Tool Kit for Public–Private Partnerships in Urban Water Supply for the State of Maharashtra, India

Knowledge Series

Edited by

Anouj Mehta

THE GOI-ADB PPP INITIATIVE
Mainstreaming PPPs in India
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Government of India
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The Asian Development Bank (ADB) engaged CRISIL, a leading consultancy firm, at the request of the Government of Maharashtra, under the Government of India–ADB Initiative for Mainstreaming Public–Private Partnerships (PPPs), to develop possible PPP solutions for the urban water supply sector in the state. The Department of Economic Affairs, PPP Cell (Maharashtra) and ADB have worked closely in the development of this report. No part of this document may be replicated, quoted, or printed without written confirmation from Department of Economic Affairs and ADB (India) PPP focal points.

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Foreword

Sustained growth of the Indian economy is essential for all-round development of the country. Within this requirement, sustainable infrastructure development is critical for providing the backbone for economic activities and for ensuring that resources are conserved and used most efficiently, given the limited and the fast depleting nature of these resources.

Public–private partnerships (PPPs) are seen as a key ingredient in this, for bringing in much-needed investments, as well as efficiencies in utilization and management of resources—whether water, power, or, indeed, money. Various estimates indicate that if the economy is to grow at 8% per annum, more than $500 billion of investment in infrastructure is needed between 2007 and 2012; about 30% of this requirement must come from the private sector.

The Government of India is therefore taking a structured approach to creating an enabling environment for private investment and operations in infrastructure. With Asian Development Bank (ADB) assistance, a gradually ending set of tasks, including capacity building and institutionalization of PPPs across the country, is being carried out under the Government of India–ADB Initiative for Mainstreaming PPPs. State PPP cells and departments, such as the Urban Development Department in Maharashtra, are being supported in various state-specific activities.

Together with the Department of Economic Affairs, state PPP cell, and relevant departments, the initiative focused on identifying and developing PPP structures, which can be implemented in water supply and sanitation for the cities of Maharashtra. Hence, various possible PPP structures for the sector were studied, and the applicability of these structures assessed in the context of the selected sample cities. Consultations led to development of term sheets for these PPP structures, which are identified as most suitable and feasible for implementation.

The above exercise has led to the development of this report, which may be considered as a tool kit to assist the relevant public entities in Maharashtra state for developing PPP-based projects in water supply and sanitation. The tool kit is also designed to help decision makers decide whether a particular project might be suitable for the PPP route or not. The tool kit can, therefore, be the basis for approving a project implementation structure as part of the overall project approval methodology.

We are confident that these tool kits will be used by the municipal commissioners and the chief executive officers of the urban local bodies, and other relevant state government officials and decision makers while considering PPP-based implementation of urban water supply and sanitation projects.

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This tool kit would not have been possible without the continuous and rigorous inputs by DEA represented by Ms. Aparna Bhatia. The reviews and consultations facilitated by the senior members of the Government of Maharashtra helped incorporate the ground realities. The ADB team, led by Mr. Anouj Mehta, has been part of every step of tool kit preparation, providing their insights to develop it in a user-friendly manner.

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Abbreviations

ADB	–	Asian Development Bank
AMC	–	Akot Municipal Council
CMC	–	Chiplun Municipal Council
CMWSSB	–	Chennai Metropolitan Water Supply and Sewerage Board
CPHEEO	–	Central Public Health and Environmental Engineering Organisation
CRISIL	–	CRISIL Risk and Infrastructure Solutions Limited
DPR	–	detailed project report
ESR	–	elevated storage reservoir
FY	–	fiscal year
IRR	–	internal rate of return
JMC	–	Jalna Municipal Council
JNNURM	–	Jawaharlal Nehru National Urban Renewal Mission
JUSCO	–	Jamshedpur Utilities and Services Company
KBMC	–	Kulgaon-Badlapur Municipal Council
kl	–	kiloliter
km	–	kilometer
KMC	–	Kolhapur Municipal Council
KUWASIP	–	Karnataka Urban Water Sector Improvement Project
lpcd	–	liter per capital per day
MJP	–	Maharashtra Jeevan Pradhikaran
MLD	–	million liters per day
MMRDA	–	Mumbai Metropolitan Regional Development Authority
NMMC	–	Navi Mumbai Municipal Corporation
O&M	–	operation and maintenance
PPP	–	public–private partnership
RFP	–	request for proposal
RFQ	–	request for qualification
Rs	–	rupees
SMC	–	Saoner Municipal Council
SMKMC	–	Sangli-Miraj-Kupwad Municipal Corporation
STP	–	sewage treatment plant
SWMC	–	Shirpur Warvade Municipal Council
TA	–	technical assistance
UIDSSMT	–	Urban Infrastructure Development Scheme for Small and Medium Towns
ULB	–	urban local body
VGF	–	Viability Gap Fund
WACC	–	weighted average cost of capital
WTP	–	water treatment plant

PART I

PPP Tool Kit for the Water Supply and Sanitation Sector

I Introduction

Background and Scope of Work

The Asian Development Bank (ADB) is supporting the Public–Private Partnership (PPP) Cell of the Urban Development Department and the Water Supply and Sanitation Department of the Government of Maharashtra in mainstreaming PPPs in select sample cities of the state through a technical assistance (TA) project. The project aims to identify and develop PPP structures that can be implemented in the water supply and sanitation sector for the cities of Maharashtra. As a part of this TA project, various possible PPP structures in the water supply and sanitation sector have been studied, and their applicability assessed in the context of the sample cities. Term sheets have been developed for the PPP structures identified as most suitable and feasible for implementation. The TA project was structured into the following phases:

Phase I: Review of PPP structures implemented in India, preliminary assessment of water supply and sanitation services in the sample cities of Maharashtra,[1] identification of probable PPP structure for approved projects, and preparation of term sheets

Phase II: Detailed financial analysis, feasibility studies, and project structuring for selected cities

Phase III: Bid process management

This tool kit is an output of Phase I of the TA project.

ADB, in discussion with the PPP nodal officer cum secretary (Urban Development Department) and principal secretary (Water Supply and Sanitation Department), Government of Maharashtra, identified a sample of 12 cities for the identification of PPP structures. To ensure that a representative category of sample cities is represented in the study, cities with varying population sizes and geographical settings were selected. While a few cities fall in the category of 30,000–100,000 population size, a few are in the 100,000–300,000 size, and the rest have a population of more than 300,000. The selected cities are largely covered under the Urban Infrastructure and Development Scheme for Small and Medium Towns (UIDSSMT) of the Government of India and/or are undertaking a project under the Maharashtra Sujal Nirmal Abhiyaan scheme. With either of these schemes in place, most of the sample towns already have identified some investments that need to be undertaken to improve their water supply and sanitation services. In some of the sample cities, the water supply is managed by the urban local body (ULB), whereas in some other towns, the institution overseeing the water supply scheme is Maharashtra Jeevan Pradhikaran (MJP). The sampled cities include Jalna, Sangli-Miraj-Kupwad, Virar, Navghar-Manikpur, Kulgaon-Badlapur, Chiplun, Kolhapur, Akot, Saoner, Shirpur, Ambarnath, and Navi Mumbai.[2] For identifying PPP options that are best suited for implementation, Phase I was structured into the following components:

(i) Detailed study of PPP structures possible in the entire chain of water supply services.
(ii) Comprehensive review of the water supply situation in sample cities and identification of areas for PPP-based intervention.
(iii) Preparation of term sheets for the PPP structures that have been identified as most suitable for the sample cities.

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[1] Only the city of Kolhapur is studied for the applicability of PPP in the sanitation sector.

[2] Since Navi Mumbai has already undertaken PPP in water supply, lessons are drawn from the existing structure.

Process Followed for the Tool Kit

The tool kit was initially conceived by ADB in conjunction with the Government of Maharashtra. The initial approach followed in the formulation of the tool kit included a review of documentation available on PPP in urban water supply. This included case studies on the implementation of PPP in urban water supply in India, such as Latur, Chandrapur, Haldia, Chennai Desalination, Salt Lake City, and the Karnataka Urban Water Sector Improvement Project (KUWASIP). Other documents reviewed were reports, articles, and presentations on the implementation of PPP in the urban water supply sector. The review of this documentation helped the team understand the current status of urban water supply in India and gain an understanding of the different means of implementing PPP in the urban water supply sector. The team drew key lessons from the case studies it referred to in the Indian context. These lessons focused on the different PPP structures suited to varying urban water supply scenarios. In addition, they highlighted the main hurdles that private participation would face in the urban water supply sector.

Subsequently, using these key lessons, the team identified the various project structuring options that could be used for implementing PPP in the urban water supply. These options were drawn up on the basis of the current implementations of PPP in the sector (e.g., the option of using the Viability Gap Fund as a source of project funding for a water supply scheme). A project structuring option for the development of bus depots was also considered. The team also undertook a study of PPP concession agreements for the urban water supply sector. The team studied the concession contracts of Latur, Haldia, Salt Lake City, Navi Mumbai, and KUWASIP. They formulated term sheets for each PPP structure based on the lessons of the documentation review and study of concession contracts. Each term sheet contains a brief reference guide for understanding the key clauses applicable under the specific PPP structure. The clauses presented in the term sheet would help the water supply service provider in drafting a contract for the PPP structure that has been selected for implementation of the identified projects in the urban water supply sector.

Next, a current assessment of the sample cities chosen by ADB was undertaken using documents, such as city development plans and detailed project reports. The team also held discussions with urban water supply officials of the sample cities to obtain the most up-to-date information on the urban water supply situation. Discussions included the current state of the urban water supply sector, problems besetting the urban water supply department, and future plans and scope for PPP in urban water supply in the city. The teams also obtained views and suggestions on the various PPP structures devised. These suggestions were incorporated into the term sheets. The team also met private developers who are involved in the provision of urban water supply services in various cities.

All the insights obtained from the study of PPP in urban water supply was used in the formulation of a step-by-step process for implementation of a PPP life cycle. Suggestions were taken from internal PPP and urban water supply experts. The process was also discussed with ADB, and the suggestions received were incorporated in the tool kit. The entire tool kit was subsequently presented to the Government of Maharashtra, ADB, and the Department of Economic Affairs. The comments and suggestions received were then incorporated into the final report.

Structure of the Tool Kit

The tool kit comprises four volumes:

- Volume 1: PPP Tool Kit for the Water Supply and Sanitation Sector
- Volume 2: Details of PPP Structures
- Volume 3: Case Studies of Sample Cities in Maharashtra
- Volume 4: Term Sheets

Volume 1 is a comprehensive tool kit, while the other volumes provide further detail on specific sections of Volume 1.

Context of the Tool Kit

The purpose of the tool kit is to assist the relevant public entities in the state of Maharashtra in developing PPP-based water supply and sanitation projects. The project development process in the urban water supply and sanitation sector involves multiple stages prior to implementation, as shown in Table 1.

The tool kit detailed in Volume I of the report discusses the assessment of water supply services and details the formulation of project structure for implementation if the PPP route is to be adopted. The tool kit provides information on how to develop a project if a PPP-based option is found necessary and possible for implementation.

Under Phase I of the TA project, a broad analysis has been undertaken for the sample cities of Maharashtra to assess and determine the possibility and suitability of PPP-based intervention for water supply and sanitation projects for these cities. The detailed analysis, needed to finalize the PPP option, would have to be undertaken as a component of Phase II of the TA project.

Table 1 Stages in the Development of Urban Water Supply and Sanitation Projects

Sl No.	Stage	Description	Level
1	Detailed assessment study	A detailed assessment of the existing service delivery is the process of reviewing the existing status of water supply and sanitation services in the city compared with the current demand based on standardized delivery norms. Such studies include water audit, leak detection study, energy audit, and consumer survey. The assessment is to be carried out across the entire value chain of water supply services. The output of this study is identification of all the areas of service delivery that need improvement in terms of augmentation of services, rehabilitation, repairs, etc.	City
2	Alternative analysis	Alternative analysis is the process of identifying the possible alternatives for resolving the problems identified in each component of the value chain, evaluating the identified alternatives, and selecting the optimum alternatives based on multiple parameters. The output is a set of defined projects for each component in the value chain.	Value chain component
3	Techno-economic feasibility for project approval	Techno-economic feasibility is the process of assessing whether the identified project is technically and financially implementable.	Project
4	Detailed project report	The detailed project report (DPR) is a specific project blueprint on the basis of which the project will be implemented. It includes detailed technical designs costing. The DPR for urban water supply projects in India needs to be prepared as per the *Manual on Water Supply and Treatment*, published by CPHEEO, Ministry of Urban Development. In the case of sanitation projects, the manual prepared by CPHEEO for sanitation services needs to be consulted.	Project

CPHEEO = Central Public Health and Environmental Engineering Organisation, SI = serial.

Users of the Tool Kit

Since this tool kit covers a part of the project development process, it may be used by any entity developing urban water supply or sanitation projects and wishing to explore the possibility of implementing the project through the PPP route. In India, organizations likely to be involved in the project development process are (i) urban local bodies (ULBs), (ii) water supply and sewerage boards, and (iii) public health and engineering departments.

Thus, individuals most likely to use the tool kit would be the departmental staff of the above entities with project development responsibilities.

In addition, the tool kit will help determine whether a particular project might be suitable for the PPP route. The tool kit can, therefore, be the basis of approving a project implementation structure as part of the overall project approval methodology. Usually, the responsibility for approval of projects is vested in the top decision-making authority of the entity, which has the primary responsibility for implementing and/or financing the project. Thus, it can be useful for the municipal commissioner and the standing committee (being the top decision-making authorities in a ULB) in urban local bodies, the managing director and the functional directors of the water supply and sanitation board, and the state government (in case of the public health and engineering department).

The tool kit would be utilized for (i) approval of project implementation structure for PPP-specific urban water supply and sanitation projects, (ii) overall project approval, and (iii) consideration of Viability Gap Fund support for individual projects.

Guidelines to the Tool Kit

Broad guidelines for use of this tool kit are as follows:

(i) To understand the concept, purpose, need, and rationale for developing the projects on a PPP basis, refer to Section II of this tool kit for an introduction to the concept of PPP in water supply and sanitation services and insights into the overall trend of PPP in water supply and sanitation in the country.

(ii) Section III of the tool kit provides the user with information on the overall process involved in developing and implementing a project on a PPP basis.

(iii) For information on the first steps to be undertaken in developing a project on a PPP basis, the user should refer to Section IV. This familiarizes the reader with the methods of identification of the areas in the water supply and sanitation services where there are service delivery and infrastructure gaps requiring intervention for improvement. This section provides insights into the various methods of service delivery assessment and the performance standards that need to be met.

(iv) If the user has already identified the projects required for improvements in the water supply and sanitation sector and wants to determine whether a PPP route can be tried for developing and implementing the project, the user must first undertake a financial assessment. Section V provides the details and key components of the financial assessment process. The section also explains the process by which a choice is made between the public-funded mode of project development and the PPP route, based on the financial assessment. Section VI builds on the financial viability assessment carried out and provides insights into additional points of assessment, which are qualitative in nature.

(v) For users who need to know some of the prerequisites for developing a project on a PPP basis, this information is listed in Section VI.

(vi) If the assessments carried out so far have strongly established the case for developing a proposed project on a PPP basis, the user can refer to Section VII to determine what type of PPP structure is best suited to implementing the project. The user will be familiarized with the various key factors, such as risks involved,

and their allocation, to determine and help select the most suitable option from the various PPP structures.

(vii) For users seeking information on the procurement process and procedures to be followed once the PPP structure for a project has been finalized, details of the bidding process, key factors that need to be considered, and the method for inviting bids, this is given in Section VIII.

II PPP in the Water Sector

General Definition and Overview of PPP

Provision of public services and infrastructure has traditionally been the exclusive domain of the government. However, with increasing population pressure, urbanization, and other developmental trends, the government's ability to adequately address public needs through traditional means has been severely stretched. This has led governments across the world to increasingly look to the private sector to provide supplementary infrastructure investments and public services through public–private partnerships (PPPs).

A PPP transaction has been clearly defined by the Department of Economic Affairs (Infrastructure Section), Ministry of Finance, in its guideline document, *Scheme for Support to Public Private Partnerships in Infrastructure*. This definition states that PPP is a contractual arrangement made by a government or statutory entity and a private sector company to provide an infrastructure service.

Thus, a PPP project is a project based on a contract or concession agreement between a government or statutory entity and a private sector company for delivering an infrastructure service on payment of user charges.

Rationale for PPP

PPP offers a win–win solution for all stakeholders—the public sector, the private sector, and the general public.

PPPs allow the public sector to derive benefits through improved efficiency and effectiveness. This is possible because of the following factors:

(i) **Innovation.** PPP allows the government to tap the private sector's capacity to innovate. The government spells out the services it needs, and the desired outcomes and/or outputs. The private sector can then introduce innovative solutions to meet the government's objectives.
(ii) **Sharing of responsibilities.** In a PPP project, the government and the private sector share the responsibilities of delivering a service, depending on the expertise of each party.
(iii) **Finance.** In a PPP project, access to private capital frees government capital to be used in projects with higher public policy objectives.

The private sector derives the following benefits:

(i) **Business opportunities.** Through PPP, the private sector can gain access to business opportunities, which were traditionally accessible only to the public sector.
(ii) **Designing and delivering innovative solutions.** PPP also allows the private sector to move from merely constructing assets according to clearly specified designs, to designing and delivering innovative solutions. The private sector has more room to innovate and offer efficient solutions for the provision of public services.

The general public also derives benefits:

(i) **The combining of the expertise of public and private entities.** When structured appropriately, PPPs will deliver public services that can better meet the needs of the public without compromising public policy goals and needs.
(ii) **Protection of public interest.** The government will ensure that public

interest is protected in all PPP projects and that service delivery will meet public needs at the best value for money when the private sector is brought in to provide government services.

While service delivery through PPP changes the means of delivering services, it does not change the government's accountability for ensuring that the services are delivered. The department's focus shifts from providing the service to managing the service provider.

The Water Supply and Sanitation Sector in India

The Value Chain

In India, urban water supply and sanitation services are provided by the state. The entire service, from source to consumer, is managed by state-level public health and engineering departments, by urban local bodies (ULBs), or city water supply and sanitation boards. Water and sanitation services can be unbundled into several components, including raw water production and treatment; bulk water supply; retail distribution; and sanitation collection, treatment, and disposal (Figure 1).

The entire process (shown in Figure 1) is referred to as the value chain for water supply and sanitation services. The unbundling of water supply services is being increasingly experimented with, e.g., separating wastewater responsibilities from water supply, separating bulk water production and treatment from water distribution, separating wastewater treatment and discharge from collection, and separating water transmission from distribution.

Institutional Setup for Water Supply and Sanitation Service

The role played by the central government in urban water supply and sanitation services is limited to defining norms for the sector[3] and providing guidelines and technical assistance to the states. The central government also intervenes through some centrally funded special programs of the Ministry of Urban Development. Similarly, the Planning Commission plays a role in evaluating financial requirements for its 5-year plans and plays an advisory role in policy making. However, the states are responsible for urban water supply and sanitation services while the ULBs operate and maintain the water supply and sanitation services. The role of ULBs in operation and maintenance (O&M) has been reinforced with the 74th Constitutional Amendment.

Capital investment for development for these water supply projects has been typically funded either through the internal funds of the ULBs or boards or by way of the regional government's budgetary support and donor support from multilateral agencies.

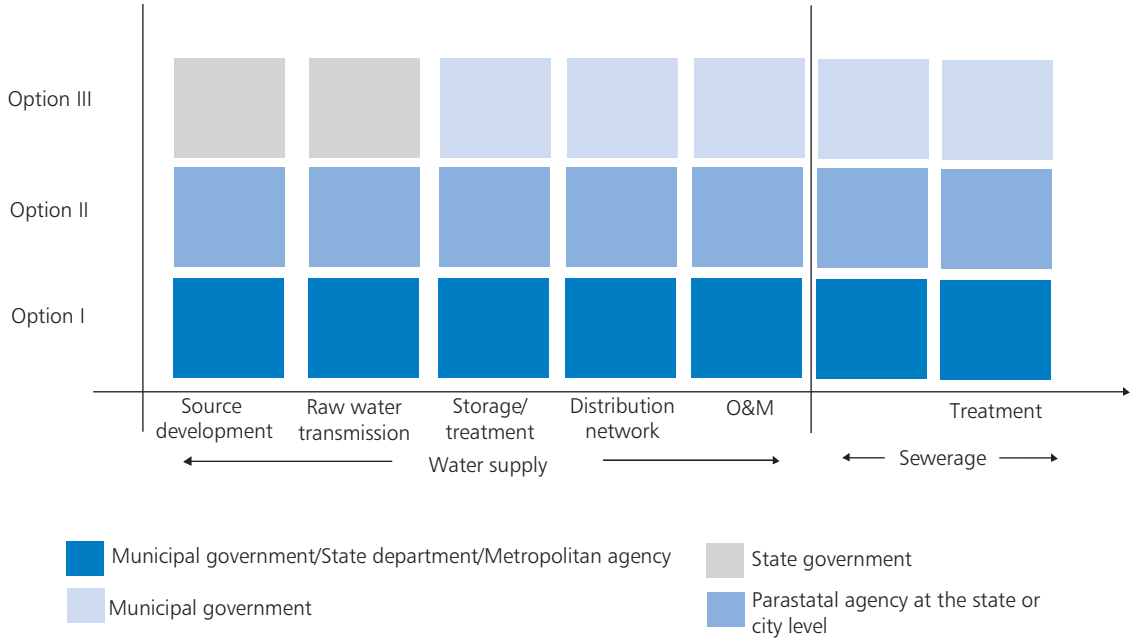
Figure 2 shows the three primary institutional setups engaged in the provision and delivery of water supply and sanitation services in the country.

Figure 1 Value Chain of the Water Supply and Sanitation Sector

Source augmentation | Raw water transmission | Water treatment | Storage reservoirs | Distribution | Sewage collection | Sewage treatment and disposal

[3] These are defined by the Central Public Health and Environmental Engineering Organisation (CPHEEO), Ministry of Urban Development, Government of India.

Figure 2 Institutional Setup for the Water Supply and Sanitation Sector



O&M = operation and maintenance.

In the first setup, the entire value chain of services of the water supply and sanitation sector is undertaken fully by one of the agencies, i.e., the municipal government, a parastatal agency, or the state government. In the case of large cities, such as Mumbai, Pune, and Ahmedabad, municipal corporations manage all the activities in the sector, including capital investment, and are also largely involved in the designing and planning stages. In the case of large metropolises, parastatal agencies at the state or city level oversee the entire value chain of water supply and sewage services, as can be seen in Option II. For instance, in cities of Delhi, Chennai, Hyderabad, and Bangalore, water supply and sanitation boards have been set up to develop and manage water supply and sanitation services. In the third form of institutional arrangement—Option III—the activities of source development and capital investment for network development are managed by the state department (in most cases, the Public Health Engineering Department), while the management of distribution network, O&M, and revenue collection are overseen by the municipal government.

Trends in PPP in the Water Supply and Sanitation Sector in India

The overall service delivery levels in the country for the water supply and sanitation sector have been assessed to be largely inadequate. There are large infrastructural gaps, and water supply and sanitation operations are plagued with high levels of inefficiencies. The per capita availability of water in most urban centers of the country is significantly less than what is needed. Only 50% (140 million) of the urban population is directly connected to the distribution networks.[4] The existing infrastructure suffers from high degree of operational inefficiencies. For instance, approximately 40%–50% of the water pumped into the system is lost in transmission, e.g., due

[4] World Bank. 2006. *India Water Supply and Sanitation, Bridging the Gap between Infrastructure and Service.*

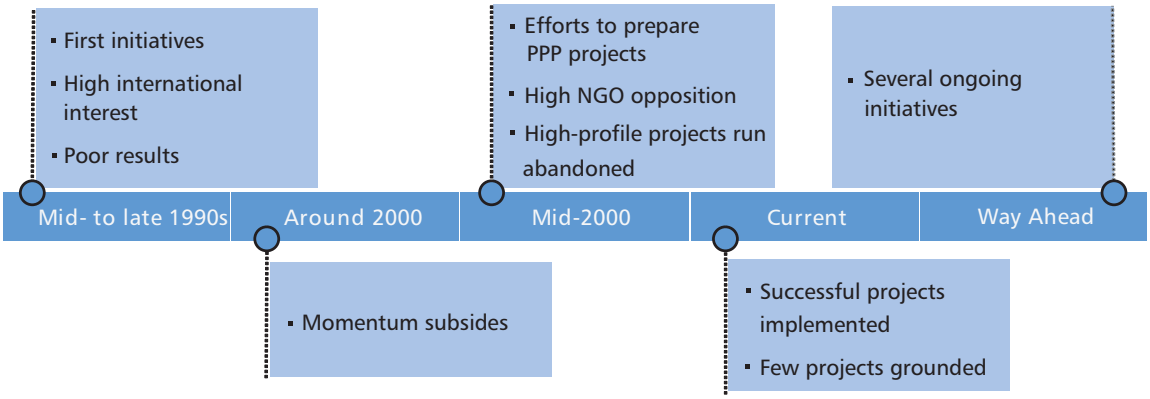
to theft. On average, only 24% of all connections in the country are metered.[5] In addition, poor collection practices by the utilities have resulted in low cost recovery rates at 20%–30% of O&M costs. The cost of production of these services has been assessed to be very high against the low level of recoveries, resulting in limited funds for routine maintenance by the service providers. This eventually causes poor infrastructure coverage, poor access, and low service quality. Furthermore, service providers have been incurring huge losses on their services.

Improvement in service delivery levels requires huge investments for augmentation and improvements of physical infrastructure, and significant scaling up of operational efficiencies. To meet both these requirements, various ULBs and parastatal agencies have explored the option of PPP for infrastructure development and O&M. PPP efforts in the country have met with varying success. While some initiatives have completely failed, there have been recent instances of successful implementation. Figure 3 traces the evolution of PPP in the water sector in India.

Mid- to late 1990s: PPP initiatives were attempted in Goa, Pune, Hyderabad, and Bangalore; however, they met with failure for multiple reasons. For instance, in Goa, a PPP initiative was attempted for the development of a bulk water supply system; PPP was sought for investment, design, construction, and O&M. However, though the project was bid out, it was abandoned due to issues of high bulk tariff proposed by the private party and low political will. A similar project for bulk supply was proposed in Bangalore, where again on account of unaffordable tariff levels and other controversies, the project was abandoned. This phase of PPP initiatives in the country was thereby largely unsuccessful due to issues of tariff setting and lack of political support.

2000–2004: Fewer projects involving PPP were attempted around this time. Noteworthy projects included the development of a water treatment plant (WTP) in Sonia Vihar, Delhi, and two other projects in Sangli-Miraj city, Maharashtra, and Bangalore. The Sonia Vihar project sought PPP for design, construction, and O&M of a WTP. The project has been implemented successfully largely due to balanced allocation of risks between the water supply board (Delhi Jal Board) and the private developer. In Sangli, however, the PPP was called for the O&M of bulk water supply and treatment and distribution operations only; but lack of political support led to the project being abandoned. The Bangalore initiative followed

Figure 3 PPP Timelines in the Water and Sanitation Sector in India



NGO = nongovernment organization, PPP = public–private partnership.

[5] ADB. 2007. *Benchmarking and Data Book of Water Utilities in India*.

a similar path. This phase, therefore, saw few initiatives being proposed.

Around 2005: This period was marked by the abandonment of several large-scale PPP initiatives, such as a pilot project proposed by Delhi Jal Board in Delhi, and projects proposed by the Water Supply Board in Bangalore. These projects met with strong political and public opposition.

2005 onwards: This period has seen several PPP initiatives being implemented successfully. These include PPP-based projects in the cities of Latur, Chandrapur, Chennai, Kolkata, Mysore, Madurai, Haldia, and Nagpur. The various PPP options and value chains in which these have been implemented are shown in Figure 4.

Several PPP initiatives are being planned and proposed in the water supply and sanitation sector following the successful implementation of ongoing projects in the recent past. This trend is also observed in the several urban sector development programs of the central and the state governments, which are encouraging and promoting development of water supply and sanitation projects in a PPP mode. The overall policy framework for PPP projects in the country has seen significant measures introduced to facilitate increased PPP in project development and O&M. For example, specific urban infrastructure funds, such as the Viability Gap Fund (VGF) scheme, have been developed by the central government to provide financial support to infrastructure projects that are to be undertaken through the PPP mode. A special purpose vehicle, the India Infrastructure Finance Company, has been constituted by the Government of India as a dedicated institution to assume an apex role in the financing and development of infrastructure projects in the country. The central government's urban developmental scheme, the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), initiated in 2005, also encourages urban infrastructure projects to be developed on a PPP basis.

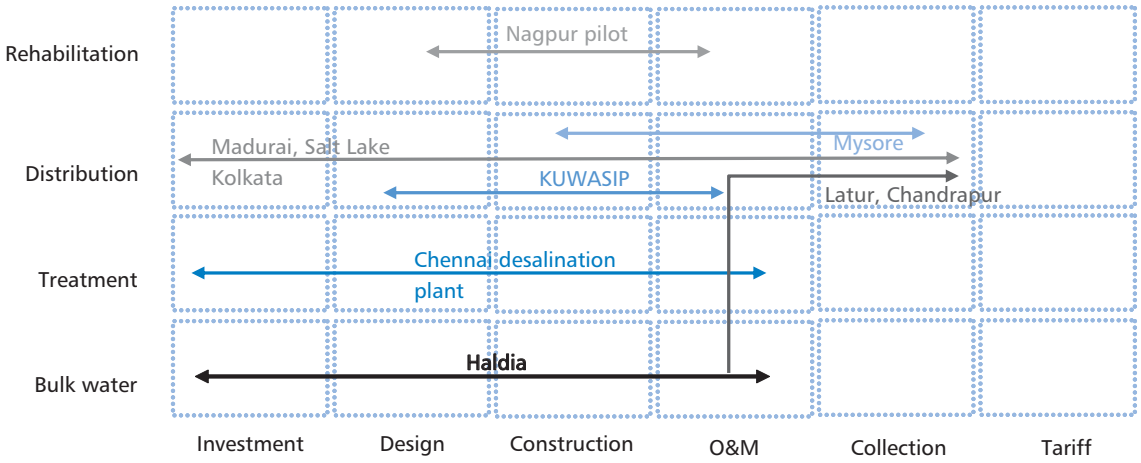
PPP Projects in the Water and Sanitation Sector in India

This section provides a summary of the PPP structures implemented in the cities of Latur, Chandrapur, Salt Lake City, Chennai, and clusters in Karnataka and Haldia.

