proposal consisting of the details of project scope, approach and methodology to meet its objectives and the work plan for performing the activities |
| Tertiary Treatment | An advanced level of treatment that can decrease the level of suspended solids and biological oxygen demand to approximately one percent of what was present in the raw sewage prior to primary treatment |
| Transect Walks | A transect walk is a systematic walk along a defined path (transect) across the community/project area together with the local people to explore the water and sanitation conditions by observing, asking, listening and looking |
| UFW | Unaccounted for Water Losses<br>Sum of physical and commercial losses of water |
| Unbilled Authorised Consumption | Amount of water that is consumed and accounted for but is not billed |
| Variable Charges | A type of a tariff which is not uniform or fixed for all users, but is based on consumption of the services and/or type of customer |
| Volume-cost Analysis | A simultaneous analysis of components of non - revenue water in terms of volume of water and its cost of production, treatment and distribution |
| Volumetric Tariffs | A linear tariff structure where in the user fees increase on a per unit consumption of service |
| Water Audit | A qualitative and quantitative analysis of water consumption to identify ways of reducing usage, reusing and recycling water |
| Water Utility | Agencies responsible for providing water and sewerage services. These may include state water boards, ULBs, private operators, etc. |
| Work Plan | A plan that details the list of activities to be performed, provides timelines for the same and allocates responsibilities along with the estimated man days |



## About the Guidebook

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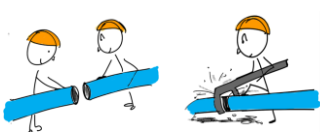
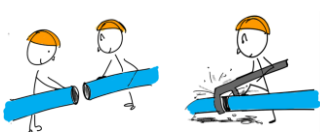
| Objectives | This guidebook has been created with the objective to:<br>▪ Provide Urban Local Bodies (ULBs) with a set of tools and guidelines to effectively identify, implement and execute projects in urban water supply and sewerage<br>▪ Strengthen participatory approaches by engaging citizen representatives at different stages of project implementation and governance<br>▪ Acquaint ULBs with a few best practices in the delivery of water supply and sewerage services |
| Target Audience | The guidebook is designed to serve as a reference manual to ULB representatives (commissioners, executive engineers, planners) responsible for implementing urban water supply and sewerage projects in Andhra Pradesh. |
| Structure | The structure of the guidebook follows the value chain associated with identifying and executing projects in the urban water supply and sewerage sector namely:<br>▪ Project Identification<br>▪ Project Procurement<br>▪ Project Monitoring<br><br>Only functions that are of relevance to ULBs at these stages have been covered in this guidebook. |



**Section:**
**I Overview of UWSS in Andhra Pradesh**

**Issues in Urban Water Supply & Sewerage**

**Responses to Issues in Urban Water Supply & Sewerage**

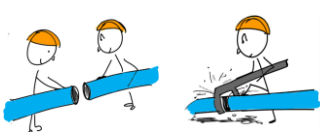


## I.1 Urban Water Supply & Sewerage in Andhra Pradesh: Issues

With the 43% of the state expected to be urban in 2020, Andhra Pradesh is among the most rapidly urbanizing states in the country. The rise in the number of urban conglomerates in the state has placed enormous pressure on the delivery of critical urban services such as water supply and sanitation. As per Public Health & Municipal Engineering Department (PHMED) statistics, the gap in the current water supply in the state is 298 Million Liters per Day (MLD), with only 83 of the 214 ULBs receiving water on a daily basis.

In addition to this, certain other areas of concern highlighted in the course of the primary surveys include:

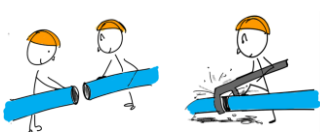
- Lack of an Integrated Urban Water Management (IUWM) approach for conservation of ground water resources and urban lakes
- High dependence on the norm of 135 litres per capita per day (lpcd) of water requirement, which leads to over – estimation of demand for water
- Inadequate capability among ULBs to assess various components of Non-Revenue Water (NRW)
- Absence of clear criteria for differentiating between consumers resulting in poor metering and implementation of tariffs
- Low willingness to charge, for fear of political backlash, hence resulting in low cost recovery and inadequate emphasis on operations and maintenance
- Poor co–ordination between PHMED & the ULBs in identifying projects for sourcing and treatment of water



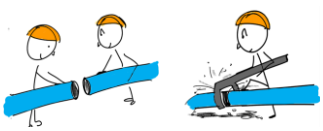
## I.2 Responses to Issues in UWSS in Andhra Pradesh

In order to address the rising challenges associated with delivering efficient yet affordable services in sectors like water supply and sewerage, the state is seen to have developed innovative models, schemes and policy frameworks. Some of the key responses, at the state level in the last decade, for improving urban water supply and sewerage services in Andhra Pradesh have been described below:

| | |
|---|---|
| Policy Frameworks | The Irrigation & CAD (I&CAD) Department of Government of Andhra Pradesh developed the 'Andhra Pradesh State Water Policy' in 2008 with a focus on key areas of water management such as creation of an enabling environment and integration of management techniques with data systems and communication mechanisms. Some of the key features pertaining to urban water supply and sewerage management, as outlined in the policy, include:<br>✓ Prioritising 24*7 safe adequate and affordable drinking and industrial water supply to meet the growing needs in urban areas.<br>✓ Creating modern knowledge databases and benchmarking and auditing systems for increased information flow from relevant agencies to the general public.<br>✓ Increased productivity of water supply by fixing standards of infrastructure, services and utilization efficiency.<br>Appropriate measures to ensure effective, timely and cost – effective delivery of water related services including drinking water, industrial, irrigation, hydro – power and community services |
| Financing Mechanisms | Andhra Pradesh Municipal Development Project (APMDP) is a World Bank assisted scheme initiated in 2009 for select ULBs in the state to reform the urban sector and build capacities amongst the local bodies, with a special focus on water supply, sewerage, storm water drainage and waste management. In the first phase which started in 2011, comprehensive water supply works are being implemented in 13 ULBs. |



| | |
|---|---|
| Schemes | 'Last Mile Connectivity for the Urban Poor' is a scheme initiated and implemented by the Andhra Pradesh Urban Finance & Infrastructure Development Corporation Limited (APUFIDCo) to provide individual tap connections to households who are Below Poverty Line (BPL). With the implementation of various Central Schemes such as JNNURM and the APMDP by World Bank, the water supply network has increased over the decade, thereby increasing the number of household level connections. However, ULBs are unable to mobilise upfront investments. The Last Mile Connectivity Scheme is designed to help ULB overcome this 'last mile' gap in investments. The one time individual household connection charge which approximately costs Rs. 2,000 will be provided to the BPL families at Rs. 200 to be paid in two monthly installments. The amount is cross subsidised via a loan given by APUFIDCo to the ULBs repayable at an interest rate of 7.5%. In case the ULB is unable to generate enough revenue from water tariffs to repay the loan, then the loan is converted into a grant upon approval from the O/o Commissioner & Director of Municipal Administration (CDMA) |
| Guidelines | The Public Health & Municipal Engineering Department (PHMED), Government of Andhra Pradesh has formulated a model Terms of Reference (ToR) for provision of consultancy services to prepare Detailed Project Reports in water supply. This Model ToR can be used by the ULBs as well as the department to issue tenders for hiring private consultants to prepare DPRs. |
| Innovative Models | The Visakhapatnam Industrial Water Supply implemented in 2004 sought to rehabilitate the existing pipeline, expand the distribution network and supply a total of approximately 500 MLD of water to Visakhapatnam Steel Plant, Simhadri Power Plant and the City Municipal Corporation. The total project cost was Rs. 432 Cr, of which 11% was equity and the rest was debt. The project was developed on a Build – Operate – Own - Transfer basis for a concession period of 32 years. The concessionaire was to collect user charges of Rs. 7 per KL (with a 4% price escalation p.a.). However, due to reduction in the industrial water consumption; the project was terminated.<br><br>A recent initiative has been the Visakhapatnam Sewage Treatment Recycle and Reuse Project on a DBFOT basis. In this, the municipal corporation will supply secondary treated sewage to the concessionaire for a given tariff. The concessionaire is expected to conduct tertiary treatment of sewage and supply it to the industries. The ULB has selected the private concessionaire and the treatment plant is currently under construction. |



While these initiatives and policies have helped create a useful framework within which improvements in water supply and sewerage service may be delivered, the absence of adequate capacities among municipal authorities is a key inhibiting factor preventing the state from fully reaping the benefits emanating from them. In order to support ULBs overcome this critical gap, this Guide Book seeks to lay down a set of guidelines at every stage of the value chain, i.e., from conceiving a water supply/sewerage project to its implementation and post-award governance. These guidelines are designed keeping in mind the needs of urban local bodies and is targeted at empowering ULB representatives involved in operating and maintaining water supply and sewerage projects. The key segments covered in the Guidebook are presented in Exhibit 1.

**Exhibit 1: List of Focus Areas in the Guidebook**

**1 Project Identification**

- Current demand for water supply and sewerage services
- Assessment of infrastructure (Non Revenue Water) and service delivery
- Strategies for reduction of non revenue water
- Methods for cost recovery
- Assessment of Willingness to Pay
- Technological options for sewage treatment
- Selection of operational model (Centralised and Decentralised)

**2 Project Procurement**

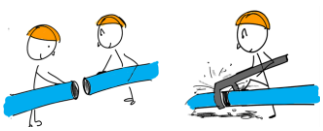
- Types of procurement modes: features and limitations
- Selection of the procurement mode

**3 Project Monitoring**

- Formation of project monitoring committee
- Formation of customer service forum
- Identifying measurable targets
- Creating monitoring mechanisms

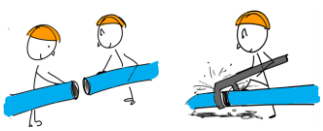
**4 Community Involvement**

- Degrees of community involvement
- Participatory decision making process
- Community – managed projects
- Community – led monitoring

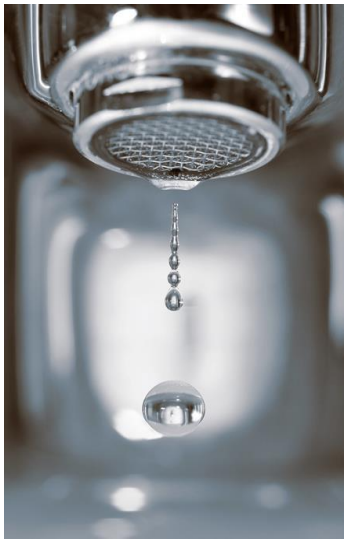


**Section: II Project Identification**

- Assessment of Demand for Water Supply
- Non Revenue Water
- Cost Recovery
- Assessment of Sewage Generation
- Extent of Sewage Treatment
- Choice of Technology
- Operational Model



## II.1 Assessment of Demand for Water Supply



This section outlines the various approaches of estimating water demand and briefly describes the advantage and limitations of each approach. However, irrespective of the method that one may choose, the following key factors that must be considered before estimating demand include:

- Number and size of households
- Income distribution
- Quantity of current water consumption
- Various household requirements of water and their respective quantities
- Current resources of water and the existing deficit (if any)
- Cost of water supply

### II.1.1 Conventional Method

**When to Apply**

- Quick estimate of demand for water
- Existence of bulk metering

**Methodology**

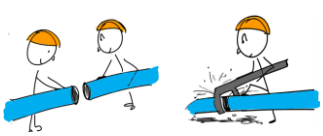
| Steps | Description |
|---|---|
| **One** | Calculate the size of the population |
| **Two** | Use the norms of water demand as given by MoUD or CPHEEO |
| **Three** | Calculate total demand as follows:<br>Total Demand for Water = Population Size × 135 lpcd |
| **Four** | Calculate amount of water produced, through water audits at the stage of sourcing and production |
| **Five** | Using steps 3 and 4**,** calculate Incremental Water Required<br>= Water Supplied – Water Demanded |

A similar incremental water requirement, can be calculated as per size of households

| Steps | Description |
|---|---|
| One | Estimate average size of households |
| Two | Total Demand for Water per Household = Total Demand |

**Limitations**

- The water supply norm may not be the **'actual'** amount of water that is demanded/ consumed (the water demanded by the households and commercial estates may vary from city to city)





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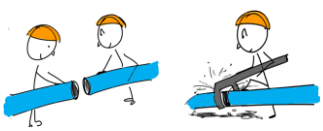
| | |
|---|---|
| | ▪ Doesn't allow customers to provide their preferences about the quantity of water required<br>▪ The deficit calculated through water audit at the stage of sourcing may not be the actual water supplied (due to NRW) |

## II.1.2 Stated Preference Survey[ii]

| | |
|---|---|
| When to Apply | ▪ Estimate the demand for water for different purposes and accommodate the preferences of households/ commercial establishments<br>▪ Obtain answers to the following questions:<br>  ▪ What are the sources of water? (piped, bore well, hand pump, public stand post)<br>  ▪ How much water is consumed from each source?<br>  ▪ What is the quality of water?<br>  ▪ What is the water drawn from each source used for? (e.g., drinking, cooking, laundry) |
| Methodology | |

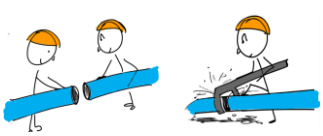
| Steps | Description |
|---|---|
| **One** | Create a questionnaire for the stated preference survey |
| **Two** | Engage with local NGOs, schools and colleges to gather volunteers to carry out the survey |
| **Three** | Test the survey in selected wards or households |
| **Four** | Modify the questionnaire (if required) |
| **Five** | Use the modified questionnaire to conduct surveys in the rest of the city |
| **Six** | Collect and analyse data |
| **Seven** | Calculate the actual demand for water |
| **Eight** | Calculate actual incremental water required using estimates from step 7 and total water sourced |

| | |
|---|---|
| Limitations | ▪ Poorly designed and administered surveys may produce misleading results<br>▪ Policy decisions taken at the state/ national level may pay little or no attention to the results produced by the survey<br>▪ Process is deemed to be fairly complex and is usually carried out by an external agency |



## II.1.3 Revealed Preference Approach[iii]

| | |
|---|---|
| When to Apply | ▪ Estimate demand for water based on the changes in consumption as influenced by various factors such as increase in tariffs, reduction in water supplied, etc.<br>▪ To accurately monitor water supply using hydraulic modeling or similar advanced technology<br>▪ Requires high extent of metering for conducting water audits at the consumption level |
| Methodology | The economic behavior of the consumers is analysed using water audits and data on consumption patterns to arrive at the actual demand for water supply. Some of the data that may be collected and empirically tested under this framework include:<br>▪ Change in the quantity of water consumed by households due to changes in prices (elasticity)<br>▪ Reduction in water consumption by industries due to technological improvements<br>▪ Increase in the number of commercial establishments (hotels, malls)<br>▪ Number of consumers more reliant on bottled water for drinking |
| Limitations | ▪ Does not accommodate community preferences<br>▪ Does not accommodate factors that may affect future demand |



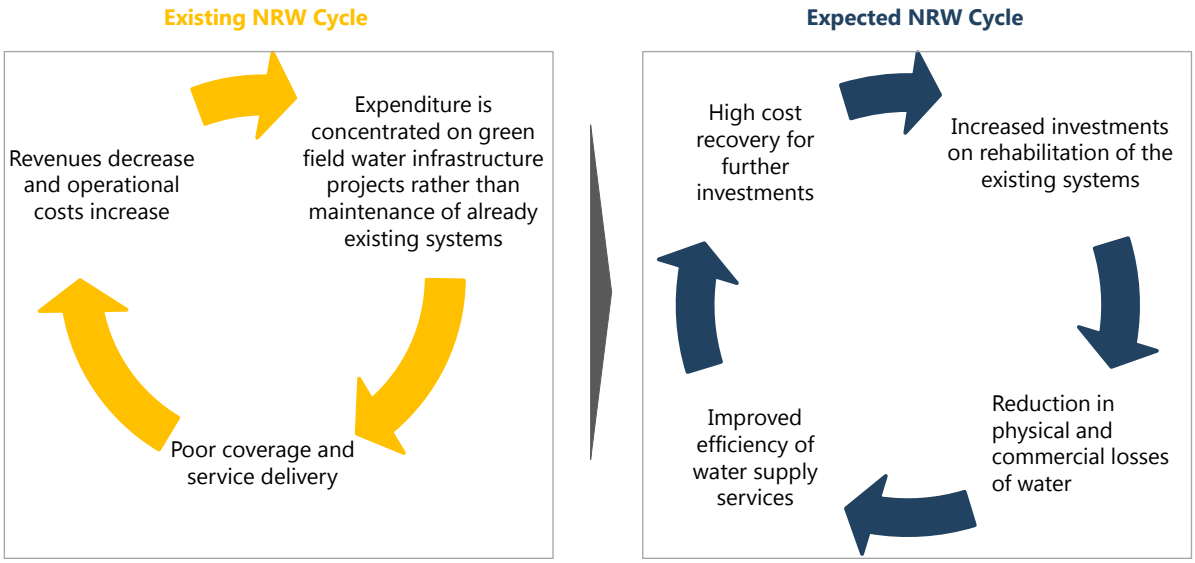
## II.2 Non Revenue Water

| Questions to be Addressed | |
|---|---|
| | ▪ **Why** should the issue of NRW be addressed?<br>▪ **What** is Non Revenue Water?<br>▪ **How** to assess Non Revenue Water?<br>▪ **How** to reduce NRW? **How** to maintain these strategies? |

The large amount of NRW causes a vicious cycle of low investments in operations and maintenance, poor coverage and services and hence, low returns/cost recovery. Exhibit 2 depicts the NRW management trap on the left while the virtual or the required flow of NRW management is illustrated on the right.

In order to attain the latter, we first begin with the components of NRW and then identify the strategies to reduce and optimise it.

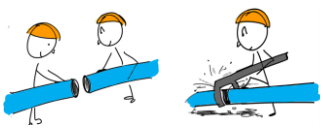
**Exhibit 2: Non Revenue Water Existing and Expected Cycles**




## II.2.1Non – Revenue Water: Definition & Components

Non Revenue Water is the difference between the total amount of water transmitted after treatment for consumption purposes (system input volume) and the amount of water on which costs are recovered (revenue earned from billed authorised consumption). It is arrived at by subtracting revenue water from the total water that enters the system.

**Total NRW = System Input Volume of Water – Revenue Water**



## Assumptions

This method provides an easy and quick estimate of NRW to the water utility managers and is based on the following assumptions:

- Meters at the water treatment plant are accurate. There is no error in calculating the outflow of water.
- The water utilities are aware of the amount of water that is billed.

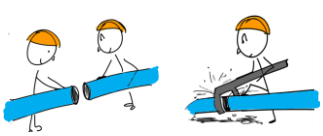
NRW is caused by infrastructure deficits, operational inefficiency and managerial incompetence. However, for any utility to create strategies to reduce NRW, it needs to identify the proportion of various components that contribute to NRW. These components cover the entire volume of water in the system, beginning from its outflow from the treatment plant to the consumer end. This mechanism of breaking down the volume of water supply into various components helps utilities to achieve a water balance. The International Water Association (IWA) identifies two main components of NRW:

### I. Unaccounted For Losses

- Indicates the amount of NRW caused due to deficit in the infrastructure and/or mismanagement of the water supply system.
- Based on these deficiencies UFW is further broken down into two sub – components

#### Physical Losses

- Also called as technical or real losses, these are actual losses of water caused due to leakages in the entire water supply system. Leakages in the transmission and distribution mains are often caused due to breaking of pipelines or large bursts. Most of these leakages are unreported as they remain invisible. But the pressure of water is very high at these mains and any small leakage may cause high loses.
- There may be leakages in the overhead tanks or storage reservoirs that cause over flow of water.
- Losses may also arise owing to leakages in the service connections. This type of physical loss is more frequent but can be easily reported and corrected due to its visibility.



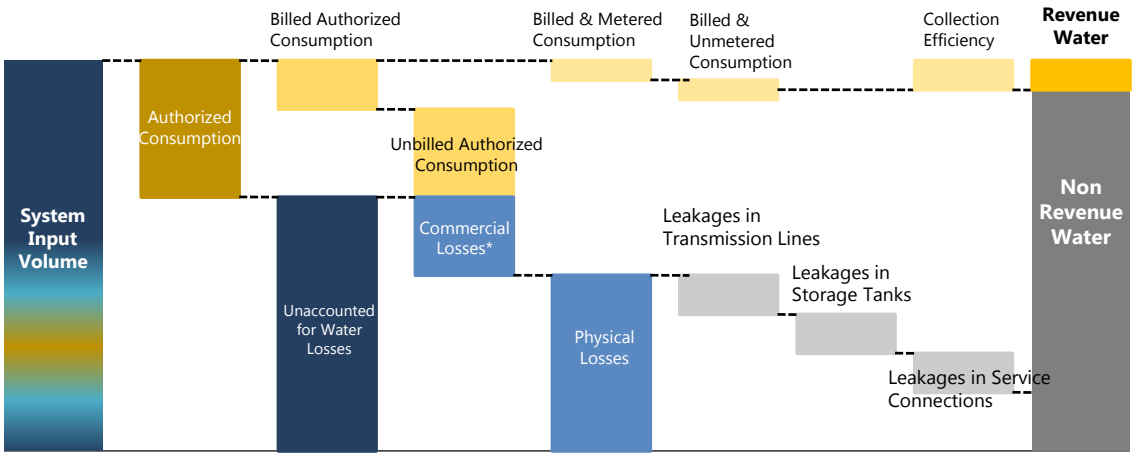
### Commercial Losses

It is also termed as 'apparent losses'. It is the amount of water consumed that remains unaccounted due to:

- Poor water audits
- Illegal consumption
- Metering inaccuracies
- Data handling errors

Exhibit 3 provides an overview of the various components of NRW. Utility managers and water service providers must use this chart of water balance to determine the points where losses occur and devise ways to increase the actual revenue.