Distribution-cum-Revenue Collection Contract at Latur and Chandrapur

The distribution-cum-revenue collection contract implemented in Latur and Chandrapur has been classified as a performance management contract. These cities faced an acute shortage of water and required augmentation of the source. In addition, the water supply operations, which

Figure 4 PPP Projects Implemented in India



KUWASIP = Karnataka Urban Water Sector Improvement Project, O&M = operation and maintenance.

were under ULB management, suffered from high operational inefficiencies and resulting poor cost recoveries. To improve water supply to these cities, Maharashtra Jeevan Pradhikaran (MJP) undertook a source augmentation project. However, the ULBs recognized their inability to efficiently manage the water supply services and sought private sector intervention in O&M of the water supply system.

In Latur, the capital investment for augmentation of the bulk water supply system has been borne by MJP. Post-augmentation, the entire water supply system, from source to distribution, has been handed over to the private developer for O&M. In the case of Latur, the contract is being executed by a special purpose vehicle, the Latur Water Management Company, formed by a consortium of Subhash Projects and Marketing, UPL Environmental Engineers Ltd. (UPLEEL), and Hydro Comp Enterprises. The contract was awarded for a period of 5 years. For Chandrapur, the contract was handed over to a private operator for a period of 10 years.

The primary purpose of the contract has been to bring in operational efficiencies in the entire water management system and, thereby, reduce the associated O&M cost. In addition, the private developer is required to increase coverage of the water supply services, increase the number of direct connections, reduce illegal connections, install meters, generate bills, and undertake collection. The contract defines specific performance targets for each activity undertaken by the private developer. The private developer has been given the right to levy the tariff set by MJP to collect and retain revenues from the consumers. In return, the private developer is required to pay a fixed bimonthly, biannual, or annual payment to MJP as a license fee. The financial bid criterion was the highest licensee fee payment quoted.

Water Supply and Sanitation Concession Agreement for a Service Area, Salt Lake City

A water supply and sanitation concession agreement has been implemented in Sector V of Salt Lake City, Kolkata. This agreement is in the form of a build-operate-transfer type of PPP structure. The contract, implemented by the Kolkata Metropolitan Development Authority, requires private sector participation for the development of an underground network for water supply and sewage services for the township of Sector V, managed by the Nabadiganta Industrial Township Authority. The key bidding criterion was the lowest water-cum-sewage charge, which the private developer would levy. The contract is for 30 years.

The contract was handed over to Jamshedpur Utilities and Services Company (JUSCO) and Voltas (a Tata enterprise) who formed a joint venture for undertaking the contract. As per the contract, the private developer is required to undertake construction of infrastructure for water supply and sanitation services, and to operate and manage both the systems for the concession period. The private developer levies a water-cum-sanitation charge for the services managed. At the end of the concession period, the assets are to be transferred to the Nabadiganta Industrial Township Authority. Approximately 35% of the capital costs for the project would be passed on as a subsidy from the Government of India (through the JNNURM) to the private developer.

All the operational expenses for managing the water supply and sanitation services from source to end consumer would have to be borne by the private developer during the concession period. In addition to the water-cum-sewage charge, which the private developer can levy, the developer has been given the right to levy and collect a one-time connection charge from the consumers. The tariff to be charged and the extent and timeline for its escalation would also be decided by the private developer, subject to approval from the Kolkata Metropolitan Development Authority and the Nabadiganta Industrial Township Authority.

The special purpose vehicle formed by the JUSCO–Voltas consortium has already started water supply-related work, following approval of the working schemes by the Kolkata Metropolitan Development Authority and Nabadiganta Industrial Township Authority. About 25% of the work has been achieved toward the sanctioned water supply component of the project.

Bulk Supply-cum-Operation and Maintenance Contract, Chennai

The bulk supply and O&M contract is a PPP agreement that has been implemented for the development of a 100 million liters per day (MLD) sea water desalination plant in Chennai. The PPP structure has been categorized as a design-build-own-operate-transfer model. The project has been awarded to Chennai Water Desalination, a special purpose vehicle floated by IVRCL Infrastructures and Projects. The contract was awarded to the Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB) for a tenure period of 25 years.

As stipulated by the contract, the private developer is required to design, engineer, finance, and procure the entire infrastructure for offtake of water and the transmission, treatment, and supply of treated water to the storage reservoir. In addition, the private developer is required to operate and manage the facility for the concession period. The private developer is, therefore, required to supply treated bulk water to the CMWSSB. The private developer is paid a water charge by the CMWSSB for the treated water produced.

The unique feature of this contract is the private entity is assured of a minimum fixed payment by the utility for all the activities it is required to undertake. This arrangement is also referred to as a "take or pay" system. The key bidding criterion was the per unit charge for treated water, which the private developer would collect from the CMWSSB.

Augmentation-cum-Operation and Maintenance Contract for Distribution System for a Cluster of Urban Local Bodies, Karnataka

The augmentation-cum-O&M contract for the distribution system is a performance-based fee model, implemented under the Karnataka Urban Water Sector Improvement Project for the towns of Belgaum, Hubli-Dharwad, and Gulbarga. This performance contract is a PPP model with a 100% capital subsidy from the government agency—the Karnataka Urban Infrastructure Development and Finance Corporation.

These select cities of Karnataka faced problems with their distribution networks: there was no accurate estimation of the loss of water incurred in transmission and distribution, the supply hours were reported to be irregular, and no clear information was available with the ULBs on the status of water supply infrastructure assets. Private assistance was sought to improve the water supply services.

Under the PPP structure, the private developer was required to undertake rehabilitation works on the distribution network of a cluster of towns and oversee the O&M of the distribution network. The private developer is, therefore, first required to undertake construction works for the distribution network and will be fully reimbursed by the state agency for the rehabilitation activity it undertakes. The private developer is, therefore, responsible only for water supply activities at the distribution end, including supplying treated water to all the connections, installing meters, generating bills, collecting revenues, and undertaking repair works.

The contract was awarded to an international bidder, Veolia Eau - Compagnie Générale des Eaux, based in Paris, France. The operator is contracted to operate and manage the distribution network in the cities for 2 years, following 18 months of distribution network rehabilitation.

The private developer gets fixed operator fees from the ULBs for executing O&M. This fee, which is to be paid by the ULBs to the private developer, is the critical bid parameter.

Augmentation of Water Treatment System-cum-Operation and Maintenance Contract of the Water Supply System, Haldia

A PPP arrangement was designed for the augmentation of the WTP and for operation and management of the water supply system at the Haldia Industrial region. A concession-based PPP agreement has been implemented in Haldia for the development of the WTP system and for the O&M works of the water supply system. The agreement was implemented by the authority to meet the long-term demand of

industrial consumers of the region. Developed as a greenfield water supply project, it envisages the development of a 227 MLD WTP along with O&M of the water supply system.

The water supply system for the region was earlier managed by the West Bengal Public Health and Engineering Department on behalf of authority. The water supply system was plagued with several problems, including high production and distribution losses, poor service quality, poor O&M of the WTP, and very high operation costs. Private sector participation was, therefore, sought for the development of the WTP and for O&M of the distribution system.

The contract has been handed over to a consortium consisting of JUSCO, Ranhill Utilities Berhard of Malaysia, and Infrastructure Development Finance Company. The total tenure of the project is 25 years.

The project for raw water offtake, transmission, and treatment plant has been developed on a build–operate–transfer basis.

The concession agreement requires the private developer to undertake the construction of the raw water offtake system and raw water transmission lines, augmentation to the existing treatment plant, and operation and management of the water supply system from source to end consumer. Any expansion and rehabilitation work for the distribution network would be managed by the authority before inviting the private developer to operate and manage the water supply system. The private developer is required to make a fixed monthly payment as a license fee to the authority for the right to operate the existing water supply assets and the entire system. This highest fixed monthly payment was set as the critical financial bid parameter.

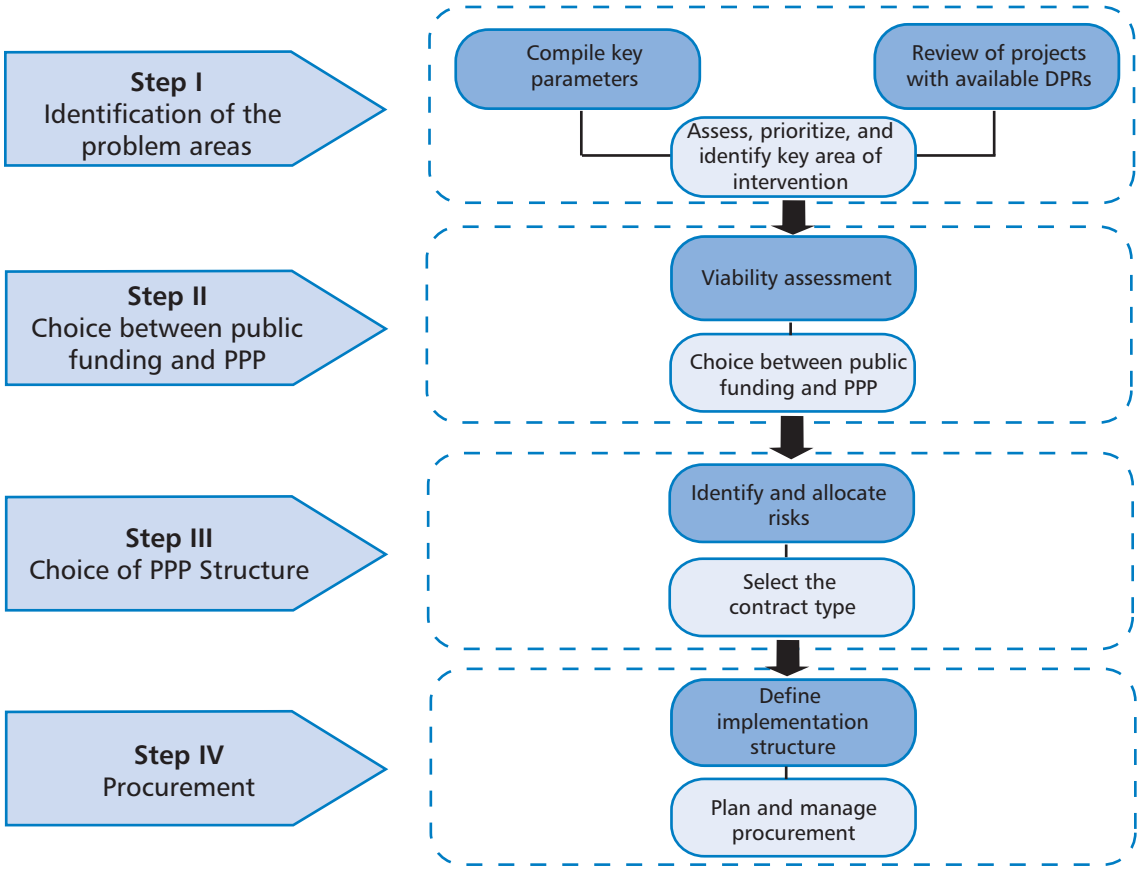
III Implementing PPP: An Overview

This section provides an overview of the steps to be followed in determining a suitable public–private partnership (PPP) structure for an identified project in the water supply and sanitation sector, and outlines the remaining activities that need to be undertaken to facilitate the implementation of the selected PPP structure (Figure 5).

Step 1: Identification of the Problem Areas

The determination of the set of projects required to improve the existing water supply and sanitation services is based on identification of all the areas of service delivery where some form

Figure 5 Overview of Stages in Determining Suitable PPP Structures



PPP = public–private partnership.

of project-based intervention is required. In this context, the first step is to list all the issues in the current system based on a detailed assessment. This detailed assessment is to be carried out by the urban local body (ULB) or state agency for the water supply and sanitation services across its entire value chain by undertaking studies, such as consumer surveys, water audit, leak detection, and energy audits. The results of these assessments should be compared with the key performance indicators and standards applicable for each level of operations. The existing detailed project reports (DPRs) should be reviewed to check if the proposed project components would adequately address the issues identified and, if not, whether these would need to be rectified. It is important to ensure that even the DPRs, which have been sanctioned, are assessed to ensure that if the assessment indicates that further modifications are required, they are pursued. The ULBs may then explore the possibility of modifying the DPR to ensure that the relevant areas of service delivery are adequately addressed. If, on account of change in scope, the costs of the project increase, the ULB can consider approaching the state or central government for additional funding or may explore the PPP option. The output of the assessment would indicate the accurate status of the services, the issues being faced in the current system, and the interventions required.

Step 2: Choice between Public Funding and PPP

Having identified the areas where intervention in the form of specific projects is required, the next stage is to determine whether the proposed projects should be taken up entirely through the ULB or state agency or whether they should be developed on the basis of a PPP route. This choice is largely guided by a detailed project viability assessment. This assessment would then have to be followed up with a qualitative assessment to determine which of the two parties—the private developer or the public agency—is realistically best suited to undertake the project.

Step 3: Choice of PPP Structure

If the analysis undertaken in the previous stage indicates that the PPP option is to be pursued for developing the proposed project, the next logical activity is to determine an appropriate PPP structure. A host of PPP structures can be developed and implemented; however, the choice of a particular structure from among the various options is made based on the project characteristics and the uniqueness of the context. One of the key parameters determining the choice is the extent and type of risks that are associated with the project and the allocation of these risks between the private developer and the ULB or state agency. Therefore, an exhaustive list of risks associated with the project needs to be prepared and deliberated upon, and its allocation duly considered to determine the suitability of the various PPP structures. From the activities undertaken in stages two and three, the most suitable PPP structure would be identified.

Step 4: Procurement

Having identified and finalized the PPP structure to be adopted to develop, operate, and maintain the proposed project, the next stage is to plan the procurement process. The contractual structure identified needs to be translated into a workable action plan with clear and precise definitions of the responsibilities for the two contracting parties—the ULB or state agency and the private developer to be identified. The financial model prepared for the project would then be further refined according to the requirements of the transaction structure. Based on the transaction structure, the contract for the PPP arrangement would need to be drawn up. Finally, the procurement plan would need to be finalized and put into operation.

The remaining sections of Volume I discuss these four main steps in greater detail.

IV Step 1: Identification of the Problem Areas

Assessment of the Current Water Supply and Sanitation System

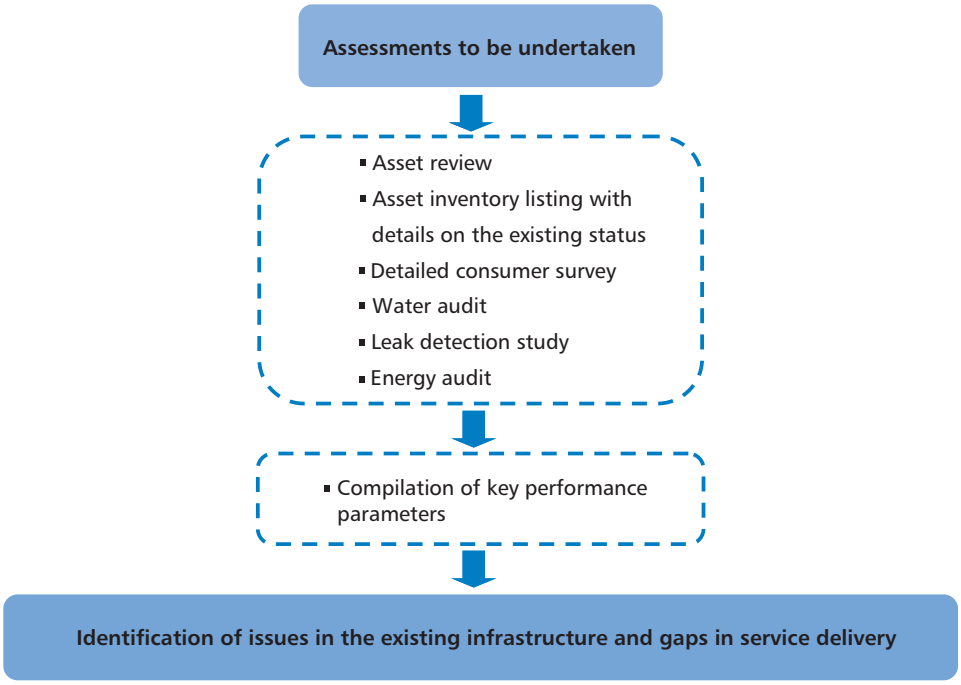
A detailed assessment of the existing status of infrastructure and service delivery across the value chain of the water supply and sanitation system forms the basis for identification of areas of improvement (Figure 6). The output of the assessment would indicate the accurate status of the services and the issues being faced in the current system. For successful implementation of any form of public–private partnership (PPP) in this sector, there needs to be a well-maintained, accurate database of existing services.

A combination of physical assessments and service-level review needs to be carried out simultaneously to ascertain the issues and gaps in the existing water supply and sanitation services. These assessments are equally critical for issue identification. The comprehensive list of assessments that must be undertaken is now described in detail.

Asset Review

A review of the existing water supply and sanitation assets of the urban local body (ULB) forms an integral component of the physical infrastructure assessment to be undertaken

Figure 6 Overview of Stages in Assessment of Water Supply and Sanitation Services



by the ULB or state agency. The assessment of existing physical infrastructure needs to be carried out to determine the existing condition of water supply and sanitation assets in the service area and to identify those which need to be replaced or rehabilitated on account of their poor condition or inadequacy. In addition, technical issues of operation associated with the assets can also be identified as part of the physical assessment.

The assessment is expected to identify

(i) the status of availability and adequacy of physical infrastructure, such as toilets, sanitation, septic tanks, Variable Grade Sewers (VGS), and the (water) distribution network in slums;
(ii) the operational condition of the infrastructure in the water supply and sanitation system; and
(iii) the infrastructure components that require augmentation and/or replacement.

The ULB or state agency may undertake the asset review on its own or it may obtain technical assistance for the review. The status of the current infrastructure directly determines the level of services provided by the ULB or state agency. For instance, if the raw and/or pure water transmission lines are corroded, there will be substantial water loss during conveyance, resulting in reduced availability of potable water for consumers. Similarly, if the sewage treatment plant is operating below standard, or has outdated technology, this would result in improper treatment of the sewage and pollution of natural water bodies.

The ULBs and state agencies may not have a detailed updated record of the water supply and sanitation infrastructure. Poor or unreliable information on the status of assets means that an accurate picture of the existing status of the infrastructure would not emerge and, therefore, the interventions required could not be identified. Furthermore, if the PPP-based project is identified, the ambiguous information about current infrastructure would make it difficult to correctly frame performance standards to measure the effectiveness of a private developer in operating and maintaining the system.

Table 2 shows a representative form from the asset inventory list that the service provider should maintain. It is a basic form indicating the minimum components of the inventory list, and can be modified for a comprehensive compilation and presentation of information. Asset inventory listing may also be undertaken for each value chain.

Parallel to the infrastructure assessment undertaken by the ULB or state agency, a review of the service delivery levels to determine the current status of the entire system is also critical. As a part of the service delivery assessment, it is important to undertake (i) a detailed consumer survey, (ii) a water audit and leak detection study, (iii) an energy efficiency audit, and (iv) a water quality audit.

Detailed Consumer Survey

The ULB or state agency, in most cases, has been found to have inadequate or unreliable information in areas, such as the extent of coverage of its services, the number and type of water supply connections, and the exact consumption levels. Without such information, it is difficult to correctly plan an improvement or intervention or hand over the system to a private

Table 2 Representative Sample of an Asset Inventory List

Asset	Specification of the Asset	Age	Value	Condition	Remarks

developer for development and/or operation and management of the system. It would invariably result in imbalanced allocation of responsibilities and risks between the stakeholders. A basic premise on which a PPP option is built is the provision of good, reliable information about the existing system by the ULB or state agency to the private developer. Therefore, it is critical that the ULB or state agency exploring the PPP option for development and improvement of water supply and sanitation services undertakes a detailed consumer survey on the existing status of services it provides.

The time required to carry out a consumer survey varies, depending on the population and area serviced. The consumer survey needs to include a good representative sample in terms of the size of population or the zones, so as to yield accurate information. The detailed consumer survey would address the following information gaps:

(i) What is the type of connection?
(ii) What is the frequency of water supply?
(iii) How reliable are the water supply services?
(iv) Is the tariff level affordable?
(v) How often are the septic tanks cleaned?

A detailed consumer survey would provide an accurate picture of the status of water supply and sanitation services to help identify areas of intervention required.

Water Audit and Leak Detection Study

A water audit is a thorough examination of the accuracy of water agency records and system control equipment. Leak detection is the systematic method of surveying the entire system to identify leaks and precisely identify the points of leakage in the water supply system. The primary objective of this survey is to assess the entire water supply system to detect the extent of technical and commercial losses. The audit would help the service provider to determine the efficiency of the distribution system and to select and implement programs that would reduce water and revenue losses.

Water losses, whether due to leakages, theft, under-billing of customers, or faulty system controls, represent monetary losses to the water agency. This is water that the agency has already paid to obtain, treat, and pressurize. A water audit would provide answers to the following questions:

(i) Where are losses occurring within the system?
(ii) How much water is lost in each problem area identified?
(iii) What corrective measures are needed to reduce the water loss?
(iv) What will be the cost of reducing the water loss?
(v) What savings and benefit–cost ratios will result from reducing the water loss?
(vi) When can the corrective measures be implemented?

It is important that the ULB or state agency shares the latest updated version of the water and leak detection study with the private developer.

Energy Audit Study

The ULB or state agency must also undertake an energy audit of the entire water supply and sanitation operations to determine the current level of energy consumption at various stages of the value chain and to compare this with the standard benchmarks. The audit measures the energy consumption at points where water is pumped and reviews the efficiency of the equipment being used. The energy audit undertaken generally covers

(i) a study of the existing system and past records;
(ii) the setting of existing energy consumption benchmarks;
(iii) a study of system energy efficiency from source to consumer;
(iv) checking of equipment efficiency, including pumps; and
(v) checking the process losses for energy efficiency.

This information would help to accurately identify the cost reduction efficiency benchmark that can be set.

Water Quality Audit Study

When undertaking the water quality audit, it is critically important to assess water quality levels to ascertain whether the water being supplied in the ULB is fit for potable consumption. The process requires samples of water to be collected and tested at laboratories to ascertain water quality.

Assessment of Future Demand

The assessments described would highlight infrastructure gaps in the existing scenario. Water availability under the existing scenario may meet the demands of the current population but may be inadequate for the expected rise in population. Therefore, the detailed assessment must consider both the needs of the current population and those of a horizon plan period.

Compiling Key Parameters

Key performance indicators are used to assess the level of services and to determine infrastructure gaps. Those most commonly used are discussed on page 22. For each component of the value chain, parameters have been identified for evaluating performance levels. These parameters include technical and quality indicators. The performance standards for each of the indicators are in accordance with the guidelines mentioned in the manual of the Central Public Health and Environmental Engineering Organisation (CPHEEO), of the Ministry of Urban Development. Some of the key indicators for the water supply sector, which need to be assessed, are shown in Table 3 together with their formulas and rationale.

Table 3 Key Parameters for Assessing the Performance of Water Supply Services

Indicator	Unit	Norm	Formula	Definition	Rationale	Remarks
Service-Level Performance Parameters						
Per capita quantum of water supplied (for cities without a developed underground system)	lpcd	70 lpcd	= [Quantity of water supplied to the distribution system/ Population served]	Total water supplied into the distribution system (ex-treatment plant and including purchased water, if any) expressed by population served per day	Indicates the adequacy of the water supplied for consumption at the distribution end	For cities without an underground sanitation system, a per capita water availability should ideally be 70 lpcd Only treated water input into the distribution system should be measured Only population served by the ULB to be considered
Per capita quantum of water supplied (with a developed underground system)	lpcd	135 lpcd				For cities with a fully developed sanitation system, the CPHEEO norm of 135 lpcd is to be adhered to
Quality of water supplied	–	As per Bureau of Indian Standards norms	= [(Number of samples that meet the specified potable water standards in a month/Total number of water samples in a month)*100]	Percentage of water samples that meet or exceed the specified potable water standards, as defined by CPHEEO. Sampling regimen should be as per standards and norms laid down for the same	Poor water quality can pose serious public health hazards It is highly critical to monitor the quality of the water supplied	Samples should be drawn at both points—outlet of treatment plant and at consumer end All parameters of the quality standards should be met
Frequency of water supply	Hours per day	24 hours	= [Average number of hours of pressurized water supply per day]	The number of hours in a day during which pressurized water is available	Intermittent supply results in the need for individual households to create additional storage requirements and other inconveniences	The number of hours of supply in each of the operational zones should be measured continuously for a period of 7 days The zone-wise figures should be averaged out to get city-wise data

continued on next page

Table 3 *continued*

Indicator	Unit	Norm	Formula	Definition	Rationale	Remarks
Service-Level Performance Parameters						
Water treatment plant capacity	%	100%	= [(Quantity of bulk water supply/Installed capacity of the WTP)*100%]	Installed capacity of the water treatment plant, in MLD terms, to treat the bulk water supplied for treatment	Indicates if the installed capacity is adequate to treat the bulk water supplied	If the installed capacity is less than the bulk supply, a check on the water quality standards is essential to determine if there is any deterioration in the quality of treated water
Storage levels	%	33%	=[((Installed capacity/ 1– quantity of water discharged from WTP))]	The storage capacity available in the form of elevated storage reservoirs or groundwater storage reservoirs	Indicates the extent of storage capacity available to store treated water at any point in time before actual supply to the distribution system is undertaken	groundwater
Coverage of distribution system	%	100%	= [(Total number of households with direct water supply connection/Total number of households in the service area)*100]	Total number of households in the service area that are connected to the water supply network with a direct service connection, as percentage of total number of households in that service area	Indicates the extent of households in the service area, which have a direct access to drinking water supply and, therefore, the extent not covered and where services need to be provided	Only the number of households (not properties) in the service area should be considered Would include households that receive supply at one common point, from where it is stored and distributed Common public stand posts not to be considered
Raw water transmission loss level	%	Less than 2%	= [((1– quantity of water received at WTP)/quantity of water pumped at intake works)*100]	Total raw water lost in conveyance from the source or main balancing reservoir to the treatment plant expressed as a percentage of total bulk water offtake at source	Indicates the efficiency of the conveyance system to ensure that only technical loss levels due to friction are permissible.	In case of conveyance through open channels, the loss level would be higher due to evaporation Loss level exceeding permissible standards indicate either corroded pipelines or theft of raw water

continued on next page

Table 3 *continued*

Indicator	Unit	Norm	Formula	Definition	Rationale	Remarks
Service-Level Performance Parameters						
Water treatment loss	%	2%–3%	= [((1– quantity of water discharged from WTP)/quantity of water received at WTP))*100]	The quantum of water that is lost at the time of treatment on account of technical issues	Indicates if the technology and the equipment used for treatment procedure are operating efficiently and result in only acceptable levels of loss	Loss levels beyond acceptable limits indicate either obsolete equipment being used or operational inefficiency
Pure water transmission loss	%	Less than 2%	= [((1– quantity of water discharged from ESR)/quantity of water discharged from WTP)*100]	The quantum of water lost during conveyance from the WTP to the storage reservoirs	Indicates if the pure water transmission pipeline is corroded or has points where there are leaks	Loss levels beyond acceptable limits indicate either corroded pipelines, theft of pure water
Extent of metered service connections	%	100%	= [(Number of metered direct service connections + Number of metered public stand posts)/ Total number of direct service connections + Total number of public stand posts)*100]	Total number of functional metered water connections expressed as a percentage of total number of water supply connections Public stand post connections should also be included	Facilitates in measuring the exact quantum of water consumed and thereby that which can be billed as per consumption levels	Of the meters installed, it is important to check the extent that are fully functional and operational All the installed meters need to be 100% functional
Non-revenue water	%	20%	= [((Total water produced and put into the transmission and distribution system – Total water sold)/(Total water produced and put into the transmission and distribution system))*100%]	Extent of water produced, which does not earn the ULB or state agency any revenue	Reduction in non-revenue water levels is vital for the financial sustainability of the ULB or state agency	Only treated water input into the distribution system to be included Water sold implies actual volume of water supplied to customers In the absence of a functionally effective metering alternate methods of measurement needed

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Table 3 *continued*

Indicator	Unit	Norm	Formula	Definition	Rationale	Remarks
Service-Level Performance Parameters						
Cost recovery in water supply services	%	100%	= [(Total annual operating revenues/ Total annual operating expenses)*100]	Total operating revenues expressed as percentage of total operating expenses incurred in the corresponding time period	Financial sustainability is critical Provides a basis for tariff fixation, enables setting targets for revenue mobilization and cost control in delivery of water supply services	Operating expense includes charges on electricity, chemicals, staff, bulk water purchase costs, etc. Revenues may be in the form of taxes/ cess/surcharges, user charges, connection charges, sale of bulk water, etc.
Collection efficiency	%	100%	= [(Current revenues collected in the given year/Total operating revenues billed during the given year)*100]	Efficiency in collection is the current year revenues collected, expressed as a percentage of the total operating revenues, for the corresponding time period	Indicates the extent of operational efficiency present in the system and makes note of the extent of arrears	Collection of arrears to be excluded

CPHEEO = Central Public Health and Environmental Engineering Organisation, ESR = elevated storage reservoir, lpcd = liters per capita per day, MLD = million liters per day, ULB = urban local body, WTP = water treatment plant.

The indicators discussed in Table 3 are the most critical parameters for assessing the status of water supply services in a city or town. In addition to these indicators, it is important that the ULB or state agency also consider other important factors in the value chain, such as the age of the installed equipment and the efficiency of operations. Also, the efficiency of consumer grievance redress needs to be monitored and the adequacy of staff to manage the existing connections assessed.

The sanitation services of the ULB or state agency also need to be assessed. Key parameters are presented in Table 4.

Table 4 Key Parameters for Assessing the Performance of Sanitation Services

Indicator	Unit	Norm	Formula	Definition	Rationale	Remarks
Service-Level Performance Parameters						
Coverage of sanitation network	%	100%	= [(Total number of properties with direct connection to the sanitation network/ Total number of properties in the service area)*100]	Denotes the extent to which the underground sanitation (or sanitation collection) network has reached out to individual properties across the service area	Last mile access to sanitation networks is key to improvement in service levels of sanitation management	The total number of properties (as against households) as recorded in the municipal records should be assessed Only properties with access connection to underground sanitation network should be included. Those that connect their sanitation outlet to stormwater drains or open drainage systems should not be considered
Adequacy of sanitation treatment capacity	%	100%	= [(Treatment plant capacity/Total water consumed + Estimated water use from other sources)*0.8]	Adequacy is expressed as secondary treatment (i.e., removing oxygen demand as well as solids, normally biological) capacity available as a percentage of normative wastewater generation, for the same time period	It will highlight the adequacy of available and operational sanitation treatment capacity	To include water supplied to the distribution system ex-treatment plant and including purchased water, if any, and water supplied through any decentralized system
Collection efficiency of sanitation network	%	100%	= [(Wastewater collected/((Total water produced + Estimated water use from other sources)*0.8)]	The quantum of wastewater collected as a percentage of normative sanitation generation in the urban local body (ULB)	Signifies the effectiveness of the network in capturing wastewater and conveying it to the treatment plants	To include water supplied to the distribution system ex-treatment plant and including purchased water, if any, and water supplied through any decentralized system

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Table 4 *continued*

Indicator	Unit	Norm	Formula	Definition	Rationale	Remarks
Service-Level Performance Parameters						
Extent of reuse and recycling of sanitation	%	Minimum of 20%	= [(Wastewater recycled or reused after appropriate treatment/ Wastewater received at the treatment plants)*100]	Percentage of wastewater received at the treatment plant that is recycled or reused after appropriate treatment for various purposes	For sustainable water management, it is desirable that wastewater sanitation is recycled or reused after appropriate treatment. To maximize the same, it is important that this indicator is measured and monitored	Indicator should be reported at the city or ULB level as a whole This should only consider water that is directly conveyed for recycling or reuse, such as use in gardens and parks or for irrigation
Quality of sanitation treatment	%	100%	= [(Number of samples that pass the specified secondary treatment standards/ Total number of wastewater samples tested in a month)*100]	Extent of wastewater samples that pass the specified secondary treatment standards	It is important that the treated water that is discharged back into water bodies, or used for other purposes such as irrigation, meets the environmental standards laid down	Sampling should be taken as per good industry practices and laid down norms by environmental agencies, such as pollution control boards of respective state
Extent of cost recovery in sanitation management	%	100%	= [(Total annual operating revenues/ Total annual operating expenses)*100]	Extent of cost recovery is expressed as wastewater revenues as a percentage of wastewater expenses, for the corresponding time period	For ensuring financial sustainability, it is necessary to ensure that costs incurred are fully recovered	All operating expenses and revenues of the revenue account only to be included and incomes and expenses of capital account to be excluded
Efficiency in collection of sanitation charges	%	100%	= [(Current revenues collected in the given year/Total operating revenues billed during the given year)*100]	Efficiency in collection is defined as current year revenues collected, expressed as a percent of age of the total operating revenues billed	Efficient collection of revenues due in the current year is critical for overall financial health of the utility	Collection of arrears to be excluded

The indicators discussed in Table 4 are the most critical parameters for assessing the status of a city's sanitation service. In addition, it is important that the ULB or state agency considers other important factors in the value chain, such as the age of the installed equipment, and its operational efficiency, and the efficiency of the consumer grievance redress process needs to be monitored. Indicators that can effectively capture the impact on health of the consumers in the service area, such as the incidence of waterborne diseases, may also be included. These indicators would provide a baseline against which to judge the impact of improved sanitation services on the health of the consumers in the service area.

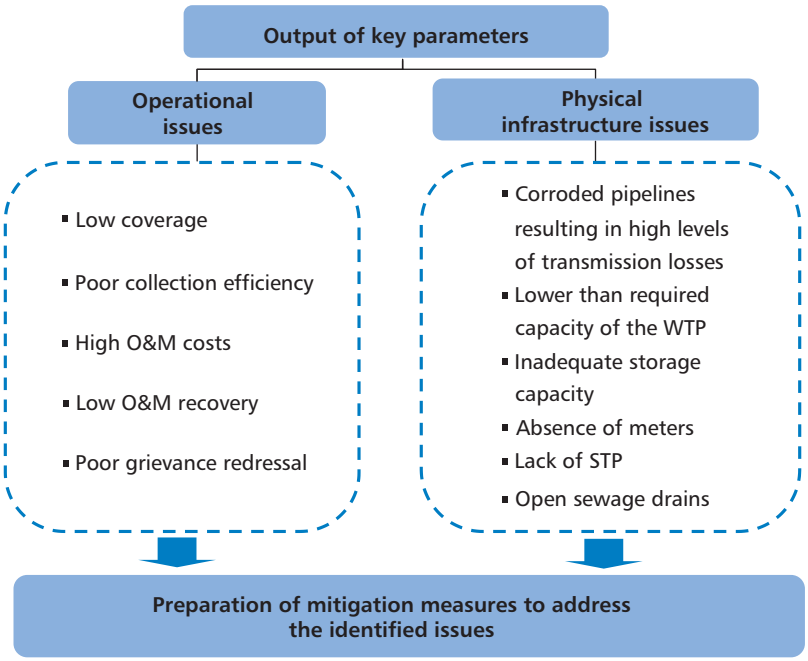
The above-mentioned indicators would facilitate in assessing the service-level status of the asset. In addition to these, the quality and status of the water supply and sanitation assets would be reflected in the water audit, leak detection audit, and energy audit, which are also to be carried out as part of the technical assessment.

Identification of Key Issues

The detailed assessment undertaken would help identify the major issues faced in the water supply and sanitation services in the city. These may be categorized as those relating to the operational handling of the system and those relating to the physical infrastructure (Figure 7).

The ULB or state agency would need to prepare a set of mitigation measures or remedial actions to address each issue, first focusing on addressing the operational issues that require minimal levels of capital investments, and then addressing the physical infrastructure that typically requires much greater capital investment. These measures may take the form of infrastructure development projects where a gap has been identified, or steps for revision of tariffs to improve cost recovery.

Figure 7 Indicative List of Issues in the Water Supply and Sanitation Services



O&M = operation and maintenance, STP = sewage treatment plant, WTP = water treatment plant.

Review of Projects with Approved Detailed Project Reports

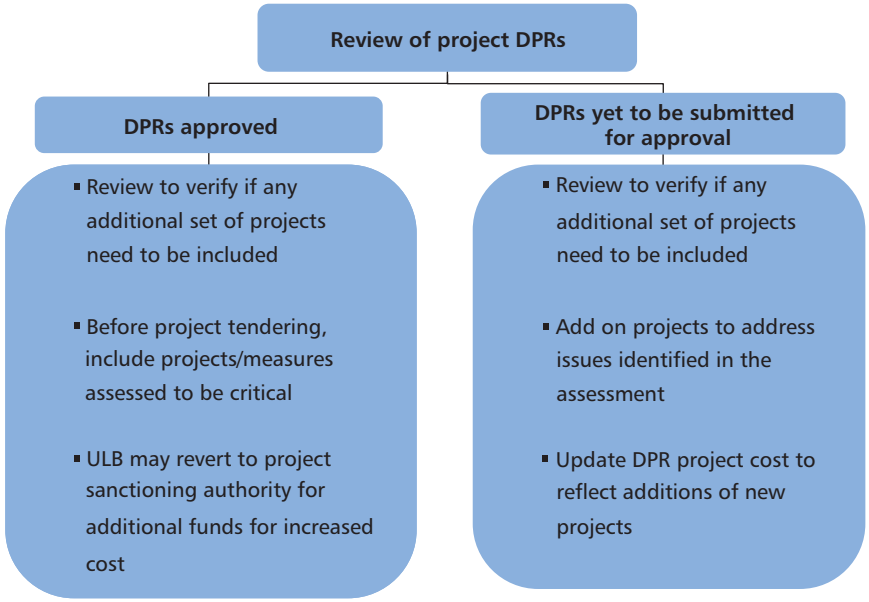
The output of the assessment process would be the key input for any project the ULB or state agency proposes to develop to improve water supply and sanitation services. As a next step, the ULB needs to develop short-, medium-, and long-term projects that would effectively address the issues identified. The ULB or state agency may develop detailed project reports (DPRs), which would list all the components that need to be addressed in terms of augmentation, replacement, and rehabilitation and the corresponding investment requirement.

The ULB needs to adopt a different approach, depending on whether the DPR has been approved, or whether it has been prepared but has yet to be approved and sanctioned by the concerned authority.

For projects with approved DPRs, a further assessment of the system should be undertaken to identify any other improvements that are needed in addition to those listed in the approved DPR. Thus, the existing DPR may be modified to incorporate initiatives, which the ULB might consider important, to ensure that all issues identified in the assessment are included. All such modifications to the DPR should be undertaken only before the period of project tendering. Also, the ULB should determine whether the additional capital investment required for the new works identified can be met within the existing approved project cost or whether further government assistance is needed. If additional assistance is needed to pursue newly identified initiatives, the ULB may revert to the project sanctioning authority of the central or state government for further investment support.

For projects where the DPR has been prepared but awaits approval (under an existing scheme, such as the Urban Infrastructure Development Scheme for Small and Medium Towns under the Jawaharlal Nehru National Urban Renewal Mission state scheme), a thorough review of the components of the DPR needs to be undertaken. The review must assess and establish the need for the various proposals made in the DPR, and should critically evaluate the costs considered for the various activities. The ULBs would need to include any additional project, which is felt

Figure 8 Assessment of Project Detailed Project Reports



DPR = detailed project report, ULB = urban local body.

necessary after the assessment undertaken, and the costs of the DPR would need to be updated correspondingly.

A detailed list of the activities to be considered while undertaking a due diligence review of the cost components has been elaborated upon in Section V. In addition to the costs, the projected revenue for the proposed project must also be elaborated. The detailed components of the revenues, which would likely accrue to the project, are also explained in Section V.

Any infrastructure-related and other issues not directly addressed in the DPR should be added, and the corresponding investment requirement should be revisited.

Prioritization of Key Areas of Investment

Having identified the projects that need to be undertaken and their associated costs and expected revenues, the projects should be listed in order of priority. The ULB or state agency would need to look at a host of criteria to determine the order of priority. Typically, the ULB or state agency would not necessarily have the capacity to undertake the identified investments across the various projects simultaneously, and technical skills and expertise may not be readily available. Some issues might require immediate attention, while others may be addressed at a later stage.

The rationale for prioritization of projects would depend broadly on the amount of investment required and the degree of urgency of the project. For both the parameters, the ULB or state agency would need to undertake a detailed analysis to determine project components across the various value chains that require intervention.

Ideally, the ULB should first take measures to address all the issues of operational inefficiency in the entire value chain of water supply and sanitation services identified during the assessment study. The ULB should then address infrastructure deficiencies through augmentation works. For instance, if the assessment of the chain of water supply services identified that the distribution network faces issues, such as large distribution losses and poor pressure levels, and that the bulk water supply to the city requires augmentation, then the ULB should ideally address the distribution network issues before taking up projects for augmenting the bulk supply. The rationale behind this sequence is that, if the ULB or state agency prioritizes bulk supply augmentation over distribution network improvement, the ULB or state agency would pump additional water into a poorly performing distribution system, and the additional water supplied would be lost if the distribution network has corroded pipelines. Therefore, the ULB or state agency should have compelling reasons to pursue a specific project over other projects identified.

Financial considerations would also need to be considered when prioritizing projects. Against the projects and their identified costs, the ULB would need to review the possible alternative sources of funding for the required investment, e.g., from internal revenues of the ULB or state agency or from external sources, such as grants and commercial borrowings. The ability of the ULB to undertake and sustain the required investment would have to be assessed.

V Financial Feasibility

The assessment outlined would help to identify the projects required for improving the water supply and sanitation services. The next important step is to assess their financial viability with respect to the costs involved and the alternative sources of funding available. This section describes the process of undertaking a financial feasibility study of a project and the factors that need to be considered to arrive at a decision on the project's viability.

Determination and Due Diligence of Project Cost

A detailed financial analysis is one of the most critical activities to determine the possibility of developing a project in a public–private partnership (PPP) mode. The financial analysis would determine the viability of the project based on the costs involved and the expected revenues.

The key input for the financial feasibility analysis is the project cost. Three broad categories of costs need to be considered: capital costs for project development, operation costs, and maintenance costs of the infrastructure or asset created. The following sections define these costs and guide their identification by the urban local body (ULB).

Determination of Project Cost

Capital Costs

Capital costs for the development of water supply and sanitation projects include basic capital costs on buildings required for the project, including any fit-out costs required to convert an existing property to the required use. Land acquisition costs include the cost of assets that need to be acquired across the value chain. Cost estimates should reflect the full resource costs of the project.

The components of a bulk supply project include expenditure for the intake well, elevated storage reservoirs, jack well, pump house, raw water pumping machinery, raw water pumping main, and approach bridge. Similarly, the capital cost to develop a water treatment plant (WTP) would include expenditure on the development of a pump house, WTP, sumps, and bulk meters. At the distribution end, the capital cost largely would be that associated with the laying of pure water pipelines and installation of bulk meters. All relevant costs for each component of the value chain and part of the project are to be considered during the estimation of the capital cost.

The estimation of capital costs should also include the opportunity cost of assets already owned by the institution and which are to be used in the project. If the asset could be sold or used for another purpose, then the use of that asset in the project has an opportunity cost.

The capital costs are identified from the detailed project report.

Table 5 lists the main components of the capital cost of a typical project.

Operating Costs

In addition to consideration of the capital costs to be incurred for the creation of an asset, the project cost estimation should also include the costs on operation of the assets created (Figure 6). In the case of water supply and sanitation projects, these costs include

(i) raw bulk water purchase charges;
(ii) power consumption charges;
(iii) input costs, such as chemicals for water treatment, and sewage treatment;
(iv) cost of employees directly involved in service delivery, including wages and salaries, employee entitlements, superannuation, and training and development;

Table 5 Broad Components of the Capital Costs

Sl No.	Particulars	Capital Cost (Rs10,000,000)
1	Land acquisition cost	
	Water supply services	
2	Construction cost on • Bulk water supply system • Raw water transmission pipelines • Water treatment plant • Distribution network • Storage reservoirs • Electric substations • Pump houses	
3	Installation and additional costs on • Bulk meters and consumer end meters • Information technology infrastructure • Energy-saving measures	
	Sanitation Services	
	Construction cost on • Sanitation pipeline • Sanitation treatment plant • Electric substations • Pump houses	
4	Contingency reserve	
5	Preliminary and pre-operative expenses	
6	Interest during construction	
7	Operations and maintenance to be capitalized	
	Total	

Rs= rupees, SI = serial.

(v) administration expenses; and
(vi) insurance costs.

The operating costs are identified on the basis of the demand projections presented in the detailed project report and the rates of operating costs identified on the basis of current market rates or rates paid in recent similar projects.

Maintenance Costs

In addition to considering the operational costs of the assets, it is equally important for the ULB to take into account the expenses relating to the maintenance of the assets created. These costs largely relate to the regular civil works, e.g., repair works and minor replacements, which need to be undertaken on a recurring basis to maintain the capacity and quality of the asset. Maintenance costs typically include raw materials (spares), tools and equipment, and employee costs associated with maintenance work.

A combination of the capital costs and operation and maintenance (O&M) expenses for the proposed project indicate the total investment costs required.

Table 6 Broad Components of the Operation Costs

Sl No.	Particulars	Cost (Rs10,000,000)
1	Administrative expenses	
	Water supply services	
2	Operation and maintenance cost on • Raw bulk water purchase • Power consumption • Chemicals utilized • Meters • Connection costs	
	Sanitation Services	
	Operation and maintenance cost for • Energy • Chemicals • Sludge handling • Connections	
3	Salaries and other establishment expenditure	
4	Insurance costs	
5	Any other miscellaneous expenditure	
	Total	

Rs= rupees, Sl = serial.

Due Diligence on Project Cost

This activity involves reviewing the project costs—both capital and operational—to ensure that they conform to some minimum tests of reliability, credibility, and consistency. This stage is important to ensure that the estimate of costs and revenues are acceptable to prospective bidders. A description of some of the important parameters for the review of project costs follows.[6]

Inflation

The costs of individual items should reflect current market prices. If the costs are based on standard historical prices, they should be adjusted to reflect inflation, and the assumed rate of inflation should be documented. Unrealistic assumptions on inflation and/or omission of inflation will result in cost estimates that are lower and do not reflect prices. This, in turn, will lead to substantial differences between the costs planned for and those actually incurred.

Opportunity Cost

In cases in which the sponsor deploys its own resources, such as staff, machinery, or funds, in the project, the opportunity cost (the return forgone by the sponsor by not deploying these resources profitably elsewhere, including its own operations) will need to be considered as the cost of the resource.

If opportunity costs are omitted from the cost estimates, the cost estimates would be underreported, inflating the feasibility of the project, and the project will then not be comparable with the private sector reference.

Basis for Estimation of Costs

The basis, or assumptions, for the estimation of the costs needs to be verified. The costs of individual items considered for arriving at the final cost should be based on either standard costs, costing for similar projects in the recent

[6] Please note that this is an indicative list of the minimum required parameters of the review.

past, actual market prices, or standard industry norms.

All of these above-mentioned factors need to be adjusted for inflation. The implications of unrealistic bases for the estimation of costs are that the cost estimates would not reflect the current level of prices. The estimates would be inconsistent and incomparable, thus distorting the feasibility analysis.

Identification of Project Revenues

The next important estimation, which needs to be undertaken as a part of the financial feasibility analysis, is the project revenues. Project revenues are the income generated from the provision of water supply and sanitation services to the consumer. It should be noted that inflows of a revenue nature will be considered as project revenues. Any inflow of a capital nature would be added to the project funding or reduced from the gross cost of the project, depending on its accounting nature.

The revenues fall into two broad categories: direct revenues and indirect revenues.

Direct Sources of Revenue from Water Supply Service

Water Supply Charges

The single largest and the most important component of revenue generated from the provisioning of water supply services is that obtained from a levy of water supply charges. Water supply charges may be levied in the form of flat rate tariffs, volumetric tariffs, or telescopic tariffs.

Flat rate tariff. This refers to a pricing structure wherein the customers are charged a fixed amount of tariff based on the size of pipe connections at certain intervals, irrespective of the quantity of water consumed. It is, therefore, a linear rate, which may not vary with the usage of the service or with the time of availing of the service. In the case of water supply services, this implies that a fixed monthly charge is levied for different categories of consumers—residential, commercial, and industrial. Usually, within these categories, a differential rate is levied, depending on the type of individual unit holding. For instance, in the residential user category, different units, such as residential houses, slum dwellings, educational institutions, and government establishments, are charged varying rates based on the size of pipe connections.

Therefore, a residential unit may be charged Rs120 per month for water supply services, whereas a slum unit may be charged Rs40 per month, and an institution may be charged Rs200 per month. The rates for commercial establishments and industrial units are generally much higher than the domestic rates. Irrespective of the quantity of water used, the consumer would be charged only a fixed rate. Typically, such a pricing structure is found in cities where no meters have been installed at the consumer end.

Volumetric tariff. This refers to a pricing structure wherein the tariff rate varies according to the amount of water used by the consumer. It is, therefore, a variable rate, where for different consumption levels, different tariff rates are applicable. Such a tariff structure is applicable in cities and towns where meters have been installed at the consumer end. There are separate consumption brackets with corresponding per unit charges. The broad consumption category remains the same as that under the flat rate tariff structure, i.e., residential, commercial, and industrial. Within these categories, slabs for different consumption levels exist (Table 7).

Water meter readings are recorded and, depending on the volume of water consumed, tariff is levied.

Telescopic or increasing block tariff. In this tariff structure, there are two or more prices for water used, where each price applies to a customer's use within a defined block. Prices rise with each successive block. Generally, under such a pricing structure, the first block price is deliberately set below cost. A water user in a particular use category (e.g., residential) is charged a unit price for the first units abstracted

Table 7 Representative Volumetric Tariff Structure

Residential	Rupees per kiloliter
Below 15 kl	6.0
16 kl–30 kl	8.0
31 kl–50 kl	15.0
51kl–100 kl	20.0

kl = kiloliter.

Table 8 Representative Telescopic Tariff Structure

Residential	Rupees per liter
Below 15 kl	2.5
16 kl–30 kl	6.0
31 kl–50 kl	12.0
51 kl–100 kl	20.0

kl = kiloliter.

up to a specified amount, which defines the end of the initial or first block. Above this amount, the user faces a higher price for additional units until a second specified amount is reached, which defines the end of the second block, and so on until the highest block in the increasing block structure is reached. The user can typically abstract as much water as desired in this highest block, but for each additional unit of water, the bill increases by an amount equal to the highest price in the rate structure.

Water Connection Charges

Another component of the revenue from the provision of water supply services is the water connection charge. This is a one-time payment made by a consumer to the service provider for accessing water supply services. The charge is generally based upon the size of the connection, user category (e.g., domestic or industrial), location of the property (i.e., within or outside city limits), and the distance of the property from the nearest water main. Connection charges usually include a basic connection fee and various add-on charges for physical facilities, labor, administrative fees, and other costs.

Therefore, as a part of the total projected revenues, it is important that the future demand for the water supply services is estimated. Based on the anticipated increase in the number of connections that need to be provided, the applicable water connection charges need to be applied and the revenue from this source should to be estimated.

Penalties

A small contributor to the total revenues earned is the penalty imposed on consumers who are illegally connected to the water supply system and those who have not paid their water bills. The revenue to be earned from this source may be estimated on the basis of the trend in the arrears in the total collections to be made.

Charge for Establishment of Meter

The cost incurred by the ULB in purchasing and installing meters at the consumer end is generally recovered as part of the total water bill generated. The revenue from this source is to be largely treated as an inflow, intended to recover the costs already incurred by the ULB. The costs are generally recovered in installments from the consumers, and this should also be accounted for in total revenues.

Indirect Sources of Revenue

In addition to the direct sources of revenue, the ULB should also explore the indirect revenue sources for the water supply sector, such as development charges and real estate revenues.

Development Charges

The ULB should consider the possibility of developing a special corpus fund to make payments to the private developer for developing the water supply system. A municipal fund may be created with revenue contributions from the development charges, which are currently levied under the Maharashtra Regional and Town Planning Act 1966. Approximately 50%, or a pre-decided share of the development charges so levied, may be consolidated to form the fund.

Real Estate Revenues

The ULB may also explore the possibility of unlocking the real estate value of the municipal land within its possession. As part of the payment or compensation agreement between the ULB and the private developer, the ULB may consider the option of providing the developer with a transfer of development right.

The sum total of the above revenue streams would have to be projected as part of the financial analysis for the water supply services.

Direct Revenues for Sanitation Service

Sanitation Charge

Sanitation charges form a significant component of the total revenues accruing from the provision of sanitation services. Sanitation charges generally are levied as a percentage of water charges and are collected from all the premises that have sanitation connections. Therefore, as part of the total projected revenues, the income from the sanitation charges should also be estimated and included in the total revenue stream.

Sanitation Connection Charge

The sanitation connection charge is the fee that the ULB or state agency levies as a one-time charge on consumers for provision of a connection. The fee consists of a charge for providing connections and a tapping charge. The total revenue from connection fees each year depends on the number of connections provided in that year. Therefore, the total revenue for sanitation charges should also account for the income from connection.

Penalties

A small component of the revenue from sanitation services is from imposition of penalties. Generally, penalties are imposed on those consumers who have not taken a legal connection to the sanitation system and are dumping their sewage in open drains. This income component is computed on the basis of the trend of income from penalties in the previous years.

Indirect Revenues for Sanitation Service

Revenues from sale of treated sewage need to be treated as an indirect source of revenue by the ULB. Treated sewage may generally be purchased by manufacturing or industrial units that have a high use of water for their activities. If the option exists, the ULB may identify such units and guarantee a pre-determined quantity of treated sewage water in exchange for a certain price.

Preparation of the Financial Model

Once the project costs and revenues are identified, the next stage in the financial analysis is to build the financial model of the project. This task involves

(i) identifying all the inputs for the financial model, including
   (a) project cost,
   (b) project revenues,
   (c) operation and maintenance costs, and
   (d) assumptions for the financial model; and
(ii) preparing the financial model, including
   (a) calculation of project cash flows, and
   (b) calculation of project internal rate of return (IRR).

Inputs to the Financial Model

Some basic assumptions and inputs to be considered when a financial model is prepared include the following:

(i) Project cost as derived from the detailed project report capital costs, pre-operative expenses (to be capitalized), fees of the transaction advisor (if any), and cost of legal approvals. In addition, the phasing of the capital expenditure also needs to be defined.
(ii) Project revenues, including the revenues that have been identified from all the sources as indicated in the preceding sections.
(iii) Operation and maintenance costs as derived from the detailed project report as per the demand projections and estimated operating expenses.
(iv) Certain assumptions for projecting the cash flows in the future, e.g., long-term inflation rates, long-term interest rates, and income tax rates in the future.

All these assumptions will need to be documented as part of the financial feasibility process.

Preparation of the Financial Model

The financial viability of any capital-intensive project is largely defined by the returns on investment the project is expected to earn the investors. Therefore, one of the key objectives behind the preparation of a financial model is to estimate the returns that the project can generate in the future. These returns are calculated on the basis of project cash flows, which are available for both debt and equity investors who have invested in the project.

To calculate the project cash flows, the following key statements must be prepared:

(i) projected profit and loss account,
(ii) projected balance sheet,
(iii) projected cash flow statement,
(iv) a statement of the assumptions used across the financial statements, and
(v) total capital expenditure and its phasing.

These five financial statements together constitute the basic financial model of the project. Generally, these financial statements are projected to cover the economic life of the created asset so as to consider the costs of the complete project life cycle. In case the economic life of the project is longer than 30 years, the ULB can, at this stage of preliminary financial feasibility, limit the duration of the project to 20–30 years.

Assessing the Viability of the Private Investment

The spectrum of PPP contract structures can be broadly classified into

(i) contracts in which the private sector invests capital, either the whole project cost or a part; and
(ii) contracts in which the private sector does not invest capital.

The following discussion applies specifically to PPP contracts in which the private sector invests capital. Such PPP contracts can take the form of concessions (e.g., build–operate–transfer, build–own–operate, build–own–operate–transfer, and design–build–finance–operate). The private sector invests capital in these contracts as a business investment. This means that the private investor expects attractive returns from the investment made. Therefore, the key question to assess the commercial viability of the project under consideration is whether the returns from the project are attractive enough for a private investor. The following sections discuss the calculation and assessment of the project returns to determine their attractiveness.

Principles and Risk Return Relationship

Based on the projected cash flows, which have been estimated in the preceding step, the next activity to be undertaken is to compute the IRR of the project. The IRR is then compared against a benchmark to assess whether the project is commercially viable. Possible benchmarks could be returns that are generated through similar projects or returns that are assumed to be reasonable by a private developer in the water supply and sanitation sector. It should be noted that projects of large-scale investments would differ from case to case. For instance,

an only-bulk-supply augmentation project would differ from one that requires development, operation, and maintenance of both bulk water supply and a distribution system. The ULB or state agency, therefore, cannot assume an arbitrary rate of return. A suitable rate of return would have to be clearly identified.

In order to identify whether a project is commercially viable or not, the following formula can be used:

Project Internal Rate of Return ≥ Weighted Average Cost of Capital

The weighted average cost of capital (WACC) is a minimum return that a project must earn on its asset base to satisfy its creditors, owners, and other providers of capital. WACC is calculated as

$$WACC = (1–t)\ (E/K)*C_e + (D/K)*C_d$$

Where,

t = amount of tax applicable
E = value of equity in the project
D = value of debt in the project
K = D+E
C_e = cost of equity/minimum return expected by equity investors
C_d = cost of debt/minimum return expected by debt investors

The project IRR must, at least, be equal to the WACC of capital for the project to be deemed commercially viable. The value of the WACC would be directly related to the risk perceived in the project by the investors.

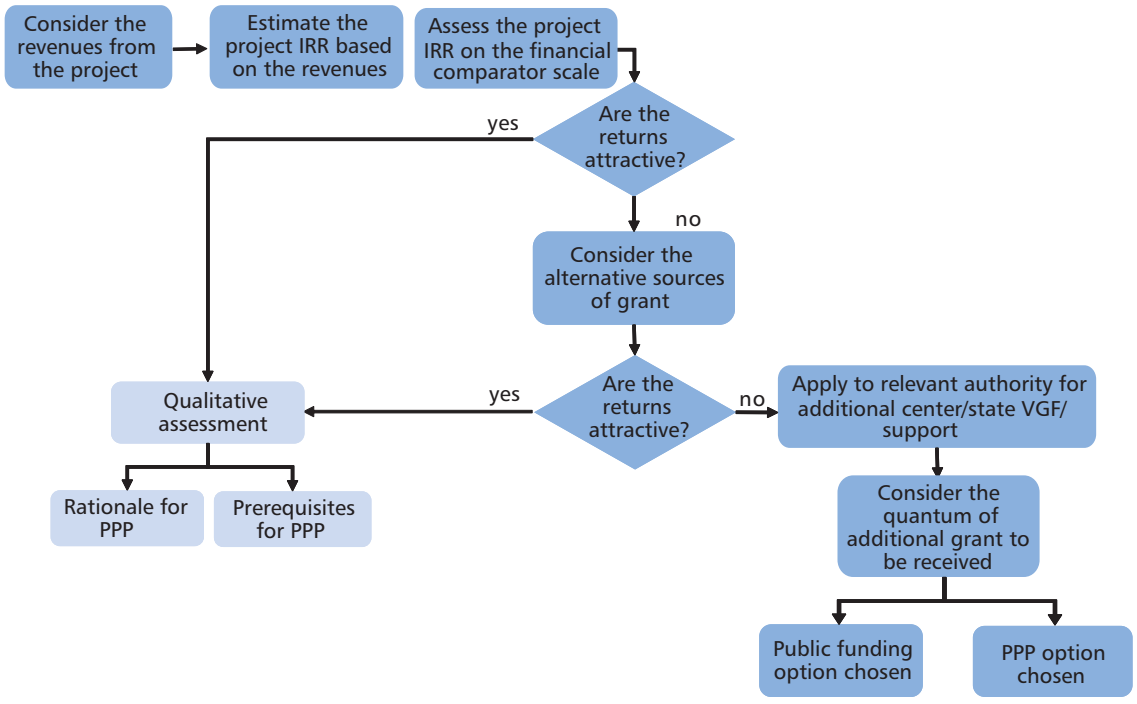
Process Flow of Viability Assessment

The steps to be followed for undertaking the viability assessment are summarized in Figure 9.

The project IRR is defined as the discount rate that makes the net present value of all cash flows from a particular project equal to zero. Generally speaking, the higher a project's IRR, the more desirable the project.

The project IRR is calculated using the inputs of project cash flows over the economic life of the

Figure 9 Process Flow for Viability Assessment



IRR = internal rate of return, PPP = public–private partnership, VGF = Viability Gap Fund.

project. In case the economic life of a project exceeds the tenure for which the cash flows have been projected, then for the last year of the projected cash flows assume the terminal value of the project as the cash flow.