**Exhibit 3: Water Balance/ Components of Non Revenue Water**



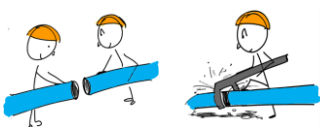

*Source: International Water Association and Athena Research*

### II. Accounted for Losses

This is the amount of water that has been accounted for (i.e., the volume of water that has reached the consumers and audits for the same have been undertaken), but does not generate revenue due to the following reasons:

### Unbilled Authorised Consumption

- The amount of water that is consumed and accounted for but remains unbilled.
- It includes water supplied by the utility through public stand posts, tube wells and bore wells which is legal but provided free.
- It may also include the water used for commercial purposes such as fire fighting, street cleaning and watering public parks.



| | |
|---|---|
| Inefficiency in Revenue Collection of Billed Authorised Consumption | ▪ This component is the amount of water that is authorised for consumption and is billed, but does not recover full costs.<br>▪ It is the amount of water that differentiates actual revenue from potential revenue and may occur due to several factors such as lack of effective metering for volumetric tariff |
| Billed Authorised Consumption | ▪ This refers to collection/operational inefficiency of the staff to administer lump sum water charges and errors in handling household data, among others. |

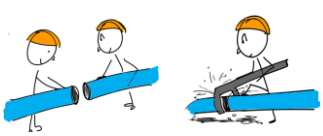
## II.2.2 Assessment of NRW

The factors that contribute to estimating NRW is the accuracy of the production meters, customer meters and their reading and billing. A more detailed method of calculating the components of water balance and consequently estimating NRW is given by *Liemberger & Partners' WB – EASYCAL* (See Annex – A.8).

The indicators listed in Exhibit 4 need to be measured for each component of NRW. These indicators must be measured in these units: 1) Cubic meters per kilometre of main per day, 2) Litres per service connection and 3) Currency (Rs.).

**Exhibit 4: List of Indicators for Measuring Non Revenue Water**

| | Indicator | Limitations |
|---|---|---|
| Physical Losses | $\frac{\text{Leakages in transmission lines}}{\text{Total Physical loss}}$<br>$\frac{\text{Leakages in distribution lines}}{\text{Total Physical loss}}$<br>$\frac{\text{Physical Losses}}{\text{Unaccounted for Water Loss}}$ | ▪ " Invisible" small leaks<br>▪ Direct relationship between network pressure and leakages<br>▪ Calculation of water losses based on frequency of water supply and consumption<br>▪ Is usually calculated using number of leaks repaired as a proxy |
| Commercial Losses | $\frac{\text{Functional Production Meters}}{\text{Total Number of Meters}}$<br>(at various levels – bulk water, transmission and distribution mains, service connections)<br>$\frac{\text{Commercial Losses}}{\text{Unaccounted for Water Loss}}$<br>$\frac{\text{Physical Losses}}{\text{Commercial Loss}}$ | ▪ Usually the date of meter turning inaccurate is unknown<br>▪ Lack of metering may result in unaccounted commercial losses |



| | | |
|---|---|---|
| **Authorised Consumption** | Extent of Metering $= \frac{\text{Metered Service Connections}}{\text{Total Service Connections}}$<br>Collection Efficiency $= \frac{\text{Revenue Collection}}{\text{Operating Revenue}}$<br>Potential Revenue Water $= \frac{\text{Billed}}{\text{Total Water Produced}}$ | ▪ Errors in meter system are unknown<br>▪ Lack of household data, accounting mechanism, inefficient billing system<br>▪ Cities may have a high volume of water supply services that are accounted for but unbilled. In such a case, strategy for non – revenue water is not applicable as there may be no willingness to charge/pay. |

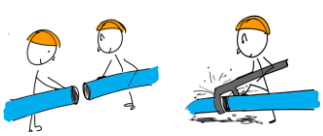
Upon completion of the assessment of these indicators, the utilities should now be able to perform a volume-cost analysis, which will help ULBs:

- To identify the points of physical and commercial losses and enable ULBs to prioritise the activities of NRW
- To calculate the cost of water lost. This will enable ULBs to understand which of the specifications of NRW cause maximum amount of loss of revenue

For example, if many leakages are detected in the distribution lines of a zone which causes large volumes of water to be lost and hence a significant revenue loss, then the ULBs must aim to repair them immediately. In brief, the volume – cost analysis enables the ULBs to logically plan NRW activities. Exhibit 5 presents a simple volume – cost matrix, with the amount of water lost and the related costs that remain uncovered due to this loss.

**Exhibit 5: Volume - Cost Analysis of Non Revenue Water**

| Volume of Water (in Litres) | Marginal Cost of Water (Rs. per litre) | | |
|---|---|---|---|
| | High | Medium | Low |
| High | Leakage in transmission and distribution main | Unauthorised consumption | … |
| Medium | Leakage in storage tanks<br>Replacement of customer meter | Customer metering, data handling errors | Pressure management |
| Low | Leakage in customer service connections | Unbilled consumption | Reservoir over flow |



## II.2.3 Strategies to Reduce Physical Losses

Different types of leakages need to be managed differently based on their location and the pressure of water:

- **Leakages in transmission and distribution lines** are usually invisible and hence take time to be reported. However, due to the high amount of pressure at that stage of water supply, the loss of water here tend to be significant.
- **Leakages in service connections** are easily visible and usually small in size with comparatively lesser quantities of water getting lost.

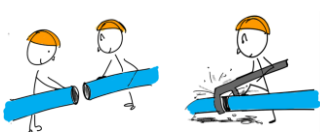
Based on these characteristics, the four important strategies to reduce physical losses are:

### Active Leakage Control

- The management of leakages can be divided based on the District Metered Areas (DMAs). Please refer to Box 1 for more details. Regular monitoring of the flow of water into the zones and repair of the number of leakages can be done via effective metering and leakage detection mechanisms.
- Meters should be installed at the level of transmission of water, bulk supply into the zones and at the customer connections. The further the metering system is decentralised, the greater would be its effectiveness in identifying the amount of water lost through leakages at a particular point.
- A few equipments that are used for pin pointing leakages are noise loggers, leak noise correlators, ground microphones and sounding sticks.

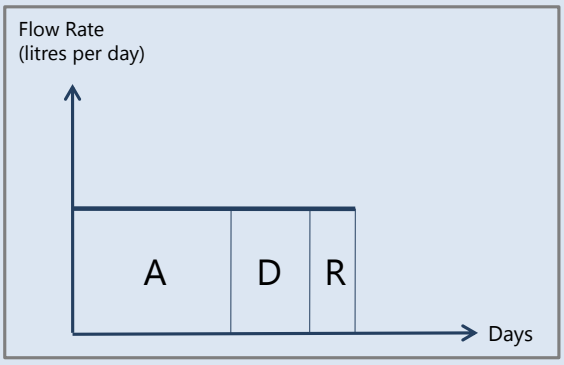
### Pressure Management

- The rate of leakage in the pipeline system depends on the amount of pressure applied by water pumps. Moreover, there is a direct relationship between the volume of water lost from a leakage and the amount of pressure of water flow.
- For effective pressure management, the ULBs should recognise the location of placing valves based on the demand for water and the type of customer.



## Speed & Quality of Repairs of Leaks

- Apart from the pressure, the time taken to realise, detect and repair leaks and bursts is another factor that determines the volume of water lost. The graph below shows the relationship between the volume of water lost and the number of days taken for awareness, detection and repair of the leakage.

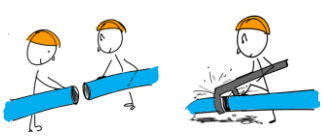



A: Awareness D: Detection of Leakage R: Repair of Leakage

- The identification of the leakage depends on the location and its repair depends on the costs associated with it. As reported bursts and visible leaks require less time for detection, the water lost through it will also be less. Skilled staff equipped with the appropriate tools and an organised method for repairing the leaks can effectively contribute to reduction in water losses.

## Asset Management

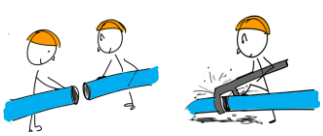
- Annual maintenance of the water supply infrastructure such as the storage tanks, reservoirs and pipelines must be done to manage the assets.
- With the aging of the piped networks, valves, meters, distribution main, etc., arrangements for its replacement has to be undertaken.
- The frequency of this process depends on the quality of the existing assets, the depreciation rates, the records of bursts and leakages, among others. This also helps in prioritisation of the rehabilitation works.



## II.2.4 Commercial Loss Strategy

ULBs should aim for a maximum commercial loss of 4-6% of the total NRW. Reducing commercial losses requires minimal investments and can be undertaken immediately. But, it requires strong commitment, skilled staff, political will and community support. The three essential strategies for reducing these losses are:

| | |
|---|---|
| Improvement of Accuracy of Meters | ▪ Install meters properly: Utilities should purchase meters on behalf of customers and install them where readers can easily locate and read them<br>▪ Train staff: Staff should be trained to handle meters and detect non – functioning meters<br>▪ Monitor water quality: Poor quality of water due to some construction works in pipes may cause sediments to seep into the internal parts of the meters<br>▪ Monitor intermittent water supply: Sudden increase in pressure can damage the meter's components<br>▪ Size meters properly: The preference survey can help in understanding the nature of water consumption by different customers. This information helps in determining the proper size of meters for households and businesses |
| Removal of Illegal Connections | Illegal connections involve the usage of water without the knowledge and approval of the ULB. The utility has to detect them through surveys and resolve the issues with the customers |
| Reduction of Data Handling & Accounting Errors | Although the data collected depends on the accuracy of meters, it is important to reduce the errors in handling the water audits, when performed manually. The staff must be trained and provided with the right equipments to read meters and collect data on water consumption. |



**Box 1: District Metered Areas**

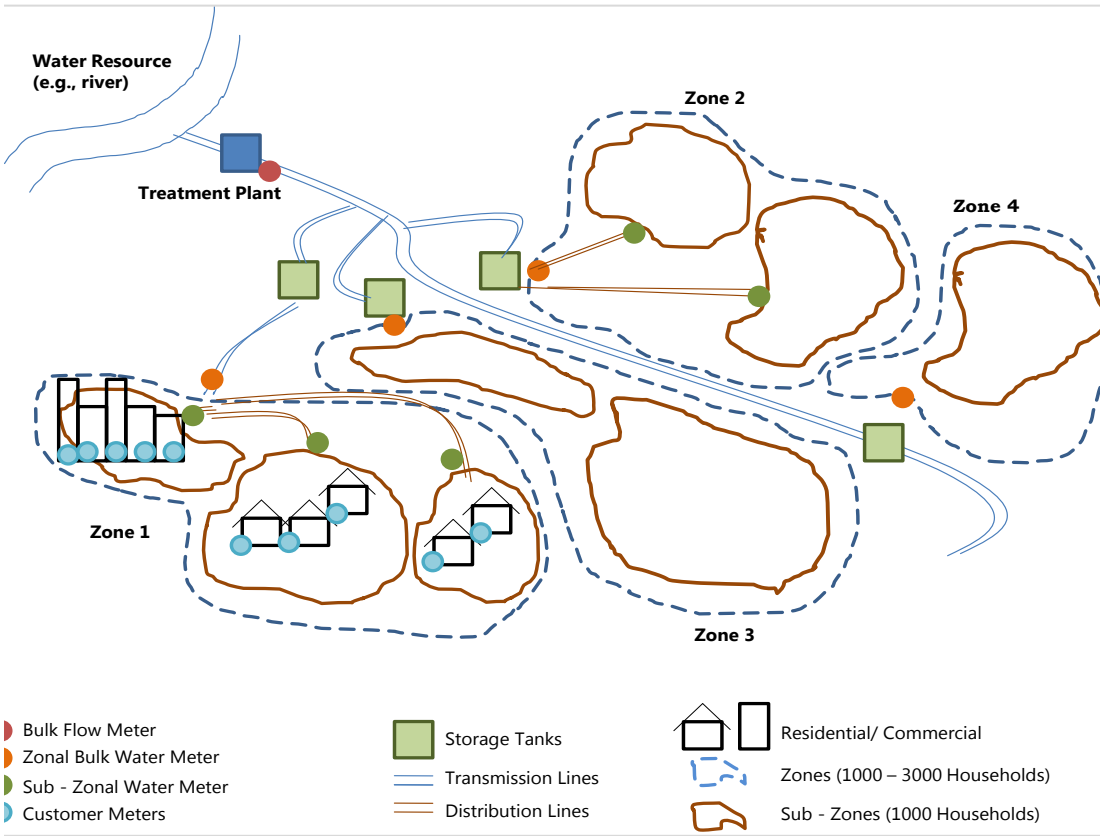
IWA defines a District Metered Area (DMA) as a discrete area of a distribution system usually created by the closure of valves or complete disconnection of pipe work in which the quantity of water entering and leaving the area is metered. This implies that a large open system of water supply in a city is hydraulically divided into several districts/ zones (as shown in diagram below). The DMA is designed based on following criteria:

- Number of connections per DMA (IWA recommends 1000 – 2500)
- Number of valves that must be closed to isolate the DMA
- Number of flow meters (bulk, district/ zonal, sub – zonal and customer)
- Ground – level variations and pressure requirements (flat lands require less pressure for water flow)
- Easy visibility of topographical features such as drains, roads, highways, etc

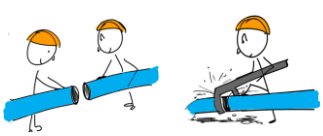
The ULBs or the water utility operators must ensure that all the valves within the network system of a DMA remain closed and the flow of water is metered. A team can be assigned to each DMA with an operational manual as a reference material.

The advantages of having a DMA include:

- Systematic and easy administration of water flow and pressure management
- Increased accuracy in data collection and water audits
- Prompt detection of leakages and tampered meters



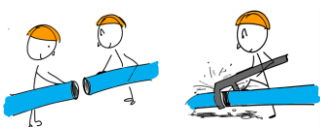


## II.2.5 Strategies to Improve Billing & Collection Efficiency

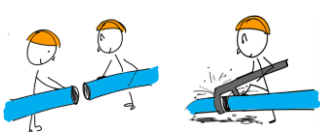
While the reduction of unaccounted for water losses is more infrastructure intensive, the ability to improve the existing billing and user charge collection methods is predominantly driven by administrative reforms. Some of the most common forms of billing and collection inefficiencies include incomplete customer databases, delivering bills to wrong addresses, unpaid bills by consumers, inaccurate water audits, etc. These reasons are directly linked to further mismanagement of the water supply services. Inefficient billing contributes to:

| | |
|---|---|
| Inadequate Revenue | Consequently, there is a lack of funds to improve/ rehabilitate/ maintain pipelines and meet increased urbanisation requirements. |
| Lack of Credit Worthiness & Bankability of Projects | Poor cost recoveries make it challenging for ULBs to tap the financial market, raise capital from financial institutions and the public. |
| Weakening of accountability of the customer to the ULB | Households tend to be discouraged when wrong/over - rated bills are delivered. |



Following methods can be adopted to improve billing efficiencies and overcome these challenges:

| | |
|---|---|
| Billing System | ▪ **Implement a monthly billing cycle:** provides adequate time for ULBs to validate and raise bills and collect user charges<br>▪ **Use a computerized system:** easy, efficient and reliable way to collect and update customer data bases, keep a track of water consumed in each area/zone and amount of revenue to be generated<br>▪ **Implement a rational tariff:** efficiency of the billing system also largely depends on the type of tariff. Although flat tariffs or property taxes are easy to administer; volumetric tariffs, though cumbersome to implement, incentivise responsible use of resources |
| Automatic Meter Reading | ▪ Use of data loggers rather than manual reading and noting of water consumption, enables accurate recording and billing. This can be implemented in two ways:<br>▪ Spot Billing: Here meters are read and bills are generated to the customers on the spot<br>▪ Batch Billing: Here meters are read and automatically fed into the master database, to be later generated into bills and delivered to customers |
| Regular & On – Time Payment | ▪ Provide employee incentives based on the number of bills distributed and revenue collected in a given month by each employee<br>▪ Provide customer incentives. For example, allow customers (especially urban poor) to pay in instalments, or offer discounts for quick payments<br>▪ Adopt a disconnection policy. Although this is politically challenging, ULBs may opt to do so |



**Box 2: Improvement in Collection Efficiency in Hyderabad**

The Hyderabad Metropolitan Water Supply & Sewerage Board (HMWSSB) is among the first utilities in India to implement a volumetric tariff structure (increasing block tariff) and to have achieved a cost recovery of 84.4% % (in 2010). Some of the strategies adopted by HMWSSB include:

- **Spot Billing Initiative:** The Board outsourced the billing function to a private party to handhold data logger machines, generate bills on the spot and deliver to the customers immediately. The scheme was implemented in two divisions of the city covering 0.35 million customers. As per the Scheme the Board paid Rs. 2.5 for every bill generated to the private player as transaction costs. With the success in improving the billing mechanism, the Board in 2007 decided to train its own staff of meter readers to do the same activity such that there would be one meter reader responsible for 2,000 connections per month.
- **Employee Incentives:** Meter readers were incentivised to collect tariffs from 'Never Paid Customers' through financial rewards of 3% of the collections made from these customers. There were about 40,000 such customers. With the implementation of this, in a two year span, the Board collected revenue from one-quarter of them. Moreover, the meter readers are given targets of revenue collection based on current demand estimates and arrears. They are incentivised to meet these targets and awards are given by the Chief Minister of the State.
- **One-Time Settlement Scheme:** This scheme, implemented in 2004 was applicable to those customers who had huge arrears in their bills, which covered 2.8 Lakh customers. To encourage them to pay their arrears, the Board would give a discount of 10% for a one – time full payment or it was payable in 10 installments for those who could not pay an upfront arrear amount. In June 2004, the scheme led to a revenue collection of Rs. 2.3 Crore from 1.6 lakh customers.

## II.2.6 Outsourcing NRW Reduction Activities


The concept of reduction of NRW is divided into several phases and activities. The ULB may choose to take up each of these in a phased manner by themselves, based on their capacity and capability or contract it out to private players. Breaking down the entire value chain of NRW into various tasks helps the ULB to identify issues and solve them one by one. This particularly helps when funds are low and/or issues in NRW are limited in nature. Exhibit 6 below gives a potential list of outsourced activities that aim to reduce NRW. An example of one of these projects has been briefly discussed in the Box 3.

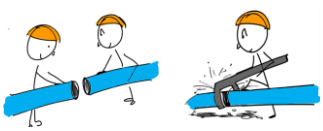
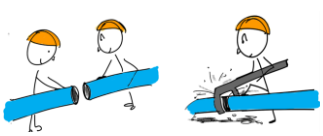


**Exhibit 6: Private Sector Participation for Reduction of NRW**

| S/N | Type of Contract | Description | Examples |
|---|---|---|---|
| 1 | Leak Detection | Survey to detect leaks in the distribution pipelines and repair of the same | Chennai, Bangalore |
| 2 | Metering | Installation of meters at various levels – raw bulk water, ward wise distribution, consumption | Chennai |
| 3 | UFW Reduction | Focus on one component of NRW: usually used when physical losses are very high | Sao Paulo, Brazil |
| 4 | NRW Reduction | Phased approach on reducing various components of NRW (leakages, metering, revenue collection) | Indore, Bhopal |
| 5 | Performance based Management Contracts | Performance based payments to the private sector for reduction of NRW, extent of metering, sewage and water supply coverage. Payments made as a % of achievements | Hubli – Dharwad, Nagpur, Algiers |
| 6 | Target Contracts | Pre-determined targets set for the private sector; Performance linked to penalties and bonuses | Integrated Management Contracts in Uganda |



**Box 3: NRW Reduction & Efficient Water Supply in Malkapur**

Malkapur, initially a village in Maharashtra experienced a population increase at the rate of 58% in 1981- 91 and 275% in 1991-2001. The piped water supply scheme that was commissioned and implemented in the village in 1988 was designed to cater to an expected population of 14000 in 2010 on the basis on 40 lpcd. However, in 2001, the population rose to 23000, thereby placing immense pressure on the existing water supply system. Due to acute shortages in water, the Gram Panchayat (GP) operated the system all day whenever electricity was available. Despite this, water was available only for 2-3 hours per day, forcing the citizens to rely on other sources such as tankers and bore wells. In order to meet the demand, in 2006, a project was approved with a budget of Rs. 12.3 Crore, to provide 70 lpcd to 67000 people by 2030. Consequently, in 2008 the Malkapur GP was converted to a Nagar Panchayat, signifying a transition from rural to urban. The approved project was launched in 2010, and is being undertaken by the Malkapur Nagar Panchayat (MNP) and MJP. It was supported under the Government of Maharashtra scheme of Accelerated Rural Water Supply Programme (ARWSP).

The project is an entirely government (ULB with support from MJP) led model and entails a combination of systematic interventions including management reforms, staff training, new technologies, financial support, citizen's engagement and improved revenue model. The key features of the project include:

- **Technical Innovations:**
  - Use of Water GEMS software to build the hydraulic model of the entire network of pipelines from the source to the distribution and finally consumer connections. This model uses information on the use of water at different times during the day along with the spatial information of the Geographical Information System (GIS).
  - Automatic meter reading system introduced for monthly billing and cost recovery.
  - Computerised billing and customer friendly services such as SMS alerts for registering complaints, etc.
- **Awareness Campaigns:** IEC campaigns were organised to reach out to all citizens of the town, explaining the objective, strategies and benefits of the project including promotion of water conservation. Extensive discussions were held with media, welfare associations, and prominent citizen groups for regular project consultation.
- **Financial Model:** Of the total project cost of Rs. 13 Crore, 90% was funded by the MJP and the rest by MNP through a surcharge on property tax. The Exhibit below presents a list of success indicators of the project:

| Indicator | Before | After |
|---|---|---|
| Continuity of Water Supply | 1-3 hours every alternate day | 24*7 hours |
| Coverage | Partial | 100% |
| UFW | >40% | 12% |
| Services to Poor | Dependent on public stand posts & water tanks | Individual tap connections at subsidised rates |
| Saving of Power | 19-20 hrs of pumping | 13-14 hours of pumping |
| Cost Recovery | 60% | 80% |
| Extent of Metering | Nil | 100% |

## II.3 Cost Recovery

**Questions to be Addressed**

- What are the characteristics of an optimal tariff structure?
- What are the different types of tariff structures?
- What are the factors responsible for setting tariffs?
  - Willingness to pay
  - Subsidies
  - Project costs
  - Extent of metering
- How to conduct a willingness to pay survey?

### II.3.1 Characteristics of an Optimal Tariff Structure

An efficient tariff structure is one that ensures economic efficiency, social equity and environmental sustainability.

**Economic Efficiency**

- ✓ Cost Recovery
- ✓ Reflect the willingness of the consumers to pay for services

**Social Equity**

- ✓ Treat similar consumers equally
- ✓ Ensure equitable access to all
- ✓ Acceptability by all classes of consumers
- ✓ Designed in a transparent manner

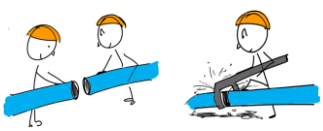
**Environmental Sustainability**

- ✓ Ensure efficient use of water
- ✓ Encourage re-use of waste water
- ✓ Promote water conservation


An economically efficient tariff structure allows recovery of the project cost to the extent possible/ decided and lets the consumers realise the true value of paying tariffs for the service.

A socially equitable tariff is one that is designed transparently after consulting the consumers, provides equal access of water to all (quantity and quality) and takes into account the income levels of population/ affordability to pay.

A tariff that is sensitive to environmental causes is one that discourages wastage of water, and encourages re use to the extent possible.





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## II.3.2 Comparative Analysis of Different Types of Tariff Structures

**Flat tariff** structure is usually in the form of a lump sum amount/ user charge or a fixed tax. It is easy to calculate and is based on the average cost/ marginal cost of water distribution and/or service delivery per household. Moreover, it may have a positive impact on the collection efficiency as it is easy to administer. However, such a tariff structure does not ensure social equity and may result in the economically challenged group paying as much as their counter parts. It also discourages water conservation. Quick pros and cons of flat tariffs are given below.

### Pros & Cons of Flat Tariffs

**Pros**

- Easy to administer by a single government entity or an independent regulator
- Ensures social equity and uniform services
- Makes the process of tariff revision simpler
- Easy to implement in areas where cost of production is high

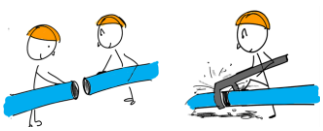
**Cons**

- Does not reflect the true cost of production
- May result in subsidizing high income consumers
- May also result in reduction of water conservancy (i.e., it may violate the principles of economic and environmental sustainability)

**Variable water charges** are usually of three types. These tariff types are highly correlated with the quantity of water consumed and the type of consumer. Water tariffs as a percent of **property tax** is designed as per the area and value of the property of the consumers. Here, ULBs may alter the percentage of property tax, based on the type of customer. For example, commercial or similar non – residential properties may be charged higher than households. This tariff structure is being implemented in Ahmedabad.

**Volumetric tariffs,** on the other hand are linear in nature. They are directly correlated to the quantity of water consumed. The tariff is the average cost per litre/ kilolitre of water. The payments increase as and when the consumption increases. This allows increased economic efficiency as it improves cost recovery and also promotes minimal usage of water.

A similar type of a variable tariff is **increasing block tariff**, which is largely practiced in class I cities in India. A tariff of this type has slabs that ensure increased user charges as and when consumption increases. Different slabs can be applicable to different types of consumers, namely households, industries and commercial



establishments. The tariff structure also incorporates sewage treatment charges. For example, in Bangalore, there is charge of 50% of water supply tariff for waste water discharge, collection and treatment. The Box 4 presents different tariff structures India, along with its implications on collection efficiency and cost recovery. Exhibit 7 provides a comparative analysis of different tariff structures.

**Exhibit 7: Comparative Analysis of Tariff Structures**

| | | Variable Tariffs | | | Flat Tariffs | |
|---|---|---|---|---|---|---|
| | | Increasing Block | Volumetric | Property Tax | Lump sum | Water Tax |
| Economic Efficiency | Cost Recovery | H | H | M | L | L |
| | Accountability | H | H | M | L | L |
| Social Equity | Equity and Access | L | L | H | H | H |
| | Acceptability | L | L | H | H | H |
| Environmental Sustainability | Efficient Use | H | H | M | L | L |
| | Re-use of Waste Water | H | H | M | L | L |

**High** H **Medium** M **Low** L

**Box 4: Tariff Structures in Select Cities of India: Practices & Implications**

A variety of tariff structures are practiced in India ranging from connection – based flat tariffs to volumetric user charges. These tariffs are either implemented by the State Water Board, as in the case of cities in Kerala and Tamil Nadu or are independently designed by the ULBs as in Andhra Pradesh. The type and amount of tariff structure levied influences the collection efficiency, and consequently the cost recovery. A few examples of such current or past practices have been described below.

- **Ferrule Based Flat Tariffs in Raipur, Chhattisgarh**

  Until February 2010, the Raipur Municipal Corporation (RMC) had a ferrule based flat tariff structure. The connection fee per annum for domestic customers/residential units was Rs. 720 for a half inch pipe and Rs. 1200 for commercial institutions.

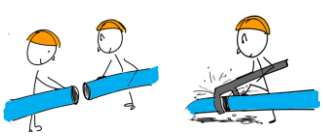
  With 85% of the customers having access to tap connections, the city had almost nil customer metering and a mere 26% cost recovery. Owing to poor cost recovery of annual O&M, RMC in 2011 revised the tariff structure by implementing an increasing block tariff structure for metered areas and flat tariffs for the unmetered.

- **Property Taxes in Ahmedabad, Gujarat**

  Ahmedabad Municipal Corporation has been levying water tariffs in the form of property taxes to be paid by residential, semi–residential and commercial institutions on a monthly basis. Although these tariffs are variable in nature they do not account for actual consumption of water. The city has zero metering with NRW of nearly 31%. The collection efficiency is 60.3% and annual O&M cost recovery is 53.9%. The tariffs are highly subsidised by the state government, which also undertakes capital works.

- **Increasing Block Water Tariffs in Udupi, Karnataka**

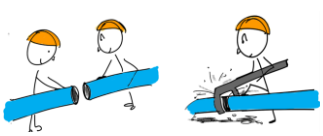
  Increasing block tariffs have been long practiced in the city of Udupi. However, the cost recovery ratio during the decade 1995-96 to 2007- 08 increased only from 67.79% to 73.66%. The municipal body in 2008 revised the tariff structures. The domestic and commercial rates for the first slab (for consumption up to 18 kilo litres) were increased by 66.6% from Rs. 45 to Rs. 75 and Rs. 90 to Rs. 150, respectively. Moreover, for the next slab, the rate (charged on per KL of water) was increased by three times. Further, the slabs were increased from two to four. These changes increased cost recovery to 128% during 2010 – 11.



## II.3.3 Factors Affecting Tariffs

Apart from understanding the different tariff structures and its characteristics, ULBs must have a check list of all the factors that determine tariffs. These factors influence the level of tariff that should be charged by the ULBs and thereby determine the financial viability of the project. These include:

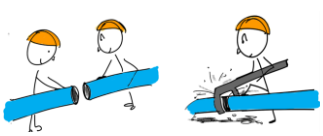
| | |
|---|---|
| Composition of the Total Project Cost | ▪ The total project cost consists of upfront capital investments and annual operations and management costs.<br>▪ Section A.3 in the annexes provides investment estimates for distribution and O&M of water supply as well as sewage network and treatment. These estimates may be used as a reference to further estimate the project cost and hence determine tariffs<br>▪ The O&M costs consist of power costs, chemicals, staff and maintenance works such as leakage repair, new/tampered meters, customer services, etc. Usually, the power costs range from 40 – 60% of the total annual O&M expenditure. This raises the need to index water tariffs with the energy tariffs |
| Percentage of Cost Recovery | The ULBs need to decide how much of the total cost incurred should be recovered. The benchmarks set by MoUD indicate that the ULBs must initiate 100% O&M cost recovery and gradually aim to partially recover capital expenditure. |
| Quantum of Arrears | ▪ The amount of outstanding debt and the interest to be paid on it affects the level of tariff directly.<br>▪ ULBs should choose to take a loan only if there is a sustainable revenue model. |
| Quantum of Subsidies & Grants | ▪ The quantum of subsidies or grants available may contribute to very low user charges. But, there are certain factors pertaining to subsidies that affect the tariffs:<br>▪ *Type of subsidy (direct or cross – subsidisation):* If the latter is applied then the tariffs would be differentiated (for lower and high income citizens)<br>▪ *Time period of subsidy:* Subsidies may be provided only during the initial phase, and attempts must be made to reduce it over time to ensure that the project is financially self – sustainable. |



## Willingness to Pay (WtP) Survey

Willingness to pay is a quotient which needs to be assessed to determine the water tariffs and involves a systematic approach. The process below gives a step by step method to carry out a willingness to pay survey.

| | |
|---|---|
| Preliminary Tasks | ▪ Identify the target population (use sampling strategies if required), for example,<br>✓ High income households<br>✓ Low income households<br>✓ Slum population<br>✓ Commercial establishments<br>▪ Address the financial objective of the project<br>▪ Identify the services that need to be charged<br>▪ Design a work plan for conducting the survey |
| Questionnaire Design | Design a questionnaire for the WtP survey (A template has been provided in the annex – Please refer to Annex A.1) |
| Data Analysis & Estimation of Prices | Compile the data collected from the survey and analyse it to estimate tariffs:<br>▪ Respondent details and income levels<br>▪ Ownership of water connections<br>▪ Requirement for water (different uses and quantity)<br>▪ Willingness to pay – Yes/ No<br>▪ Willingness to pay – If yes, how much? |
| Community Consultations | ▪ Publish data<br>▪ Get inputs from the non – willing consumers through discussions and consultations |
| Final Tariff Structures | Incorporate inputs from the survey and community consultations and finalise the tariff structure |



## II.4 Assessment of Sewage Generation

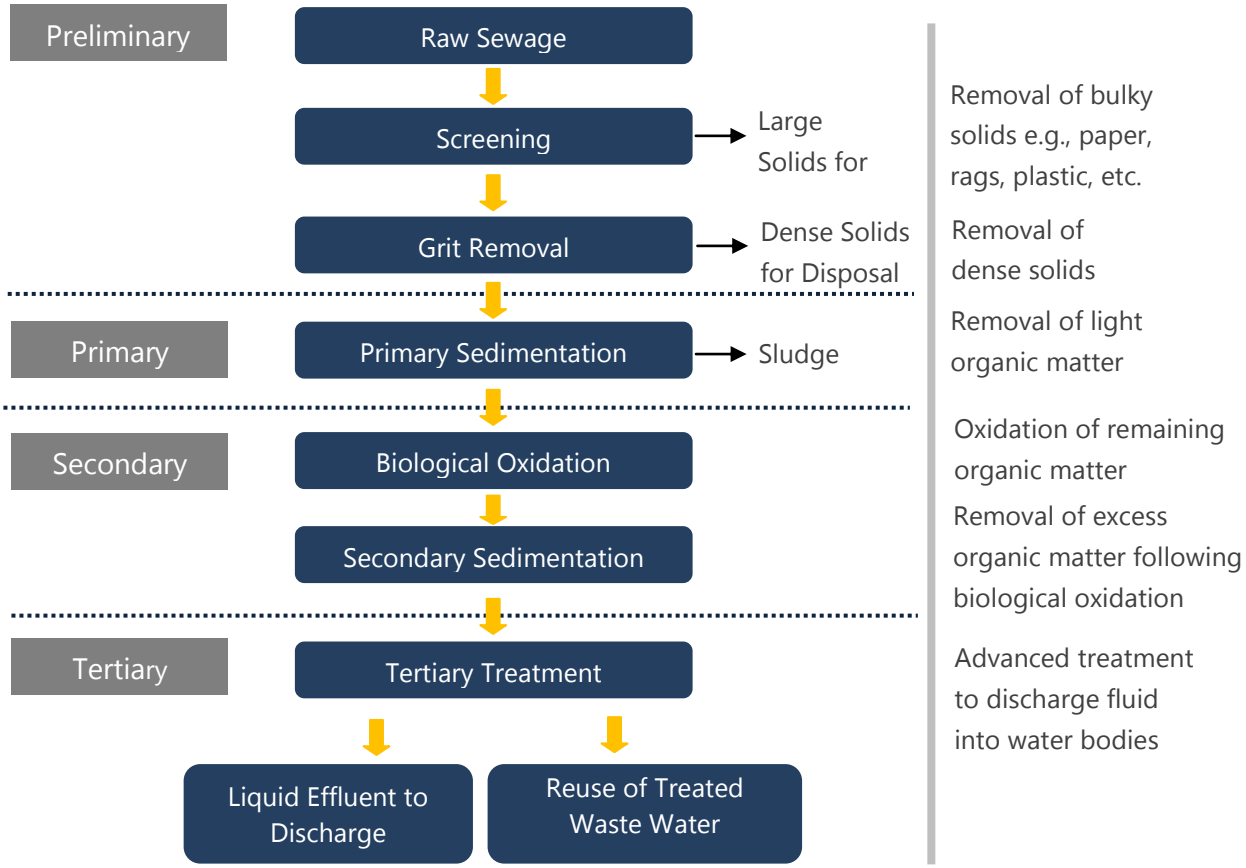
The amount of sewage generated is usually considered to be at 80-85% of the total quantity of water consumed[iv]. A preference survey may be used to arrive at an estimate of the water consumed.

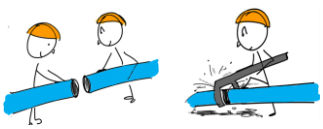
| | |
|---|---|
| **Step 1** | Calculate the amount of water consumed, based on the SPS<br>*If SPS is not used, a quick estimate would be to subtract the amount of water lost due to physical losses from the total amount of water produced.* |
| **Step 2** | Calculate 80% of the total water consumed (from step 1). This is the amount of current sewage generation. |

## II.5 Extent of Sewage Treatment

Sewage needs to be collected, transmitted, treated and reused to the extent possible. A quick understanding of the different levels of sewage treatment is given in the Exhibit 8.

**Exhibit 8: Waste Water Treatment Process**





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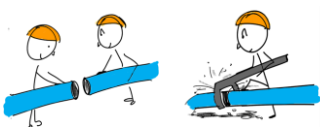
However, in order to arrive at the extent to which waste water should be treated; a few factors need to be considered. A ULB can choose to treat sewage till the primary, secondary or tertiary level. Exhibit 9 gives a list of factors to be considered while deciding the level of treatment. The degree of sewage treatment required increases based on three basic parameters such as the legal discharge standard, extent of reuse of sewage and the quality of sewage.

The three parameters are directly correlated with the type of sewage treatment. i.e., a tertiary level of treatment may be chosen if the legal water discharge standards are high, there is a need to constantly reuse the sewage to meet increasing demands of water and the water is highly contaminated such that advanced treatment is necessary before a pollution crisis occurs.

**Exhibit 9: Factors Affecting Degree of Sewage Treatment**

| | Preliminary | Secondary | Tertiary |
|---|---|---|---|
| Legal Discharge Standard | Low | Medium | High |
| | Higher the standards set by the pollution control board, the higher is the level of treatment required. | | |
| Degree of Reuse Required | Low | Medium | High |
| | If the city is located in a district with scarce water resources, then there must be a greater emphasis on reuse of water. | | |
| Degree of Contamination of Water | Low | Medium | High |
| | City with high levels of industrialisation may generate higher amounts of contaminated sewage, there by requiring advanced treatment. | | |
| Existence of Market Linkages | No | Yes | Yes |
| | Apart from these parameters, certain other factors such as existence of market linkages and technical skills of households (for management of sewage services in case of a decentralised system) needs to be assessed. Cities with a potential market for sale of recycled sewage for various uses such as gardening, fire fighting, power generation must opt for treatment of sewage to the extent required for such purposes. | | |
| Technical Skills Required by Households | Yes | No | No |
| | In case ULBs opt for a decentralised sewage collection and treatment involving management by households, then their respective technical skills for each type of technology and the treatment must be considered. | | |

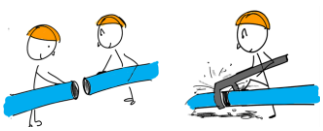


## II.6 Choice of Technology

The choice of technology for waste water collection, transportation and treatment is based on the geographical site/ location and the managerial capability of the ULBs and/or households. Exhibit 10 presents an analysis of the various technological options ranging from on–site treatment to off-site treatment.

**Exhibit 10: Different Choices of Sewage Technology**

| | Leach Pits | Septic Tanks | De-sludging Vehicle | Conventional Sewerage |
|---|---|---|---|---|
| **Applicability** | ▪ Low to medium density areas (peri-urban)<br>▪ Enough plot to install pits and use the fecal/ digested sludge as fertilizers | ▪ Partial treatment of sewage where conventional system is absent<br>▪ Micro-wet land to allow *evapo-traspiration* losses and moisture uptake | ▪ High density informal settlements<br>▪ Used to collect and transport *sullage* to a treatment facility | ▪ Highly urbanized areas to collect, transport, treat and dispose sewage |
| **Management** | ▪ Installation done by ULB/ parastatal body<br>▪ O&M undertaken by households | ▪ Installation and collection of *septage* done by ULB/parastatal body<br>▪ O&M undertaken by households | ▪ Small – scale *desludging* operators (NGOs or small private entrepreneurs) | ▪ Parastatal body/ ULB; some activities such as laying sewage network or operating the treatment plant may be outsourced to the private sector |
| **Limitations** | ▪ Households need to be educated<br>▪ Water may percolate into the soil surrounding the pit and pollute ground water | ▪ Upfront cost borne by the households<br>▪ Requires space for installation<br>▪ Regular O&M if tanks are insufficient | ▪ Regulation of transportation of sewage (prohibit from disposing into open drains)<br>▪ Suction pumps may have low absorption capability | ▪ Requires high O&M costs |
| | **On – Site** | | | **Off – Site** |



## II.7 Selection of Operational Model for Sewerage System

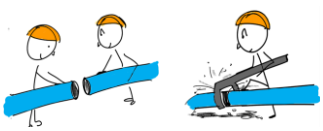
### II.7.1 Comparative Analysis of Centralised & Decentralised Systems

| Centralised System | Decentralised System |
|---|---|
| ▪ Single system of collection, transmission and treatment of waste water from several communities<br>▪ Common treatment plant with high capacity and advanced technology<br>▪ High – cost intensive approach<br>▪ Usually for tertiary treatment where large volumes of waste water generated needs to be treated and reused | ▪ Treatment of small volumes of water generated by various institutions (Cluster/ onsite system where waste water is treated by an individual household/ a group of dwellings located close to each other)<br>▪ Use of technology: septic tanks or aerobic units<br>▪ Low cost approach<br>▪ Usually used for primary treatment / sedimentation/ removal of sludge |

### II.7.2 Why and When to Select a Decentralised Model?

- Saves money as deciding on a preventive strategy (assessing communities needs) helps to manage waste water before a sewage crisis occurs
- Enables better water resource management by not transferring large volumes of waste water generated from different sources to a common treatment plant
- A cost-effective mode of sewage treatment for communities who cannot afford to pay for sewerage systems with advanced technologies
- Applicable in regions with low populations/ individual houses rather than highly populated urban areas with high rise buildings
- Appropriate for varying site conditions, including ecologically sensitive areas. The treatment methods can be effectively customised to suit regional conditions

*Annex A.6 presents details of an on – site decentralised sewerage system*

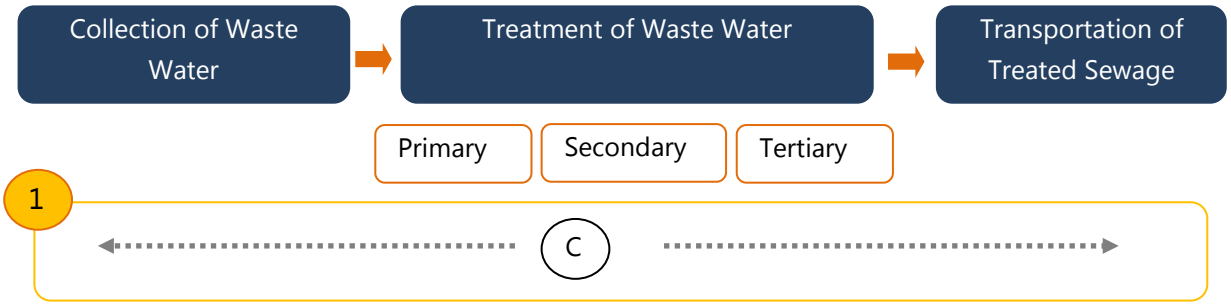


## II.7.3Combinations of Centralised & Decentralised Systems

The selection of a centralized or decentralized system depends on the following parameters:

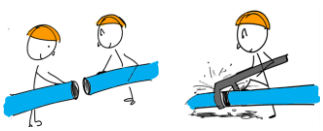
| Economic | Technical | Social |
|---|---|---|
| ▪ Financial cost<br>▪ Income levels of community<br>▪ Market linkages for reuse of treated sewage | ▪ Geographical site conditions<br>▪ Parameters that influence the level of treatment and technology | ▪ Population size<br>▪ Willingness to pay<br>▪ Support from community<br>▪ Ability of the community to manage sewage treatment |

**Exhibit 11: Various Models of Centralised and Decentralised System**

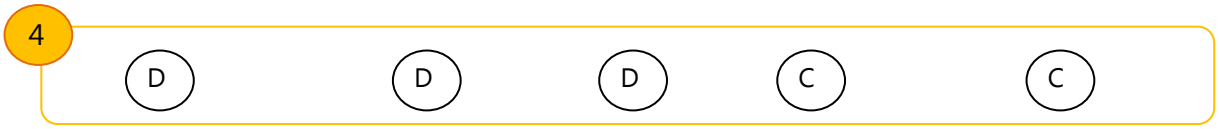



In option 1, the entire value chain of sewerage system is operated and managed by a single entity and as a single integrated system. This single entity could be the ULB or a private player, which is responsible for collecting waste water through sewage connections and sewer mains, treating the sewage at the common site and distributing it for further reuse. Such models are conventional sewerage models, usually found in cities where there is a huge potential for sale of sewage and hence the ULBs can meet with the high costs requirements of underground pipelines, advanced treatment and technical staff.

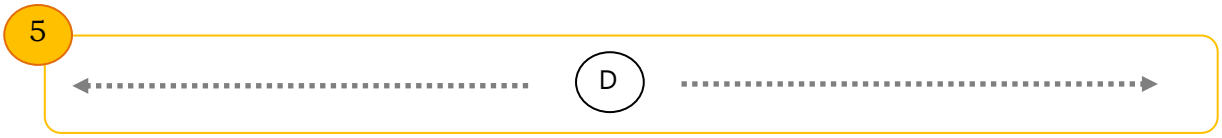

In option 2, the collection of sewage is conducted at different locations (e.g., ward wise), by different set of entities. The collected sewage from various locations is then transmitted to a common treatment plant where a single entity is responsible for treating and distributing recyclable water.