Assessment of Project Internal Rate of Return: Financial Comparator Scale

To assess the commercial viability of the project, the project IRR must be compared with a series of benchmark returns. These include comparisons with the following:

(i) **Risk-free rate of return.** The risk-free rate of return represents the lowest possible return for the project, as it represents a risk-free investment. Generally, a project being developed as an investment avenue would have a substantially higher degree of risk in addition to the sovereign risk (corresponding to the risk-free rate of return). Therefore, the project IRR should be greater than the risk-free rate of return in the market. For practical purposes, the 10-year yield on government securities is a reasonable indicator of the risk-free rate of return.

(ii) **AAA-rated bond yield.** The AAA-rated bond yield (over the risk-free rate of return) represents the return on an investment, which is rated by rating agencies as carrying the lowest risk for the investor among the bonds available in the market. The risk of the project under development will realistically be equal to or higher than that of the AAA-rated bond. This means the interest on debt to the project will be more than the AAA-rated bond yield. If the return available for equity shareholders is less than the AAA-rated bond yield, an investor will prefer to invest in the AAA-rated bond, rather than in the project. Therefore, in such a case, the public sector should fund the project completely as the returns are not attractive for a private investor.

(iii) **Interest rate at which debt is available to the ULB or state agency.** The project IRR may also be compared with the long-term interest rate at which the ULB or state agency can borrow funds from the market for the project. If the project IRR is equal to or less than the interest rate at which debt is available to the ULB, then the return available for the equity investors would be the same as the cost of debt. However, since the equity in the project would have higher risk than the project debt, the return required by the equity investors would be correspondingly higher. Therefore, the return available for the equity investors is not adequate.

(iv) **The market rate of return.** As a representation of all business opportunities available to the investor, the rate of return of the equity market over a long term on the Bombay Stock Exchange Sensitivity Index (BSE Sensex) or the National Stock Exchange Fifty (NSE Nifty) can be used to compare whether the project IRR is attractive or not. In case the returns available for the equity investors are equal to or more than the market rate of return, the project can be declared as commercially viable for execution through private investment.

If the project returns are found attractive for private investment, the focus would shift to an assessment of the project on a specified set of qualitative parameters for choosing between public funding and PPP.

If the project returns are not found to be attractive with the projected revenues considered, the possibility of obtaining a capital grant to fund the costs of the project may be explored. Typically, if the returns on a project are found to be unattractive, the viability of the project may be enhanced by considering the option of the Government of India's Viability Gap Fund (VGF) scheme. Under this scheme, where commercial viability is low, viability gap funding may be explored to enhance the viability of a PPP project developed, financed, constructed, maintained, and operated by a private sector developer.[7]

[7] Refer to The Scheme for Support to Public–Private Partnerships in Infrastructure, Department of Economic Affairs, Ministry of Finance.

Viability gap funding is typically provided in the form of a capital grant, which reduces the gross cost of the project by the grant amount. In certain cases, viability gap funding can also be provided in the form of deferred grant, or revenue grant, in which case it becomes an additional source of revenue for the project.

Where the actual project IRR lies in comparison to the range of benchmarks will inform the following decisions to be taken by the ULB or state agency:

(i) whether the project returns are attractive enough for a private investor to pursue it, and
(ii) whether the project would require VGF support to make it commercially viable.

Viability Gap Fund

The VGF scheme of the Government of India was established to lend financial support to those infrastructure projects developed on a PPP basis. However, to attract a VGF grant, basic guidelines need to be adhered to:

(i) The scheme provides VGF grants to PPP projects in specific sectors, sponsored by any level of administration—central, state, or local government.
(ii) VGF support is issued only after the other options of enhancing viability are exhausted or are not possible in the case of a specific project, i.e., if the ULB or state agency has explored all available options for funding a proposed water supply and sanitation project and would need additional investment support to make it sufficiently commercially viable to attract private sector investment.
(iii) VGF support is capped at 20% of the project cost. An additional VGF grant, capped at 20%, can be given by the government agency sponsoring the project.
(iv) The VGF scheme provides a one-time grant or deferred grants for the exclusive reason of making the project viable. It is generally in the form of a capital grant at the stage of project construction.
(v) To be eligible, the project should involve provision of a service against the payment of user charge.
(vi) The approved amount of VGF grant for a project is released in its entirety to the lead financial institution (lead member of the consortium financing the project). The lead financial entity releases the grant after the equity of the private partner is exhausted. The release of the grant to the project is in the ratio of release of the debt.

The extent of VGF support that would be required to make the project attractive for private investment would, therefore, have to be assessed.

Assessment of Water PPPs Not Requiring Private Investment

In accordance with financial principles, a service should be outsourced when the market price of the service is lower than the variable costs of providing the service in-house. Variable costs are direct operating costs, which are directly proportional to the level of operations. These costs increase in the same percentage as the level of operations increase. For the water supply and sanitation sector, the variable costs would include the raw water charges, electricity costs, and chemical costs. The following steps would help the ULB or state agency choose between a privately-operated, outsourced service and a government-operated, in-house service:

(i) Based on the service component (or components) being considered for outsourcing through a PPP arrangement, the ULB or state agency will need to list all the costs for the service. The list of the service costs should be segregated into fixed and variable costs.
(ii) Separate the costs, both fixed and variable, into costs that will be retained by the ULB or state agency and costs that will be transferred to the private party (based on risk allocation).

(iii) Price the service that is being considered for outsourcing, taking the costs that will be shifted to the private operator. Price the service on the basis of the service being done in-house. The ULB or service authority will have to assume a level of operations to price the variable costs, while the fixed costs can be taken as they are.

(iv) Estimate the price for the offerings of the private sector. If the estimated price for the private sector offering is lower than the cost calculated for the government service, the PPP arrangement can be considered for further action.

VI Step 2: Choice between Public Funding and PPP

The financial viability assessment undertaken would determine whether the proposed water supply and sanitation project offers enough investment returns to be attractive enough for the private sector. The returns expected on the project would be the key indicator to the urban local body (ULB) or state agency regarding the commercial viability of the project. Once it has been clearly established that the proposed project offers adequate returns to attract a private developer to the project, the ULB or state agency would have to decide whether the project is to be taken up through the public–private partnership (PPP) route or through complete public funding. This section discusses the key parameters the ULB or state agency needs to consider before a final decision is made on the involvement of the private sector in the project. The decision needs to consider the following parameters:

(i) **Innovation.** The ULB or state agency needs to review whether the private developer would be able to provide the same set of services efficiently. Generally, the private developer would be able to bring in innovative practices that would help in improving the efficiency of operations of the service. Since earnings made by the private developer are largely linked to how best the services are provided, the developer has an incentive to try and reduce costs and improve the revenues on the project.

(ii) **Responsibility and risk sharing.** It is important that each risk in a project be allocated to that party which is best able to manage the risk at least possible cost. Therefore, it needs to be assessed as to whether a particular risk can be managed better by the private developer at a lesser cost or not. If the case is that the private developer would be able to handle the identified risk better, it is recommended that the same be handed over to it. In addition, it needs to be assessed if the private developer can also take up some of the responsibilities of the ULB or state agency and handle the same efficiently. Doing so would make some of the resources of the ULB or state agency available to undertake other higher-priority projects and/or works.

(iii) **Sharing in funding.** One of the important and major benefits of private sector participation is that the private developer would partake in some of the capital investment for the identified project. Therefore, the ULB or state agency is in a position to access some of the private sector funds for developing the projects in the water supply and sanitation sector.

Rationale for PPP

The choice of a PPP-based route for execution of the identified project would be dependent on a set of key parameters. These parameters justify the use of PPPs for the creation of an asset in the water supply and sanitation sector and may be termed the rationale for PPP. To establish the rationale for PPP, the ULB or state agency would need to assess the project on the basis of the following indicators.

Resource Constraint in the Way of Public Sector Providing the Service

The ULB or state agency will need to assess whether there are any constraints currently

faced that hinder efficient service provisioning. These constraints may be in areas, such as the capabilities of the existing work force, cost recovery, inaccessibility of better technology, and limited resources. The ULB or state agency will need to assess whether it can remove these constraints internally.

If the constraints cannot be removed internally by the ULB or state agency, the argument supporting the involvement of the private sector through PPP can be initiated, and the ULB or state agency must then determine whether private sector support would be essential in facilitating efficient service delivery.

If it is clearly established that private sector assistance would be necessary, then the PPP option can be further explored by the ULB or state agency. In this context, the following critical questions need to be answered.

1	What are the resources that are required to create the asset or provide the service?	List all the areas of operation, the costs involved, the recoveries made against the costs, the efficiency levels, etc.
2	Are there any constraints for the urban local body or state agency in arranging all the resources itself?	Define the constraint, if any, in the provision of any or all the above resources.
3	What is the nature of the constraint?	Is the constraint a statutory constraint, a budget constraint, a management capability constraint, or constraint of available skills?
4	Can the constraint be removed?	Is there a possibility of removing the constraint? Does removal of the constraint require legislative changes?

Ability of the Private Developer to Create the Asset and Provide the Service

An assessment needs to be undertaken to determine whether the private sector has the capability to innovate and provide an efficient service. PPP contracts should be explored only if the private sector, whether domestic or international, has the technical skill and management capacity to perform the service that the ULB or state agency intends to carry out through PPP. Otherwise, the ULB or state agency would have to procure the requisite skills and upgrade its internal capacity to provide the service. In this context the following questions may be deliberated upon by the ULB or state agency.

1	Does the urban local body (ULB) recognize that external expertise is essential for competent and efficient management of services?	Has it been clearly established that the private sector would be able to manage and provide the water supply and sanitation services better?
2	What are the capabilities within the ULB for operation and maintenance, procurement, or financial management?	List the internal skills available with the ULB or state agency in the area of everyday operations and management of infrastructure, financial management, accounting, procurement handling, etc. Based on the list, identify gaps.
3	What are the private sector's strengths which the ULB is proposing to explore?	Will the private developer be able to operate the system better by using better technology or system understanding?

Efficiency in Managing the Overall Costs

One of the critical parameters to be assessed concerns the efficiency in managing the overall costs involved in the development and operation and maintenance (O&M) of the water supply and sanitation services. The ULB or state agency would need to undertake an analysis to determine whether there is scope for cost savings in developing and provisioning the service if the private sector is involved. To do this, the ULB or state agency would need to first assess the total costs involved. This can be derived from the financial analysis already been carried out to determine the financial viability of the project. The cost to be considered here is the total O&M cost that is required to be incurred for provisioning of water supply and sanitation services.

The total O&M cost so obtained needs to be compared with that which the private developer would incur for operating and managing the same set of water supply and sanitation services. This comparison would be made once the financial model prepared in the preceding task is refined according to the suitable PPP model. That exercise would generate the service costs for the PPP arrangement for comparison with the public sector costs calculated earlier. Depending upon the output of the analysis, it can be seen whether the cost savings under the private developer are substantial or not. Some of the key points or questions which need to be considered are as follows:

Overall Level of Competition in the Market

From the perspective of the ULB or state agency, it is desirable that there is a substantial number of private developers on the market with the skills and the financial wherewithal to provide the water supply and sanitation services efficiently. The existence of multiple players puts the ULB or state agency in a better position in terms of asking for the best of technical and operational expertise from the private sector to provide the services identified. Therefore, the ULB or state agency would have to also undertake an assessment of the market to determine the extent, number, and type of private sector players currently engaged in the creation of the water supply and sanitation services and in a position to operate and manage the services. Having adequate competition in the market would also help in obtaining competitive quotes for the contract. Some of the key questions to look into are indicated below.

1	Are the costs for public service known?	Has the urban local body (ULB) or state agency calculated the cost to enable comparison with the cost of the private sector? Does the ULB have the accounting information to determine whether private sector participation would offer service delivery at equivalent or lower costs?
2	Is there scope for the private developer to innovate and improve the efficiencies of operation?	Will the private developer be allowed to bring in innovations in service provisioning?
3	Would the innovations identified be able to bring down the current operation and maintenance costs substantially, or will the saving be only marginal?	Has there been sufficient strategic planning and have feasibility studies been conducted to benchmark whether the price or technology offered by the private sector would result in savings?

1	What is the potential capacity and strength of the market?	List the number of private players who have the experience in providing the identified set of services.
2	Is the private sector adequately developed so as to ensure competition among private firms?	Assess the experience of the private players who are currently engaged in the provision of water supply and sanitation services. Undertake a review of the quality of work being provided at various locations.

Prerequisites for PPP

Extent of Public and Political Support

The ULB or state agency would be able to take a final decision on whether private sector participation is required for providing water supply and sanitation services based on the views of the public and the support extended by political representatives. Given that the provision of the water supply and sanitation services has traditionally been the domain of the public sector, the inclusion of private sector in the sector is a sensitive matter. The ULB or state agency would therefore need to consult the various stakeholders who are directly or indirectly involved in the provision of water supply and sanitation services. A detailed process of consultation with the end consumers and the members of the municipal councils or corporations would be necessary to create awareness of the proposed change of hands in service provision, and the concerns of the stakeholders would need to be gauged in the interactions held.

For the PPP option to be implemented successfully, it is important that there is consensus among the general public and the political representatives regarding contracting out of the creation and provision of service to the private developer.

Legal Capacity of Urban Local Body or State Agency to Contract Out

In addition to considering factors, such as efficiency in operation and savings in costs, it is important to ascertain whether the ULB or state agency has the right to appoint a private party through a PPP contract, including concessions for providing a service for which it has the legal mandate. The ULB or state agency needs to be clear about the legal context in which private sector participation is possible. In addition, it needs to assess whether approvals are required from higher authorities to be able to involve a private party in the provision of water supply and sanitation services. The ULB will also assess whether there is a need for an enabling provision in the authority's bylaws or other legislation to provide an environment suitable for PPP arrangements. The following questions, therefore, need to be answered:

1	Does the urban local body (ULB) have the right to award concessions or enter into contractual license agreements with the private sector to essentially deliver municipal services?	Is the ULB clear on its right to outsource provisioning of water supply and sanitation services to a private developer?
2	What statutory permissions does it need to do so?	Does the ULB or state agency know of all the permissions, approvals, and relating procedures, which may be needed to facilitate inclusion of a private developer in the provision of water supply and sanitation services?
3	What are the enabling provisions or amendments in the existing legal framework that would be necessary to make such arrangements enforceable?	If the existing legal framework does not permit inclusion of a private developer in the provision of water supply and sanitation services, are amendments possible to facilitate private sector participation?

Making the Choice

The final decision on whether to execute the project through the publicly funded route or through PPP arrangements would have to be taken after the following assessments have been made:

(i) Assess whether the projected returns from the proposed investment are attractive enough for a private entity to enter into a contractual relationship. If the project returns are attractive, then the project would be suitable to be considered for execution through PPP.
(ii) Assess whether the policy and administrative environment is suitable for PPP, whether the private sector is capable of providing the service that is intended, and whether involving the private sector will generate savings in the service cost.
(iii) Assess the degree of acceptance among all the key stakeholders regarding the likely decision. Stakeholders must include prospective users, employees of the ULB or state agency currently managing the service (if any), and public representatives. Concerns of these stakeholders should be addressed before taking the final decision.

The ULB or state agency would then need to finalize the choice between public funding and PPP. The final decision will be influenced by the public policy mandate of the ULB or state agency in addition to the above parameters. The decision and rationale for the subsequent procedure should be documented.

VII Step 3: Choice of PPP Structure

Having decided that the ULB or state agency would develop the project on a public–private partnership (PPP) basis, the next step would be to identify the appropriate PPP structure. This involves (i) identifying all the risks associated with the project, (ii) allocating risk between the private developer and the ULB or state agency, (iii) selecting a set of appropriate PPP contract options, and (iv) choosing the most suitable PPP contract structure.

These activities are now discussed in greater detail.

Identification of Risks

A component critical to any PPP structure is the risks involved in the development of the project. Successful implementation of a PPP contract is, therefore, dependent on how the risks associated with the project are allocated. Before the risks are allocated, they must be identified. Hence, as a step toward making a choice about the PPP option to be implemented, all the risks associated with the project must be listed.

Table 9 Generic Risk Categories

Risk Category	Description of Risk	Direct Consequence
Commissioning risk	The risk that the infrastructure will not receive all approvals to satisfy an output specification, such as expected changes in legislation which allow for a specific output specification not materializing	Additional ramp-up costs, cost of maintaining existing infrastructure, or providing a temporary alternative solution where this leads to a delay in the provision of the service
Construction risk	The risk that the construction of the assets required for the project will not be completed on time, within budget, or to specification	Additional raw materials and labor costs, cost of maintaining existing infrastructure, or providing a temporary alternative solution where this leads to a delay in the provision of the service
Demand (usage) risk	The risk that the actual demand for a service is lower than planned	Reduced revenue
Design risk	The risk that the proposed design will be unable to meet the performance and service requirements in the output specifications	Cost of modification, redesign costs
Environmental risk	The risks that the project could have an adverse environmental impact, which affects project costs not foreseen in the environmental impact assessment	Additional costs incurred to rectify an adverse environmental impact on the project incurred from the construction or operation of the project or pre-existing environmental contamination
Financial risk	The risk that the private sector over-stresses a project through inappropriate financial structuring	Additional funding costs for increased margins or unexpected refinancing costs

continued on next page

Table 9 *continued*

Risk Category	Description of Risk	Direct Consequence
Force majeure risk	An act occasioned by an unanticipated, unnatural or natural disaster, such as war, earthquake, or flood, of such magnitude that it delays or destroys the project and cannot be mitigated	Additional costs to rectify
Industrial relations risk	The risk that industrial relations issues will adversely affect construction costs, timetable, and service delivery	Increased employee costs, lost revenue, or additional expenditure during delay in construction or service provision (post-construction)
Latent defect risk	The risk that an inherent defect exists in the structure being built or equipment used, which is not identified up front and which will inhibit provision of the required service	Cost of new equipment or modification to existing infrastructure
Operating risk (service under-performance)	The risks associated with the daily operation of the project, including an unexpected change in operating costs over budget	Increased operating costs or reduced revenue over the project term
Performance risk	The risk that the operator will not perform to the specified service level, such as the Water Resources Department permitting offtake of less-than-required demand	Cost of failing to comply with performance standards
Change in law risk	The risk that the current regulatory regime will change materially over the project or produce unexpected results	Cost of complying with new regulations
Residual value risk	The risk relating to differences from the expected realizable value of the underlying assets at the end of the project	Lower realizable value for underlying assets at the end of the project term
Technology obsolescence risk	The risk that the technology used will be unexpectedly superseded during the term of the project and will not be able to satisfy the requirements in the output specification	Cost of replacement technology
Upgrade risk	The risks associated with the need for upgrading the assets over the term of the project to meet performance requirements	Additional capital costs required to maintain specified service

An illustrative list of risks associated with a project and their consequences is presented in Table 9.

The list of risks presented in Table 9 is generic and indicative in nature. Detailed project-specific risks would have to be identified and detailed in addition to those listed above by the urban local body (ULB) or state agency. It is important that the list is as exhaustive as possible.

Allocation of Risks

The balanced allocation of all the risks identified plays a critical role in the successful implementation of any PPP structure. In this context, the general principle governing risk transfer is that each risk should be allocated to whoever is best able to manage it at the least

cost, taking into account the public interest. Therefore, an optimal, rather than a maximum, transfer of risk needs to be undertaken.

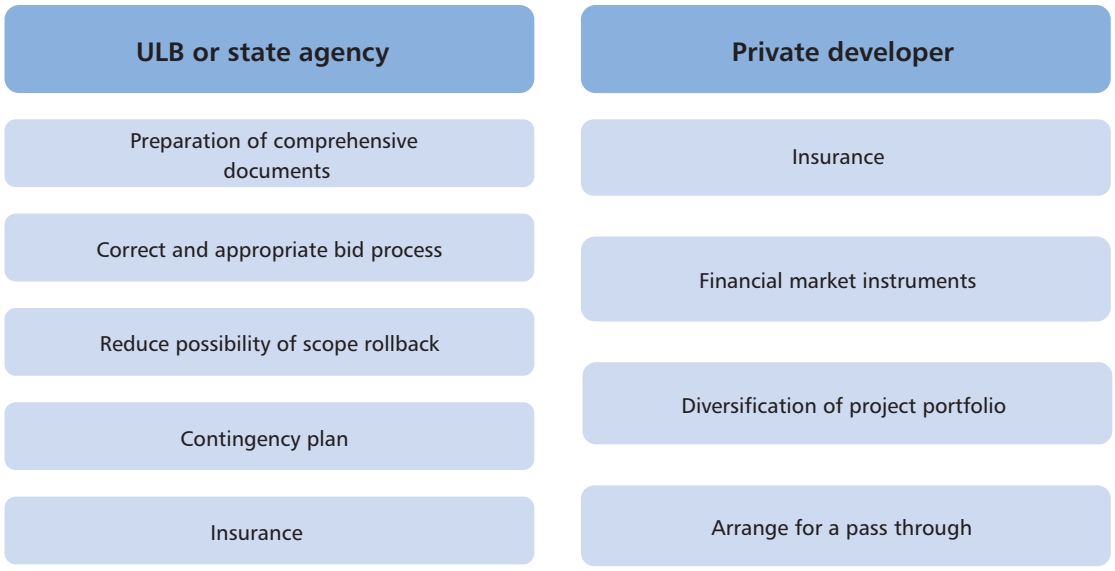
The important factors to be considered during risk allocation include

(i) the nature of the project;
(ii) the strengths and ability of each party to manage a risk (this may change over time as each party's risk mitigation skills improve);
(iii) the flexibility of the output specification (whether any constraints exist, which influences the method for managing risk);
(iv) previous levels of risk transfer (this indicates the historical success of each party in managing particular risks and their potential ability to manage risks in the future);
(v) prevailing market attitudes toward risk;
(vi) public interest factors;
(vii) other policy considerations; and
(viii) aspects relating to the project environment, the prevailing and expected economic situation, the appetite for risk-taking by foreign institutions, etc.

Once the risks have been identified and allocated appropriately, the next activity to be undertaken is the development of probable risk mitigation strategies. Risk mitigation strategies are developed with the intention of reducing each party's exposure to the risk. Simultaneously, it inherently increases the likelihood of achieving (or bettering) the project's base case scenario. An indicative list of risk mitigation strategies or measures for both the ULB or state agency and the private developer is given in Figure 10.

In addition to identifying and allocating risks and developing mitigation measures, it is recommended that the ULB or state agency also develop a dispute resolution mechanism. Once the project implementation begins under the private developer, it is necessary to ensure that a regulatory body, which would formally look into the disputes that might arise during the concession period, is formed.

Figure 10 Risk Mitigation Measures for the Urban Local Body or State Agency and the Private Developer



ULB = urban local body.

Selection of Possible PPP Structures

The activities and the steps taken so far have created the context for implementation of a PPP-based model for the development of the proposed project. The next stage in this process is to determine which of the PPP structures is best suited to addressing the needs of the proposed project. Five such possible PPP structures are now discussed. These are based on PPP structures that have been successfully implemented in the country.

Performance-Based Management Contract

In the performance-based management contract, the private developer is required to undertake operation and maintenance (O&M) of the entire water supply system from source to consumer, including metering, billing, and collecting revenues. If sanitation services are to be also included as part of the PPP contract, their operation and management would also have to be managed by the private operator. In this contract, all the major capital costs, which are required for improving the service, be they for service level augmentation, expansion, etc., would have to be borne by the ULB or state agency. Under this PPP structure, the private developer is given the rights to levy and collect the user charges set by the ULB. As per the financial feasibility, the private developer may be given the right to retain the revenues against payment of a fixed license fee to the ULB or state agency. In other cases, the private developer may be required to hand over the revenues collected to the ULB or state agency, and in return for activities undertaken it will be paid an operator's fee by the ULB or state agency.

If the ULB or state agency intends to implement a performance-based management contract for its water supply and sanitation services, it is important that it should have undertaken a water and energy audit. Since the performance criteria for the private developer would be defined on the basis of the existing scenario of the water supply and sanitation services, it is important that the water and energy audit be undertaken on a priority basis. The output from the audit would help the ULB identify the areas of operational improvement that would be required, and the private developer would use the results of the audit to gauge the actual level of the services. The ULB or state agency should then define required performance targets for the private developer.

Concession Agreement for Water Supply and Sanitation Services

A concession agreement for water supply and sanitation services is a PPP contract wherein the private developer would be required to undertake investments to create assets in the water supply and sanitation value chain and would also be required to undertake the O&M of the entire system for the period of the concession. This concession agreement would require the private developer to design, finance, construct, operate, and manage the water supply and sanitation services for the concession period. The capital investment required for undertaking the augmentation works would be met wholly or partly by the private developer. In addition, all operational expenses for managing the water supply and sanitation services, such as electricity charges, bulk water charges, establishment expenses, and repair and maintenance, would have to be borne by the private developer. The private developer would recover the investments made by collecting and retaining user charges levied on consumers. Any change to the tariff, the rate of escalations, etc., would be determined by the ULB. Typically, the tenure of such a contract ranges from 15 years to 30 years and is dependent on the financial feasibility of the proposed project.

Concession Agreement for Construction, Operation, and Maintenance of Bulk Water Supply System

The concession agreement for the construction and O&M of the bulk water supply system is a typical PPP structure under the design–build–own–operate–transfer model. As per this structure, the private developer is required to construct the bulk supply infrastructure to provide treated water up to the point

of the storage reservoir. From the storage reservoir to the distribution network to the consumer, the water supply responsibility rests with the ULB. The capital investment required for the augmentation works needs to be borne by the private developer. The operation and management of these assets during the concession period rests with the private developer. Therefore, all the associated operating expenses, including the purchase of bulk water, payment of electricity charges, purchase of chemicals for water treatment, and establishment expenses including labor charges, are the responsibility of the private developer.

For the treated water produced, the private developer is paid a water charge by the ULB. The typical tenure of this contract is 20–30 years.

Concession Agreement for Construction, Operation, and Maintenance of the Distribution System

In this form of concession agreement, the design and finance of the identified augmentation works would be undertaken through a capital grant of 100% from the government. As per the contract, the private developer is required to first undertake the construction and rehabilitation works for the identified section of the water system, and further to the construction activity, undertake the O&M of the entire water supply system. The private developer would get full capital reimbursement from the ULB or any other government agency for the rehabilitation works undertaken. Once the construction is complete, the private developer alone is responsible for O&M of the entire water supply system, including the supply of treated water to all the connections, installation of meters, generation of bills, and collection of revenues. The costs of any major expansion, which may be required to the existing infrastructure, would have to be borne by the ULB.

A set of performance targets would be set by the state nodal agency or by the ULBs in the cluster for the O&M activity. For O&M undertaken by the private developer, an operator fee is paid by the ULBs or the state nodal agency for the period of the contract based on the achievement of performance standards. The tenure of such contracts can range between 5 years and 10 years.

Concession Agreement for Development of the Bulk Water Supply System and Operation and Maintenance of the Entire System

The concession agreement for the development of the bulk water supply system, including the O&M of the entire water supply system, is a PPP structure developed on a build–operate–transfer basis. According to the concession agreement, the private developer is required to undertake the construction of the bulk water supply system, including the raw water offtake system, raw water transmission lines, and water treatment plant. The private developer will also be responsible for O&M of the water supply system from source to the end consumer. The private developer is given the right to levy, collect, and retain revenues from the consumers for the activities undertaken. The private developer is required to make a fixed monthly payment as license fee to the ULB for the right to operate the existing water supply assets and the entire system. The typical concession period would range from 20 years to 30 years.

Service Management Contract: Metering, Billing, and Collection

Under the service management contract for metering, billing, and collection, the private developer would be required to undertake investments for installation of meters at the consumer end, oversee O&M, maintain a computerized data recording system, generate bills, and collect user charges from the consumers. The private developer would not be required to undertake any other activity in the entire chain of water supply services. The type of meter to be installed and the number of connections where the meter is to be installed would be specified by the ULB or state agency. The tariff to be levied would also be determined by the ULB or state agency. The performance standards laid out by the ULB or state agency would specify aspects, such as the revenue collections target to be achieved and the extent of meter functional levels that

need to be maintained. The cost of purchase and installation of the meter would generally be recovered by the private developer from the consumers as part of the water supply service bills. Recovery is generally in installments.

The ULB or state agency pays a fixed annuity for the O&M undertaken by the private developer. This annuity amount would generally be the bidding parameter.

Preparatory Documents and Activities Required to be Undertaken

Before any PPP contract is implemented, the ULB or state agency needs to undertake a number of important activities and make available critical documents to the private developer (as shown in Table 10).

Matching of PPP Structures with the Value Chain and Prioritized Projects

In addition to the PPP options described, there may be other PPP structures, which may be developed to suit the specific project requirements of the ULB or state agency. After identifying the projects to be implemented and the value chain for which they are best suited, the ULB or state agency would next need to review the PPP alternatives in the context of the project requirements in order to determine the best suited PPP option. The

Table 10 List of Documents and Activities to be Arranged by the Urban Local Body or State Agency

Sl No.	Documents	Activities
1	Contract/Agreement document	• Raw bulk water purchase contract with Water Resources Department for water source supply from _____source_ river • Power purchase agreement with the concerned electricity departments electricity board for supplying power to the water supply system and the proposed tariff details
2	Site and asset information	• Contour maps, network maps, and network survey on a geographic information systems platform • Asset inventory with technical specification • Site details in terms of land area, assets, etc. • Number and type of water supply connections • Number and type of bulk meters
3	Reports	• Water audit • Leak detection • Energy audit • Water quality standards • Consumer study • Water demand projection • Capital investment plan
4	User charges	• Tariff levels, escalation rate, and schedule • Connection charges • Electricity charges escalation rate and schedule • Penalties
5	Manuals	• Construction guidelines, debris disposal guidelines • Waste disposal guidelines • Environmental regulations • Quality control guidelines

Sl = serial.

ULB or state agency would need to clearly understand the project requirements across the value chain of water supply and sanitation services, and review these in the context of the possible PPP options. The ULB or state agency then needs to identify the PPP option from among the suitable structures, which would fully address the project requirements. An indicative PPP structure matrix, along with different scenarios of the prevailing value chain of services, is given in Table 11. Based on the assessment, the best suited PPP arrangement would have to be finalized by the ULB or state agency.

Table 11 PPP Matrix in the Context of the Value Chain

Parameters	Concession Agreement for Integrated Water Supply System	Performance Management Agreement for O&M of Entire Water Supply Services	Service Agreement for Only Metering, Billing, and Collection	Concession Agreement for Bulk Supply System	Concession Agreement for Distribution System
• Low bulk water supply • High raw water transmission loss • Inadequate capacity of WTP • Obsolete WTP • High WTP operational losses • Low distribution network coverage • Low metering • Low O&M recoveries • High investment need	3				
• Low bulk water supply • High raw water transmission loss • Inadequate capacity of WTP • Obsolete WTP • High WTP operational losses • High investment need for bulk supply and WTP				3	
• Satisfactory distribution network operation					

continued on next page

Table 11 *continued*

Parameters	Concession Agreement for Integrated Water Supply System	Performance Management Agreement for O&M of Entire Water Supply Services	Service Agreement for Only Metering, Billing, and Collection	Concession Agreement for Bulk Supply System	Concession Agreement for Distribution System
• Adequate bulk water supply • Moderate raw water transmission losses • Adequate WTP capacity, low losses • Low distribution network coverage • High distribution losses • Low metering • High investment need for improvisation of distribution network					3
• Adequate bulk water supply • Moderate raw water transmission loss • Adequate WTP capacity, low losses • High distribution network losses • Untimely repairs and maintenance of distribution network • Minimum coverage of meters or number of meters • Low O&M recoveries • No investment need		3			

continued on next page

Table 11 *continued*

Parameters	Concession Agreement for Integrated Water Supply System	Performance Management Agreement for O&M of Entire Water Supply Services	Service Agreement for Only Metering, Billing, and Collection	Concession Agreement for Bulk Supply System	Concession Agreement for Distribution System
• Adequate bulk water supply • Low transmission losses • Adequate WTP capacity, low losses • High distribution network coverage • Minimum coverage of meters or no meters • Low collection efficiency			3		

O&M = operation and maintenance, WTP = water treatment plant.

VIII Step 4: Procurement

Procurement is the final phase in developing and implementing a project in the water supply and sanitation sector on a public–private partnership (PPP) basis. A detailed implementation plan for the contractual structure needs to be prepared, including clear and precise definitions of the scope of work and the roles and responsibilities of the two contracting parties—the urban local body (ULB) or state agency and the private developer. This is termed as the transaction structure. The financial model prepared for the project would then be refined according to the requirements of the financial structure. Based on the transaction structure, the contract for the PPP arrangement would need to be drawn up. Finally, the procurement plan will be finalized and put into operation.

Transaction Structure

The implementation structure would define the context of dealings and the relationship between the private developer and the ULB or state agency. In preparing the transaction structure, the following considerations need to be kept in mind.

(i) The transaction structure should be within the definition of the legal and public mandate of the ULB or state agency, i.e., it should not dilute the legal responsibility of the ULB or state agency.
(ii) The transaction structure should be responsive to the interests of the private sector and should promote competition within the private sector.
(iii) The transaction structure should allocate risks and responsibilities to ensure that the party most capable of managing particular risks and responsibilities is entrusted with those.

The transaction structure would be legally formalized in the form of the PPP contract.

Under the transaction structure, the following information would have to be provided:

(i) the parties involved in the contract,
(ii) the contractual relationship between the parties,
(iii) the nature of the agreement,
(iv) the key risks and their allocation,
(v) tariff,
(vi) government commitment,
(vii) duration of contract,
(viii) performance indicators,
(ix) payment terms,
(x) award criteria, and
(xi) contract management strategy.

These key points are now further elaborated.

Define the Parties Involved in the Contract

The transaction structure would clearly identify and define the parties involved in the proposed contractual agreement. For instance, in the water supply and sanitation services, a contractual agreement would typically involve a competent authority, a ULB (municipal corporation or council), customers, the developer or private developer, subcontractors, etc. This list is only indicative and would vary across the various contracts.

The transaction structure would need to state the contractual relationship between the parties involved. The contractual relationship would be largely defined on the grounds of services and/or activities to be undertaken by both the parties, and payments that would be made for the services.

The transaction structure should clearly state which party is undertaking what activity in the water supply and sanitation service value chain. For instance, a performance management contract for operation and maintenance (O&M)

of the water supply services should clearly state whether the ULB or state agency is responsible for the purchase of raw bulk water from the water resources department and providing it at no cost to the private developer for treatment and distribution, or whether the private developer would also have to bear the expenses on the purchase of the bulk water. Similarly, each of the activities in the value chain needs to be mapped and responsibilities among the parties clearly stated in the transaction structure.

The contractual relationship would also be defined in terms of the payment arrangements between the two parties. For instance, the transaction structure should state whether the ULB or state agency is required to make any payment to the private developer for the activities it is entrusted with, or if the private developer is required to make a fixed license fee payment to the ULB or state agency, or if there is a revenue-sharing arrangement between the parties.

State the Nature or Type of Contractual Agreement

The transaction structure would need to state the type of agreement being developed, e.g., concession agreement, performance-based management agreement, or service contract. The type of PPP contract proposed would be clear from the analysis and activities previously undertaken. The type of contractual agreement should be stated and a broad explanation of and a brief on the activities involved should be presented.

State the Key Commercial Risk and its Allocation

The set of possible key risks involved in the provision of water supply and sanitation services has already been discussed. However, the commercial risks facing the project may be explicitly stated as part of the transaction structure. For instance, in a concession agreement for the development, operation, and management of water supply services, the commercial risk may be the collection of revenue risk that the private developer would have to bear. It is possible that some of the customers might refuse to pay the private developer for water supplied. Such a scenario would result in lower revenue realizations than that estimated by the private developer and would give rise to problems in the smooth operation of services. Another type of revenue risk is associated with the projected demand for water supply services in a greenfield project. If the actual demand for the water supply services is significantly less than that estimated, this would again pose a huge risk in the operations of the services. Hence, the commercial risks on the project should be stated in the transaction structure.

Set the Tariff to be Levied

Various approaches for tariff setting exist. Tariffs are perhaps the most politically sensitive aspect of a PPP contract, particularly for water supply services. It is important to ensure that the tariff set by the ULB is determined after gaining a complete understanding of costs, which are incurred to provide that service. The structure of the tariff should be made transparent such that the cross subsidies provided to users are clearly known. The ULB or state agency should account for the following considerations before defining the tariff:

(i) State of competition. Where market competition for the service is strong, the private sector is usually given considerable scope to set their own tariffs, although they may be subject to utility rate regulations. Where some degree of monopoly power exists, tariffs tend to be regulated, and where the government sets them, mechanisms for changes must be clearly arranged.

(ii) Public acceptance of PPP. Where PPPs have been in existence for a substantial period of time and the users accept them and are comfortable with them, it is easier to delegate the right of defining fares to the private sector. This will be more difficult to do in a scenario where the public authority is in a transition phase of moving toward PPP from traditional public procurement.

(iii) Social objectives. Where the ULB or state agency wants to protect the weaker sections of the society from completely

market-based tariffs, it is desirable that it retains the right to define fares. It is to be noted here that the consumers are, in most instances, willing to pay for improved water supply services. Any tariff charged should be in line with the quality of the service delivered. An increase in tariff levels without a corresponding improvement in the water supply services would not be acceptable to consumers.

Government Commitment

The transaction structure should state the government's commitment to the process of PPP-led project development. Support from the government is crucial in the implementation and running of the project. Potential private developers are always concerned about the extent of political will and support for the development of a project on a PPP basis, and this area is considered to be highly sensitive.

Performance Indicators/Parameters

The transaction structure would have to state, in clear terms, the various standards of performance that would be applicable to the private developer. These would largely relate to the construction standards, which the private developer would have to adhere to and the O&M standards for the water supply and sanitation services during the life of the contractual agreement. In addition, the standard of the assets at the time of their transfer back to the ULB or state agency should also be mentioned.

Payment Terms

Payments in PPP contracts can be made either from the private developer to the ULB or vice versa. For instance, in a contractual agreement, the private developer would pay the ULB or state agency, on a bimonthly basis, a fixed license fee for the right to operate and maintain the water supply and sanitation services. Conversely, in a service agreement, the ULB would make payments to the private developer to undertake the required activities. The terms and mode of payment should be clearly specified in the transaction structure.

Duration of the Contract

The time period for which the contract is applicable would have to be specified in the transaction document. This generally varies, depending on the type of PPP contract. In PPP structures where the private developer is required to invest and also operate and manage the services, the time span of the contract would generally be longer. The contract duration is largely guided by the time it would take the private developer to recover investments made on the project. For instance, a PPP project, which requires the private developer to undertake investments in the development of a water treatment plant and bulk water pipelines and also to take care of the operation and management of the entire system from source to distribution end, would generally have a tenure of 25–30 years. Conversely, a PPP contract in the form of a management contract or a service agreement would typically be of shorter duration.

Award Criteria

The award criteria and their relative weight would need to be specified in advance of bidding, since this helps potential bidders understand the selection mechanism and reduces the risk of allegations of corrupt government practices. The criteria largely determine the allocation of benefits between government and consumer. For instance, one of the key award criteria in a PPP agreement for a performance-based management contract would be the highest license fee sum agreed to be paid by the private developer to the ULB or state agency for the right to operate and maintain the water supply and sanitation services. In cases where a viability gap funding-based grant is being explored to make the proposed project commercially viable, the award criterion would be the lowest viability gap funding grant requested by the private developer.

Drafting the PPP Contract

The PPP contract puts the implementation structure into a legal document that can be enforced. The contract agreement is the most

important document in the transaction as it regulates the transaction during its entire tenure. It defines the rights and obligations of the contracting parties and the terms and conditions under which the obligations would be discharged. It also regulates enforcement of the terms and conditions and specifies the consequences of default by a contracting party.

The PPP contract would need to be drafted by the ULB or state agency before it initiates the procurement process, as during the procurement process the prospective bidders would need to be made aware of the contract conditions subject to which they would be required to bid. A typical contract would have the following components:

(i) recitals,
(ii) definitions and interpretations,
(iii) rights of the parties,
(iv) consideration of the contract,
(v) commencement of operations,
(vi) obligations of the parties to the contract,
(vii) payment mechanism,
(viii) performance management,
(ix) defaults and consequences of defaults,
(x) step-in and substitution rights,
(xi) dispute resolution, and
(xii) termination of the contract.

Selection of the Procurement Strategy

It is critical that the procurement strategy chosen is transparent and suited to the type of contract selected for the PPP arrangement. The two procurement strategies, which are broadly followed, are

(i) **The competitive procurement strategy.** Competitive procurement strategies are the most efficient strategy in case the contract size is large and it is expected that the number of prospective bidders would be large. Competitive strategies are seen as the preferred procurement strategy when the contracting party is initiating the procurement process to identify the private partner for a PPP arrangement. The generic competitive strategies include methods, such as international competitive bidding, national competitive bidding, limited competitive bidding, and shopping (international or domestic markets).
(ii) **The *suo moto*, or unsolicited strategy.** In exceptional cases, the contracting party might not follow the competitive bidding route for procurement of the private party. The alternative procurement strategies are not strictly competitive; they may be completely *suo moto*, as in direct contracting, or they might have induced competition. The different forms of this strategy include direct contracting, Swiss challenge, and margin preference procurement strategies.

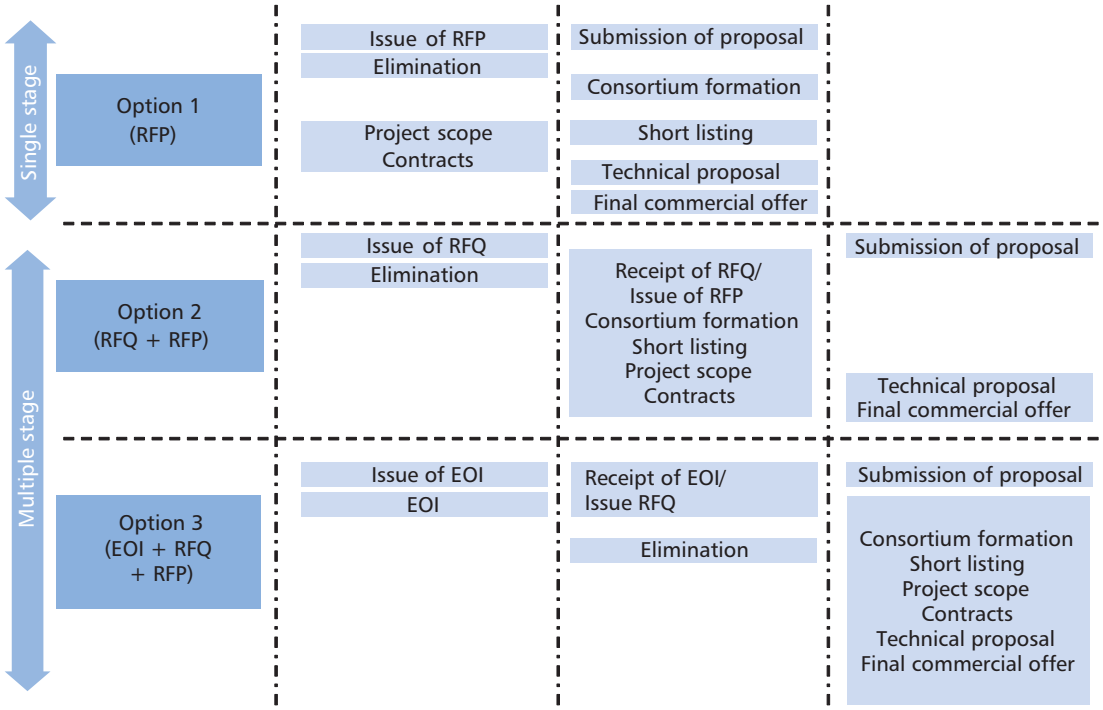
Depending on the specific need and on-site situation, the ULB will select one of these procurement strategies. The procurement strategy selected would have to be approved by the relevant authority before it could be implemented further.

Design of the Procurement Process

Several alternative procurement processes can be implemented, as shown in Figure 11.

The selection would be based on the matrix of criteria represented by the following schematic (Figure 12).

Figure 11 Alternative Procurement Process Strategies–Implementation



EOI = expression of interest, RFP = request for proposal, RFQ = request for qualification.

Figure 12 Alternative Procurement Process Strategies–Selection Criteria

	Project characteristics	Bidders characteristics
Option 1 RFP	Project scope is unambiguous Execution options well defined	Bidder universe is well-defined and limited
Option 2 RFQ + RFP	Project scope is ambiguous; requires extensive discussion	Bidder universe is well-defined Number of bidders is large and needs to be limited Considerable effort required by bidders to submit proposals
Option 3 EOI + RFQ + RFP	Project scope is ambiguous; requires iterative discussion	Number of bidders is large and needs to be limited Bidder profile needs sharpening Considerable effort required by bidders to submit proposals

EOI = expression of interest, RFP = request for proposal, RFQ = request for qualification.

Managing the Procurement Process

Various alternative procurement processes may be pursued. Depending upon the requirements and characteristics of the project, the most suitable procurement process can be selected. This section discusses the process based on a two-stage request for qualification–request for proposal (RFQ–RFP) approach, and provides an overview of the procurement process and information on the basic requirements for each stage.

Undertake Pre-Bid Activities

Review and Update Project Information

One of the basic requirements here is that the ULB or state agency should organize and put together all the project-specific information collected and detailed in the earlier phases. In doing so, the following should be reviewed and analyzed:

(i) **Project definition, objective, and scope.** As an introduction to the procurement document, it is suggested that the overall project definition, objective, and scope are stated clearly and precisely in terms of business outcomes and expected outputs.
(ii) **Procurement plan.** Updated project timelines, processes, and deliverables based on the latest available information should be stated.
(iii) **Nature of project and structuring.** The ULB or state agency's views on project structuring and funding should be stated. However, potential bidders should also be given the option to provide innovative solutions.
(iv) **Third-party contracts.** The procurement plan should provide details on the timing and signing of the third-party contracts. Draft contracts providing the critical information need to be prepared.
(v) **Payment mechanism.** Details of the payment mechanism, as identified and defined by the ULB or state agency, would have to be clearly stated.
(vi) **Risk matrix.** The risks identified in the analysis stage should be frequently reviewed, and the latest updated version would need to be provided as part of the procurement documentation. It is important that risks are clearly stated so that the bidders can consider them while preparing bid proposals.

Key Considerations in the Procurement Process

Some of the critical areas that need to be adequately deliberated upon by the ULB or state agency during the procurement stage are as follows:

(i) **Bidding time frames.** It is necessary that an appropriate length of time is provided to the bidders for submission of their bids. Generally, the time period required for bidders to prepare and submit bids is directly linked to the size of the project being bid and directly affects the quality of the bid. Suitable time frames can be determined by gauging the perceptions and opinions of the bidders at or during the RFQ stage.
(ii) **Information related to institutional assets.** All information regarding the assets to be used by the private developer as part of the project would have to be provided, i.e., information on all the equipment used, such as pipelines, jack wells, valves, water treatment plants, and meters.
(iii) **Labor issues.** In case the PPP project requires modifications to existing labor or staff, the bidders should be provided with sufficient information to account for such project costs and risks.
(iv) **Competition and regulatory issues.** All the requisite approvals for compliance need to be explicitly stated. Also, the competition laws should be examined and appropriate procedural and/or approval requirements should be dovetailed into the PPP process.
(v) **Bid costs.** The costs of due diligence by private parties may be significant. Where possible, and where bidders agree, survey costs may be shared between pre-qualified bidders. The costs to the department or ULB of providing survey

information to the bidder could be capitalized into the project cost at a later stage.

Prepare Request for Qualification and Pre-Qualify Bidders

During the RFQ stage, the intention is that only those bidders who are technically and financially qualified and those possessing requisite skill sets for implementation of the project submit bids for the project and continue into the remaining stages of the PPP procurement process.

While pre-qualification should not be undertaken solely to limit the number of bidders to a pre-specified or targeted number, it is advisable to have at least three pre-qualified bidders to ensure competitive bidding and achieve value for money through the bidding process. The stages are as follows:

(i) Preparation of the RFQ document. The RFQ document would need to clearly communicate to the private bidders the requisite delivery specifications of the project. All the necessary information regarding the project should be provided to the bidders. The document should also clearly lay down the RFQ evaluation criteria and any specific requirements of the institution.

(ii) Advertise and distribute the RFQ document. Once the RFQ document has been finalized, it would have to be distributed. The ULB or state agency would be required to advertise the RFQ in the form of a public advertisement in at least one newspaper of national circulation and at least one newspaper of regional circulation. In addition, any other medium of communication, such as an official portal of the ULB or state agency, could be used for advertising.

(iii) Receive queries and give clarifications. Generally, the bidders would have some clarifications and other pre-bid queries on the information provided. Once these queries are received by the ULB or state agency, it is mandatory that they respond to the clarifications sought. Typically, the ULB or state agency is required to respond to all clarifications sought 2 weeks prior to the date of the final bid. If required, the institution could also consider organizing a pre-bid conference at which the issues raised by the bidders could be collated and addressed. However, this should be in addition to providing written communication to the bidders.

(iv) Evaluation of responses. The responses received to the RFQ document should be evaluated based on the evaluation criteria specified in the RFQ document. The evaluation criteria should consider the technical and financial capability of the private party, their understanding of the project, and their skill sets to deliver the committed outputs within the required time frames.

(v) Publish list of pre-qualified bidders. Firms meeting the pre-qualification criteria and approval by the appropriate tender board must be so notified by the institution and invited to tender. The notification must indicate the terms and conditions under which tender documents shall be obtained, as well as the date, hour, and place for latest delivery of tenders by the tenderer, and of the tender opening.

Applicants who are not successful in the pre-qualification must be informed by the institution within a week after receipt of all the required approvals to the pre-qualification. Only bidders that have been pre-qualified are entitled to participate further in the procurement proceedings.

Prepare Request for Proposal

At the RFP stage, a preferred bidder is selected based on an objective, comprehensive, and transparent selection process. The RFP document (including the draft PPP agreement) is the formal bid document issued by the institution. Its issue to short-listed parties signals a commitment to deliver the project, subject to the defined hurdles being cleared. The RFP document should also be structured in such a manner that it clearly lays down the informational requirements of the bidders. The form and manner of submission of information should be clear and concise to

assist the evaluation committee in selecting the appropriate bidder. The following should be present in the RFP document:

(i) a disclaimer,
(ii) an outline of the contents of the RFP,
(iii) the purpose of issuing the RFP,
(iv) terms and conditions of issuance of RFP and bid formalities,
(v) general Information to bidders,
(vi) minimum essential requirements,
(vii) service requirements,
(viii) standard specification,
(ix) payment mechanism and penalties,
(x) legal requirement and draft PPP agreement,
(xi) commitments required from bidders, and
(xii) the evaluation process.

PART II

Details of Public–Private Partnership Structures

I Background

This section provides key information relating to the five public–private partnership (PPP) structures outlined in Section VII of the first part of this tool kit. The overall structure of each PPP, the obligations of the parties involved, and the nature and type of risk allocations[1] between the public and private entities and other key features are presented. The five PPP structures are

(i) the performance management contract for operation and maintenance of water supply system;
(ii) the concession agreement for water supply and sewerage services;
(iii) the concession agreement for construction, operation, and maintenance of bulk water supply system;
(iv) the concession agreement for construction, operation, and management of the distribution system; and
(v) the concession agreement for development of the bulk water supply system and operation and maintenance of the entire system.

[1] The risk allocation, as mentioned in this part, is to provide a perspective to the user of the tool kit. Details of the risk allocation are in Part IV of the tool kit.

II Performance Management Contract for Operation and Maintenance of Water Supply System

Under this arrangement, the private developer is required to undertake the operation and maintenance (O&M) of the entire water supply system from source to consumer, including metering, billing, and collecting revenues. The primary purpose of the contract is to bring in operational efficiencies in the entire water management system and thereby reduce associated O&M costs.

About the PPP Structure

In this agreement, the private developer would be required to take over the operation and management of the existing assets of the water supply scheme, comprising offtake wells with all pumping stations, electrical installations, water treatment plants (WTPs), water storage reservoirs, transmission pipelines, and the distribution system up to the consumer end. The operation and management of the water supply services would match the performance standards specified by the urban local body (ULB) in the agreement with the private developer. The performance standards have primarily two components: coverage and quality. Coverage standards will include the number of households with direct connections. Quality standards will include availability of service, pressure, water quality, effluent treatment, and customer service. The standards would include specifications, such as the number of meters to be installed within a specific time period and operational efficiency levels to be maintained.

Under this public–private participation (PPP) structure, the private developer is given the rights to levy the user charges set by the ULB, collect the charges, and retain the revenue for the period of the contract. The responsibility of the private developer also includes the purchase of bulk water from the Department of Water Resources or Irrigation, transmission to the WTP, and the supply of treated water to the end consumers. In addition to providing water to existing consumers, the private developer would be required to provide these services to all new connections, install bulk meters at all source and consumer points, generate bills, and collect user charges from the consumers. The periodic repair and related maintenance of these assets would have to be undertaken by the private developer.

All the operational expenses would have to be borne by the private developer, including payment to the Department of Water Resources or Irrigation for purchase of raw bulk water, and payment to the State Electricity Board for units consumed. Since the private developer is given the right to take over the entire water supply services and operate and manage it for a fixed time period, a license fee is required to be paid by the private developer to the ULB in return. This fee may be paid at mutually agreed intervals (e.g., monthly, bimonthly, or annually). The composition of revenue accruing to the private developer includes water charges collected from users, fees from new connections, penalty charges and, as the case may be, from the sale of surplus water.

The highest fixed fee quoted by the private developer to be paid to the ULB would be the key financial bid criterion.

Typically, the tenure of such a contract ranges between 3 years and 5 years and is dependent on the financial feasibility of the proposed project. Figure 13 presents a holistic view of the entire transaction under a performance management contract for O&M. The key roles and responsibilities of the stakeholders are given in Table 12.

Figure 13 Performance Management Contract for Operation and Maintenance of Water Supply Services

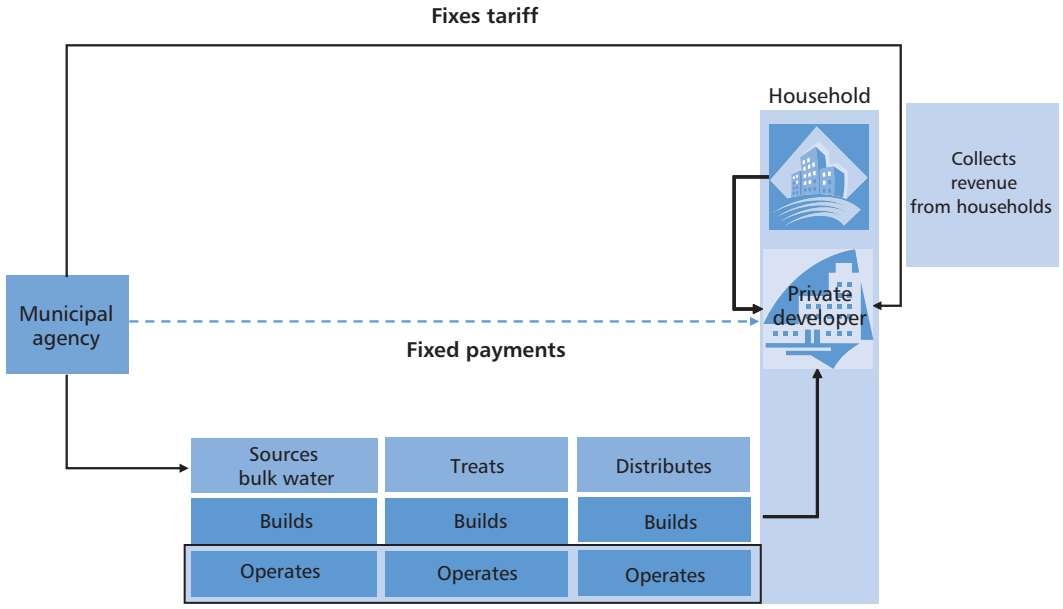


Table 12 Key Roles and Responsibilities of the Private Developer and the Urban Local Body

Particulars	Private Developer	Urban Local Body
Primary task	Operates and manages the water supply system from source to consumer	Sets performance standards
	Provides new water service connections	Handover of water assets to the private developer to operate and manage
	Installs bulk and consumer meters, generates bills, collects revenues	Coordinates and oversees works of the private developer
Tariff	Levies tariff, generates bills as per tariff, collects and retains revenue	Sets the tariff, determines the revision rate and period
Operating expense	Installs meters	Oversees the operation and maintenance (O&M) expenses
	Bears expense on repairs to assets	
	Pays for raw water purchase and electricity consumption	

continued on next page

Table 12 *continued*

Particulars	Private Developer	Urban Local Body
Operating expense	Labor charges, chemical charges	
	Any other O&M expense	
Capital expense	No capital expense borne	All capital augmentation works to be undertaken—source, water treatment plant, network augmentation, etc.
Asset ownership	Transfers assets and operational rights to the urban local body at the end of the contract	Retains ownership to all water assets, including the meters installed

A detailed list of the obligations and responsibilities of the stakeholders is presented in Part IV of this tool kit.

Before such a contract comes into effect, the private developer and the ULB need to undertake certain preparatory activities. To set reasonable performance targets for the private developer, the ULB would need to

(i) carry out consumer surveys and water and energy audits to accurately ascertain the existing status of the water assets and supply services;
(ii) facilitate the takeover of assets by the private developer for the period of the contract by entering into necessary agreements and/or negotiations of water purchase with the Irrigation Department and electricity purchase with the State Electricity Board;
(iii) provide the rights and permits to the private developer to be able to take over the assets and discharge the tasks as required;
(iv) provide land lease rights to the private developer for operating the water supply systems, etc.; and
(v) make available to the private developer all details on the current connections, network maps, applicable acts and bylaws, water demand projections, water quality levels, etc.

The key risks, which need to be borne by the private developer and the ULB, are shown in Table 13.

Table 13 Key Risks, Roles, and Responsibilities of the Private Developer and the Urban Local Body

Sl No.	Risks	Private Developer	Urban Local Body	Comment
1	Commencement risk		✓	The urban local body (ULB) will be responsible for transferring existing assets to the private developer.
2	Operations risk	✓		The operation and maintenance (O&M) of the entire water supply system shall be done by the private entity. All costs for the same shall be incurred by such private entity.
3	Financial risk	✓		All costs for O&M of the entire water supply system and meeting of performance benchmarks shall be met by the private entity. The finances for such operations shall have to be arranged by the private entity.

continued on next page

Table 13 *continued*

Sl No.	Risks	Private Developer	Urban Local Body	Comment
4	Payment risk	✓		The risk of collecting revenues from the citizens may also reside with the private entity. This shall be project-specific and decided by the ULB.
5	Performance risk	✓		The risk that the water supply system performs such that the performance criteria are met shall reside with the private entity.
6	Change in law risk	✓	✓	Any additional cost incurred by any party due to change in law shall have to be borne by the respective party.
7	Force majeure risk	✓	✓	Any additional cost incurred by any party due to force majeure shall have to be borne by the respective party.

Sl = serial.

Applicability of the PPP Structure

This kind of PPP structure is applicable where

(i) the current operational efficiencies of the water supply system are poor, e.g., the system has non-revenue water losses (above 25%–30%) due to a high number of illegal connections, poor collection efficiencies, low per unit cost recoveries, and/or lack of metering; and

(ii) the ULB has undertaken major capital improvement works before handing over the system to the private developer for improvisation of operational efficiencies, and no significant capital expense needs to be made by the private developer.

III Concession Agreement for Water Supply and Sewerage Services

A concession agreement for water supply and or sewerage servicing is a build–operate–transfer type of public–private partnership (PPP) structure.

About the PPP Structure

In this concession agreement, the private developer would be required to design, finance, construct, operate, and manage the water supply and sewerage services for the concession period.[2] Under this PPP structure, the private developer would undertake the construction of infrastructure for water supply and sewerage services, and operate and manage both the systems during the concession period. The capital investment required for undertaking the augmentation works would be met wholly or partly by the private developer. The private developer would be required to undertake construction and/or augmentation works for some or all of the following works for the water supply and sewerage sector and undertake operation and maintenance (O&M):

(i) water supply transmission pipelines (raw and/or pure water),
(ii) water treatment plant,
(iii) underground and/or elevated storage reservoirs,
(iv) laying of distribution network pipelines,
(v) sewage treatment plant, and
(vi) drainage pipelines.

After construction of the systems, O&M of the water supply and sewerage systems would have to be managed by the private developer, including the generation of bills and collection of user charges from consumers. In addition, all operational expenses for managing the water supply and sewerage services, such as electricity charges, bulk water charges, establishment expenses, and repair and maintenance, would have to be borne by the private developer.