In option 3, the collection of sewage and its primary treatment is conducted in a decentralised operational mode. This approach is usually adopted in small towns where individual households are responsible for preliminary treatment of sewage by installing septic tanks. These tanks are also operated and maintained by them. The primary treated sewage is then collected from the household sites to a common treatment plant for further treatment and is then distributed to nearby industries for reuse.

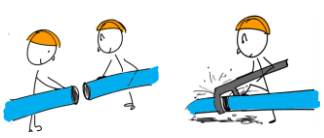



In the fourth option, the collection and treatment of sewage up to secondary level is undertaken by several entities by dividing the city into several wards/ zones where as the tertiary treatment and transmission of recycled sewage is carried out by a single entity. Usually a different private player is allocated for each zone for secondary treatment of sewage after which it is transmitted into a common effluent plant, operated by the ULB or another private entity.




The last option is a complete decentralised system in which the entire value chain of sewerage system is broken down and handed over for operations to different entities at different locations of the city. Such a model includes treatment and reuse of sewage at the source of generation. Mini – sewage treatment plants are installed in apartment complexes and commercial centres where in the sewage collected is treated to the extent possible and reused for gardening, flushing toilets, etc. This model avoids constructing of underground sewerage system, reduces costs of operating and maintaining large treatment plants and keeps the water loop closed within the vicinity.

Decentralised (D) Centralised (C)



## II.8 Stakeholder Management

Need

Stakeholder management at both pre and post award stages of the project is critical for successful implementation of the project. In a socially sensitive sector like urban water supply and sewerage, the stakeholders are many with varied perceptions and interests in the way waste should be managed. Stakeholder expectations should thus be better managed to ensure the sustaianbility of the waste management process.

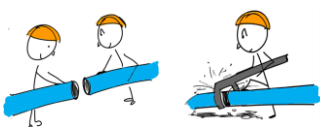
The first step for ULBs in this regard is to identify all relevant stakeholders. Exhibit 12 displays broad categories of stakeholders in UWSS projects. The second step is to identify and list expectations of each stakeholder and group together stakeholders that have common expectations. Please refer to Exhibit 13.

**Exhibit 12: Identification of Stakeholders**

| Community | Private | Government |
|---|---|---|
| Informal Water Vendors | Service Provider | ULB Council |
| Resident welfare Associations | Financier | Parastatal Bodies |
| SHGs/NGOs/CBOs | | State/Central Government |
| Project Affected Community | | |

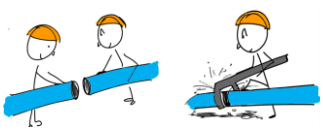
**Exhibit 13: Pre and Post Award Expectations of Stakeholders**

| | Community | Private | Government |
|---|---|---|---|
| Pre-Award Expectations | ▪ Participatory Decision Making<br>▪ Project Approval<br>▪ Willingness to Pay<br>▪ Addressing Concerns<br>▪ The three points below are repetitive | ▪ Robust Procurement System – transparent and efficient<br>▪ Clarity in Project Scope<br>▪ Community Support | ▪ Robust Procurement System – transparent and efficient<br>▪ Compliance with Draft National Water Policy 2012 /State Policy on Urban Drinking Water<br>▪ Competitive Procurement<br>▪ Value for Money |
| Post-Award Expectations | ▪ Efficient and Timely Service<br>▪ Complaint Redressal<br>▪ Cleanliness and Hygiene<br>▪ Relief and Rehabilitation | ▪ Facilitative Governance<br>▪ Political Support<br>▪ Timely Payment<br>▪ Robust Dispute Redressal Mechanism<br>▪ Community Support | ▪ Achievement of Service Level Benchmarks<br>▪ Robust Dispute Redressal Mechanisms<br>▪ Stringent Monitoring and Reporting |



# Section: III Project Procurement

- Project Procurement
- Procurement Options
- Risks Sharing Framework



## III.1 Project Procurement

1 Identification

2 Approval

3 Financial Arrangement

4 Procurement

5 Monitoring

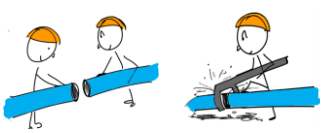
6 Post-Award Governance

In the urban water supply and sewerage sector, the interplay of a large number of factors makes the choice of an appropriate procurement mode a challenging process demanding close attention. Some of the key parameters that a ULB must investigate before finalising the procurement mode are the socio-economic profile of citizens, financial health of the ULB, access to technology and environmental concerns.

This section provides a step by step approach to help ULBs adopt a suitable procurement mode.

The section begins with an overview of the two main procurement modes — i.e., public procurement and Public Private Partnerships, wherein their definition, features and limitations are listed.

Next, a set of key factors that influence the choice of a procurement mode is listed, followed by a competency framework that indicates different procurement options available to ULBs depending on their technical, managerial and financial capacity. The competency framework is supplemented by a risk sharing matrix that provides an overview of the various kinds of risks associated with different procurement options.



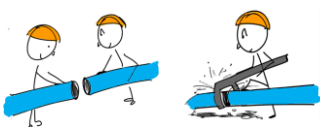
## III.2 Procurement Options

| Procurement Options | Public procurement and complete outsourcing of project through Design, Build, Finance, Operate, & Transfer (DBFOT) model of Public Private Partnerships (PPPs) are the two extreme alternatives available to ULBs. In recent times, PPPs have evolved as an important medium to meet the infrastructure or operational deficits of the ULBs. The features associated with these two modes are briefly outlined below. |
|---|---|

### III.2.1 Public Procurement

Public Procurement refers to the scenario where a ULB undertakes all aspects of project management, from project designing to project monitoring. In other words, once the project has been identified and approved, the key aspects of the project like project design, construction, financing, operations & maintenance and monitoring are done by the ULB by utilising government resources.

| | |
|---|---|
| **Features** | ▪ Project cost is borne by the ULBs/ state governments<br>▪ Separate contracts awarded for different works – procurement of goods, works and service<br>▪ Higher risk retention by the ULBs<br>▪ Simple procedure/limited managerial expertise required for procurement process and project management<br>▪ Reduces the number of stakeholder consultations |
| **Limitations** | ▪ No scope for sharing project cost<br>▪ Limited risk transfer to private sector<br>▪ Limited efficiency gains |

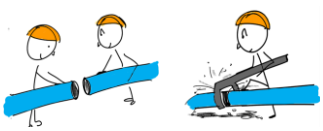


## III.2.2 Public Private Partnerships

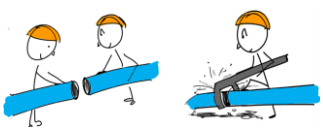
Here the definitions of PPP as per the Draft National PPP policy and Andhra Pradesh Infrastructure Development Enabling Act (2001) are presented.

**Box 5: Public Private Partnerships**

| | |
|---|---|
| Draft National Public Private Partnership Policy,<br><br>Government of India, 2011 | '*Public Private Partnership refers to an arrangement between a government / statutory entity / government owned entity on one side and a private sector entity on the other, for the provision of public assets and/or public services, through investments being made and/or management being undertaken by the private sector entity, for a specified period of time, where there is well defined allocation of risk between the private sector and the public entity and the private entity receives performance linked payments that conform (or are benchmarked) to specified and pre-determined performance standards, measurable by the public entity or its representative*' [Draft National PPP Policy, GOI (2011)] |
| Andhra Pradesh Infrastructure Development Enabling Act (2001) | '*Public Private Partnership (PPP) means investment by Private Sector Participant in an Infrastructure Project of the Government Agency or the Local Authority*'. [Andhra Pradesh Infrastructure Development Enabling Act (2001)] |



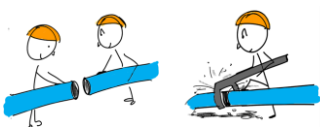
| **Box 6: PPP Types** | |
|---|---|
| User-Fee Based BOT Models | *"This refers to competitively bid concessions where costs are recovered mainly through **user charges** (in some cases partly through VGF from the government)."* [Draft National PPP Policy, GOI (2011)] |
| *"In sectors/projects not amenable for sizeable cost recovery through user charges, owing to socio-political/affordability considerations, the government harnesses private sector efficiencies through contracts based on availability/performance payments. Implementing an annuity model will require necessary framework conditions, such as payment guarantee mechanism by means of making available multi-year budgetary support, a dedicated fund, letter of credit etc. Government may consider setting-up a separate window of assistance for encouraging annuity-based PPP projects. A variant of this approach could be to make a larger upfront payment (say 40% of project cost) during the construction period."* [Draft National PPP Policy, GOI (2011)] | Annuity Based BOT Models |
| Performance Based Management/ Maintenance Contracts | *"Under a management contract, a private party is paid a fee for managing an existing asset or business. Management contracts transfer limited responsibilities and risk to the private party. Performance based management contracts are 'output' based contracts and the payment made to private partner is measured on outputs reflecting the service quality levels. The service quality levels are pre-defined in the contract."* [Draft National PPP Policy, GOI (2011)] |
| *"In traditional Design-Build (DB) contract, the private contractor is engaged for a fixed-fee payment on completion. The primary benefits of DB contracts include time and cost savings, efficient risk-sharing and improved quality. Government may consider a turnkey DB approach with the payments linked to achievement of tangible intermediate construction milestones (instead of lump-sum payment on completion) and short period maintenance / repair responsibilities. Penalties/incentives for delays/early completion and performance guarantee (warranty) from private partner may also be incorporated. Subsequently, as the market sentiment turns around these projects could be offered to private sector through operation-maintenance-tolling concessions."* [Draft National PPP Policy, GOI (2011)] | Modified Design-Build (Turnkey) Contracts |



| **Box 7: EPC Contract** | |
|---|---|
| EPC Contract | *"An EPC agreement specifies the **required** design and performance standards and allows the contractor to design and construct the project using best practices and innovation to optimise on efficiency and economy as compared to the rigidity of the item rate contract that relies on a single design provided by the government. The contractor also has full freedom to plan the construction schedule for efficient use of its manpower, equipment and other resources while payments are linked to specified stages of construction as compared to payment for individual items/ units under the item rate contracts. Awarding contract for a **lump sum price** ensures predictability and financial discipline, both for the contractor and the government. Clearly stated obligations and risks of the respective parties help in achieving timely completion of the project while minimising the disputes."* (EPC Agreement for Construction of Two Lane National Highway Works, Ministry of Road Transport & Highways, GOI (2012) |

To sum up, PPPs in general have the following features and limitations:

| | |
|---|---|
| Features | ✓ Allows ULBs to access private finance<br>✓ Brings together the strengths of both public and private sector<br>✓ Allows greater sharing of responsibilities<br>✓ Allows public sector to tap gains of innovation<br>✓ More effective risk management and cost control |
| Limitations | × A sustainable revenue model is a pre-requisite to incentivise private finance<br>× Reduces accessibility as the issue of cost recovery may result in limited access to services by users<br>× Exclusive rights to a preferred player may result in private monopoly (anti-competitive issues)<br>× Demands highly capable governance mechanism to offer best value of services |



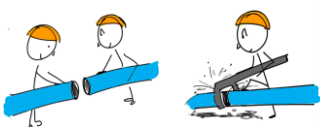
## III.2.3 Steps in Procurement

The choice of procurement is influenced by several factors. Institutional framework, political support, capacity of ULB and commercial factors are four key factors that should be considered.

To begin with, a ULB should undertake a pre-procurement analysis which includes a series of activities. These activities are described in Exhibit 14.

**Exhibit 14: Steps in Pre-Procurement Analysis**

| Steps | Activity | Description | Reference Figures |
|---|---|---|---|
| 1 | Review the Institutional Factors | It involves the following:<br>▪ Review of the National Water Policy (2012) and Andhra Pradesh State Water Policy (2008) | **15** |
| | | ▪ Setting up service standards<br>▪ [The Ministry of Urban Development has set service standards in the form of Service Level Benchmarks (SLB) that envisages their achievement over the long run. A ULB may prepare a road map that clearly indicates the target achievements on these benchmarks and other parameters, if any, for the short, medium and long run] | **16** |
| | | ▪ Based on the stipulations of the National Water Policy 2012, Andhra Pradesh State Water Policy 2008 and SLBs<br>1. Identify project features<br>2. Translate project features into required quantitative and qualitative resources<br>3. Identify gaps | **17- 20** |
| 2 | Assess Political Support | PPPs require strong political support. The ULB must gauge the extent of political support for PPPs in case the project requires private sector involvement | **…** |
| 3 | Assess competency and risks associated with different procurement modes | Finally, the ULB should locate a suitable procurement mode based on availability / deficit of financial, technical and managerial resources | **21** |

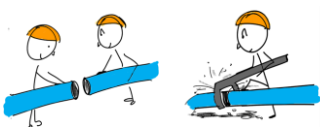


| | |
|---|---|
| Step 1 | Review the institutional factors. |
| Step 1.1 | Review the National Water Policy (2012) and Andhra Pradesh State Water Policy (2008) to identify priorities and reforms outlined. These include orivision of 24*7 water supply, reuse of water and among others. For greater understanding of this, the Exhibit 15 gives a brief of the features of these policies. |

**Exhibit 15: Outline of Water Policies**

| National Water Policy 2012 |
|---|
| Water to be charged after meeting pre – emptive uses of drinking and food security |
| Reuse of urban effluents from kitchens and bathrooms, after primary treatment, in flush toilets should be encouraged |
| Urban domestic water systems need to collect and publish water accounts and audit reports indicating leakages |
| Volumetric metering should be preferred |
| Water supply bills should include sewerage charges |

| Andhra Pradesh State Water Policy 2008 |
|---|
| Prioritising 24*7 safe adequate and affordable drinking and industrial water supply to meet the growing needs in urban areas |
| Appropriate modern knowledge database, benchmarking and auditing systems for increased information flow from relevant agencies to the general public |
| Increased productivity of water supply by fixing standards of infrastructure, services and utilization efficiency |
| Take appropriate measures to ensure effective, timely and cost – effective delivery of water related services including drinking water, industrial, irrigation, hydro – power and community services |



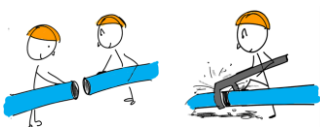
Step 1.2

Set standards for UWSS management

- The Ministry of Urban Development has set seventeen Service Level Benchmarks (SLBs) for the ULBs to achieve in the provision of water supply and sewerage services to the citizens
- Exhibit 16 lists the SLBs. Based on a realistic assessment of its strengths and constraints, a ULB could set standards to be achieved in the short, medium and long term

**Exhibit 16: Service Level Benchmarks**

| Water Supply Parameters | SLB (%) |
|---|---|
| Coverage (Individual Tap Connections) | **100** |
| Frequency of Water Supply | **24*7 hours** |
| Per Capita Supply | **135 litres** |
| Extent of Metering | **100** |
| Non Revenue Water | **20** |
| Collection Efficiency | **90** |
| Cost Recovery | **100** |
| Efficiency in Redressal of Customer Complaints | **80** |
| Quality of Water | **100** |
| **Sewerage Management Parameters** | **SLB (%)** |
| Coverage (Sewerage Connections) | **100** |
| Sewage Collection Efficiency | **100** |
| Sewage Treatment Adequacy | **100** |
| Quality of Sewage Treatment | **100** |
| Reuse & Recycling | **20** |
| Cost Recovery | **100** |
| Revenue Collection Efficiency | **90** |
| Efficiency in Redressal of Customer Complaints | **80** |



Step 1.3

Based on stipulations of National and State Water Policy and SLBs, project features are identified, a feasibility study to estimate resource requirement for the identified project features is undertaken and the gaps to gauge the areas for interventions is identified.

Step 1.3.1

ULB should list down the project features. An indicative list of project features is provided in Exhibit 17. The project features could include all or a combination of the following aspects:

- Method of providing tap connections
- Method of reducing NRW
- Method of Metering
- Performing water audits
- Providing customer services

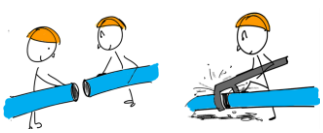
**Exhibit 17: Indicative Project Features**

1. 100% tap water connection
2. Remove illegal connections
3. 24*7 water supply
4. 135 lpcd water supply
5. Detect and repair leakages
6. Inclusive project – involvement of informal water vendors
7. 100% bulk and customer metering
8. Formation of district metered areas
9. Set up of customer service centre

A ULB can set project targets for immediate and short run based on resource constraints. This could be in the form of annual targets for household coverage, continuity of water supply, etc. Exhibit 18 provides an indicative template for targets to be achieved over the next five years.

**Exhibit 18: Template for Immediate and Short Term Objectives**

| Targets | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| Household Coverage (No. of zones/wards/households) | … | … | … | … | … |
| Frequency of Water Supply | … | … | … | … | … |
| Per Capita Supply of Water | … | … | … | … | … |



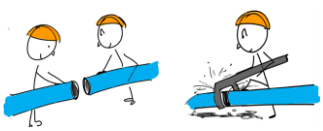
Step 1.3.2

Translate project features into the required resources.

- Conduct a feasibility study to assess the required financial (capital and O&M cost), quantitative and qualitative resources. Exhibit 19 briefly lists key quantitative and qualitative resources that would be required
- The quantitative resources would include assets, inventory and staff while the qualitative resources comprise technical and managerial skills

**Exhibit 19: Quantitative and Qualitative Resources**

| Quantitative Resources | Qualitative Resources |
|---|---|
| **Quantitative resources** refers to availability of assets, inventory and staff<br><br>Assets required for UWSS comprise pipelines, distribution networks, overhead tanks, customer services office, IT infrastructure for monitoring, sewage treatment plant, etc.<br><br>Inventories required for UWSS comprise meters, leak detection machines, etc.<br><br>Staff includes persons for different segments of the UWSS value chain – pumping water, managing NRW, collection of user charges, etc. | **Qualitative resources** refer to availability of staff with design, construction, operational, monitoring and financial management capabilities.<br><br>Design includes technical skills to prepare lay outs for distribution lines, district metered areas, selection and use of appropriate technology for treatment of sewage and among others.<br><br>Build includes the technical capability to construct appropriate infrastructure like over head tanks, repair leakages, etc.<br><br>Operate includes operational planning, resource planning, regular service delivery, etc.<br><br>Financial Management skills include estimation of project cash flows, revenue optimisation, improving cost efficiency, preparation of annual accounts and balance sheets, auditing, etc.<br><br>Quality Control includes skills and tools to identify operational problems, monitoring of service delivery, setting benchmarks, etc.<br><br>Staff Management includes human resource planning, performance appraisal, training need identification, etc. |



Step 1.3.3

Identify gaps

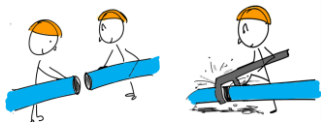
Post assessment of the required and available quantitative and qualitative resources, a ULB may find that it needs to focus on either of the following:

1. Construct supporting UWSS infrastructure and build capacities to improve operation
2. Construct only supporting UWSS infrastructure
3. Improve only the operations

Exhibit 20 presents a snapshot of the various scenarios that ULBs may find themselves depending upon the availability of quantitative and qualitative resources.

**Exhibit 20: Possible Areas for Intervention**

| Resources | Category | Sub-category | Resource Availability | | |
|---|---|---|---|---|---|
| **Quantitative Resources** | Asset (A)<br>Inventory (I)<br>Staff (S) | | **Low** | **Low** | **High** |
| **Qualitative Resources** | Technical Resource | Design (D)<br>Construction (C)<br>Operations (O) | **Low** | **High** | **Low** |
| | Managerial Resource | Financial Management (F)<br>Quality Control (QC)<br>Staff Management (SM) | | | |
| **Intervention Required** | | | **Status 1:**<br>Construct supporting UWSS infrastructure and build capacities to improve operation | **Status 2:**<br>Only construct supporting UWSS infrastructure | **Status 3:**<br>Only improve the operations |



**Step 2**

Once the ULB has identified the areas of intervention as shown in Exhibit 20, the next step is to gauge the political and community support for PPPs. If the ULB is not able to garner support from the elected representatives and the community, then the success of the project if undertaken through PPP would be adversely affected. Therefore, presence of the following enabling factors is crucial for successful implementation of PPP projects:

1. Political willingness and leadership
2. Political stability
3. Community buy-in
4. Staff support

ULBs that are likely to face resistance from staff need to have a mitigation strategy that could be in the form of relocation of staff to other services or departments.

Only those ULBs that meet the above listed criteria should consider PPPs as a possible procurement alternative.

Exhibit 21 provides procurement modes that may be selected by ULBs based on their financial, technical and managerial capability.

**Step 3**

This step consists of two actions.

**Step 3.1**

First, a self-assessment to evaluate ULB competencies must be conducted. The competency framework provided in Exhibit 21 provides a list of scenarios linking financial status (capital and operational), technical and managerial capability to procurement modes.

Second (Step 3.2), various types of risks associated with the identified procurement mode must be assessed and risk mitigation strategies must be created. (Please refer to Exhibit 22 for details).

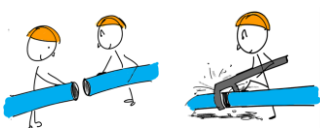
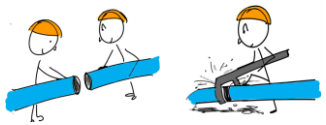


**Exhibit 21: Competency Framework**

| Procurement Option | FUND | | | | | | | | | | | | | | | | RESOURCES | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CAPEX | | | | | | | | OPEX | | | | | | | | TECHNICAL | | | | | | MANAGERIAL | | | | | |
| | IR | | GRANT | | VGF | | LOANS | | IR | | GRANT | | TAX | | USER CHARGES | | DESIGN | | BUILD | | OPERATE | | FINANCE | | QC | | SM | |
| | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No |
| **1. PP** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SCENARIO 1.1 | ■ | | | | | | | | ■ | | | | | | | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | |
| SCENARIO 1.2 | ■ | | | | | | | | | | | | ■ | | | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | |
| SCENARIO 1.3 | ■ | | | | | | | | | | | | | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | |
| SCENARIO 1.4 | | | ■ | | | | | | | | | | | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | |
| SCENARIO 1.5 | | | | | | | ■ | | | | | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ | |
| **2. EPC** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SCENARIO 2.1 | ■ | | | | | | | | ■ | | | | ■ | | ■ | | | ■ | | ■ | ■ | | ■ | | ■ | | ■ | |
| SCENARIO 2.2 | | | ■ | | | | | | ■ | | | | ■ | | ■ | | | ■ | | ■ | ■ | | ■ | | ■ | | ■ | |
| SCENARIO 2.3 | | | | | | | ■ | | | | | | ■ | | ■ | | | ■ | | ■ | ■ | | ■ | | ■ | | ■ | |
| **3. SERVICE CONTRACT** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SCENARIO 3.1 | | | | | | | | | ■ | | | | | | | | | | | | ■ | | ■ | | ■ | | | ■ |
| SCENARIO 3.2 | | | | | | | | | | | | | ■ | | | | | | | | ■ | | ■ | | ■ | | | ■ |
| SCENARIO 3.3 | | | | | | | | | | | | | | | ■ | | | | | | ■ | | ■ | | ■ | | | ■ |
| **4. MANAGEMENT CONTRACT** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SCENARIO 4.1 | ■ | | | | | | | | ■ | | | | | | | | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ |
| SCENARIO 4.2 | | | ■ | | | | | | | | | | ■ | | ■ | | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ |
| SCENARIO 4.3 | | ■ | | ■ | ■ | | | ■ | | | | | ■ | | ■ | | | ■ | | ■ | | ■ | | ■ | | ■ | | ■ |
| **5.BOT** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SCENARIO 5.1 | | ■ | ■ | | | ■ | | ■ | | ■ | | ■ | ■ | | ■ | | ■ | | | ■ | | ■ | | ■ | | ■ | | ■ |
| SCENARIO 5.2 | | ■ | | ■ | ■ | | | ■ | | ■ | | ■ | ■ | | ■ | | ■ | | | ■ | | ■ | | ■ | | ■ | | ■ |
| SCENARIO 5.3 | | ■ | | ■ | | ■ | ■ | | | ■ | | ■ | ■ | | ■ | | ■ | | | ■ | | ■ | | ■ | | ■ | | ■ |

IR: Internal Reserves of the ULB. | Grant: A grant that is available to a ULB from external sources including state or central government | VGF: A Viability Gap Funding grant that is available to a ULB for financing only PPP projects | Loans: Loans for infrastructure projects that are available to ULBs from government agencies like APUFIDCo | Tax: Revenue generated by a ULB through property tax or any common tax | User Charges: Capability to generate revenue through levy of user charge or a fee in lieu of provision of UWSS services to citizens | Design: Capacity and capability to prepare plant layout, operational design, etc. | Build: Capacity and capability to undertake the required construction activities | Operate: Capacity and capability to undertake operations and carry out maintenance activities | Finance: Capability to manage financial aspects of project | QC: Quality control that includes capability to provide standard services, identify problems in advance and take remediation steps | SM: Staff capacity and the capability to manage human resources in a productive and efficient way |



## 1. Public Procurement

For a ULB to select public procurement as a mode of project implementation, it *must* have all the required technical and managerial resources. However, based on the ability to fund projects and availability of various financing mechanisms, it may fall under 6 possible scenarios.

*After self assessment, if a ULB is seen to fit within scenario 1.1 to 1.5, then it may opt for Public Procurement*

*It is assumed that ULBs going for the public procurement mode have all the required technical and managerial capacities*

### Scenario 1.1

ULBs that have adequate internal reserves to meet the total project cost and also the operational expenditure during the project life

### Scenario 1.2 & 1.3

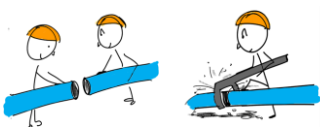
ULBs have internal reserves that are adequate to meet only the required capital expenditure and have buoyant tax revenues that would take care of the operational expenditure during the project period. The tax may be property tax or any other general tax that may or may not be levied in lieu of UWSS services provided to citizens. Alternatively, operational cost can be covered through user charges that are dedicated fee levied on citizens in lieu of provision of UWSS services. The potential cost recovery is estimated through willingness to pay surveys and takes into account the administrative capabilities of the ULB in improving collection efficiency.

### Scenario 1.4

The ULBs does not have internal reserves to meet the capital and operational cost, but have access to external grants (central, state or others) to meet only capital cost. Therefore capital cost is met in the same way while the operational costs are met through user charges. The potential cost recovery is estimated through willingness to pay surveys and takes into account the administrative capabilities of the ULB in improving collection efficiency.

### Scenario 1.5

ULBs do not have adequate internal reserves or access to grants to meet the project cost. Such ULBs may take loans from financial institutions such as APUFIDCo provided that ULBs meet the borrowing criteria as laid by them. Here ULB should be in a position to recover the O&M cost through user charges.



## 2. EPC contracts

*It is assumed that ULBs adopting the EPC mode have the technical capacity only for undertaking the operations but have all the relevant managerial capacities*

This option is suitable for those ULBs that possess the requisite managerial capability to operate and manage urban water supply and sewerage systems, but have a comparative disadvantage with respect to the design and construction of the same. However, the availability and source of funds for capital and operational expenditure is ULB specific. ULBs may choose to adopt an EPC contract under three possible scenarios.

### Scenario 2.1

ULBs that are able to meet the capital cost through internal reserves and O&M cost through internal reserves, tax receipts or other sector specific user charges.

### Scenario 2.2

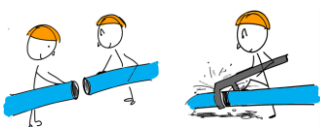
- ULBs do not have internal reserves but have access to external grants (central, state or others), e.g., JNNURM or Last Mile Connectivity Scheme
- ULBs meet O&M cost through internal reserves due to ongoing reformatory measures for cost recovery and hence have enhanced tax collection outlook
- Can meet O&M cost through user charges

The potential O&M cost recovery is estimated through willingness to pay surveys and takes into account the administrative capabilities of the ULB in improving collection efficiency

### Scenario 2.3

This option is suitable for those ULBs that:

- Do not have internal reserves or access to external grants (central, state or others), e.g., JNNURM but can get loans from APUIFIDCo.
- Can meet O&M cost through internal reserves due to ongoing reformatory measures for cost recovery and hence have enhanced tax collection outlook



## 3. Service contract

These types of contracts are suitable for those ULBs that are faced with capacity and capability constraints in operations, financial management, quality control and staff management. ULBs facing such constraints may vary in terms of availability and source of funds to meet payments that would accrue during the operations stage. ULBs may opt for service contracts under four scenarios:

*It is assumed that ULBs choosing the service contract mode do not have adequate managerial capabilities and also lack technical skills required for carrying out operations*

**Scenario 3.1**

- ULBs have internal reserves to make the fixed payments to the service operator

**Scenario 3.3 & 3.4**

- The ULB has high tax buoyancy or
- The potential to recover annual O&M costs through user charges

## 4. Management contracts

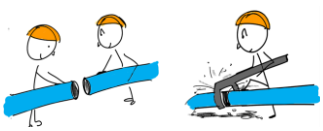
Management contracts are one of the simplest forms of PPPs which may be adopted when services rendered by the ULBs are inefficient and the ULBs do not have the capability and capacity to enhance them. They differ from service contracts for two reasons. First, it usually includes some amount of capital works such as rehabilitation of infrastructure. Second, the private operator may invest in a small proportion of the capital cost.

*It is assumed that ULBs choosing the service contract mode do not have adequate managerial capabilities and also lack the required technical skills*

These types of contracts are suitable for those ULBs that are faced with capacity and capability constraints in design, construction, operations, financial management, quality control and staff management. Since the scope of work may involve some rehabilitation and maintenance work, design and construction capability are required here unlike service contracts. ULBs facing such constraints may vary in terms of availability and source of funds to meet payments that would accrue during the operations stage. Accordingly, ULBs may opt for management contracts under four scenarios:

**Scenario 4.1**

- The required infrastructure for water supply and sewerage already exists within the city, but needs rehabilitation and maintenance
- The ULB is incapable of rehabilitating (either Brownfield or expansion) the water and sewerage works and operating and managing it



**Scenario 4.2**

- The ULB does not have internal reserves but has access to grants to meet capital cost
- The ULB does not have internal reserves or access to grant to meet fixed O&M cost but can meet O&M cost through internal reserves through ongoing reformatory measures for cost recovery

**Scenario 4.3**

- ULBs do not have internal reserves or access to grant to meet capital cost but have access to VGF (e.g., GOI) and meet the rest of the need through private finance (which is minimal in management contracts)
- ULBs do not have internal reserves or access to grant to meet fixed O&M cost but can meet O&M cost through internal reserves in future due to ongoing reformatory measures for cost recovery and hence have enhanced tax collection outlook

## 5. BOT models

BOT models are long term concession agreements wherein the ULB lacks the capability and capacity to build and operate water supply and sewerage works. It also may not have enough financial resources to finance the entire project cost. In such a case, the ULB may invite a private entity to address the financial, technical and managerial gaps.

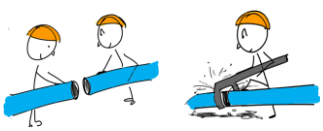
*It is assumed that ULBs choosing the BOT mode have technical skills for project design but do not possess other technical and managerial capacities required for carrying out operations*

**Scenario 5.1, 5.2 & 5.3**

- ULB can source a part of capital cost through any of the three sources – centre/state grant, VGF or loan
- The remaining capital cost is financed by the private player who also brings in technical and managerial skills required for construction, operation and maintenance of the project

There are variants of the BOT mode such as the BOT Toll, BOT – Annuity, DBFOT, etc. that allow greater sharing of risks with the private entity. The various kinds of risks associated with selected procurement mode are assessed through the risk sharing matrix provided in Exhibit 22.

Once a particular procurement mode is identified, a value for money (VfM) analysis is undertaken to establish the rationale for choosing PPP, if the selected procurement mode is PPP.



## III.3 Risk Sharing Framework

Exhibit 22 indicates how various types of risks are shared between ULB and private sector as the nature of procurement changes from public to PPP. Under the public procurement mode, the ULB/ implementing agency bears the all risks associated with a project. An EPC contract, allows the ULB to park the construction risk with the private entity while retaining all other risks, i.e., those associated with design, innovation, project scope, operations, revenue & financial (if not contracted out), and force majeure, among others. Service contracts allow ULBs to assign operational risks to the private operator. Operational risk includes service delivery at set standards, accountability of service delivery, etc. Through management contracts, ULBs are able to broaden the scope of operational risk by including risks associated with carrying out maintenance works. In addition, the construction risk is also assigned to the private partner. As one moves further down the spectrum, through BOT contracts, ULBs can park the construction, O&M and financial risks with the private partner and only retain the political, legal, regulatory and residual risks. BOT contracts have two variants – BOT Toll and BOT Annuity. The difference between the two is that in the latter, the revenue risk (based on the demand and cost per unit) is borne by the ULB while BOT Toll allows ULBs to share even the revenue risk with the private partner.

**Exhibit 22: Risks in Project Procurement**

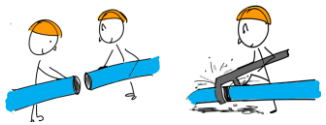
**Types of Risks**

| Option | Procurement Mode | POL | CON | O&M | L&C | REV | FIN | FM |
|---|---|---|---|---|---|---|---|---|
| 1 | Public Procurement | | | | | | | |
| 2 | EPC Contract | | | 1 | | 1 | | |
| 3 | Service Contract | | | 2 | | | | |
| 4 | Management Contract | | 3 | | | 4 | | |
| 5 | BOT Annuity | | | | | | | |
| 6 | BOT Toll | | | | | | | |

**Legend**

| | |
|---|---|
| POL | Political Risk |
| CON | Construction Risk |
| O&M | Operational Risk |
| L&C | Legal & Contractual Risk |
| REV | Revenue Risk |
| FIN | Financial Risk |
| FM | Force Majeure Risk |

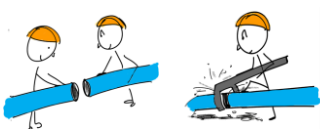
[1] These risks are not applicable here as the procurement is not for O&M.
[2] The O&M risk in the service contract refers to operations & management and excludes maintenance.
[3] Management contracts may include a portion of capital works which is usually in the form of rehabilitation of existing infrastructure (brown field projects) or expansion of current system to meet incremental needs. Although the construction works are limited, the risks associated with it are assigned to the private partner.
[4] In a few instances, revenue risks may be bundled with O&M risks and in such cases, the revenue risks are also assigned to the private partner. The case of Latur water supply project is one such example where Latur Municipal Corporation assigned revenue risks to its private partner.



# Section: IV Project Monitoring

Importance of Project Monitoring

Methodologies for Project Monitoring

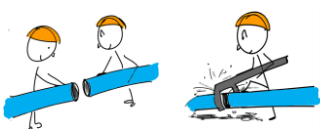


## IV.1 Importance of Project Monitoring


Monitoring of the performance of the services offered by a project is essential to a host of stakeholders. The common interest for the service providers, users, financiers and government would be improved service delivery over time. The Exhibit 23 gives a list of reasons that justify the importance of monitoring and performance management and the benefits that accrue to stakeholders.

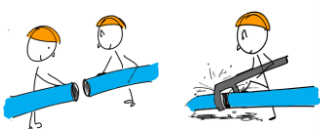
**Exhibit 23: Importance of Project Monitoring for Stakeholders**

| Stakeholder | Importance/ Relevance |
|---|---|
| Utility/ Service Providers | ▪ Provides an analytical platform for benchmarking processes periodically and compare performance with other utilities<br>▪ Allows for self – assessment<br>▪ Provides justification for financial assistance requests<br>▪ Lays down the requirement for a strategic business plan |
| Monitoring Agencies/Regulators | ▪ Regulate tariffs and water usage from various resources<br>▪ Comparative analysis of service levels of various utilities |
| Customers | ▪ Increases accountability as redressal of customer complaints is more effective |
| Private Developers/ Financiers | ▪ Comparative analysis of performances of various utilities<br>▪ Focus on weaknesses, financial viability |
| Central Government | ▪ Allows for evaluation of performance of the sector across region, cities, states, country<br>▪ Provides a baseline for strategic planning |



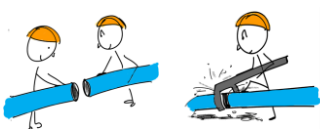
## IV.2 Methodologies for Project Monitoring

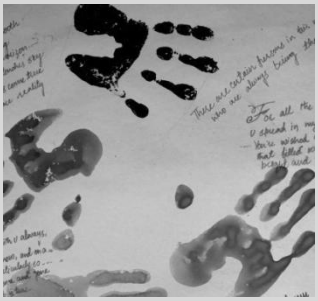
| Steps | Methodologies |
|---|---|
| Organise a Benchmarking Team | Organize a professional team with skills in engineering, technology, finance, utilities operations and processes |
| Identify Study Objectives | ▪ Undertake a thorough review of the problems and opportunities<br>▪ Hold preliminary discussion with stakeholders to address issues in efficiency and finance |
| Selecting Benchmarking Methodologies | ▪ Identify specific aspects of services to be benchmarked based on the extent to which data on inputs and outputs are available |
| Data Collection & Analysis | ▪ Collect data<br>▪ Apply data verification procedures<br>▪ Check for a) missing data and b) accuracy (calculations/ data errors)<br>▪ Perform data analysis such as developing performance indices or use of similar statistical techniques |
| Review Performance & Adopt Strategies for Improvement | ▪ Identify weak points that hinder the utility from achieving the target<br>▪ Devise a plan for the next phase to achieve goals<br>▪ Create a mechanism for frequent review of the performance based on per-determined indicators/parameters and their respective targets |



**Section: V Community Involvement**

- Degree of Community Involvement
- Project Planning & Identification
- Management of Services
- Community Involvement for Monitoring



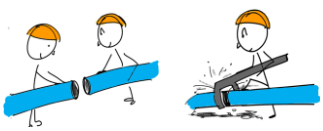


Anecdotal evidence from various PPP projects in social infrastructure projects reveals that involving the community at various stages of the project is a critical pre-requisite. For example, in the Alandur Sewerage Project, the community was involved by the local body right from the initiation stage of the project. The design, scope and expected outcomes of the project was shared with citizen representatives. Owing to the pro-active steps taken by the government to involve the community at the project conceptualization stage, the project secured an upfront capital investment of 30% of the total project cost from the citizens.

A similar initiative in Latur, Maharashtra was undertaken through collaboration between the Maharashtra Jeevan Pradhikaran (MJP) and the Latur Municipal Corporation (LMC). The two government entities contracted out the distribution and customer services aspects of water supply to a Special Purpose Vehicle (SPV) for 10 years which was owned by a private entity. A tripartite agreement between MJP, LMC and the private entity was signed. Effective communication to the local citizens about the project need and adoption of pro–poor strategies such as providing shared household connections to slum population played an instrumental role in the success of the project.

## V.1 Degrees of Community Involvement

The degree of community involvement in project design, implementation and delivery depends on the willingness of the implementing agency to involve people, co-ordination between them and the local citizens and capacity of the community to be a part of the project. On the whole, there are four different degrees of community involvement and it ranges from the community being just informed about the project features to whole projects being designed and led by the community themselves.



**Community – led Models with Expert Opinions**

A project initiated, decided and designed by the local citizens which is also managed and monitored by them. They may take relevant suggestions from the experts/local government, if necessary

**Agency Initiated, with Community Participation**

A project initiated, decided and designed by the local government/ implementing agency with management of select services by the people.

**Informed & Consulted**

Community is informed about the project and opinions are taken. Project is implemented and managed by the government/ private agency.

**Informed**

Community is simply informed about the project features via local media.

***Increased Community Participation***

Exhibit 24 describes the flow of information between the community and implementing agency. The first step involves a unidirectional flow of information from the community to the government agency, which is in the form of complaints on services and various consultations. At the next level information may flow from the implementing agency to the community where in the agency informs the local citizens about the scope of the project and its outcomes. The last one is an interaction between parties or a two way flow of information in the form of consultations and feedback.

Based on these aspects, community involvement may be sought in the following stages:

- Planning and design process
- Management of operations and services
- Monitoring of projects/ utilities.

The next section focuses on how to involve the community for the three identified categories, namely planning, management of services and monitoring. It also provides sample techniques and tools that are used for community mobilisation and training, accompanied by respective case studies and examples.

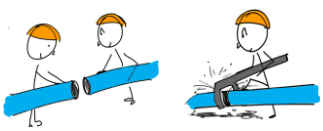
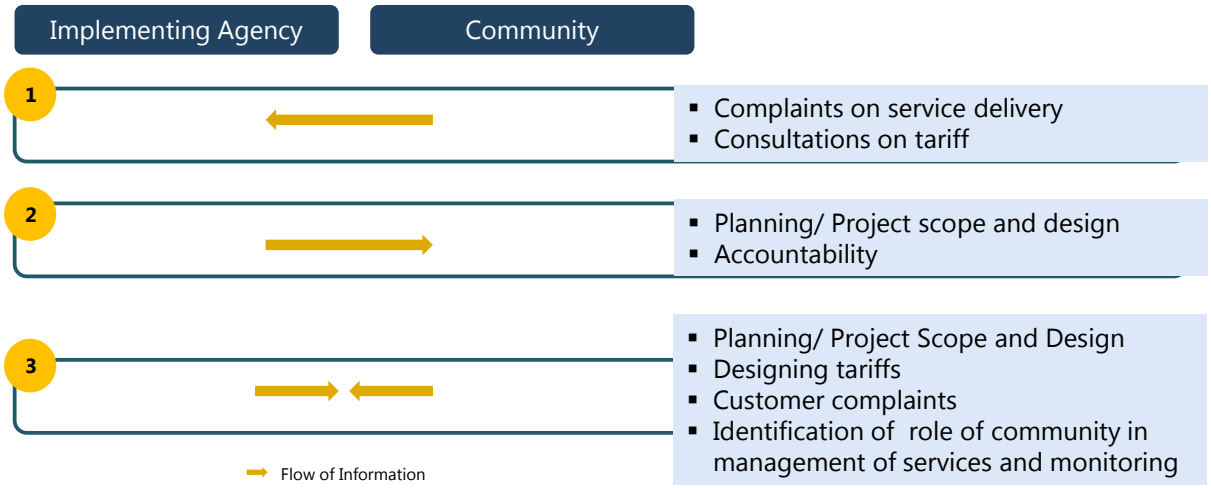


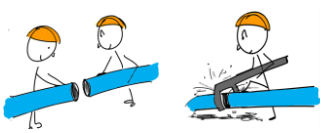
**Exhibit 24: Flow of Information between Community and Implementing Body**



## V.2 Planning and Project Identification

Community may be involved in this phase for establishing the need for the project by disseminating project information and for assessing the willingness to pay. Following are the detailed steps to be followed to facilitate participatory decision making:

| Steps | Methodologies |
|---|---|
| Initiating the Process | ▪ Inform the community. This broadly involves:<br>o Transfer of information about project details<br>o Getting community – buy in<br>o Taking opinions on project design and implementation<br>o Understanding the needs of the local citizens, including the urban poor through the use of process/ tools such as focused group discussions, use of local media, kiosks, street plays, etc.<br>▪ Design survey templates and, questionnaires (as required)<br>▪ Design a work plan to carry out the participatory planning process<br>▪ Engage with a local NGO (if required) |
| Create Awareness | ▪ Mobilize people by communicating events planned for participatory process. This could be done via posters, radio announcements, gathering community leaders involved in water supply and sanitation (if any), etc.<br>▪ Organise formal meetings that include the citizens, community leaders, slum population and other stakeholders<br>▪ Disseminate information about the project. Create awareness about the need for the project, its features and expected outcomes |
| Get Inputs from the Community | ▪ Divide the area for project implementation into wards/ divisions<br>▪ Perform needs assessment in every ward<br>▪ Identify priorities, i.e. issues in current services of water supply that need highest attention in each ward<br>▪ Obtain feedback on the relevance of the proposed project |

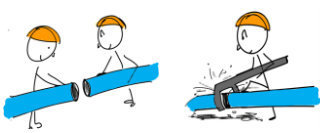


| | |
|---|---|
| Information Gathering | ▪ Gather information from the meetings and FGDs<br>▪ Match the inputs on the project gained from the people with the objectives that the proposed project seeks to achieve<br>▪ Re-design project as per needs assessment |
| Further Consultations & Final Decisions | ▪ Discuss the re-structured project with the local citizens to take final inputs<br>▪ Create a vision for the community and address the objectives and strategies of the project from both long and short term perspectives<br>▪ Provide an action plan to the citizens on the same |