In the concession agreement, the urban local body (ULB) would specify the augmentation works and design specifications for the construction activity to be undertaken and the time schedule for completion of works, and would provide information relating to the existing level of water supply and sewerage operations. The private developer would be required to purchase bulk water, treat the raw water, and supply treated water to all the specified connections. In addition, if the sewerage infrastructure is also to be managed by the private developer, the sewage from all connections would have to be carried to the sewage treatment plant and the treated wastewater disposed off. The private developer would recover the investments made by collecting and retaining user charges from consumers. Any change to the tariff, the rate of escalations, etc., would be determined by the ULB. Typically, the tenure of such a contract ranges between 15 years and 30 years and is dependent on the financial feasibility of the proposed project.

[2] This may also include the takeover, operation, and maintenance of the existing water assets. However, this shall be project-specific and a decision of the urban local body.

Figure 14 presents a holistic view of the entire transaction under a concession agreement for water supply and sewerage. The key roles and responsibilities of the stakeholders are given in Table 14.

A detailed list of obligations, responsibilities of the stakeholders is presented in Part IV of this tool kit.

Figure 14 Structure of Concession Agreement for Water Supply and Sewerage Services

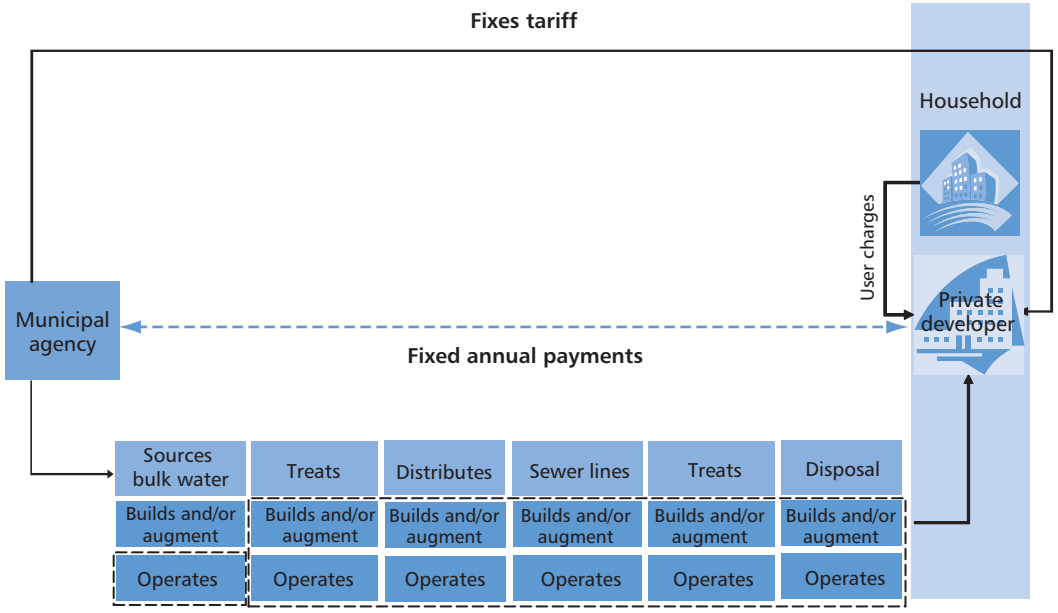


Table 14 Key Roles and Responsibilities of the Private Developer and the Urban Local Body

Particulars	Private Developer	Urban Local Body
Primary task	Designs, plans, constructs water distribution and sewerage infrastructure	Provides permits, rights of operation
	Operates and manages the water supply and sewerage infrastructure	Facilitates negotiations for bulk water and electricity purchase
	Levies user charge, generates bills, collects and retains revenues	Oversees construction, and operation and maintenance (O&M) activity
Tariff	Levies tariff set by the urban local body	Determines the tariff level, schedule for changes, escalation factor, etc.
Operating expense	Pays for raw water purchase and electricity consumption	Oversees the O&M expenses
	Bears expense on repairs to assets	
	Installs meters	
	Labor charges, chemical charges	
	Any other O&M expense	
Capital expense	Bears capital expenditure for works identified, escalation in costs of raw material inputs	
Asset ownership	Retains ownership during concession period and hands over assets at the end of contract term	Takes over assets at the end of the concession period

For such an agreement to come into effect, the private developer and the ULB need to undertake preparatory activities. In order to set reasonable performance targets for the private developer, the ULB would need to accomplish the following:

(i) Carry out consumer surveys, and water and energy audits to accurately ascertain the existing status of the water assets and sewage assets and water supply services.
(ii) Provide the design specifications for the assets to be augmented and/or constructed, procurement process, raw material utilization, etc.
(iii) Provide land lease rights to the private developer to undertake construction. The terms of lease would have to be clearly stated as a part of the concession agreement.
(iv) Facilitate the takeover of assets by the private developer for the period of the contract by entering into necessary agreements and/or negotiations of water purchase with the Irrigation Department and electricity purchase with the State Electricity Board.
(v) Provide the rights and permits to the private developer to enable it to take over the assets and discharge the tasks as required.
(vi) Make available to the private developer all details on the current connections, network maps, the applicable acts and bylaws, water demand projections, water quality levels, etc.

The composition of revenue accruing to the private developer includes water charges collected from users, fees from new connections, penalty charges and, as the case may be, sale of surplus water.

The key risks, which need to be borne by the private developer and the ULB, are stated in Table 15.

Table 15 Key Risks, Roles, and Responsibilities of the Private Developer and the Urban Local Body

Sl No.	Risks	Private Developer	Urban Local Body	Comment
1	Commencement risk		✓	The urban local body (ULB) will be responsible for transferring the existing assets to the private developer.
2	Construction risk	✓		The construction, and operation and maintenance (O&M) of the water supply and sewerage assets shall be done by the private entity. All costs for the same shall be incurred by such private entity.
3	Design risk	✓	✓	The design risk shall be shared by the ULB and the private entity. The specifications of the assets shall be mentioned by the ULB in the request for proposal document. The design shall be proposed by the developer in line with such specifications.
4	Operations risk	✓		The O&M of the entire water supply and sewerage system shall be done by the private entity. All costs for the same shall be incurred by such private entity.
5	Financial risk	✓		All costs for the O&M of the entire water supply system and meeting the performance benchmarks shall be met by the private entity. The finances for such operations shall have to be arranged by the private entity.

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Table 15 *continued*

Sl No.	Risks	Private Developer	Urban Local Body	Comment
6	Payment risk	✓		The risk of collecting revenues from the citizens may also reside with the private entity. This shall be project-specific and decided by the ULB. In addition to this, all payments to contractors, suppliers, etc., shall have to be borne by the private entity.
7	Performance risk	✓		The risk that the water supply system performs such that the performance criteria are met shall reside with the private entity.
8	Change in law risk	✓	✓	Any additional cost incurred by any party due to change in law shall have to be borne by the respective party.
9	Force majeure risk	✓	✓	Any additional cost incurred by any party due to force majeure shall have to be borne by the respective party.

Sl = serial.

Applicability of the PPP Structure

This PPP structure is applicable if

(i) the PPP structure is suitable for greenfield projects requiring large capital investments for infrastructure creation (this is ideal in a scenario where no infrastructure facility is available and where a large number of rehabilitation and replacement of the existing infrastructure services would have to be carried out),
(ii) the ULB does not have the financial capacity to undertake the required capital investments and has poor operational efficiencies, and/or
(iii) the per unit operation cost of the utility would be higher without PPP and the costs could be reduced.

IV Concession Agreement for Construction, Operation, and Maintenance of Bulk Water Supply System

The concession agreement for the construction, operation, and maintenance of the bulk water supply system is a typical public–private partnership (PPP) structure under the design–build–own–operate–transfer model.

About the PPP Structure

According to this concession agreement, the private developer is required to undertake the design, construction, finance, operation, and management of water supply services from the raw water source to the distribution point. The augmentation activity includes construction of the raw water offtake machinery; installation of electrical substations and raw water transmission lines; and the construction of water treatment plants (WTPs), pure water transmission lines up to the point of the storage reservoir, and storage tanks. The capital investment required for the augmentation works needs to be borne by the private developer. The private developer is, therefore, required to construct the bulk supply infrastructure for the provision of treated water up to the point of the storage reservoir. From the point of the storage reservoir to the distribution network up to the consumer, the water supply responsibility rests with the urban local body (ULB).

The operation and management of these assets during the concession period rests with the private developer. Therefore, all associated operating expenses, including the purchase of bulk water, payment of electricity charges, purchase of chemicals for raw water treatment, and establishment expenses including labor charges, are the responsibility of the private developer.

The ULB would specify the quantity of treated water that would have to be made available by the private developer at all times. The private developer is paid a water charge by the ULB for the treated water produced. The unique feature of this contract is that the utility assures a fixed payment for all the activities required to be undertaken by the private entity. This arrangement is also referred to as a "take or pay" system. Figure 15 presents a holistic view of the entire transaction under a bulk supply-cum-operation and maintenance (O&M) contract. The key responsibilities of the private developer and ULB are listed in Table 16.

A detailed list of obligations and responsibilities of the stakeholders is presented in Part IV of this tool kit.

The preparatory activities, which the ULB and the private developer need to undertake, largely pertain to the estimation of the quantity of treated bulk water that needs to be made available. Therefore, accurate water demand projections need to be made. The private developer would need to conduct the necessary tests to ascertain the raw water quality standards and determine the appropriate water treatment technology. The

Figure 15 Concession Agreement for Construction, Operation, and Maintenance of Bulk Water Supply System
Fixes the per unit treated water tariff

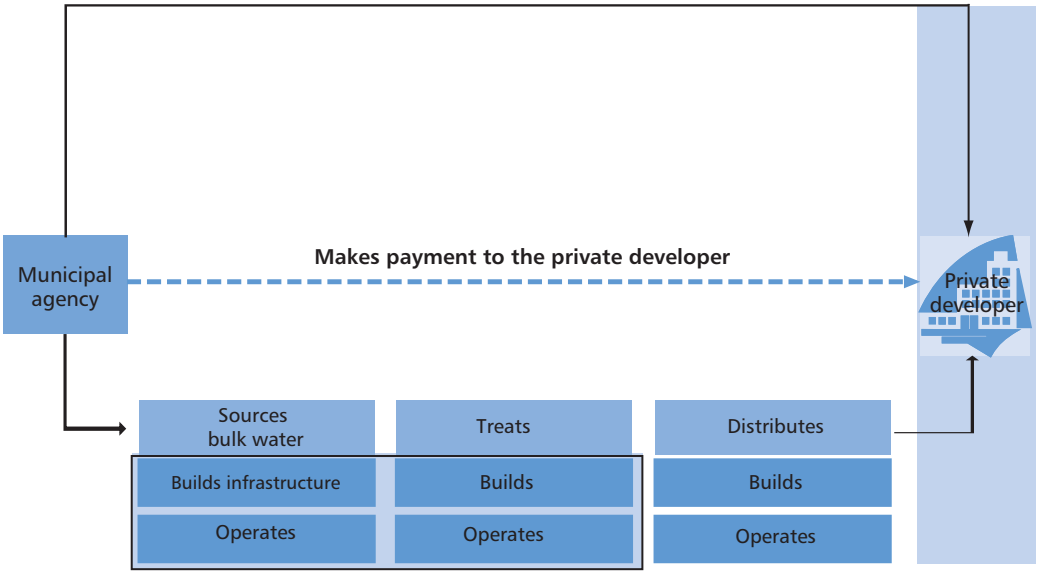

Table 16 Key Roles and Responsibilities of the Private Developer and the Urban Local Body

Particulars	Private Developer	Urban Local Body
Primary task	Provides treated water supply	Sets treated water level requirements, specifies water quality levels
	Designs, plans, constructs raw water offtake infrastructure, raw water transmission pipelines, and water treatment plants	Defines the technical specifications for the infrastructure to be created
	Operates and manages the water supply infrastructure, including water treatment plants	Provides permits, rights of operation
		Oversees construction, and operation and maintenance (O&M)
Tariff		Sets the tariff for treated water supplied
Operating expense	Pays for raw water purchase and electricity consumption	Oversees O&M expenses
	Bears expense on repairs to assets	Facilitates negotiations for bulk water and electricity purchase
	Labor charges, chemical charges	
	Any other O&M expense	
Capital expense	Bears capital expenditure for works identified, escalation in costs of raw material inputs	
Asset ownership	Retains ownership during concession period and hands over assets at the end of contract term	Takes over assets at the end of the concession period

ULB in such an agreement would need to undertake the following:

(i) Provide land lease rights to the private developer to undertake construction activity. The terms of lease would have to be clearly stated as a part of the concession agreement.
(ii) Detail design specifications, procurement process, raw material utilization, etc.
(iii) Facilitate the takeover of assets by the private developer for the period of the contract by entering into necessary agreements and/or negotiations of water purchase with the Irrigation Department and electricity purchase with the State Electricity Board. Also, all the rights and permits given to the private developer need to be stated clearly.

The key risks, which need to be borne by the private developer and the ULB, are stated in Table 17.

Table 17 Key Risks, Roles, and Responsibilities of the Private Developer and the Urban Local Body

Sl No.	Risks	Private Developer	Urban Local Body	Comment
1	Commencement risk		✓	The urban local body (ULB) will be responsible for the transfer of existing assets to the private developer.
2	Construction risk	✓		The construction, and operation and maintenance (O&M) of the water supply and sewerage assets shall be done by the private entity. All costs for the same shall be incurred by the private entity.
3	Design risk	✓	✓	The design risk shall be shared by the ULB and the private entity. The specifications of the assets shall be mentioned by the ULB in the request for proposal document. The design shall be proposed by the developer in line with such specifications.
4	Operations risk	✓	✓	The O&M of the entire water supply system shall be done by the private entity. All costs for the same shall be incurred by such private entity.
5	Financial risk	✓		All costs for the construction and O&M of the bulk water supply system shall be met by the private entity. The finances for such construction and operations shall have to be arranged by the private entity.
6	Payment risk	✓		The risk of collecting revenues from the citizens may also reside with the private entity. This shall be project specific and decided by the ULB. In addition, all payments to contractors, suppliers, etc., shall have to be borne by the private entity.
7	Performance risk	✓		The risk that the water supply system performs such that the performance criteria are met shall reside with the private entity. Any additional cost incurred by any party due to change in law shall have to be borne by the respective party.
8	Change in law risk	✓	✓	Any additional cost incurred by any party due to change in law shall have to be borne by the respective party.
9	Force majeure risk	✓	✓	Any additional cost incurred by any party due to force majeure shall have to be borne by the respective party.

Sl = serial.

Applicability of the PPP Structure

This PPP structure is applicable if

(i) the existing bulk supply system is inadequate and needs augmentation and rehabilitation;

(ii) the extent of raw water transmission and treatment losses is high, requiring infrastructure replacement and improved operations and management; and

(iii) the ULB does not have the financial capacity to undertake the required capital investments.

V Concession Agreement for Construction, Operation, and Management of the Distribution System

The concession agreement for the construction, operation, and management of the water distribution system is a public–private partnership (PPP) structure along the lines of a build–operate–transfer module.

About the PPP Structure

In this form of concession agreement, the design and finance of the identified augmentation works would be undertaken through a 100% capital grant from the government. The private developer is required to first undertake the construction and/or rehabilitation works for the identified section of the water system, and further to the construction activity, undertake the operation and maintenance (O&M) of the entire water supply system. The private developer would get full capital reimbursement from the urban local body (ULB) or any other government agency for the rehabilitation works undertaken.

Once construction is complete, the private developer alone is responsible for the O&M of the entire water supply system, including the supply of treated water to all connections, installation of meters, generation of bills, and collection of revenues. The private developer is, therefore, responsible for

(i) creation of identified assets in the water supply system and operate and maintain the entire system,
(ii) monitoring of pressurized and continuous supply of water,
(iii) leakage reduction,
(iv) all metering for consumer connections,
(v) management of water quality at various distribution points, and
(vi) development of a system for billing and monitoring of the same.

In such a contract therefore, depending upon the financial feasibility of the project, the responsibility of the purchase of raw water and its supply to the water treatment plant would rest either with the private developer or with the ULB. However, any major expansion that may be required to the existing infrastructure would have to be borne by the ULB.

The purpose of involving a private developer at the distribution end is to bring in operational efficiencies that the existing system lacks. Such a contract can be implemented for a single ULB or for a cluster of ULBs, which may have a common raw water source and face similar issues of operational inefficiencies at the distribution end. A nodal agency would be involved in overseeing the water supply services to the cluster.

A set of performance targets for the O&M activity would be set by the state nodal agency or by the ULBs in the cluster. An operator fee is paid by the ULBs or the state nodal agency for the O&M activity undertaken by the private developer for the period of the contract based on the achievement of performance standards.

Figure 16 Concession Agreement for Construction, Operation, and Maintenance of the Distribution System

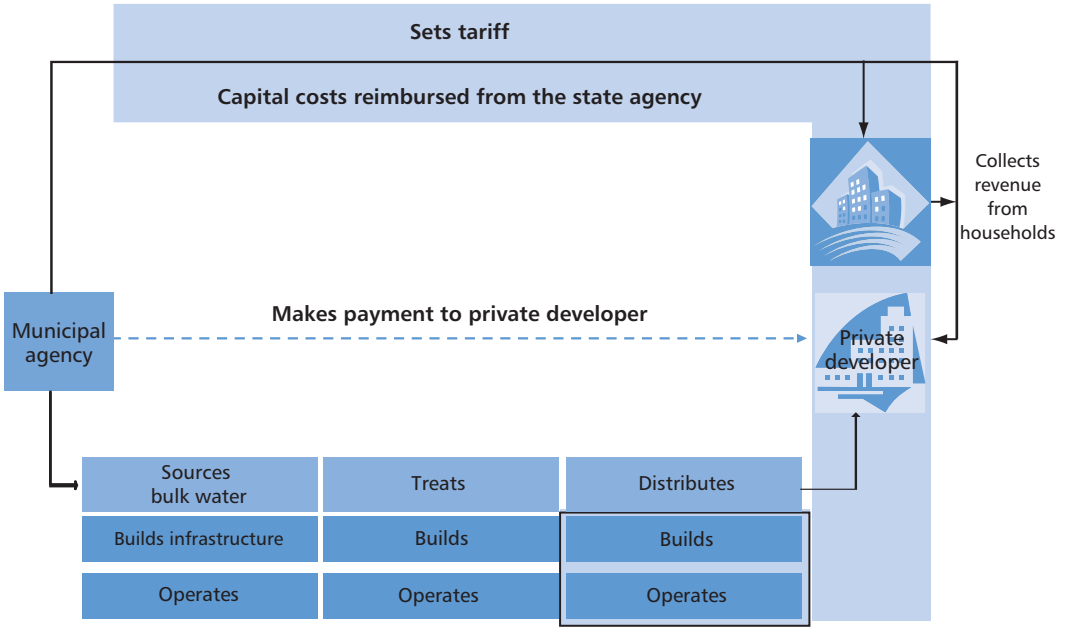

Table 18 Roles and Responsibilities of the Different Institutions

Particulars	Private Developer	State or Nodal Agency	Urban Local Body
Primary task	Designs, plans, constructs distribution pipelines	Sets performance standards	Supply of treated bulk water for distribution
	Operates and maintains the distribution network		Operates and manages the water supply system up to the distribution point
	Provides new water supply connections		Defines the technical specifications for the distribution network rehabilitation works
	Installs meters, generates bills, collects revenues		Oversees the operation and management (O&M) works of the distribution network
			Handover of distribution system for operation and maintenance by the private developer
Tariff	Collects revenues as per tariff set, hands over the collections to urban local body		Sets tariff to be set, escalation factor

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Table 18 *continued*

Particulars	Private Developer	State or Nodal Agency	Urban Local Body
Operating expense	Pays for electricity consumption for distribution of treated water		Operating expenses until distribution point, including bulk water purchase, operation of water treatment plant, transmission, etc.
Operating expense	Bears expenses on installation of meters, O&M of meters		
	Bears escalations on input costs for rehabilitation works beyond permissible levels		
	Bears expense on repairs to assets		Oversees the O&M expenses
	Labor charges, chemical charges		Facilitates negotiations for bulk water and electricity purchase
	Any other O&M expense		
Capital expense	Undertakes initial capital expense for rehabilitation works and be reimbursed	Capital expenditure reimbursement to private developer	
Asset ownership	Only given right to operate and maintain the assets. Returns asset at the end of the contract period		Takes over assets at the end of the concession period

Figure 16 presents a holistic view of the entire transaction under the augmentation-cum-distribution network expansion contract. The key roles and responsibilities are listed in Table 18.

Under such a PPP agreement, the state agency and the ULB need to determine if the private developer's services need to be extended to the entire city or whether they should be focused initially on a few demonstration zones and then extended to the remaining zones based on performance results. A performance-based timeline can be set to analyze the outcome of the contract for the demonstration zones.

Before the contract is implemented, the ULB or ULB cluster (as the case may be) needs to undertake the following steps:

(i) Undertake an assessment to ascertain the extent of rehabilitation works that needs to be constructed by the private developer.
(ii) Detail the design specifications, procurement process, raw material utilization, etc.; however, all the procurement activity will have to be managed by the private developer.
(iii) Undertake a water audit to ascertain the extent of losses at the distribution end.
(iv) Determine the tariff to be charged and prepare an action plan for the transition period from flat rate to volumetric tariff.
(v) Provide the private developer with accurate information on the points of bulk water supply, the status on existing connections and properties, the number and type of connections to be served, the number and type of meters to be installed, etc.
(vi) Provide land lease rights to the private developer to undertake construction activity.
(vii) Facilitate the takeover of assets by the private developer for the period of the contract by entering into the necessary agreements and/or negotiations of electricity purchase with the State Electricity Board. The ULB will have to provide its own employees for a limited period of time to assist the private developer.

Table 19 Key Risk Sharing

Sl No.	Risks	Private Developer	ULB or ULB Cluster	Comment
1	Commissioning risk		✓	The urban local body (ULB) will be responsible for the transfer of existing distribution assets, if any, to the private developer.
2	Construction risk	✓		The construction, and operation and maintenance (O&M) of the water supply distribution assets shall be done by the private entity. All costs for the same shall be incurred by the private entity.
3	Design risk		✓	The design risk shall be shared by the ULB and the private entity. The specifications of the assets shall be mentioned by the ULB in the request for proposal document. The design shall be proposed by the developer in line with such specifications.
4	Operations risk	✓	✓	The O&M of the distribution network shall be done by the private entity. All costs for the same shall be incurred by such private entity.
5	Financial risk	✓		All costs for the construction and O&M of the entire distribution network shall be met by the private entity. The finances for such operations shall have to be arranged by the private entity.
6	Payment risk	✓		All payments to contractors, suppliers, etc., shall have to be borne by the private entity.
7	Performance risk	✓		The risk that the distribution system performs such that the performance criteria are met shall reside with the private entity.
8	Change in law risk	✓	✓	Any additional cost incurred by any party due to change in law shall have to be borne by the respective party.
9	Force majeure risk	✓	✓	Any additional cost incurred by any party due to force majeure shall have to be borne by the respective party.

Sl = serial.

The key risks, which need to be borne by the private developer and the ULB or state agency, are stated in Table 19.

Applicability of the PPP Structure

This PPP structure is applicable if

(i) a city or a cluster of cities faces similar water supply-related issues of operational inefficiencies at the distribution end,

(ii) no augmentation or capital works need to be undertaken for raw water bulk supply and treatment by the private developer, and

(iii) the capital costs for the rehabilitation activity are to be fully funded as a grant from the state nodal agency or ULB.

VI Concession Agreement for Development of the Bulk Water Supply System and Operation and Maintenance of the Entire System

The concession agreement for the development of the bulk water supply system, including the operation and maintenance (O&M) of the entire water supply system, is a public–private partnership (PPP) structure developed on a build–operate–transfer basis.

About the PPP Structure

In this concession agreement, the private developer is required to undertake construction of the bulk water supply system, including the raw water offtake system and raw water transmission lines. The private developer will also be responsible for the augmentation or creation of a treatment plant and the operation and management of the water supply system from source to the end consumer. Augmentation works are to be carried out by the private developer only for the bulk supply system, whereas any expansion of the distribution system is the sole responsibility of the urban local body (ULB). Therefore, any expansion or rehabilitation work for the distribution network is to be managed by the ULB before inviting the private developer to operate and manage the water supply system.

The private developer would also be required to undertake the necessary capital investments for the construction works identified. The private developer would be required to offtake raw water, supply it to the treatment plant, and transmit the treated water through the existing distribution network to the consumers. All the operating expenses, including procurement of raw materials, deployment of labor, payment for electricity charges, and repair and maintenance, need to be managed by the private developer. The private developer would also have to follow all safety norms for disposal of the waste generated from all the water treatment plants, and would not be entitled to charge extra fees for the same. All the new assets created by the ULB would also have to be managed by the private developer.

The private developer is given the right to levy, collect, and retain revenues from the consumers for the activities undertaken. The private developer is required to make a fixed monthly payment as license fee to the ULB for the right to operate the existing water supply assets and the entire system. The highest monthly payment quoted would be the key financial bid parameter.

Under such PPP agreements, the private developer may also be given the right to sell surplus water to consumers other than those identified by the ULB. However, only limited surplus sales can be undertaken, and a revenue share in the earnings from the surplus water is to be provided to the ULB. The typical concession period would range from 10 years to 15 years.

Details of the contract structure are given in the term sheet presented in Part IV.

Figure 17 presents a holistic view of the entire transaction under the augmentation-cum-distribution network expansion contract. The key roles and responsibilities under such a PPP arrangement are listed in Table 20.

Figure 17 Concession Agreement for Development of the Bulk Water Supply System and Operation and Maintenance of the Entire System

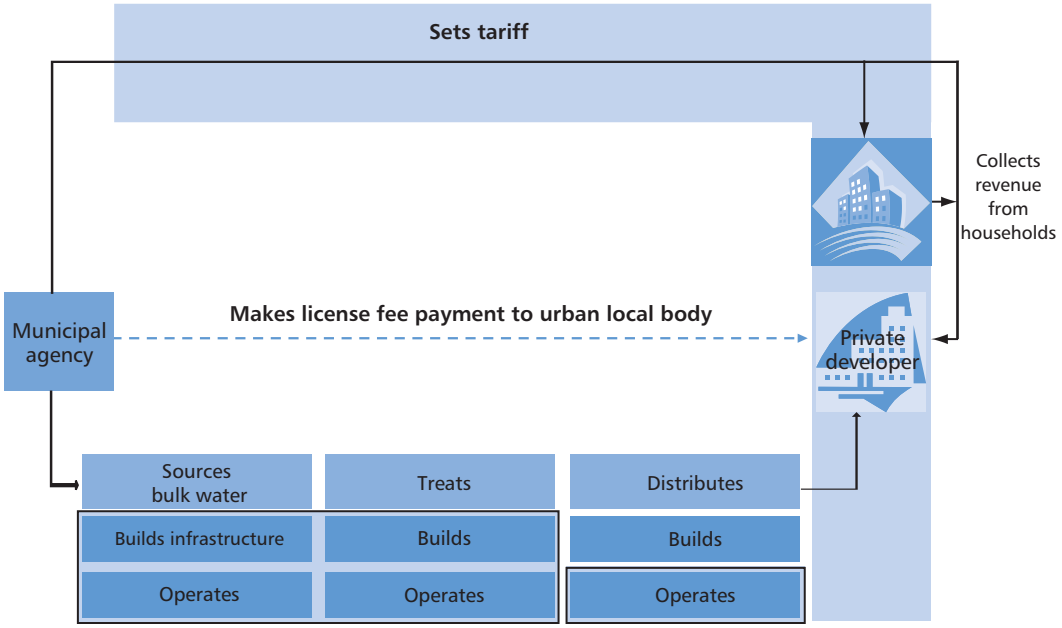

Table 20 Roles and Responsibilities of the Different Institutions

Particulars	Private Developer	Urban Local Body
Primary task	Designs, plans, and constructs raw water offtake system; augments raw water transmission lines and water treatment system	Undertakes rehabilitation and/or expansion works, if any, to the distribution network
	Operates and manages the entire water supply system from source to end consumer	Oversees the operation and maintenance (O&M) works underway
	Levies and collects user charges	
Tariff	Levies and collects user charges as per set tariff	Sets the tariff levels, structure, and escalation factor
Operating expense	Bears electricity consumption charges	Oversees O&M activity undertaken
	Civil works, repairs to the assets	
	Labor charges and any other O&M	

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Table 20 *continued*

Particulars	Private Developer	Urban Local Body
Capital expense	Bears all the construction work capital cost	
Asset ownership	Retains the right to operate the assets for the concession period and hands over assets at the end of the contract period	Takes over assets at the end of the contract period.

Before the contract comes into force, the ULB would have to undertake the following activities:

(i) Assess the bulk supply system to accurately ascertain the extent of rehabilitation works that needs to be carried out by the private developer.
(ii) Detail the design and technical specifications of the infrastructure asset to be developed.
(iii) Ascertain water demand projections and provide the private developer with the schedule of projection. After enforcement of the contract, any change to the part of water required to be drawn from the source would be subject to approvals from the ULB.
(iv) Undertake financial and commercial viability assessment for the project to determine whether the private developer would need to bear the expense of the bulk water purchase or whether this may be paid for by the ULB.
(v) Determine the tariff to be charged and prepare an action plan for transition from flat rate to volumetric (if applicable) rates and share these with the private developer.

Table 21 Key Risk Sharing

Sl No.	Risks	Private Developer	Urban Local Body	Comment
1	Commissioning risk		✓	The urban local body (ULB) will be responsible for the transfer of existing assets, if any, to the private developer.
2	Construction risk	✓		The construction of the bulk water supply system and the operation and maintenance (O&M) of the water supply system shall be done by the private entity. All costs for the same shall be incurred by the private entity.
3	Design risk	✓		The design risk shall be shared by the ULB and the private entity. The specifications of the assets shall be mentioned by the ULB in the request for proposal document. The design shall be proposed by the developer in line with such specifications.
4	Operations risk	✓	✓	The O&M of the entire water supply system, as per the pre-specified performance benchmarks, shall be done by the private entity. All costs for the same shall be incurred by such private entity.

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Table 21 *continued*

Sl No.	Risks	Private Developer	Urban Local Body	Comment
5	Financial risk	✓		All costs for the construction of the bulk water supply system and the O&M of the entire water supply system and meeting the performance benchmarks shall be met by the private entity. The finances for such operations shall have to be arranged by the private entity.
6	Payment risk	✓		The risk of collecting revenues from the citizens may also reside with the private entity. This shall be project-specific and decided by the ULB. In addition, all payments to contractors, suppliers, etc., shall have to be borne by the private entity.
7	Performance risk	✓		The risk that the water supply system performs such that the performance criteria are met shall reside with the private entity.
8	Change in law risk	✓	✓	Any additional cost incurred by any party due to change in law shall have to be borne by the respective party.
9	Force majeure risk	✓	✓	Any additional cost incurred by any party due to force majeure shall have to be borne by the respective party.