**Box 8: Participatory Decision – Making Process for Urban Planning in Kitale, Kenya**

Practical Action (UK and Eastern Africa) in partnership with the Municipal Council of Kitale undertook a project using the Sustainable Livelihoods Approach and Participatory Urban Appraisal. The project activities sought to help poor women, men and children living in informal settlements to identify their development priorities, and prepare spatial and settlement specific neighborhood plans. The participatory planning process involved the following stages:

1. *Community Mapping*: Detailed listing of all community infrastructure facilities and services
2. *Data verification and validation:* The data collected and analysed from the first stage was communicated to the citizens for further feedback. This was done through house- to-house surveys and focus group discussions
3. *Community vision and action plan*: The discussions with community regarding the issues were transformed into a short term vision, which were further converted into strategies, programmes and activities
4. *Evaluation:* These programmes were discussed further with community leaders to get their inputs, create realistic frameworks, look for alternative options and design the work plan



## V.3 Management of Services

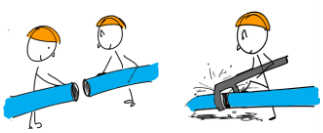
Community can participate in managing the services when a decentralised approach is used to implement the project. Here the role of the community goes beyond mere participation in consultations and involves:

- Enhance efficient delivery of services
- Promote greater democracy and equity in the development process
- Promote a more prominent role for women in development
- Ensure more appropriate choices of technology and service level
- Reduce the costs to agencies by making better use of local resources, skills and knowledge
- Build community confidence and capacity to undertake further development activities

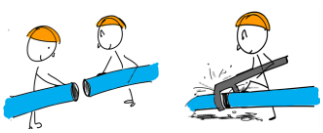
Community led management usually comprises of three basic components:

1. **Responsibility:** Community takes ownership of the assets created and is obliged to perform services that are required by the beneficiaries[v]
2. **Authority**: The community is authorised to take decisions on behalf of the consumers
3. **Control**: Community evaluates outcomes and gathers opinions from the people

Based on the comparative advantage of the citizens to operate water works, areas for management need to be identified, training must be provided and mechanism for monitoring their performance must be created. The steps below provide the methodologies for the same.



| Steps | Methodologies |
|---|---|
| Identification of Areas | Identify community – based organisations that are willing and capable to manage water supply and sewerage facilities and hand over specific aspects of the project to them. Some of the areas where community involvement is required include:<br>▪ To frequently interact with the implementing agency to ensure that the interests of the community is well represented and accommodated for in the project<br>▪ To organise contributions by the community, in cash or kind, towards construction, and towards operations and maintenance<br>▪ To manage the staff responsible for proper operation and maintenance<br>▪ To keep accurate records of all payments and expenditures<br>▪ To promote hygienic and effective use of the new facilities<br>▪ To hold regular committee meetings to discuss and decide on issues, procedures, and problems |
| Community Staff Planning | ▪ Clearly state the roles and responsibilities of the community members at every phase of project implementation<br>▪ Identify the pre-requisites of the community staff to qualify for project management For example, fluency in speaking, reading and writing the local language, twelfth standard pass, basic knowledge of computers |
| Assess Community Readiness for Contribution | ▪ Conduct a quick survey to identify the list of households willing to contribute labour<br>▪ Create incentives for households to increase contribution, such as:<br>o Fixed weekly remuneration per person for doing certain works<br>o Households may be given a discount on user charges for contributing labour<br>o Below Poverty Line (BPL) households may be allowed to pay for water connections in monthly installments, for contributing labour |
| Provide Training & Allocate Roles | ▪ Design manuals to equip citizens/communities with the required knowledge/tools to operate and maintain assets<br>▪ Conduct field visits/ on – site training where community managed projects have been successful |

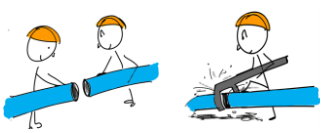


| | |
|---|---|
| Monitoring & Evaluation | ▪ Create a list of indicators for evaluation of performances for all community managers under each role. For example<br>o Attendance<br>o Regularity in reporting<br>o Number of leakages fixed in a month<br>o Improvement in tariff collection efficiency<br>▪ Design a framework for carrying out monitoring and evaluation activities |

**Box 9: Community Involvement for Integrated Urban Water Management in Mulbagal**

Arghyam, in 2007 initiated a project in the town of Mulbagal, Karnataka with approval from various government departments and in association with several partner organisations. The project was designed and implemented, based on the principles of Integrated Urban Water Management. This approach included the features of participatory methods, source-to-sink planning and sustainable interventions. This was carried out in several phases, as shown in the annexes A.4. Following were the outcomes of the project:

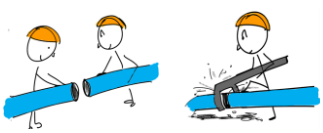
- Community toilets were repaired and management of four of these was given to the community, with rest handed over to the ULB. A care taker was trained and employed by the citizens and was paid a small fee for usage of the sanitation services.
- A new local group called *Nirmala Balaga* was formed to undertake solid waste management activities for 750 households
- A defunct rain water harvesting system was repaired and is now managed by the school
- Water transfer from the pumping station to the reservoirs was maximised with optimal consumption of energy and limited investments
- An ancient temple tank was cleaned by the citizens, which now is a source of ground water for the people



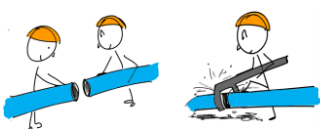
## V.4 Community involvement for Monitoring

Ward level committees/ Resident Welfare Associations can be formed to monitor and regulate water supply and sewerage operations. Existing NGOs/ CBOs could be engaged too. In order to equip community groups to effectively monitor project outcomes a set of capacity building activities must be undertaken. Also to ensure that the responsibilities vested with the community are delivered well, a clear set of selection criteria to identify the right local partner must be laid, a set of performance indicators must be identified and assessment methods must be outlined. Some of these aspects are briefly described below:

| Steps | Methodologies |
|---|---|
| Identification & Procurement of Local Partners | Refer he section on selection of a partner organization in Annex – A.2 |
| Create Local Committees | ▪ Form community groups based on zones/ streets/number of households/location/etc.<br>▪ Select representative members based on the following criteria:<br>o Inclusion of the poor, disadvantaged and women<br>o Prior knowledge and experience in identifying and tackling issues pertaining to water supply and sewage<br>o Strong interest, commitment, acceptance by people, transparent and willingness to be accountable for providing monitoring services |
| Identify the Monitoring Indicators & Formulate a Work Plan | ▪ Create a list of indicators that representative members must monitor (Please refer to annex A.6)<br>▪ Devise a work plan that must be followed by the representative members. The work plan must include:<br>o Role of the leaders<br>o Frequency of monitoring (once a week, twice a month, etc.)<br>o Methods of monitoring<br>o Reporting to customer redressal unit or the ULB<br>o A mechanism to convey changes or any updates from the ULB to the members |



| | |
|---|---|
| Provide Training | Design training material on methodologies to monitor the indicators. This could include:<br>▪ Conducting focused group discussions and meetings<br>▪ Going for transect walks<br>▪ Holding community/ door–door interviews<br>▪ Mapping public drinking water stations and kiosks<br>▪ Devising methods for data collection and analysis |
| Reporting | ▪ The representative community members should be responsible for regular reporting of the data collected, insights generated and issues identified<br>▪ The leaders may take action on potential solutions independently and report it to the ULB<br>▪ Any public grievances, inefficiencies in service delivery, etc. should be reported |



# A: Annexes

Cost Estimates

Questionnaires

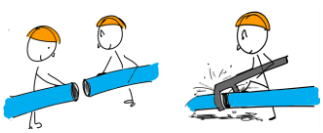
Case Studies

Participatory Planning Approaches

Monitorable Targets

Mini Sewage Treatment Plants

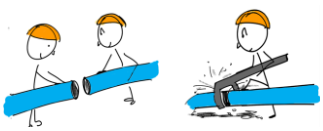
Water Balance Easy Calculator



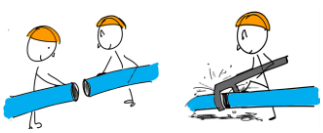
# A.1 Questionnaires

## A.1.1 Stated Preference Survey

| | |
|---|---|
| Stated Preference Survey | The objectives of this exercise should be to get total household water consumption details and generate answers to the following questions:<br>▪ What are the sources of water?<br>▪ How much water is consumed?<br>▪ What is it used for? |
| A. Details of the Respondent | Name of the Respondent:<br>Household Family Name:<br>Household Address:<br>Household Contact Number: |
| B. Details of the Household Members | 1. Name:<br>Age:<br>Gender:<br>Employment:<br>2. Name:<br>Age:<br>Gender:<br>Employment:<br>---------- (* number of family members) |
| C.1. Piped Water Connection | 1. Do you have piped water connection?<br>□ Yes □ No<br>2. Is it a shared connection?<br>3. How many tap connections are there within the house?<br>4. What is the frequency of water?<br>____ number of days per week<br>5. What is the continuity of water supply?<br>____ hours per day<br>6. How is the quality of water supply?<br>□ Very Good □ Good □ Bad □ Very Bad<br>Any Comments: _____<br>7. What is the number of buckets filled (if any)?<br>8. What is the size of buckets filled (if any)?<br>9. What are the uses of water supplied? |



| | |
|---|---|
| C.2. Informal Water Vendors | 1. Do you buy water from informal vendors?<br>□ Yes □ No<br>2. How many litres do you buy?<br>____ per day / ____ per week<br>3. How many times a day/ week does the water vendor visit the locality?<br>4. Do you stand in queue for it? If yes, when and how long?<br>5. How is the quality of water supplied?<br>□ Very Good □ Good □ Bad □ Very Bad |
| C.3. Bore well/ Tube well/ Public Stand Posts | 1. Do you rely on other sources of water? If yes, which of these:<br>□ Bore well □ Tube well □ Public Stand Post □ Others _____<br>2. How many buckets of water do you fill from these sources?<br>3. What is the size of the bucket? _____ litres<br>4. How far is this source of water located? _____ kms.<br>5. How is the quality of water?<br>□ Very Good □ Good □ Bad □ Very Bad<br>6. How long do you stand in the queue?____ hours<br>7. What is the frequency and continuity of water supplied?<br>____hours per day and ___ days per week |
| D. Water Consumption | What is the approximate amount of water consumed daily and from which source for each of these uses?<br>**Amount (in litres) Source**<br>1. Drinking<br>2. Cooking<br>3. Washing Clothes<br>4. Washing Utensils<br>5. Bathing<br>6. Others (gardening, car washing, etc) |
| E. Comments | Other Comments by the Respondent: _____ |

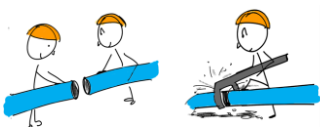


## A.1.2 Willingness to Pay Survey

The Willingness – to – Pay (WtP) Survey can be an extension of the Stated Preference Survey. Both these surveys could be conducted together for each household, unless there are two different sets of sample population identified.

As for this template, sections A, B, C and a part of D remains common. Further elaborations have been made to the questionnaire.

| | |
|---|---|
| D. Water Consumption | **SAME AS IN A.I.1 and Additional Questions**<br>1. Do you have enough water for the above mentioned purposes?<br>□ Yes □ No<br>2. How do you manage to make up for the shortage of water supply? _____<br>3. Would you prefer piped water connection to other sources?<br>□ Yes □ No |
| E. Sewage Connection | 1. If you have piped water connection, then is it linked to the sewage pipeline? □ Yes □ No<br>2. If you use other sources of water, then where is the waste water generated? □ Yes □ No<br>3. Do you have any mechanisms for primary waste water treatment?<br>□ Yes □ No<br>If yes, which of these?<br>□ Septic Tank<br>□ Building based Mini Sewage Treatment Plant<br>□ Others |
| F. Details of Other Utilities & Facilities | 1. Do you have electricity at home? □ Yes □ No<br>If yes, how much do you pay for it monthly? Rs.____<br>2. Do you have electronic appliances at home?<br>□ Yes □ No<br>If yes, which ones and what is the date of purchase?<br>**Date of Purchase**<br>1. Television<br>2. Fridge<br>3. Washing Machine<br>4. Computer |



1. Do you have a vehicle at home? □ Yes □ No

If yes, give details and date of purchase?

| | Model | Date of Purchase |
|---|---|---|
| 1. | Car | |
| 2. | Scooter | |

2. Do you have a Bank Account? □ Yes □ No

## G. Willingness to Pay

1. Can you estimate the amount spent on water consumption? Rs. ____ per month
2. What is the monthly household income?
3. If the coverage of water supply is expanded to install a piped connection in your household, how much would you be willing to pay?

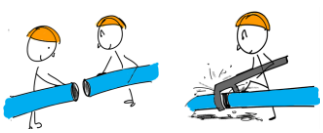
**Note:** A slab could be provided to make this question more precise

**Water/Sewage**

a) Initial installment (Rs. Per connection)
b) Water consumption (Rs. Per litre)
c) Reuse/ recycle (Rs. Per litre)

| | Water (Rs. Per litre) | Sewage (% of total water bill) |
|---|---|---|
| < 8KL | 30 | 5 |
| 8 – 25 KL | 45 | 10 |
| 25 – 50 KL | 60 | 15 |
| > 50 KL | 75 | 20 |

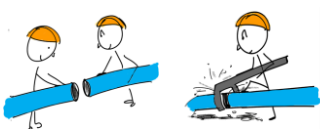
4. What are the reasons for not being able to afford the piped connection?
5. Do you have preferences other than individual tap connection?
   - □ Group tap connection
   - □ Hand pump per street
   - □ More number of public stand posts
   - □ Others _____
6. How much would you pay per month for any of the sources chosen in question 5?
7. Any other comments _____



## A.2 Participatory Planning Approaches

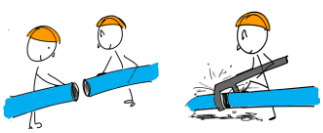
### A.2.1 Focus Group Discussions

| | |
|---|---|
| What is a Focus Group? | A focus group is a small group of **six** to **ten** people led through an open discussion by a **skilled moderator**. The group needs to be large enough to generate rich discussion but not so large that some participants are left out. |
| Nature of Group | **Homogenous** group of participants is required. It reduces conflicting interests amongst varied groups and provides an atmosphere for free voices. |
| Time Required | The ideal amount of time for a focus group is anywhere from **45** to **90** minutes. Beyond that most groups are not productive and it becomes an imposition on participants' time. |
| Number of Questions | Focus groups are structured around a set of carefully predetermined questions – usually **no more than 15** – but the discussion is free-flowing. Ideally, participant comments will stimulate and influence the thinking and sharing of others. |
| Number of FGDs | Usually **three** to **four**! You'll know you've conducted enough FGDs (with the same set of questions) when new inputs/feedback/opinions are not generated, i.e. more discussions are adding less incremental value. |



## A.2.2 Selection of a Partner Organisation/ Local NGO

| | |
|---|---|
| Issue Tender | ▪ Design the scope of the work for the partner organisation<br>▪ Advertise the tender via local media<br>▪ The tender must contain the following:<br>o Prequalification criteria<br>o Project design<br>o Time line of the project |
| Evaluate Technical Proposal | ▪ The interested organisations should have submitted the technical proposals including the strategy for carrying out activities, work plan and details of the identified experts<br>▪ The ULB must evaluate these proposals based on criteria and assign marks for the project approach, methodology and the experts |
| Evaluate Financial Proposal | ▪ The organisations qualified for the technical proposal must submit their financial proposal<br>▪ The ULBs must themselves carry out the financial assessment and prepare a shadow bid<br>▪ This shadow bid shall be used as a criteria to select the final organisation/ contractor |
| Contract Agreement | ▪ Evaluation committee shall finalise the terms and conditions under the project with the selected partner organisation and sign the agreement. This shall include:<br>o Scope of work and deliverables<br>o Payments to staff<br>o Monitoring and evaluation of the activities carried out |
| Monitoring | ▪ A thorough monitoring mechanism must be developed by the ULB to regulate the activities of the partner organisation<br>▪ A few ways could include:<br>o A ULB representative accompanying the partner organisation on field visits<br>o Submission of reports by the partner organisation |



## A.3 Cost Estimates

The Report on Indian Urban Infrastructure and Services prepared by the High Powered Expert Committee provides estimates of investments that are required for strengthening and maintaining the water supply and sewerage works. The assumptions and investment requirements laid down in the report are discussed below and may be referred to by ULBs based on their size while preparing the financial structure of projects.

### A.3.1 Water Supply

- 80% of distribution pipelines are to be replaced in all cities
- 45 lpcd of water storage is required
- Cost of metering and connection per household is Rs. 2,500
- Service life of assets is 30 years

**Exhibit 25: Per Capita Investment Costs for Water Supply (Rs. 2009-10 Constant Prices)**

| City Class Type | Production | Distribution (Rehabilitation/ Brownfield) | Distribution (Greenfield) | Annual O&M |
|---|---|---|---|---|
| **IA** | 1487 | 1831 | 2030 | 797 |
| **IB** | 1482 | 2679 | 2914 | 613 |
| **IC** | 1404 | 3855 | 4520 | 491 |
| **II** | 1357 | 3200 | 3600 | 491 |
| **III** | 1282 | 6755 | 4619 | 368 |
| **IV+** | 1282 | 6755 | 4619 | 245 |

### A.3.2 Sewerage

- 100% underground sewage network for all classes
- 100% collection and treatment of sewage
- 80% of water consumed is generated as waste water
- O&M costs for treatment is up to secondary treatment
- Asset life is 30 years

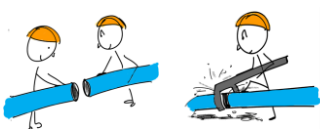


**Exhibit 26: Per Capita Investment Costs for Sewerage (Rs. 2009-10 Constant Prices)**

| City Class Type | Network | Treatment | Annual O&M |
|---|---|---|---|
| IA | 2092 | 1268 | 414 |
| IB | 2573 | 1268 | 373 |
| IC | 2338 | 1073 | 290 |
| II | 3246 | 2070 | 290 |
| III | 3637 | 2012 | 207 |
| IV+ | 4636 | 2012 | 145 |

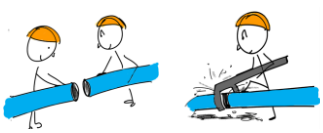
## A.4 Performance based Management Contracts

What are Management Contracts?

These contracts are short term managerial agreements between two parties (For example, state water board & ULB or, ULB & private operator), with defined roles and risk allocation. The contracting body acts a policy regulator and a monitoring agency where as the operator is the manager of the water service delivery. The operator is expected to bring in very minimal investments and high levels of operational expertise and offer services to the customers as detailed in the contract. The payments made to the operator in return for the services offered are linked to its performance, which are indexed to certain pre-determined targets. Bonuses or penalties may also be applied to these payments.

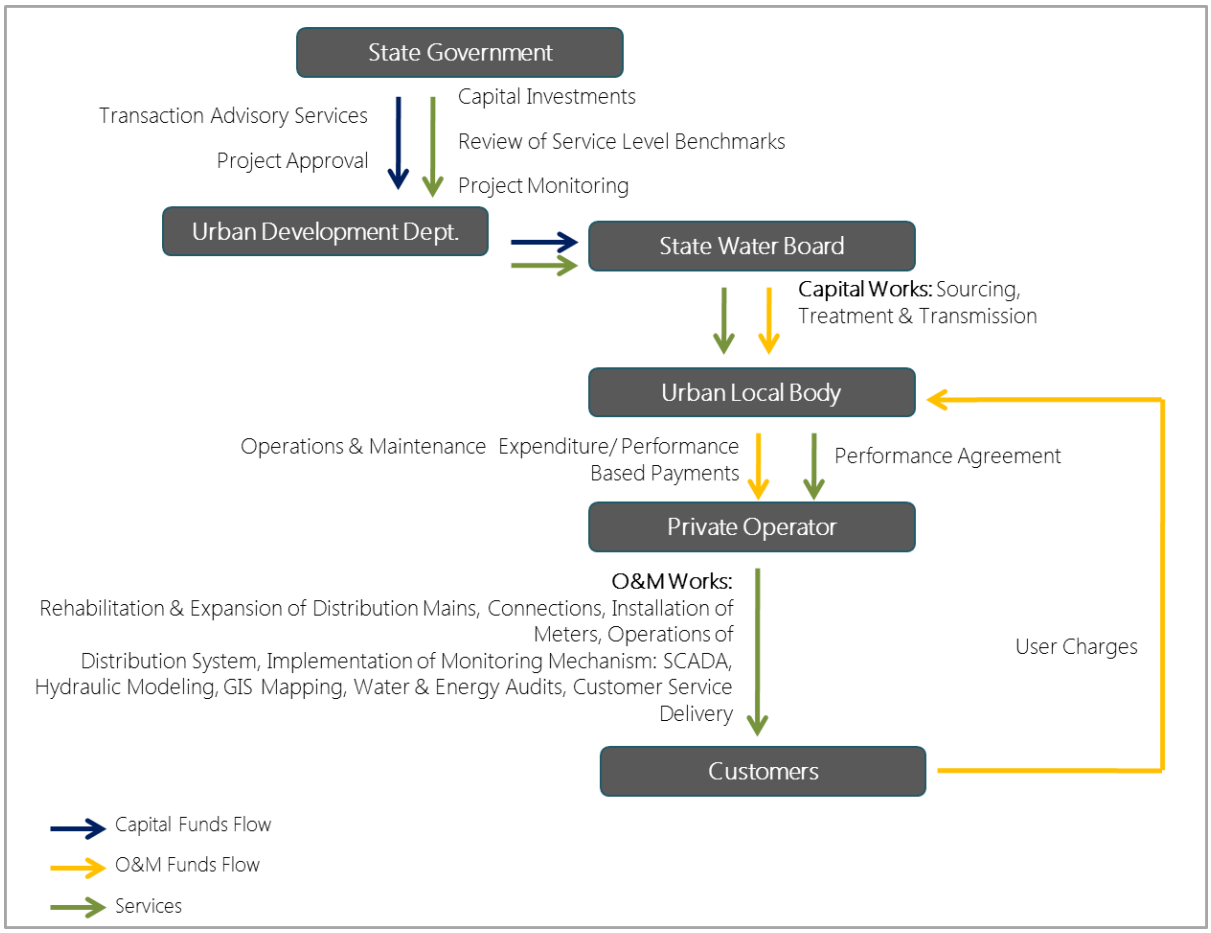
Exhibit 27 provides a sample organogram of a typical management contract of a water supply project. The state water board creates the capital works for sourcing, treating and transmitting water to the municipal bodies. The funds for these works flow from Transfers as determined by the State Finance Commission, once the project is approved. After this, the ULB enters into an agreement with a private operator who takes over the responsibility of distributing water and offering efficient and reliable services to the customers. The role of the private player here is to bring in managerial and technical expertise to improve the following conditions of the water supply system:

- Accuracy of water audits
- Accuracy of energy audits
- Estimation and reduction of NRW
- Rehabilitation of pipelines, tampered meters, etc
- Form DMAs with 100% metering
- 24*7 water supply
- Improve accessibility and equity
- Increase collection efficiency



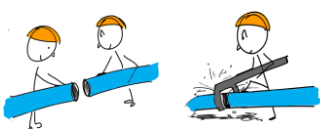
Although the water tariffs are collected by the private operator, usually they are not treated as payments made to them. The revenue collected is transferred to the escrow account of the ULB, where in based on the performance and achievements of the operator as per the target set, the payments are made. For example, for a NRW reduction target of 20%, an operator achieving more than this target, may be given a bonus. These terms and conditions are provided in the contract with the mutual consensus of all stakeholders. The initial investments for O&M may be given by the state or the ULB or the private operator may self finance it if the revenue model is attractive.