Sl = serial.

(vi) Develop and maintain accurate information on the points of bulk water supply, the status of existing connections and properties, the number and type of connections to be served, the number and type of meters to be installed, etc.

The risks to be borne by the ULB and the private developer are stated in Table 21.

Applicability of the PPP Structure

This PPP structure is applicable if

(i) only augmentation and improvements to the distribution network are required, and/or
(ii) the existing distribution network coverage is low, distribution losses are high, and O&M recoveries are low.

PART III

Case Studies of Public–Private Partnerships in Maharashtra

I Introduction

The overall process of identification of the public–private partnership (PPP) structure and the process of implementation has been described in Part I of this tool kit. A preliminary assessment of the sample cities was undertaken on the basis of this tool kit.

The first step in determining a suitable PPP structure for the water supply system and sewerage services in the city was the identification of the problem areas in the existing system. A set of performance assessment parameters was compiled to determine the status of the services. The output from this process was compared with water supply improvement projects already identified by the city and for which detailed project reports (DPRs) were also available to verify if the current issues in the system have been adequately addressed in the proposed project.

In the second step, the choice between a public mode of funding and a PPP-based mode of project development was assessed for the water supply projects already identified in the city. A preliminary viability assessment based on financials for the projects identified was carried out. Based on the output of the preliminary assessment, an appropriate choice of option between public and private modes of developing the project was made.

In the third step in the process of PPP determination and implementation, a suitable PPP structure for the water supply and sewerage services was recommended. The risks of this structure and their allocation between the parties were identified.

As a final step in the process, the key bidding parameter for the specific PPP option was indicated.

In this part, the broad assessment of the water supply services for the select sample cities followed by the preliminary financial analysis and the recommendation for the suitable PPP option are presented. This is intended to provide the user of this tool kit with a broad idea of the process and the steps to be followed in identifying and finalizing a suitable PPP structure for the development of projects in the water supply and sewerage services.

II Summary of City Analysis

This section presents a broad assessment of the water supply and sewerage services of a sample of 12 selected cities of Maharashtra: Jalna, Sangli-Miraj-Kupwad, Kolhapur, Virar, Navghar Manikpur, Chiplun, Akot, Saoner, Shirpur, Kulgaon-Badlapur, Ambernath, and Navi Mumbai. The assessment provides insights into the status of water supply and sewerage services in the chosen cities. Based on the assessment, a preliminary financial analysis was undertaken to assess the viability of the water supply and sewerage services projects identified for development on a public–private partnership (PPP) basis. The objective of the preliminary analysis is to assess the scope for a PPP-based intervention in the provision of water supply and sewerage services in the selected cities. A summary of the output from the preliminary financial analysis is given in Table 22.

Table 22 Summary of PPP Structures for Sample Cities

City or Town	Capital Cost (Rs million)	Investment Required (Rs million)	Type of PPP Structure	Comment
Jalna	3,310	1,960	• Performance management contract for operation and maintenance (O&M) of the entire water supply services from source to consumer	• A PPP option for design, finance, and construction of the proposed water supply project is not feasible since it requires Viability Gap Fund (VGF) support for approximately 85% of the project cost. With such high funding assistance required from the government, the project cannot be packaged under a public–private partnership (PPP) module. • The state government would need to assist in meeting the capital requirement of Rs1,960 million to augment the proposed works and then hand over the system to a private developer for O&M.
Sangli-Miraj-Kupwad	2,540	1,370	• Integrated water supply contract only for design and construction of the proposed projects • Performance-based management contract for the entire water supply system	• If the option of an integrated concession agreement for design, finance, construction, and O&M of water supply networks is handed over as a single contract to the private developer, the total government support, including grants and VGF assistance, would be more than 65% of total project cost. Given the high grant assistance, the project would not be viable as a single PPP module.

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Table 22 *continued*

City or Town	Capital Cost (Rs million)	Investment Required (Rs million)	Type of PPP Structure	Comment
Sangli-Miraj-Kupwad				• PPP for the proposed project may be divided into two separate contracts: – Private developer is required to undertake design, finance, and construction; the developer will retain revenues from users for the concession period to recover investments. – A separate performance management contract for only O&M of the water supply system would be made in return for annual payments by Sangli-Miraj-Kupwad Municipal Corporation.
Kolhapur	2,808	1,989	• Integrated concession agreement for design, finance, construction, and O&M of the water supply and sewerage system	• The private developer would be able to design, finance, and construct the required projects and earn Rs650 million (net present value: 14%) against a requirement of Rs1,340 million by Kolhapur Municipal Corporation due to significant operational efficiencies brought in by the private developer.
Virar	52	52	• Service management contract for metering, billing, and collection	• Current water supply operations are assessed to be satisfactory. • No major investment is required. • The scope for PPP in metering and billing collection is high since private operator can bring in high efficiency, resulting in additional water revenue. • Given the limited financial capability of the urban local body (ULB), it need not undertake lump sum investment in meters but pay an annuity to the private operator.

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Table 22 *continued*

City or Town	Capital Cost (Rs million)	Investment Required (Rs million)	Type of PPP Structure	Comment
Navghar-Manikpur	60	60	• PPP not applicable	• Current water supply operations are assessed to be satisfactory. • No major investment is required. • There is limited scope for PPP in metering and billing collection since ULB is highly efficient in its billing and collection. • The limited investment needed for metering can be obtained through government grants.
Chiplun	150	70	• Performance management contract for O&M of water supply services	• The capital requirements for the ongoing project are being arranged by the council, and thus do not demand any PPP intervention for the proposed project. • The existing tariff would require revision and post-revision; a private operator can be brought in to only operate and manage the water supply services on an annuity basis.
Akot	530	360	• Performance management contract for O&M of water supply services	• If the option of an integrated concession agreement for developing, operating, and managing the water supply services is considered, the VGF requirement is estimated to be approximately 76% of the capital cost after considering funding from the Urban Infrastructure Development Scheme for Small and Medium Towns. This defeats the purpose of undertaking the project on a PPP basis. • The ULB, with support from the state government, should invest in the proposed physical infrastructure. • A PPP option for operating and managing the water supply services on an annuity basis can be explored by the Akot Municipal Council.

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Table 22 *continued*

City or Town	Capital Cost (Rs million)	Investment Required (Rs million)	Type of PPP Structure	Comment
Saoner	73.9	7.3[a]	• PPP not applicable	• Existing investment needs of Saoner Municipal Council are being arranged internally and the project construction has commenced. In such a scenario, there is no scope for a private developer to undertake the proposed project. • PPP in O&M of the water supply system has limited scope since the town is small and the existing collection efficiency is high. Thereby, there is limited value addition, which the private operator can provide to the ULB.
Shirpur	52	52	• PPP not applicable	• Current water supply operations are assessed to be satisfactory. • No major investment is required. • There is limited scope for PPP in metering and billing collection since the ULB is highly efficient in its billing and collection. • Shirpur-Warvade Municipal Council has the financial capacity to install and maintain meters.
Kulgaon-Badlapur	268.5	26.8	• PPP not applicable	• The scheme is currently managed by Maharashtra Jeevan Pradhikaran. • No need for huge capital investment currently. • The existing level of services has been largely assessed to be satisfactory, and the current issues are being addressed in the project proposed. • Kulgaon-Badlapur Municipal Council has the financial ability to undertake the proposed capital investment and would not require private participation to undertake capital investment. • Given the existing level of services, there is no scope for a PPP intervention.

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Table 22 *continued*

City or Town	Capital Cost (Rs million)	Investment Required (Rs million)	Type of PPP Structure	Comment
Ambernath	48	12		• The scheme is currently managed by Maharashtra Jeevan Pradhikaran. • There is currently no need for huge capital investment. • The existing level of services has been largely assessed to be satisfactory, and the current issues are being addressed in the project proposed. • Given the existing level of services, there is no scope for a PPP intervention.

Rs = rupees.

[a] The Saoner Municipal Council has arranged for this investment from internal funds and debt.

III Jalna

Brief Introduction to Jalna

Jalna, the headquarters of the Jalna district, encompasses an area of 70.87 square kilometers and has a population of 300,000 (235,000 at the 2001 census). There are 48,000 households in the city. The city is managed by the Jalna Municipal Council (JMC), with a revenue budget of Rs291.3 million (fiscal year 2007) and a revenue surplus of Rs11.5 million.

JMC manages the city's water supply system and incurs a deficit of Rs31.5 million on its water supply operations. The council has liabilities of approximately Rs1,530 million toward its water supply operations. Thus, the city has no investment capacity to undertake new projects.

Water Supply System at Jalna

Jalna draws a total water supply of 19 million liters per day (MLD). The city has two water sources: Ghanewadi Lake (7 kilometers [km] from the city) and Shahgad in Godavari River (60 km from the city). The majority of the water (13 MLD) is sourced from the Shahgad headwork scheme, which has been jointly developed and operated for Jalna and Ambad by Maharashtra Jeevan Pradhikaran (MJP).

Raw water from Shahgad headworks is supplied to the water treatment plant at Ambad, and treated water is transmitted through 26 km of pure water transmission mains to Jalna.

Jalna receives a treated water supply of approximately 38 liters per capita per day (lpcd) at the consumption point. Water is available for 1 hour on alternate days and is supplied through individual connections and public standposts. A basic profile of the water supply system of JMC is presented in Table 23.

Step 1: Identification of the Problem Area

As a first step in assessing the status of water supply services in the city of Jalna, a survey of problem areas of the existing system's services needs to be carried out. This would highlight the interventions required to improve the level of services. The first activity to undertake is a service assessment against a few key performance criteria. On the basis of the assessment, the key issues in the current system would need to be identified and existing projects reviewed. The assessment presented for Jalna is based on only a few key parameters. For the detailed review discussed in Part I of the tool kit, the urban local body (ULB) would be required to carry out a consumer survey, water audit, leak detection, and energy audit for the entire value chain of water supply services.

Compiling Key Parameters

Based on the preliminary analysis of the water supply service data[1] and discussions with JMC officials, CRISIL Risk and Infrastructure Solutions Limited (CRISIL) assessed the current water supply system in Jalna. Table 24 presents the key indicators for assessing the water supply system at Jalna and their inferences.

[1] In the absence of a water or energy audit report, the data provided by the municipal representatives has been considered for all the assessments. The actual technical losses may be more or less than those stated and can be verified only if a water audit is undertaken along with consumer survey.

Table 23 Basic Profile of Water Supply Services in Jalna

Jalna Utility Profile			
Key infrastructure components	Bulk supply		19 MLD
		Shahgad headworks	13 MLD
		Ghanewadi Lake	6 MLD
	Water treatment capacity		15 MLD
	Treated water available for consumption		38 lpcd
	Storage capacity	9 elevated storage reservoirs	10.1 MLD (Equivalent to 0.6 days of consumption)
	Distribution network	22 kilometers	
	Direct connections	16,814 (35% of total households)	
Water supply financials (FY2007) Tariff	Water account revenue	Rs10.9 million	
	Annual operation and maintenance costs	Rs42.4 million	
	Flat tariff	0.5 inch	Rs806 per annum
		20 mm	Rs1,555 per annum
		1 inch	Rs3,662 per annum

FY = fiscal year, lpcd = liter per capita per day, MLD = million liters per day, mm = millimeter, Rs = rupees.

Source: Jalna Municipal Council.

Table 24 Water Supply Indicators and Inferences for Jalna

Performance Area	Norm	Jalna	Key Inference
Bulk Water			
Supply (per capita treated water available for consumption)	135 lpcd	38 lpcd	Jalna needs to have minimum water supply of 135 lpcd available for consumption as per the CPHEEO norms; the water available at consumption point in Jalna is 38 lpcd (14.2 MLD).[a] If the existing transmission and distribution losses are reduced from the current level of 45% to an average of 20%, the water available would increase by 3.5 MLD and raise per capita availability for consumption to 50 lpcd. Thus, improvement in operational efficiency would help increase the supply to a limited extent. However, in order to solve the issue in the long term, the city needs to augment its water supply.
Raw water transmission loss	2%	10%	Extremely high raw water transmission loss owing to corroded pipelines and theft.
Treatment			
Capacity utilization of water treatment plant	100%	100%	Within the norms
Treatment quality		Good	No improvement needed
Treatment loss	Less than 3%	2%	As per norms

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Table 24 *continued*

Performance Area	Norm	Jalna	Key Inference
Transmission and Distribution			
Losses	Less than 15%	35%	Approximately 15% is lost in pure water transmission. In addition, a 20% loss occurs during distribution.[b]
Consumer			
Coverage (connections/total households)	100%	70%	Assuming that one connection caters to two households, the city should ideally have 24,000 connections.
Metering	100%	0%	In the absence of metering, JMC cannot realistically estimate the losses in the system and the consumption pattern. Also, in order to ensure that the tariff paid by the consumer is in line with consumption, JMC needs to introduce a volumetric tariff system. Hence, all the water connections need to be metered.
Duration of water supply	24 hours	1 hour on alternate days	The current supply hours and frequency are not adequate.
Operation and maintenance cost recovery	100%	26%	The cost recovery levels are highly inadequate. JMC not only needs to improve its operational and collection efficiency, but also to revise its tariff to cover at least the operations costs.
Unit production cost Unit income		Rs6.12/kl Rs1.58/kl	The revenue demand raised by JMC covers just 26% of its water production cost.
Collection efficiency	100%	56%[c]	Poor level of collection efficiency.

CPHEEO = Central Public Health and Environmental Engineering Organisation, JMC = Jalna Municipal Council, kl = kiloliter, lpcd = liter per capita per day, MLD = million liters per day, Rs = rupees.

[a] Per capita water consumption calculations are rough estimates based on analysis of data made available by JMC officials. In the absence of water audit report, or estimates on the number of households being supplied with direct service connections, these are, at best, approximate estimates.

[b] The estimate on losses is as per information provided by JMC officials.

[c] Figure refers to current revenue collections against current demand raised.

Source: CRISIL analysis as provided by Jalna Municipal Council.

Identification of Key Issues

After the assessment of the water supply services in Jalna, the next step is for the ULB to clearly list all the service and infrastructure-related issues being faced by the current water supply system in the city. Based on the status of the water supply system, key indicators, and the resultant inferences, the following areas appear to need investment on a priority basis:

(i) augmentation of bulk water source to meet the current and future demand of water;

(ii) rehabilitation and/or replacement of existing transmission and distribution infrastructure to reduce technical losses to minimum acceptable standards;

(iii) installation of meters at all points of bulk distribution and consumption and adoption of a volumetric-based tariff system; and

(iv) improvement in the financial status of water account of JMC through revision of tariff rate and structure, increase in coverage, and improvement in collection efficiencies.

Review of Water Supply Projects with Approved Detailed Project Reports

Having identified the key issues in the existing status of provisioning of water supply services in the city, the next activity is to undertake a brief review of the projects that have already been identified for Jalna under various schemes for improvement of the water supply services. Table 25 lists the projects JMC has identified for the water supply sector.[2]

Step 2: Choice between Public Funding and the PPP Option

Having undertaken the assessment of the existing status of the water supply services in the city, identified key issues, and briefly reviewed the projects identified by the city, the next stage involves choosing between public funding and implementation of the proposed project and the private or public–private partnership (PPP)-based mode of developing and implementing the project. This decision requires a viability assessment to be undertaken.

A preliminary financial analysis has already been undertaken to assess the commercial viability of the projects identified to determine whether they are to be developed in a PPP mode. The viability assessment undertaken in the following sections has largely focused on determining whether the public sector, i.e., JMC, or the private sector has the financial means to undertake the project. The investment required under each scenario has been looked at. In addition, the option of support from the Viability Gap Fund (VGF) has been considered to help assess the viability of the project from the private sector perspective.

Table 25 Proposed Water Supply Projects for Jalna

Potential Area of Investment	Scheme Proposed	Details
Augmentation of water drawn from Jaikwadi Dam	Proposed under UIDSSMT scheme It includes a source augmentation of 65 MLD, raw water rising main of 46 km, and a water treatment plant capacity of 24 MLD.	Capital expenditure required (DPR): Rs2,000 million Capital expenditure required (escalated cost): Rs2,600 million Grant: Rs1,110 million[a] JMC's contribution is Rs120 million contribution plus an escalation of Rs1,360 million
Rehabilitation and expansion of the distribution network	MJP Scheme approved by the state government It includes rehabilitation and expansion of 170 km of distribution pipeline.	Capital expenditure required (DPR): Rs570 million Escalated cost: Rs710 million Grant: Rs230 million JMC's contribution: Rs340 million contribution plus an escalation of Rs140 million

DPR = detailed project report, km = kilometer, lpcd = liter per capita per day, MJP = Maharashtra Jeevan Pradhikaran, MLD = million liters per day, Rs = rupees, UIDSSMT = Urban Infrastructure Development Scheme for Small and Medium Towns.

[a] The grant is 80% of an approved cost of Rs1,230 million.

Source: Project information as provided by Jalna Municipal Council.

[2] For the purpose of this assessment, a due diligence on the project components and costs was not undertaken.

Table 26 Key Assumptions

Particulars	Assumptions
Phasing of capital expenditure	Over a period of 4 years
Raw water transmission losses	2%
Treatment losses	2%
Distribution losses	20% in case of JMC 15% in case of private operator
Tariff[a]	A volumetric tariff of Rs6.42/kl, with a revision of 3% every year. The tariff is fixed such that it covers the minimum production cost.
Collection efficiency	Phasing from 56% to 70% in case of JMC
	Phasing from 70% to 95% in case of private operator
Cost reduction efficiency	0% in case of JMC
	20% in case of private operator to 2012

JMC = Jalna Municipal Council, kl = kiloliter, Rs = rupees.

[a] The weighted volumetric tariff calculated on the basis of the current tariff structure.

The set of key assumptions used in undertaking the financial analysis is shown in Table 26. From the detailed project report (DPR) review presented, it can be observed that Jalna plans to undertake projects worth Rs3,310 million by fiscal year 2011. For these projects, Jalna needs to arrange for a capital investment of Rs1,960 million. The key assumptions of the analysis are outlined in Table 26.

Based on the assumptions in Table 26, the preliminary financial assessment has been undertaken to review the viability of undertaking the project under two scenarios: Option 1, where the investments identified for the proposed projects is made by JMC; and Option 2, where the investments identified for the proposed projects is to be fully funded by the private developer.

Under Option 1, JMC would have to invest Rs1,960 million of capital (excluding grant amount) and, in addition, incur the operations cost of an average of Rs230 million per annum. This results in a net cash outflow of Rs1,940 million considering the water supply charges, which would accrue to JMC and the operational efficiencies of JMC. However, JMC generates a revenue surplus of only Rs11.5 million and already has a huge liability of Rs1,530 million. In such a scenario, JMC would not be able to undertake the project in an integrated manner on its own.

Under Option 2, if the entire investment gap of Rs1,960 million and the operations cost of an average of Rs160 million per annum[3] up to 2030 is incurred by the private operator, then in spite of the private operator retaining the water supply revenues, the operator would need to obtain VGF support of Rs1,410 million. This is in spite of the improved operational and managerial efficiencies of the private operator. The total grant of Rs1,340 million, coupled with VGF support of Rs1,410 million, would result in 83% of the total cost being funded by the government. This would defeat the purpose of implementing the project on a PPP basis. Hence, it is not financially feasible to implement and operate the water supply system on an integrated basis through PPP.

Table 27 presents the investment requirements under each option.

[3] The operations cost incurred by private operator is lower compared to JMC since he or she brings in cost efficiency of 20%.

Table 27 Investment Requirement with a PPP

Particulars	Capital Expenditure (Rs million)	In Case of Investment by JMC (Rs million)	In Case of Investment by Private Operator (Rs million)
DPR cost	2,570		
Escalated cost	3,310		
Grant	1,340		
Investment gap	1,960		
Total investment required by JMC Viability Gap Fund support to private sector	(Net present value:14%)	1,990	1,480

DPR = detailed project report, JMC = Jalna Municipal Council, kl = kiloliter, PPP = public–private partnership, Rs = rupees.
Source: Preliminary financial analysis.

The analysis clearly shows that the option of developing the project on a fully government-funded mode is not viable given the huge investment need and the limited fund availability at JMC. Also, the option of private sector investment is assessed to be not viable in its present form of PPP structure. It is, therefore, prudent to assess whether the PPP option can be still pursued under a modified form of PPP arrangement. The alternative PPP structuring options are now explored.

Step 3: Choice of PPP Structure

Having assessed the viability of developing the proposed project through a public-funded or PPP mode, the next step is to determine the choice of PPP structure that is best suited to address the overall needs of the proposed project.

Since the project cannot be undertaken on a PPP basis, Option 2—the PPP scenario—has been further reviewed, and two alternative PPP structuring options evaluated: Option 2(a) capital investment by the private developer and revenue to be retained by the private developer; and Option 2(b): operation and maintenance (O&M) of the project under PPP on an annuity basis.

Under Option 2(a), the water supply project would be designed, financed, and constructed on a PPP basis by the private developer. In return, the private developer would get the revenues earned from the consumers as user charges for a fixed number of years. However, preliminary analysis shows that this will not be financially feasible, and the developer will need additional VGF support (in addition to the grant) of Rs760 million.[4]

Under Option 2(b), JMC would contract another private party for the operation and management of the water supply system. This private party would be given an annual fixed payment to operate the water supply system of the town. The private operator would undertake all the operation and management activity at a predetermined cost bill and collect and transfer the revenues to JMC.

From an analysis of options 2(a) and 2(b), it can be concluded that PPP for the design, finance, and construction of the proposed water supply projects is not feasible. Thus, the state government would have to provide additional financial support of Rs1,960 million to JMC and put in place the physical infrastructure for the project. Then a private developer can be appointed under Option 2(b) to operate and maintain the project for a fixed payment. However, if JMC is insistent on ensuring capital

[4] This is assuming that the tariff would be a volumetric tariff covering the production cost.

investment from the private operator, it would have to increase the tariff, or JMC would need to revisit the project cost of the proposed water supply system and undertake projects that need immediate attention only.

Therefore, as per the assessment undertaken above, the choice of PPP option for overseeing the operations and management of the water supply services for JMC is that of a performance-based management contract.

The performance-based management contract is one where the private developer is required to undertake the O&M of the entire water supply system from source to consumer, including metering, billing, and collection of revenues. All capital investments needed for improvement to the water supply and sewerage services would have to be borne by the public sector. The operating standards are as prescribed by the ULB. The private developer is given the rights to levy the user charges set by the ULB, collect the charges, and hand them over to the ULB. The ULB would make a performance-based payment to the private developer for these activities.

The details of the obligations, risks, and payment arrangements under the performance-based management contract, as mentioned in Option 2(b), are provided in Part II of this report, and the term sheet for this contract structure is provided in Part IV.

Step 4: Procurement

Having identified and finalized the PPP structure to be adopted for operating and maintaining the proposed project, the next stage is to plan the procurement process. To initiate the procurement process, JMC would need to develop a transaction structure that covers aspects relating to details on the parties involved in the contract. These include the contractual relationship between the parties, nature of the arrangement, risk allocation, tariff to be levied, contract duration, performance indicators, payment terms, award criteria, and contract management strategy. Details are given in the term sheet in Part IV.

IV Sangli-Miraj-Kupwad

Brief Introduction to Sangli-Miraj-Kupwad

In 1998, the towns of Sangli, Miraj, and Kupwad (SMK) were merged to form a single entity, called the Sangli-Miraj-Kupwad Municipal Corporation (SMKMC). It encompasses an area of 118.18 square kilometers and has an estimated 106,000 households. The SMKMC has a total revenue budget of Rs930 million and generates a revenue surplus of Rs50 million. The water supply works are managed by the SMKMC, and there is a deficit of Rs10 million in the water account. Thus, the city has very limited investment capacity to undertake new projects.

Water Supply System at Sangli-Miraj-Kupwad

SMK draws a total water supply of 66 million liters per day (MLD), of which 2 MLD is purchased from the Maharashtra Industrial Development Corporation for the Kupwad region. The present source of water supply to the city is the Krishna River.

There are three water treatment plants in the city based at Hirabaug, Malbungalow, and Miraj. The water available at the three plants is 71.4 MLD. The city receives treated water of about 106 liters per capita per day at the consumption point.

The supply hours vary, from an average of 3 hours to 4 hours a day in Sangli and Miraj to an hour a day in Kupwad. There are 48,000 direct connections in the city, of which 85% are metered. A basic profile of the water supply system of SMK is presented in Table 28.

Step 1: Identification of the Problem Area

As a first step to assessing the status of the water supply services in SMK, an assessment of the problem areas in the existing system's services needs to be carried out. Doing this would highlight the interventions required in improvement to the level of services. The first activity to undertake is a service assessment against a few key performance criteria. On the basis of the assessment, the key issues in the current system would need to be identified and the existing projects reviewed. It should be noted that the assessment presented here for SMK is based on only a few key parameters. For the detailed review discussed in Part I of the tool kit, the urban local body (ULB) would be required to carry out a consumer survey, water audit, leak detection, and energy audit for the entire value chain of water supply services. The key performance parameters used are as follows.

Compiling Key Parameters

Based on the preliminary analysis of the water supply service data[5] and discussions with SMKMC officials, CRISIL Risk and Infrastructure Solutions Limited (CRISIL) assessed the current water supply system in SMK. Table 29 presents the key indicators for assessing the water supply system at SMK and their inferences.

[5] In the absence of a water or energy audit report, the data provided by the municipal representatives has been considered for all the assessments. The actual technical losses may be more or less than that stated and can be verified only if water audit is undertaken along with consumer survey.

Table 28 Basic Profile of Water Supply Services in Sangli, Miraj, and Kupwad

Sangli-Miraj-Kupwad Utility Profile			
Key infrastructure components	Bulk supply		66 MLD
		Sangli	48 MLD
		Miraj	16 MLD
		Kupwad	2 MLD
	Water treatment capacity	Malbungalow	36.0 MLD
		Hirabaug	16.2 MLD
		Miraj	19.2 MLD
		Total	**71.4 MLD**
	Treated water available for consumption		106 lpcd
	Storage capacity	15 elevated storage reservoirs	18.5 MLD
	Distribution network	240 km	
	Connections	48,000 (45% of total households)	
Water supply financials (FY2007)	Water account revenue	Rs150 million	
	Annual operation and maintenance costs	Rs160 million	
Tariff	Flat tariff	Rs320 per month	
	Volumetric tariff	Domestic	Rs8/kl
		Nondomestic	Rs30/kl
		Special categories	Rs12/kl

FY = fiscal year, kl = kiloliter, km = kilometer, lpcd = liter per capita per day, MLD = million liters per day, Rs = rupees.

Source: Sangli-Miraj-Kupwad Municipal Corporation.

Table 29 Water Supply Indicators and Inferences for Sangli, Miraj, and Kupwad

Performance Area	Typical Norm	Sangli-Miraj-Kupwad	Key Inference
Bulk Water			
Supply (per capita treated water available for consumption)	135 lpcd	106 lpcd	As per CPHEEO norms, the total water supplied to consumers after treatment should be 135 lpcd. SMKMC, at the time of survey, supplies 106 lpcd (47 MLD). If the transmission losses are reduced from the existing level of 30% to an average of 20%, the water supply available for consumption would increase by 5.1 MLD, and raise the per capita availability of water to 118 lpcd at the consumers' end. This indicates that the city has an immediate need of augmentation of its bulk water supply.

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Table 29 *continued*

Performance Area	Typical Norm	Sangli-Miraj-Kupwad	Key Inference
Quality		Potential need for improvement in quality	The banks at the upstream of the Krishna River house several sugarcane industries, which release a huge amount of untreated industrial waste into the river. Thus, the water from the Krishna River, especially during the summer, is highly polluted due to high algae content. This results in poor quality of water to the city and overloading of the water treatment plant. Hence, there is a need to change the water source.
Treatment			
Installed capacity of the water treatment plant	100%	100%	The installed capacity available is sufficient for treatment of the current bulk supply. Also, the existing treatment plant is utilized at 92% of capacity, indicating that there is no immediate need for augmentation of the water treatment plant.
Treatment loss	Less than 3%		As per norms
Transmission and Distribution			
Losses	Less than 15%	30%	Transmission losses are very high due to leakages from old corroded pipes.
Consumer			
Coverage (connections/total households)	100%	91%	Assuming that one connection caters to two households, the city should ideally have 53,000 connections. Additional direct connections need to be provided, and the public standposts should be removed.
Metering/Total connections	100%	85 %	Only 60% of the meters are functional. Thus, meters need to be replaced.
Duration of water supply	24 hours	Ranges from 1 hour to 4 hours a day	This is not sufficient and needs to be improved. Losses need to be reduced and operations made more efficient.
Non-revenue water	Less than 20%	43%	Against a revenue potential of Rs250 million,[a] SMKMC raises a water demand of only Rs140 million. Thus, a reduction in technical and commercial losses can generate additional revenue of Rs110 million.
Operation and maintenance cost recovery	100%	93%	The tariff in SMK is already high compared to that in other cities. There is a need to increase operational efficiency and reduce energy costs to improve cost recovery.

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Table 29 *continued*

Performance Area	Typical Norm	Sangli-Miraj-Kupwad	Key Inference
Unit production cost Unit income		Rs6.48/kl Rs6.02/kl	There is a need to increase operational efficiency and reduce energy costs to improve cost recovery.
Collection efficiency	100%	82%	There is scope for improvement in collection efficiency.

CPHEEO = Central Public Health and Environmental Engineering Organisation; DPR = detailed project report; kl = kiloliter; km = kilometer; lpcd = liter per capita per day; MLD = million liters per day; Rs = rupees; SMK = Sangli, Miraj, and Kupwad; SMKMC = Sangli-Miraj-Kupwad Municipal Corporation; UIDSSMT = Urban Infrastructure Scheme for Small and Medium Towns.

[a] The revenue potential has been estimated by factoring in quantum of water supplied for distribution vis-a-vis the cost involved in per unit production of water supply.

Source: CRISIL analysis on the basis of data provided by Sangli-Miraj-Kupwad Municipal Corporation.

Identification of Key Issues

After the assessment of the water supply services in SMK, the next step is for the ULB to clearly list the key service and infrastructure-related issues faced by the towns. Based on the status of the water supply system, key indicators, and the resultant inferences, the following areas appear to need investment on a priority basis:

(i) shifting of raw water source from Krishna River to Warna to improve water quality,
(ii) rehabilitation and/or replacement of existing transmission and distribution infrastructure to reduce technical losses to minimum acceptable standards, and
(iii) installation of meters.