**Exhibit 27: Stakeholder Model of a Performance Based Management Contract**



## A.4.1 Performance Management Contract - Key Features[vi]

| | |
|---|---|
| Appropriate Risk Allocation | ▪ Provides clarity on the roles and responsibilities of each stakeholder<br>▪ Risk is allocated to the party best suited to manage it<br>▪ The role of the ULB shifts to that of a policy maker, regulator, CapEx financier, monitor and asset owner rather than a mere operator<br>▪ The private operator is responsible for providing efficient and reliable services, with performance linked to payments.<br>▪ It allows decentralised management of water supply services with reasonable and measureable targets |
| Linkage with Performance Indicators | ▪ Unlike other PPP models, performance–based management contract provides a direct link between annual achievements and payments to the private operator<br>▪ This system therefore closely monitors progress made by the operator. It further avoids monopoly profits (if any) made by the operator. |
| Enhances Financial Viability | ▪ The performance targets to be achieved by the operator also includes two important aspects:<br>o Collection Efficiency<br>o Cost Recovery (O&M costs to begin with)<br>▪ This ensures that the water supply system becomes financially viable and sustainable over time, which reduces the dependence of ULBs on grants and funds from the centre.<br>▪ Such measures also ensure tight control over the costs and revenues and therefore better financial planning and management of ring–fenced water assets |
| Increases Accountability & Inclusivity | ▪ The contract structure accommodates both external and internal accountability. External accountability addresses the stakeholder management by the ULB including relations with the private operator and the customers<br>▪ Conducting house–to-house survey, providing efficient customer redressal services, etc. increases accountability, inclusiveness and transparency<br>▪ Internal accountability includes management of the staff, conducting performance appraisals, providing incentives for achievements, etc. |
| Phased approach | As these contracts are short term, it allows for a phased approach towards achieving targets or standards set by the government. |



**Box 10: Maharashtra SujalNirmalAbhiyan**

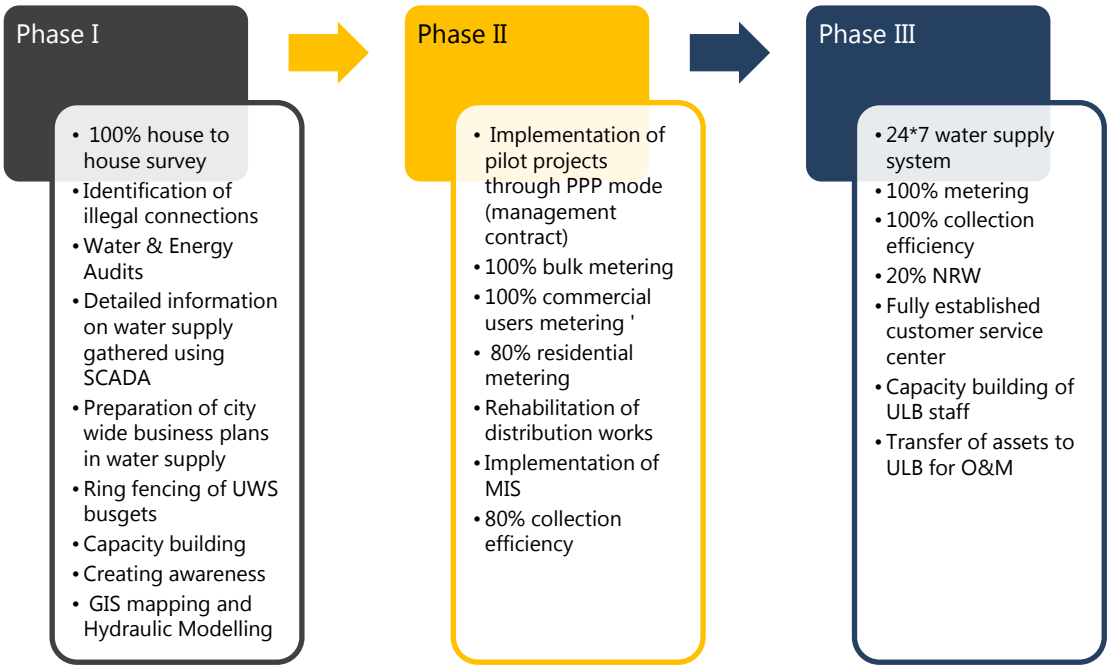
The Maharashtra SujalNirmalAbhiyan (MSNA) was initiated by Maharashtra Jeevan Pradhikaran (MJP), the state nodal agency for water supply and sanitation in 2010. The objective of this program is to create a shift from an activity – driven creation of water works to performance oriented project implementation. The program led to changes in the institutional framework with the role of MJP as a policy maker, financier and project manager where as the ULB was given further financial autonomy and made accountable for service delivery.

**Key Features**

- 135 lpcd for corporations and Class A towns and 70 lpcd for remaining towns
- 100% O&M cost recovery and partial recovery of capital costs by 2017
- Ring fencing of water supply and sanitation budget
- Cities can choose between MJP, PPP or own service delivery arrangement
- Water tariffs indexed to cover 100% O&M costs
- 100% metering
- Reduction of NRW to 15% by 2017
- 100% collection ratio by 2017
- Lifeline consumption of 40 lpcd
- Financial support linked to achievement of reform

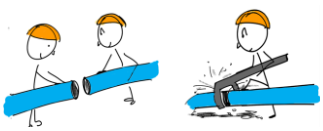
**Phases of Implementation**

- Every urban water supply and sewerage project identified in a ULB would be carried out in three phases




**Current Status & Way Forward**

- As of 2013, 70 ULBs have approached MJP for funding and project management expertise to implement management contracts in their respective cities. Of these, about 30 projects are under construction or in the operational stage.



## A.5 Case Studies

### A.5.1 Visakhapatnam Waste Water Treatment, Recycle and Reuse

| Type of Model | PPP: DBFOT |
|---|---|
| Project Scope | Concessionaire to design, construct, finance and operate a Tertiary Sewage Treatment Plant (TSTP) of 60 MLD to supply non – potable grade water (40 MLD) to the industrial consumers, such that additional fresh water sourced can be reduced and used to meet incremental domestic demand for water |
| Financial Model | **Total Project Cost:** Rs. 100 Crore<br><br>Private concessionaire to finance the project entirely in the form of debt and equity<br>**Revenue Model**:<br>1) Private Concessionaire shall pay the ULB a royalty for providing secondary treated sewage. This fee was Rs. 2.25 per KL escalated at 5% p.a. over the concession period (a tariff paid to the ULB by those industries using secondary treated sewage as raw material)<br>2) Concessionaire shall be paid a tariff of Rs. 32 for supplying tertiary treated sewage (non-potable water) to the industries, such that the internal rate of return of the project is 15.5% |
| Contracting Authority | Greater Visakhapatnam Municipal Corporation |
| Contracted out to | NA |
| Contract Period | 26 years including 12 months of construction |
| Role of the ULBs | ▪ Supply secondary treated sewage to the concessionaire and in return collect a monthly royalty<br>▪ Monitor the quality of tertiary treated sewage supplied by the concessionaire to the industries as per the standards set by the pollution control board |
| Enabling Factors | Under construction |

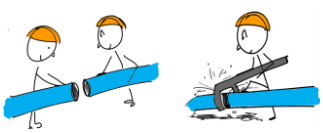
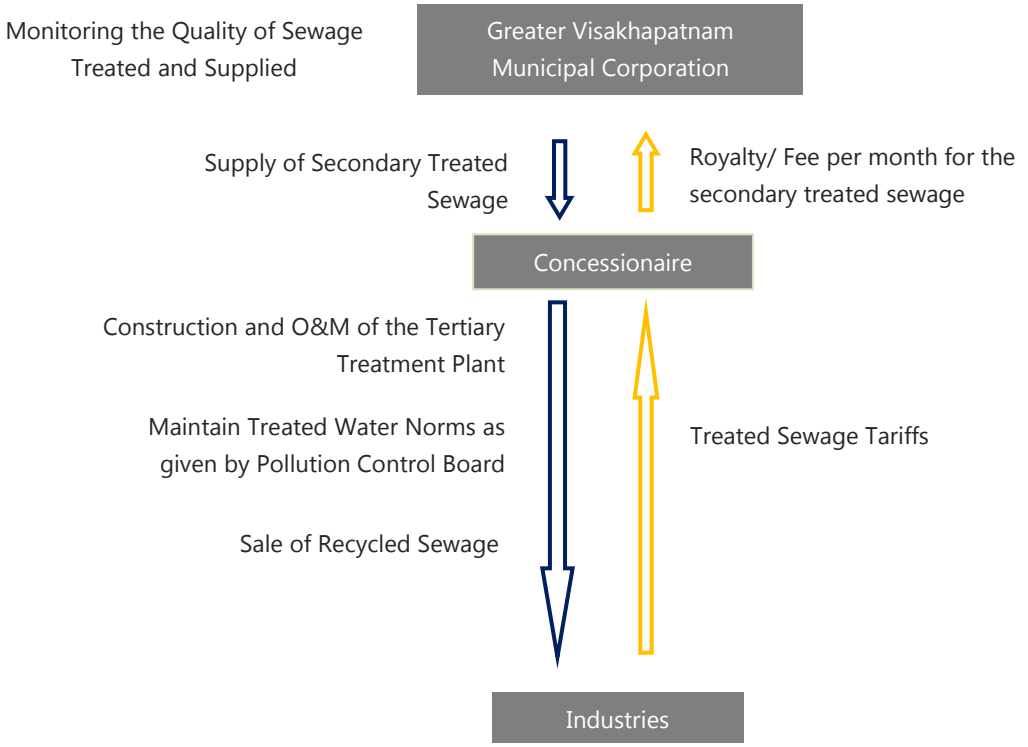
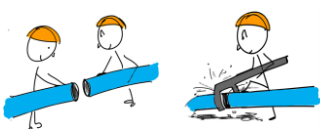


**Exhibit 28: Stakeholder Map of Visakhapatnam Waste Water Treatment, Recycle and Reuse**



## A.5.2 Pimpri-Chinchwad Water Supply System

<table>
<tr><th>Type of Model</th><th>PPP: Performance – Based Management Contract</th></tr>
<tr><td>Project Scope</td><td>
<ul>
<li>The project was designed to refurbish the water supply system in the city of Pimpri - Chinchwad, and was funded in two phases by JNNURM, (Rs. 358.62 crore and Rs. 135. 12 crore, respectively).</li>
<li>A new 100 MLD water treatment plant was added to the existing ones to build a capacity of 428 MLD. Along with it, about 59 Elevated Service Reservoirs (ESR's) were commissioned to release 370 MLD of water supply to the city (i.e., 170 lpcd to current population of 1.6 Million)</li>
</ul>
</td></tr>
<tr><td>Financial Model</td><td>
Expenditure (Rs. Lakh):<br>
1) JNNURM Water Supply Phase I
<table>
<tr><td>Elevated Service Reservoir<br>Kalakhadak<br>Punawale</td><td>85.88<br>58.11</td></tr>
<tr><td>Metering System</td><td>1,685.77</td></tr>
<tr><td>Water Treatment Plant (100 MLD)</td><td>851.73</td></tr>
<tr><td>Pipelines</td><td>1,756.68</td></tr>
<tr><td>Laying of Distribution Network</td><td>4,636.31</td></tr>
<tr><td>Strengthening of Distribution Network</td><td>2,700.61</td></tr>
<tr><td>Closed Pipeline from Pawana Dam to Sector 23</td><td>24,086.55</td></tr>
<tr><td>Total</td><td>35,862.00</td></tr>
</table>
2) JNNURM Water Supply Phase II
<table>
<tr><td>Transmission/ Feeding/ Pumping</td><td>10,140</td></tr>
<tr><td>Sump & PH/ Pumping Main</td><td>243</td></tr>
<tr><td>Elevated Service Reservoirs</td><td>1,536</td></tr>
<tr><td>Pumping Machinery</td><td>360</td></tr>
<tr><td>SCADA</td><td>1,233</td></tr>
<tr><td>Total</td><td>13,512</td></tr>
</table>
Revenue Model: The ULB collects water charges as a part of property tax
</td></tr>
<tr><td>Contracting Authority</td><td>PimpriChinchwad Municipal Corporation (PCMC)</td></tr>
<tr><td>Contractor</td><td>Suez Environment</td></tr>
<tr><td>Contract Period</td><td>NA</td></tr>
<tr><td>Strategies</td><td>The project was implemented by introducing four reforms/ changes:
<ul>
<li>Infrastructure Reform: Expanding and strengthening of the water</li>
</ul>
</td></tr>
</table>

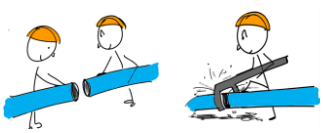


| | |
|---|---|
| | treatment plants, rehabilitation of the distribution networks and construction of 25 new ESRs<br>▪ **Technical Reforms:** Phased metered connections (a total of 1,17,936) accompanied with computerised water billing, implementation of volumetric tariffs, online payment mechanism and 24*7 customer redressel cell. Supervisory Control Advisory & Data Acquisition (SCADA) system was also implemented to track water losses and monitor water audits.<br>▪ **Administrative Reforms:** The entire area under the PCMC was divided into 47 ESR Zones, each monitored by a Junior engineer responsible for water supply, billing, cost recovery, NRW and customer services<br>▪ **Public Awareness:** Various campaigns, household surveys and visits to residential societies were made to build confidence amongst the users about treated water, address the issue of willingness to pay and ensure efficient usage. |

## A.5.3 Alandur Sewerage Project

| PPP Type | BOT – Annuity |
|---|---|
| Project Scope | ▪ Implemented in Alandur— a small town located in the outskirts of Chennai, with a total population of 1.46 Lakh (2001 Census), of which the slum population was 38,010. The estimated sewage generated was 80 lpcd.<br>▪ The project was implemented in two phases.<br>**Phase I**: Main sewer lines – 19 km<br>Minor sewer lines – 101 km<br>Pumping mains – 6 km<br>Pumping station – 1<br>Sewage treatment plant – 1 of 12 MLD<br>**Phase II**: Sewage treatment plant – 1 of 12 MLD |
| Financial Model | **Sources of Finance (Rs. Crores)** |

| | |
|---|---|
| Loan from TUFIDCO | 16 |
| Loan from TNUDF | 4 |
| Deposit collection | 8 |
| Gap funding by GoTN | 3 |
| Interest from deposits | 2 |
| Grant fund for supervision | 1 |



**Connection Charges (Rs.)**

| | |
|---|---|
| Domestic | 6,000 |
| Commercial | 10,000 |
| Industrial | 10,000 |

**Tariff Structure (Rs. Per Month)**

| | Domestic | Commercial & Industrial |
|---|---|---|
| <500 | 60 | 200 |
| 500 – 1,500 | 80 | 400 |
| 1,500 – 3,000 | 100 | 600 |
| >3,000 | 120 | 1,000 |

| | |
|---|---|
| Contracting Authority | Alandur Municipality |
| Concessionaire | ▪ A consortium of IVRCL and WA Tech Wabag was formed where in the former was mandated to undertake the electro – mechanical works and the latter was responsible for civil works and O&M of the 2 STPs.<br>▪ The O&M of the sewer lines was contracted out to a third firm after the construction works by the IVRCL consortium was completed. |
| Contract Period | 14 years<br>EPC: 3 years<br>O&M (for STPs): 11 years |
| Role of the ULB | ▪ Regulate tariffs and connection charges in consultation with the State Level Agencies<br>▪ Collection of tariffs and connection fees from the citizens and make regular payments to the private contractors<br>▪ Monitor O&M works |
| Enabling Factors | ▪ TNUIFSL provided the municipality a set of options such as soft loans from TNUDF, grants from GoTN and implementation of the project on a PPP mode to address its financial constraints.<br>▪ Upfront investment made by the community that ensured the financial viability of the project<br>▪ The Alandur Mayor played a critical role and provided the much required leadership and vision<br>▪ The capability of the Alandur Municipality to develop and implement effective IEC strategies from the project initiation stage itself and get community-buy in for the project finance played an important role in avoiding implementation delays |

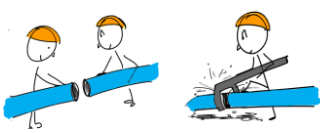
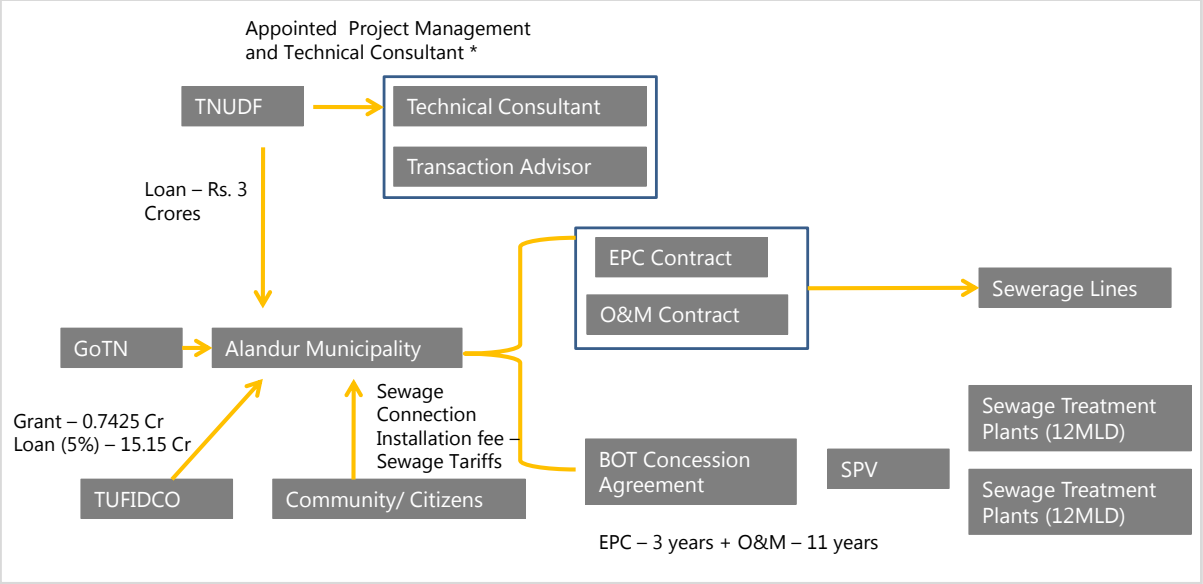
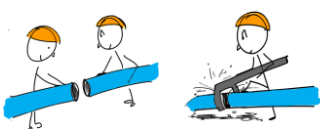


**Exhibit 29: Stakeholder Model of Alandur Sewerage Project**



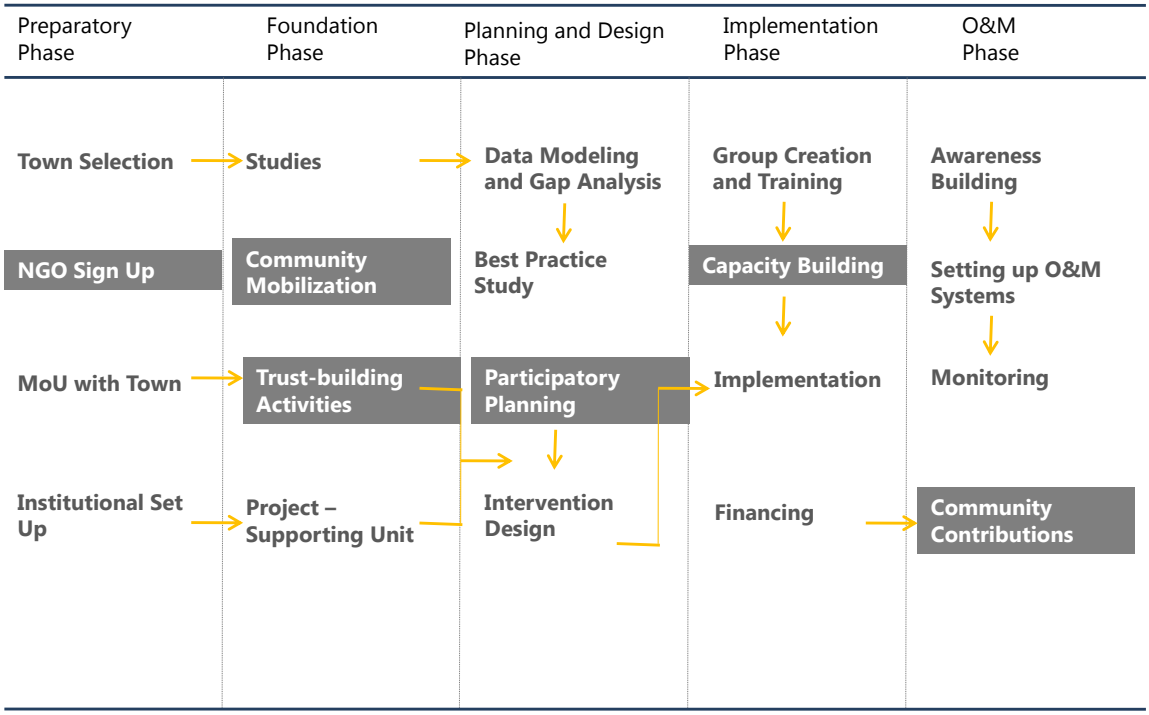

## A.5.4 Integrated Urban Water Management in Mulbagal

| Model | Participatory Approach towards Integrated Urban Water Management (IUWM) |
|---|---|
| Project Scope | The project objective was to make provision of low cost and reliable water and sanitation services to all citizens of Mulbagal (a Class III town) by empowering the community and strengthening capacities amongst the local institutions. The following pilots were implemented which led to Integrated Urban Water Management (IUWM):<br>▪ Revival of community managed toilets<br>▪ Rainwater harvesting in schools<br>▪ Energy efficiency improvement in two pumping stations<br>▪ Solid waste management in three wards<br>▪ Revival of an ancient tank by removal of sewage<br>▪ Integrated low cost sanitation |
| Financial Model | Funding from various State Agencies such as KUIDFC and Central Schemes such as Integrated Low Cost Sanitation Scheme |
| Contracting Authority | Mulbagal Town Municipal Council (TMC) |
| Contractor/Concessionaire | Arghyam, Bengaluru |
| Sub – Contractors (IUWM Partners) | Indian Institute of Science – Groundwater study and water quality study<br>Conserve Systems – Energy Audit<br>TTI – Water asset survey<br>Institute for Resource Analysis and Policy – IUWM toolkits<br>MYRADA – Social mobilisation<br>Stockholm Environmental Institute - Water Evaluation & Planning<br>CoG – Communications |



| | |
|---|---|
| Contract Period | 4 years |
| Role of the ULB | ▪ Retain the ownership of the assets<br>▪ Co – ordinate with the Project Support Unit (PSU), set up within the town for effective communication between stakeholders<br>▪ Receive training from the implementing agencies to operate and maintain the works<br>▪ Provide support to the contractor for implementing the project and mobilising community for creating awareness and enhance participation |
| Institutional Arrangement | ▪ Directorate of Municipal Administration (DMA) – nodal office for the programme, as nominated by UDD was responsible for financing and implementation<br>▪ State Level Co – ordination Committee (SLCC) – comprising of representatives from all departments pertaining to water management, was to hold quarterly meetings to share progress, key lessons from the field and obtain approvals, etc<br>▪ Sanghas (ward level groups) with elected councillors as heads was formed for community involvement<br>▪ A Project Support Unit (PSU) was set up to co – ordinate between stakeholders |
| Enabling Factors | ▪ Strengthening capacities of the local institutions<br>▪ Co-operation from the Town Municipal Council, Deputy Commissioner's office and DMA<br>▪ Structured citizen engagement and willingness to learn new techniques |

**Exhibit 30: Phases of Integrated Urban Water Management in Mulbagal**




Source: 'An Approach to Integrated Urban Water Management (IUWM): *The Mulbagal Experience',* Arghyam, 2012

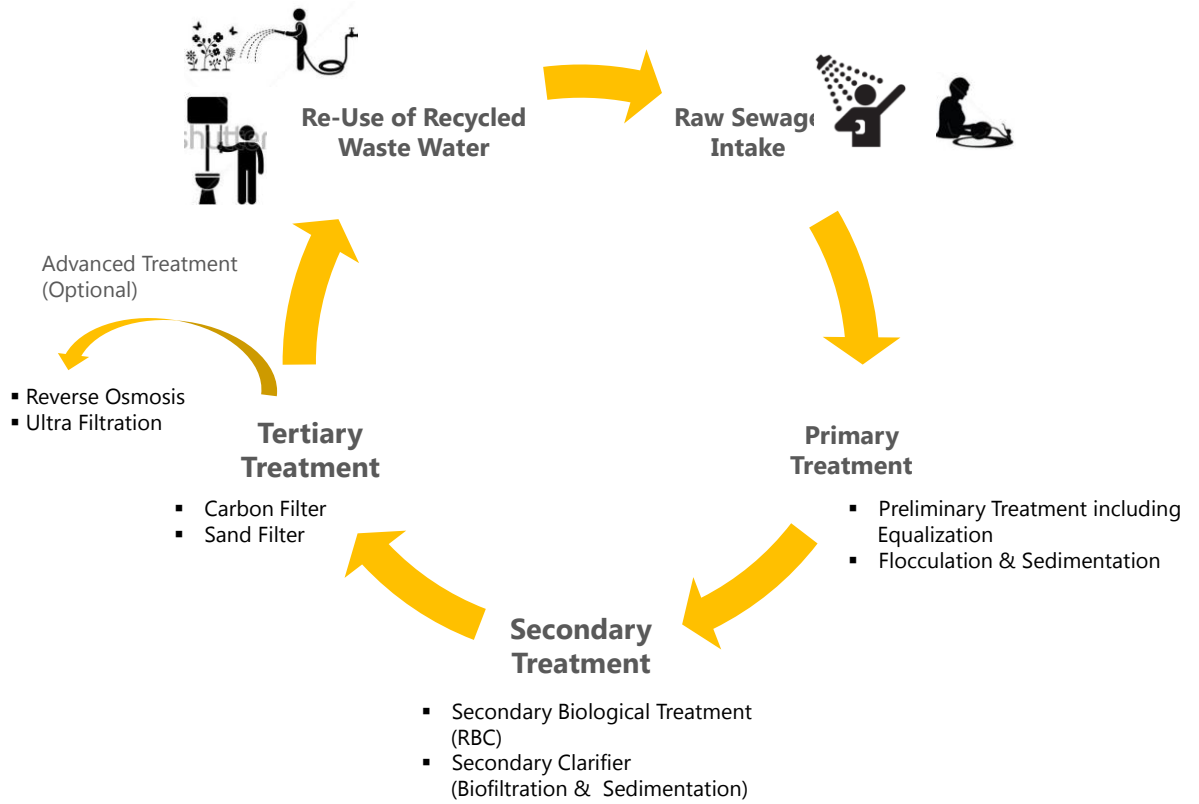
## A.6 Mini Sewerage Treatment Plants

One of the recent technologies for waste water recycling is the use of mini-Sewage Treatment Plants (STPs). Many projects have been implemented in cities and even Tier II and III towns, wherein STPs have been installed and operated in apartment complexes, industrial units, vacation resorts, hotels etc. These STPs provide low cost effective technologies that allow reuse of 50-70% of the sewage generated from domestic usage. It requires decentralised governance with very minimal skills for operating the system. The Hyderabad Water Supply and Sewerage Board (HWSSB) is also planning to undertake such projects in various multi storied buildings of the city. Given these capabilities, this case study describes the treatment process briefly, followed by the estimation of capital and O&M costs and then highlights the advantages of Decentralized STPs.

### Treatment Process

The capacities of these treatment plants range from 10 KLD - 200 KLD (2 MLD) to treat sewage generated by households, educational institutes, hospitals, commercial establishments, hotels and resorts. The STPs are meant for treating sewage right from primary treatment to tertiary treatment and about 50 – 70% of the waste water generated is recycled into the system. Exhibit 31 presents the flow of the treatment process of these mini STPs. Raw sewage generated by households is drawn into the system for preliminary treatment, where in large solids are separated from the liquid contents and flocculation of the waste water is carried out. Post this, the waste water is allowed to float in a quiescent basin until the heavy liquids (oil and grease) float on the top and is then carried to the sludge basin.

**Exhibit 31: Treatment Cycle of Mini Sewage Treatment Plants**



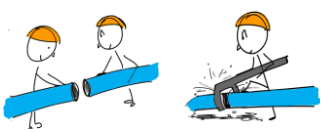
The remaining waste water undergoes secondary treatment to remove dissolved and suspended matter followed by tertiary treatment. In this phase, the waste water is treated with chemicals for its disinfection, such that it can be used for non potable purposes like irrigation, watering the parks, gardening and flushing toilets. In most cases the water is allowed to directly flow into the wetland for plantation purposes. The left over sludge is treated through anaerobic and aerobic digestion for use as fertilizers/ compost.

## Costs of Installation and Operations

The capital expenditure of installing a 400 KLD plant serving 2500 residents / 500 flats or households is Rs. 50 – 60 Lakh, while the operation and management/maintenance costs depend on the capacity of the STP. Exhibit 32 below provides an estimation of these costs.

**Exhibit 32: Costs of Installation and Operations of On-Site STPs**

| Capacity of Treatment Plant (LD) | 10,000 | 50,000 | 4,50,000 |
|---|---|---|---|
| Population Served[vii] | 93 | 463 | 4,167 |
| Households Served[viii] | 19 | 93 | 833 |
| O&M Costs (per litre) - 1.5 to 2 p | 0.02 | 0.02 | 0.02 |
| Total Annual O&M Costs (Rs.) | 73,000 | 3,65,000 | 32,85,000 |
| O&M Costs (per person per month- Rs.) | 65.7 | 65.7 | 65.7 |
| O&M Costs (Rs. per household per month) | 328.5 | 328.5 | 328.5 |
| Total Capital Expenditure (RsLakhs) | 10.0 | 17.0 | 70.0 |
| CapEx (Rs. per Litre) | 100 | 34 | 15.6 |
| CapEx (per household) in Rs. 000's | 52.6 | 18.3 | 8.4 |
| CapEx (per person) in Rs. 000's | 10.8 | 3.7 | 1.7 |



## Management of Operations

The operations and management of these sewerage treatment plants is usually carried out by the local community benefitting from it. Personnel are trained by the vendors of STPs and Annual Maintenance Contracts (AMCs) are undertaken by the contractors for trouble free upkeep.

## Features

An '***On – Site Decentralised Sewage Treatment and Re- Use***' has the following features:

- Minimum sludge generation
- No Stench
- Low power consumption
- Low cost of operation and maintenance
- Minimum civil work
- Compact design/ Less space requirement (ranging between 400 – 750 square feet)
- Very little operational noise
- Minimal skill requirement for operations

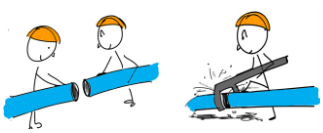
**Benefits of Decentralized sewage treatment systems:**

a) Local recycling of waste water ensures a sustainable water management system. Ensures that ground water is not contaminated.

b) With the growing dearth of land availability for large scale centralized treatment systems, this will be a more viable option

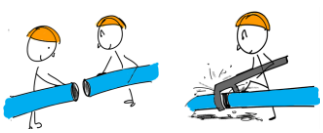
c) Can be installed even in existing complexes (retrofitting) and hence the need for extensive piping requirements is avoided

d) Water costs substantially reduced since this is a perennial source of water for large consumption activities such as - gardening / facilities washing and even flushing applications

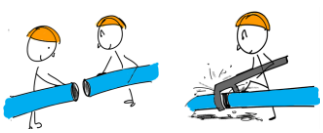


## A.7 List of Monitorable Indicators

| | Indicators | | Quantity | | Number | |
|---|---|---|---|---|---|---|
| | | | Actual | Target | Actual | Target |
| Water Supply Service Delivery | Water Supply Coverage (lpcd) | Households | | | | |
| | | Commercial | | | | |
| | | Industries | | | | |
| | Household Connections | Tap/Piped | | | | |
| | | Hand pumps | | | | |
| | | Bore wells | | | | |
| | Average Pressure (lp connection) | | | | | |
| | Number and Capacity of Storage Reservoirs | | | | | |
| | Capacity of Water Treatment Plants | | | | | |
| | Quality of Water Supplied (%) | | | | | |
| | Metering (Number and %) | Bulk | | | | |
| | | Consumption | | | | |
| | Quantity of Water Produced | | | | | |
| | Quantity of Water Supplied | | | | | |
| | Continuity of Water Supplied | Frequency (days) | | | | |
| | | Duration (hours) | | | | |
| | Customers with discontinuous water supply | | | | | |
| Non Revenue Water | Non Revenue Water | | | | | |
| | Unaccounted for Water Losses | | | | | |
| | Unbilled Connections | | | | | |
| | Billed Connections | | | | | |
| | Commercial Losses | | | | | |
| | Physical Losses | | | | | |
| | Pipe Breaks per Kilometer Per Year | | | | | |
| Sewerage Service Delivery | Sewage Coverage | Households | | | | |
| | | Industrial | | | | |
| | | Commercial | | | | |
| | Quantity of Sewage Collected | | | | | |
| | Quantity of Sewage Treated | Primary | | | | |
| | | Secondary | | | | |
| | | Tertiary | | | | |

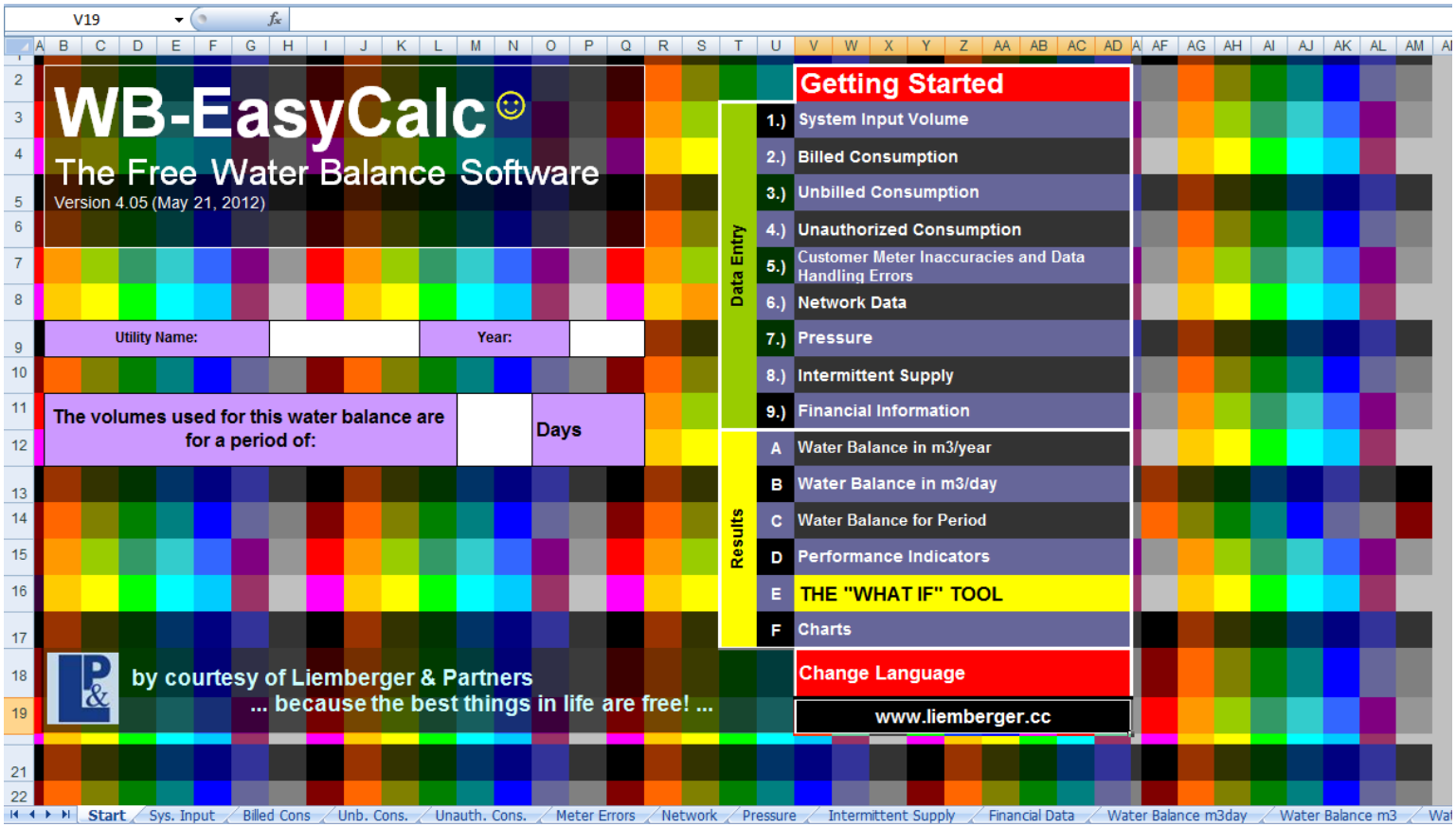


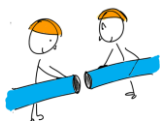
| | | | | | | |
|---|---|---|---|---|---|---|
| | Blockages per Year in Sewage | | | | | |
| | Capacity of Sewage Treatment Plant | | | | | |
| | Reuse and Recycle | | | | | |
| | Quantity of Effluent Discharged | | | | | |
| | Customer Redressal | | | | | |
| **Costs and Staffing** | Unit Operational Cost (Rs. /m^3 produced) | | | | | |
| | Unit Operational Cost (Rs./m^3 sold) | | | | | |
| | Operational Cost of Water Supply (as a % of total) | | | | | |
| | Operational Cost of Sewerage (as a % of total) | | | | | |
| | Staff per 1000 Water Connections | | | | | |
| | Staff per 1000 Population Served (Water) | | | | | |
| | Staff per 1000 Sewage Connections | | | | | |
| | Staff per 1000 Population Served (Sewage) | | | | | |
| | Labour Costs (as a % of total operational costs) | | | | | |
| | Electricity Costs (as % of total operational costs) | | | | | |
| **Billing and Collection** | Average Revenue (total revenue/ number of connections or water sold) | | | | | |
| | Revenue Generated from Resale of Treated Waste Water (Rs.) | | | | | |
| | Operating Ratio | | | | | |
| | Debt Service Ratio | | | | | |
| | Cost Recovery | | | | | |
| | Collection Efficiency | | | | | |



## A.8 WB Easy Calc

The WB Easy Calc is 'The Free Water Balance Software' developed by Liemberger& Partners and provides a dash board which could be used by the ULBs or the monitoring agencies to record and analyse water audits and indicators pertaining to non – revenue water. The software is available for free at <http://www.liemberger.cc>





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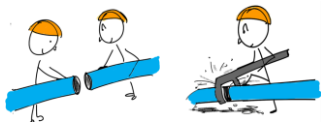
| Performance Indicators | | | | |
|---|---|---|---|---|
| **Level of Service** | | | | |
| | Best Estimate | Error Margin [+/- %] | Lower Bound | Upper Bound |
| Average Supply Time [h/day] | 24.0 | 0% | 24.0 | 24.0 |
| Average Pressure [m] | 0.0 | 0% | 0.0 | 0.0 |
| **Volume of Physical Losses** | | | | |
| | Best Estimate | Error Margin [+/- %] | Lower Bound | Upper Bound |
| CAPL - Current Annual Volume of Physical Losses [m3/day] | 0 | 0% | 0 | 0 |
| MAPL - Minimum Achievable Volume of Physical Losses [m3/day] | 0 | 0% | 0 | 0 |
| **Physical Loss Performance Indicators** | | | | |
| | Best Estimate | Error Margin [+/- %] | Lower Bound | Upper Bound |
| Infrastructure Leakage Index (ILI) | 0.0 | 0% | 0 | 0 |
| Liters per Connection per Day (w.s.p.)<br><br>w.s.p.: when the system is pressurized - this means the value is already corrected in the case of intermittent supply | 0 | 0% | 0 | 0 |
| Liters per Connection per Day per meter Pressure (w.s.p.) | 0 | 0% | 0 | 0 |

Financial Data | Water Balance m3day | Water Balance m3 | Water Balance m3year

| | | | | |
|---|---|---|---|---|
| m3/km mains per hour (w.s.p.) | 0.00 | 0% | 0.00 | 0.00 |
| **Commercial Loss Performance Indicators** | | | | |
| | Best Estimate | Error Margin [+/- %] | Lower Bound | Upper Bound |
| Commercial Losses expressed in % of Authorized Consumption | 0% | 0% | 0% | 0% |
| liters/connection/day | 0 | 0% | 0 | 0 |
| **Financial Performance Indicators** | | | | |
| | Best Estimate | Error Margin [+/- %] | Lower Bound | Upper Bound |
| Volume of Non-Revenue Water expressed in % of System Input Volume | 0% | 0% | 0% | 0% |
| Value of Non-Revenue Water expressed in % of Annual Operating Cost | 0% | 0% | 0% | 0% |
| Liters per Connection per Day (w.s.p.)<br><br>w.s.p.: when the system is pressurized - this means the value is already corrected in the case of intermittent supply | 0 | 0% | 0 | 0 |





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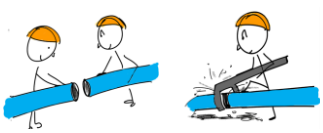

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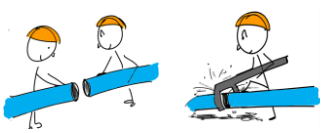

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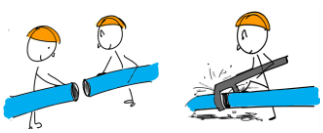

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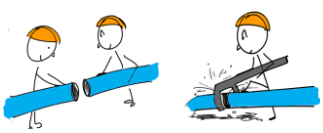


## Endnotes

[i] National PPP Policy 2011 – Draft for Consultation, Ministry of Finance, Government of India

[ii] A sample questionnaire for the stated preference survey is provided in the Annex – A.1

[iii] This approach requires high extent of metering to be able to map the quantity of consumed water by various beneficiaries. As the extent of metering is very poor in the state of Andhra Pradesh, this Guide Book does not elaborate on this approach.

[iv] It should be noted here that waste water is not proportionate to the amount of water produced or supplied, but to the amount that is consumed by the users' end

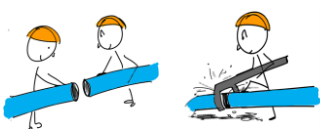
[v] In management of services, the term community has a different definition. Here the term community does not involve all the citizens who are likely to get affected by the project, but only comprises of select citizen representatives. These members take up the responsibility of service delivery as agreed upon in the contract with the ULB/private entity and represent citizens interests

[vi] This feature may prove to be disastrous if the performance targets and project timelines are unrealistic

[vii] The population figures are calculated based on the norm of 135 litres consumed per capita per day, set by Ministry of Urban Development.. 80% of this consumption is assumed to be waste water

[viii] Estimation of number of households is based on the assumption that there are 5 members per household





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