Review of Water Supply Projects with Approved Detailed Project Reports

Having identified the key issues in the existing status of provisioning of water supply services in the towns, the next activity is to undertake a brief review of the projects that have already been identified for SMK under various schemes for improvement of the water supply services. The SMKMC has identified the following projects for the water supply sector (see Table 30).[6]

Step 2: Choice between Public Funding and the PPP Option

Having undertaken the assessment of the existing status of the water supply services in the towns, identified key issues, and briefly reviewed the projects identified by the municipal corporation, the next stage involves choosing between public funding and implementation of the proposed project and the private or the PPP-based mode of developing and implementing the project. This decision requires a viability assessment to be undertaken.

A preliminary financial analysis has already been undertaken to assess the commercial viability of the projects identified to determine whether they are to be developed in a public–private partnership (PPP) mode. The viability assessment undertaken in the following sections has largely focused on determining whether the public sector, i.e., the SMKMC, or the private sector has the financial means to undertake the project. The investment required under both scenarios has been looked at. In addition, the option of the Viability Gap Fund (VGF) has been considered to help assess the viability of the project from a private sector perspective.

[6] For the purpose of this assessment, a detailed review of the projects proposed has not been undertaken.

Table 30 Proposed Water Supply Projects for Sangli, Miraj, and Kupwad

Potential Area of Investment	Scheme Proposed	Details
Shifting of raw water source from Krishna River to Warna to improve water quality	Proposed under UIDSSMT scheme Project 1: For Sangli and Kupwad: comprising of source augmentation of 58 MLD, distribution network of 100 km, upgrading of water treatment plant, etc. Project 2: For Miraj: comprising of pumping station, elevated storage reservoir, distribution network, headworks at Krishna River and water treatment plant	Capital expenditure required (DPR): Rs1,450 million Capital expenditure required (escalated): Rs1,820 million JNNURM Grant: Rs1,000 million SMKMC contribution: Rs110 million and escalation of Rs710 million
Rehabilitation and/or replacement of existing transmission and distribution infrastructure to reduce technical losses to minimum acceptable standards	Under Sujal Nirmal Abhiyan Scheme: includes a distribution network for the Kupwad region, construction of ESRs at Sangli and Miraj, upgrading of water treatment plant, and construction of pumping stations	Capital expenditure required (DPR): Rs280 million. Capital expenditure required (escalated): Rs320 million Grant: Rs168 million SMK contribution: Rs152 million
SMKMC would need to invest an additional Rs400 million for rehabilitation of the distribution network at Sangli	No proposed scheme	

DPR = detailed project report; ESR = elevated storage reservoir; JNNURM = Jawaharlal Nehru National Urban Renewal Mission; km = kilometer; MLD = million liters per day; Rs = rupees; SMK = Sangli, Miraj, and Kupwad; SMKMC = Sangli-Miraj-Kupwad Municipal Corporation; UIDSSMT = Urban Infrastructure Scheme for Small and Medium Towns.

Source: Project information as provided by Sangli-Miraj-Kupwad Municipal Corporation.

The set of key assumptions used in undertaking the financial analysis is shown in Table 31. From the DPR review presented, it can be observed that Sangli plans to undertake projects worth Rs2,540 million up to FY2011. For these projects, Sangli needs to arrange for a capital investment of Rs1,370 million.

CRISIL undertook a preliminary financial analysis to understand the applicability of PPP for the above-mentioned projects. The key assumptions of the analysis are outlined in Table 31.

Based on the assumptions stated in Table 31, the preliminary financial assessment has been undertaken to review the viability of undertaking the project under two scenarios: Option 1, where the investments identified for the proposed projects are made by the SMKMC; and Option 2, where the investments identified for the proposed projects are to be fully funded by the private developer.

Under Option 1, the SMKMC would have to invest a total of Rs1,370 million (excluding grant amount) and, in addition, incur the operations cost of an average of Rs370 million per annum.[7] This results in a net cash flow of Rs1,230 million (net present value), considering that the revenue from the water supply would accrue to the

[7] The operations cost incurred by the SMKMC is higher than the estimate for private operator. This is since, it is assumed that cost efficiency levels would be low on SMKMC's side.

Table 31 Assumptions of Preliminary Financial Analysis

Particulars	Assumptions
Phasing of capital expenditure	Over a period of 4 years
Raw water transmission losses	2%
Treatment losses	2%
Distribution losses	20% in case of SMKMC 15% in case of private operator
Tariff[a]	A current weighted average tariff of Rs12.04/kl, with 3% revision every year
Collection efficiency	82% in case of SMKMC 90% in case of private operator
Cost reduction efficiency	0% in case of SMKMC 20% in case of private operator

kl = kiloliter, SMKMC = Sangli-Miraj-Kupwad Municipal Corporation.

[a] It is the weighted volumetric tariff calculated on the basis of the current tariff structure.

SMKMC and the operational efficiencies be at a moderate rate, as mentioned in Table 31. However, the SMKMC generates a revenue surplus of Rs50 million every year. Thus, it is not in a position to undertake the investment on its own.

Under Option 2, if the entire capital gap of Rs1,370 million (including the SMKMC's contribution) and the operations cost of Rs280 million per annum up to 2030 is incurred by the private operator, then it would need viability gap funding of Rs500 million. This is in spite of improved operational and managerial efficiencies brought in by the developer, as mentioned in Table 31, and the revenue being retained by the developer. The total grant of Rs1,160 million, along with the viability gap requirement of Rs500 million, would result in 65% of the total capital cost being funded by the government. This would defeat the purpose of undertaking the project on a PPP basis. Hence, it is not financially feasible for a private operator to invest and operate an integrated water supply project.

Table 32 presents the investment requirements under each option.

The analysis clearly shows that the SMKMC cannot implement the project on its own as it does not have the investment capacity of Rs1,230 million. Also, the integrated water supply project and operations cannot be done on a PPP basis, since it results in 60% of funding from the government. This option of PPP structure has been assessed to be not viable. It is, therefore, prudent to assess whether the PPP option can still be pursued under a modified form of PPP arrangement. The alternative PPP structuring options are now explored.

Step 3: Choice of PPP Structure

Having assessed the viability of developing the proposed project through a public-funded or PPP mode, the next step is to determine the choice of PPP structure that is best suited to address the overall needs of the proposed project.

Since the project cannot be undertaken on a PPP basis, Option 2—the PPP scenario—has been further reviewed, and two alternative PPP structuring options evaluated—Option 2(a): capital investment by private developer and revenue to be retained by private developer and Option 2(b): operation and maintenance (O&M) of project under PPP on an annuity basis.

Table 32 Investment Requirement with a PPP

Particulars	Capital Expenditure (Rs million)	In Case of Investment and Operations by SMKMC	In Case of Investment and Operations by Private Operator
DPR Cost	173		
Escalated cost	254		
Grant	117		
SMKMC share (expected) but envisaged to be sourced from Private operator (A)	18		
Viability gap from private sector (B)	119	(Net present value: 14%)	(Net present value: 14%)
Total investment required (A+B)	137	Rs1,232.2 million	Rs500.8 million

DPR = detailed project report, PPP = public–private partnership, Rs = rupees, SMKMC = Sangli-Miraj-Kupwad Municipal Corporation.

Source: Preliminary financial analysis.

Under Option 2(a), the water supply project would be designed, financed, and constructed on a PPP basis by a private developer. The private developer would undertake a net investment of Rs1,370 million. This is inclusive of the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) grant to be made available to such a private operator. Preliminary analysis shows that over a period of 20 years, the private operator would earn Rs950 million in such a scenario. Thus, the bidding parameter would be the annuity payment, which the private developer would make to the SMKMC.

The SMKMC would appoint a private operator under a performance management contract for the O&M of the entire water supply system. The private operator would be paid a fixed amount on an annual basis.

In this way, the SMKMC would have two PPP contracts: (i) an integrated water supply contract without an O&M contract, wherein the developer would invest in the system and the water supply revenues would accrue to the private operator; and (ii) a performance-based management contract for the entire water supply system, wherein the private developer would operate the entire water supply system, establish meters, and undertake billing and collection. The private developer would be paid on an annuity basis by the SMKMC.

Under the integrated water supply contract, the private developer would make investments in the projects identified by the ULB. However, the private developer would not be required to undertake the operation and management for the water supply operations. In return for the investment made by the private developer, the revenues, which accrue to the ULB from the consumers as per the tariff levied, would accrue to the private developer during the tenure of the contract. The responsibility of setting tariff, levying tariff, and collection of the user charges would remain with the ULB.

The performance-based management contract is one where the private developer is required to undertake the O&M of the entire water supply system from source to consumer, including metering, billing, and collection of revenues. All the capital investments needed for

improvement to the water supply and sewerage services would have to be borne by the public sector. The operating standards are as prescribed by the ULB. The private developer is given the rights to levy the user charges set by the ULB, collect the charges, and hand them over to the ULB. The ULB would make a performance-based payment to the private developer for the activities carried out.

The details of the obligations, risks, and payment arrangements under the performance-based management contract, as mentioned in Option 2(b), are provided in Part II, and the term sheet for this contract structure is attached in Part IV.

Step 4: Procurement

Having identified and finalized the PPP structure to be adopted for operating and maintaining the proposed project, the next stage is to plan the procurement process. To initiate the procurement process, the SMKMC would need to develop a transaction structure that covers aspects relating to details on the parties involved in the contract. These include the contractual relationship between the parties, nature of the arrangement, risk allocation, tariff to be levied, contract duration, performance indicators, payment terms, award criteria, and contract management strategy. Details are given in the term sheet in Part IV.

V Kolhapur

Brief Introduction to Kolhapur

Kolhapur city, popularly known as "the Door of Konkan," is the district headquarters of Kolhapur district in the State of Maharashtra. It covers an area of 66.82 square kilometers and has a current population of 564,000 (485,000 at the 2001 census). There are 120,000 households in the city. The city is managed by the Kolhapur Municipal Corporation (KMC), which had a total revenue budget of Rs1,050 million in fiscal year 2007 and an overall revenue surplus of Rs70 million. The total liabilities of KMC are estimated to be Rs1,000 million.

KMC manages the water supply works for the city, generating a revenue surplus of Rs15.3 million from its water supply services. KMC has unpaid liabilities of approximately Rs500 million for its water supply operations.

Water Supply System at Kolhapur

Kolhapur sources 152 million liters per day (MLD) of water from the rivers of Panchaganga and Bhogoti, and from Kalmba Lake. These sources are less than 10 kilometers from the city. Water from these sources is supplied to the four water treatment plants located at Pulkhadi, Bauda, Balinga, and Kalmba, and pure water is transmitted to the different zones of the city.

Kolhapur receives treated water supply of approximately 103 liters per capita per day (lpcd) at the consumption point. Of the 127 MLD of water that is available for distribution, only 58.5 MLD is available for consumption since the rest is lost due to technical and commercial leakages in the distribution system.

Water supply hours vary between the inner core of the city and the peripheral areas. While the main parts of the city receive water supply for 15 hours on average, the peripheral areas receive water for only 2 hours. This supply is received through individual connections and through public standposts. A basic profile of the water supply system of KMC is presented in Table 33.

Sewerage System at Kolhapur

KMC manages the sewerage system in Kolhapur. The city generates 80 MLD of sewage, which is carried through the open channels, or *nallahs* (drains that carry a mixture of natural runoff, sewage, and industrial waste), of Dudhali and Jayanti, pumped to the sewage treatment plant (STP) at Kasaba Bawada, and further disposed of into the Panchganga River.

The existing sewerage network measures 50 kilometers and primarily caters to the needs of the core city areas. The peripheral areas of the city are largely dependent on septic tanks from which sewage is carried to the nallahs. A brief profile of the sewerage system in the town is presented in Table 34, and the key inferences are discussed.

Step 1: Identification of the Problem Area

As a first step to assessing the status of the water supply services in the city of Kolhapur, a survey of problem areas in the existing system's services needs to be carried out. This would highlight the interventions required to improve the level of services. The first activity to undertake is a service assessment against a few key performance criteria. On the basis of the assessment, the key issues in the current system would need to be identified and the existing projects reviewed. It

Table 33 Basic Profile of Water Supply Services in Kolhapur

Kolhapur Utility Profile			
Key infrastructure components	Bulk supply		152 MLD
	Water treatment capacity		153 MLD
	Treated water available for consumption		100 lpcd
	Storage capacity	18 elevated storage reservoirs	30 MLD (equivalent to 30% of treated supply)
		5 ground storage reservoirs	15.1 MLD
	Distribution network	400 kilometers	
	Connections	83,000 (69% of total households)	
Water supply financials (FY2007)	Water account revenue	Rs211.1 million	
	Annual operation and maintenance costs	Rs195.8 million	
Tariff	Volumetric tariff	Up to 20,000 liters consumption	Rs140 bimonthly
		20,000–40,000 liters consumption	Rs8/kl
		>40,000 liters consumption	Rs9/kl

FY = fiscal year, kl = kiloliter, lpcd = liter per capita per day, MLD = million liters per day, Rs = rupees.

Source: Kolhapur Municipal Corporation.

Table 34 Basic Profile of Sewerage Infrastructure in Kolhapur

Kolhapur Utility Profile—Sewerage System			
Key infrastructure components	Sewage generated		80 MLD
	Sewerage treatment capacity	Kasaba Bawada	45 MLD
	Sewerage network	50 km	
	Current disposal practice	Treated and untreated waste is dumped into the Panchganga River	
Financials (FY2007)	Sewerage revenues	No revenues from sewerage	
	Sewerage annual operation and maintenance costs (FY2007)	Rs1 million per annum	
Sewerage charges	Tariff	No sewerage charge levied	

FY = fiscal year, km = kilometer, MLD = million liters per day, Rs = rupees.

Source: Kolhapur Municipal Corporation.

should be noted that the assessment presented here for Kolhapur is based only on a few key parameters. For the detailed review discussed in Part I of the tool kit, the urban local body (ULB) would be required to carry out a consumer survey, water audit, leak detection, and energy audit for the entire value chain of water supply services.

Water Supply

Compiling Key Parameters

Based on the preliminary analysis of the water supply service data[8] and discussions with KMC officials, CRISIL Risk and Infrastructure Solutions Limited (CRISIL) assessed the current water supply system in Kolhapur. Table 35 presents the key indicators for assessing the water supply system at Kolhapur and their inferences.

Table 35 Water Supply Indicators for Kolhapur

Performance Area	Norm	Kolhapur	Key Inference
Bulk Water			
Supply (per capita treated water available for consumption)	135 lpcd	103 lpcd	Although Kolhapur sources 152 MLD (269 lpcd) of water, the amount available for consumption is just 103 lpcd as a result of high transmission and distribution losses. If the existing transmission and distribution losses are reduced from the current level of 71% to an average of 22%, the water available would increase by 64 MLD and raise per capita availability for consumption to 217 lpcd. Thus, in order to increase the water supply, the city does not need to augment the source but focus on reduction of the existing transmission, treatment, and distribution losses in the system.
Quality		Poor water quality	About half of the population of Kolhapur receives polluted water since the present source is located downstream of the sewage discharge. This is primarily because major polluted nallahs, such as Jayanthi and Dhudhali, carry wastewater and sewage from the unsewered parts of the city and dump it into the Panchganga River. This has been causing pollution of the river downstream.
Raw water transmission	Less than 2%	11%	Raw water transmission losses that are extremely high owing to corroded pipelines and theft.
Treatment			
WTP capacity	100%	99%	The existing installed capacity of the WTPs is sufficient and caters to the entire water supply. However, the WTP at Bawada is not functioning properly as it is obsolete and requires upgrading.
Treatment loss	Less than 3%	6%	The treatment loss is high on account of an obsolete treatment plant, resulting in more than acceptable levels of losses.

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[8] In the absence of a water or energy audit report, the data provided by the municipal representatives has been considered for all the assessments. The actual technical losses may be more or less than that stated and can be verified only if water audit is undertaken along with consumer survey.

Table 35 *continued*

Performance Area	Norm	Kolhapur	Key Inference
Transmission and Distribution			
Losses	Less than 15%	54%[a]	The transmission losses are extremely high due to corroded water transmission pipelines and illegal connections approximating to 10% of the total connections. The losses are at alarming levels and require immediate intervention in terms of replacement, rehabilitation of pipelines, improved operational efficiencies, and reduction of illegal connections.
Consumer			
Coverage	95%–100%	100%[b]	Assuming that one connection caters to two households, the city should ideally have 60,000 connections. The city has 23,000 more connections than the ideal number of connections, in addition to the 3,000 public standposts.
Metering	100%	100%	All the connections are metered; however, only 80% are functional, indicating commercial loss due to incorrect readings and approximations from the faulty meters.
Duration of water supply	24 hours	2–15 hours each day[c]	The supply hours vary across the city. Efforts to increase the current supply hours across the city need to be made.
Operation and maintenance cost recovery	100%	100%[d]	The water account of KMC showed a surplus of Rs15.3 million in FY2007. A full-cost recovery indicates the implementation of rational tariff levels.
Unit production cost Unit income		Rs3.53/kl Rs3.80/kl	The current per unit (kl) revenue realization is at satisfactory levels.
Collection efficiency	100%	67%[e]	Collection efficiencies are low. KMC has arrears amounting to Rs60 million. The overall efficiency levels, therefore, need to be improved substantially.

FY = fiscal year, kl = kiloliter, KMC = Kolhapur Municipal Corporation, lpcd = liter per capita per day, MLD = million liters per day, Rs = rupees, WTP = water treatment plant.

[a] The loss levels here take into account transmission loss, treatment loss, and distribution loss. Treatment and raw water transmission losses have been estimated to be at minimal acceptable levels, as understood from KMC officials.

[b] In the absence of accurate information on the number of households served by each connection, it has been assumed that one connection serves two households.

[c] In some zones of Kolhapur, water is supplied for only 2 hours in a day while few other zones in the city receive supply for 15 hours in a day.

[d] Though a 100% O&M cost recovery is indicative of efficient management of water supply system, in the case of KMC, this does not depict a correct picture owing to the high transmission and distribution (T&D) losses, commercial losses, and the high non-revenue water loss levels.

[e] Figure refers to current revenue collections against current demand raised.

Source: CRISIL analysis and data provided by Kolhapur Municipal Corporation.

Identification of Key Issues

After the assessment of the water supply services in Kolhapur, the next step is for the ULB to clearly list all the service and infrastructure related issues being faced by the current water supply system in the city. Based on the status of the water supply system, key indicators, and the resultant inferences, the following areas appear to need investment on a priority basis:

(i) rehabilitation and/or replacement of existing transmission and distribution infrastructure to reduce technical losses to minimum acceptable standards;
(ii) augmentation or improvements to the existing treatment plant to reduce treatment losses;
(iii) improvement in the water quality of the city by establishing an adequate sewerage system and improving its efficiencies; and
(iv) improved management of the distribution network, including installation and maintenance of the installed meters.

Since the pollution of the raw water source in the city is directly linked to the existing status of the sewerage infrastructure, it has been judged prudent to address the issues of the sewerage sector of the city. A review of the sewerage infrastructure has been carried out. A brief on the sewerage sector and its assessment is presented in the following subsections.

Sewerage Sector

Compiling Key Parameters

Based on the preliminary analysis of sewerage service data[9] and discussions with KMC officials, CRISIL assessed the current sewerage system in Kolhapur. Table 36 presents the key

Table 36 Key Sewerage Indicators for Kolhapur

Performance Area	Norm	Kolhapur	Key Inference
Sewerage Infrastructure			
Coverage	95%–100%	35%	The current sewerage pipelines cover only 35% of the total extent of the city. The pipelines are present only in the core parts of the city, leaving the peripheral and newly developed areas unsewered. Also, the existing pipelines are approximately 40 years old and corroded, requiring rehabilitation or replacement.
Treatment capacity	100%	38%	The existing STP has an installed treatment capacity of 45 MLD. However, because the STP is obsolete, it treats a very small quantity of sewage. There is an immediate need to upgrade and augment the treatment capacity of the STP to ensure 100% treatment.
Disposal		Untreated sewage disposed of in the river	This contaminates the river, leading to health problems and violation of environmental norms.
Consumer			
Operation and maintenance cost recovery	100%	0%	Since KMC does not levy sewerage charges, the operations costs are met from the general budget of KMC.

KMC = Kolhapur Municipal Corporation, MLD = million liters per day, STP = sewage treatment plant.

Source: CRISIL analysis on the basis of data provided by Kolhapur Municipal Corporation.

[9] In the absence of a water or energy audit report, the data provided by the municipal representatives has been considered for all the assessments. The actual technical losses may be more or less than that stated and can be verified only if water audit is undertaken along with consumer survey.

indicators for assessing the sewerage system at Kolhapur.

Identification of Key Issues

Based on the status of the sewerage system, and key indicators and inferences, the following areas have been earmarked for investment on a priority basis:

(i) augmentation of the STP,
(ii) expansion of the sewerage network in the city, and
(iii) rehabilitation or replacement of existing rising mains and pipelines.

Review of Water Supply Projects with Approved Detailed Project Reports

Having identified the key issues in the existing status of provisioning of water supply and sewerage services in the city, the next activity is to undertake a brief review of the projects that have already been identified for Kolhapur under various schemes for improvement of the water supply and sewage treatment services. Table 37 lists the projects KMC has identified.[10]

Table 37 Proposed Water Supply and Sewerage Projects for Kolhapur

Proposed Area of Investment	Scheme Proposed	Details
Augmentation of capacity of water treatment plant and rehabilitation of transmission lines	Proposed under UIDSSMT scheme It includes the augmentation of the water treatment plant by 36 MLD, 60 kilometers of distribution network, 10 kilometers of raw water rising main and pumping machinery.	Capital expenditure required (DPR): Rs590 million Capital expenditure required (escalated cost): Rs700 million UIDSSMT grant: Rs531 million KMC's contribution: Rs59 million and escalation cost of Rs120 million
Sewage treatment plant augmentation and expansion of the sewerage network	UIDSSMT: 80 MLD sewage treatment plant, pumping stations, and distribution network	Capital expenditure required (DPR): Rs1,750 million Capital expenditure required (escalated cost): Rs2,100 million UIDSSMT grant: Rs288 million[a] KMC's contribution: Rs32 million Plus escalation and unapproved cost of Rs1,780 million

DPR = detailed project report, KMC = Kolhapur Municipal Corporation, MLD = million liters per day, Rs = rupees, UIDSSMT = Urban Infrastructure Development Scheme for Small and Medium Towns.

[a] The approved cost is Rs320 million only.

Source: Kolhapur Municipal Corporation.

[10] For the purpose of this assessment, a due diligence on the project components and costs has not been undertaken.

Step 2: Choice between Public Funding and the PPP Option

Having undertaken the assessment of the existing status of the water supply services in the city, identified key issues, and briefly reviewed the projects identified by the city, the next stage involves choosing between the public mode of funding and implementing of the proposed project and the private or public–private partnership (PPP) based mode of developing and implementation of the project. The decision requires a viability assessment to be undertaken.

As mentioned earlier, a preliminary financial analysis has been undertaken to assess the viability of the projects identified. This assessment has been for the purpose of assessing the commercial viability of the project if it is to be developed on a PPP mode. The viability assessment undertaken in the following sections have largely focused on determining whether the public sector, i.e., KMC, or the private sector has the financial wherewithal to undertake the project. The investment need under both scenarios has been looked at. Additionally, for assessing the viability of the project, from the private sector perspective, the option of Viability Gap Fund (VGF) support has also been considered.

From the preceding analysis, it can be observed that Kolhapur plans to undertake projects worth Rs2,800 million by FY2011. Kolhapur needs to arrange for a capital investment of Rs1,980 million to execute these projects.

A preliminary financial analysis has been undertaken in the context of exploring a PPP-based alternative to fund the project requirement at Kolhapur. The key assumptions, which have been considered, are presented in Table 38.

Based on the assumptions in Table 38, the preliminary financial assessment has been undertaken to review the viability, if undertaking the project under two scenarios: Option 1, where the investment identified for the projects is made by KMC; and Option 2, where the investments identified for the proposed projects are to be fully funded by the private developer.

Under Option 1, KMC would have to invest a total of Rs1,989 million (excluding grant amount) and, in addition, incur the operations cost of an average of Rs460 million per annum.[11] This results in a net cash outflow of Rs1,340 million (net present value) considering that the revenue from the water supply and sewerage would accrue to KMC and the operational efficiencies at a moderate rate, as mentioned in Table 38. Although, KMC

Table 38 Key Assumptions

Particulars	Assumptions
Phasing of capital expenditure	Over a period of 4 years
Raw water transmission losses	2%
Treatment losses	2%
Distribution losses	30%, if managed by KMC 15%, if managed by private developer
Tariff[a]	Rs7.95 per kiloliter,[b] with 3% revision every year
Collection efficiency	Phased from 67% to 80%, if managed by KMC
	Phased from 80% to 90%, if managed by private developer
	0%, if managed by KMC
Cost reduction efficiency	20%, if managed by private party up to 2011

KMC = Kolhapur Municipal Corporation, Rs = rupees.
[a] The tariff assumed is the weighted volumetric tariff calculated on the basis of the current tariff structure.
[b] The operations cost incurred by KMC is higher than that incurred by the private operator as it does not bring cost efficiency.

[11] The operations cost incurred by KMC is higher than that incurred by the private operator as it does not bring cost efficiency.

generates a revenue surplus of Rs70 million, it has liabilities of more than Rs1,000 million. In such a scenario, KMC is not in a position to invest in this project.

Under Option 2, if the entire capital gap of Rs1,989 million (including KMC's contribution) and the operations cost of Rs280 million per annum up to 2030 are incurred by the private operator, the private operator would earn Rs300 million (net present value). This is primarily due to the improved operational and managerial efficiencies brought and the revenue retained by the developer. Therefore, the project can be undertaken on a PPP basis.

Table 39 presents the investment requirements under each option.

The analysis clearly shows that the option of developing the project on a fully government-funded mode is not viable given the huge investment need and the limited fund availability at KMC. However, the second option of the investment being made by the private developer, who also undertakes operations and management of the services, is assessed to be a viable option. This is because of the high operational efficiencies that the private developer would bring to the water supply and sewerage service, which would also make it viable for the private developer.

Step 3: Choice of PPP Structure

Having assessed the viability of developing the proposed project through a public-funded or PPP mode of funding, the next step is to determine the choice of PPP structure that is best suited to address the overall needs of the proposed project.

Since the above-mentioned structure involves the private developer making investments in the development of the water supply and sewerage services and overseeing the operations and management of the sewerage services, the feasible PPP structure for Kolhapur is that of an integrated concession agreement for water supply and sewerage services, including operations and management of the system.

An integrated concession agreement for water supply and sewerage services is a PPP contract in which the private developer would be required to undertake investments for creation of assets in the water supply and sewerage value chain and would also be required to undertake the O&M of the entire system for the period of the

Table 39 Investment Requirement with a PPP

Particulars	Capital Expenditure (Rs million)	In Case of Investments and Operations by KMC	In Case of Investments and Operations by Private Operator
DPR cost	2,340		
Escalated cost	2,810		
Grant	820		
KMC share (expected) but envisaged to be sourced from Private Operator [A]	910		
Gap from Private Sector [B]	1,898	(Net present value: 14%)	(Net present value: 14%)
Total investment required Party A+B	1,989	Rs1,340 million	Rs301.5 million

DPR = detailed project report, KMC = Kolhapur Municipal Corporation, PPP = public–private partnership, Rs = rupees.

Source: Preliminary financial analysis.

concession. In this concession agreement, the private developer would be required to design, finance, construct, operate, and manage the water supply and sewerage services for the concession period. The capital investment required for undertaking the augmentation works would be met wholly or partly by the private developer. The private developer would recover the investments made by collecting and retaining user charges levied on consumers. Any change to the tariff, the rate of escalations, etc., would be determined by the ULB.

The details of the obligations, risks, and payment arrangements under this performance-based management contract are provided in Part II of this tool kit, and the term sheet for this contract structure is provided in Part IV.

Step 4: Procurement

Having identified and finalized the PPP structure to be adopted for operating and maintaining the proposed project, the next stage is to plan the procurement process. To initiate the procurement process, KMC would need to develop a transaction structure that covers aspects relating to details on the parties involved in the contract. These include the contractual relationship between the parties, nature of the arrangement, risk allocation, tariff to be levied, contract duration, performance indicators, payment terms, award criteria, and contract management strategy. Details are given in the term sheet in Part IV.

VI Virar

Brief Introduction to Virar

Virar is a suburban city to the north of Mumbai. It is located in the Thane district of Maharashtra and covers an area of 19.6 square kilometers. The current population of the city is 246,000 (119,000 at the 2001 census), and there are 99,740 households. The city is governed by the Virar Municipal Council (VMC). VMC has a total revenue budget of Rs700 million (fiscal year 2007) and a revenue surplus of Rs3.9 million. Besides, VMC has liabilities of approximately Rs170 million.

Water supply works (from source augmentation to treatment) for Virar is managed as part of a joint scheme with three other cities—Vasai, Navghar-Manikpur, and Nalasopara. The scheme is managed by a joint committee formed by the four urban local bodies (ULBs), and a joint account is maintained.

Water Supply System at Virar

Virar's total water supply of 27 million liters per day (MLD) is drawn from two sources: Surya headworks (17 kilometers [km]) and the Uzgaon headworks (60 km). Under a joint scheme, a total of 100 MLD water is supplied to four cities, including Virar. From the Surya headworks, Virar is supplied 20 MLD. The city also receives 7 MLD from the Uzgaon headworks.

The total treated water supply available for consumption is 21 MLD (85 liters per capita per day [lpcd]). Water is available for 3 hours every day and is supplied through individual

Table 40 Basic Profile of Water Supply Services in Virar

Virar Utility Profile			
Key infrastructure components	Bulk supply		27 MLD
	Water availability for consumption	85 lpcd	
	Water treatment capacity	Surya headworks (joint scheme)	100 MLD
		Uzgaon	20 MLD
	Storage capacity	5 elevated storage reservoirs	4.9 MLD
		2 ground storage reservoirs	2.75 MLD
	Distribution network	70 kilometers	
	Connections	9,200	
Water supply financials (FY2007)	Water account revenue	Rs82.6 million	
	Annual operation and maintenance costs	Rs88.0 million	
Tariff	Flat tariff structure	Rate differs depending upon type of property and type of connection, e.g., Rs40 per month for slums, Rs120 per month for flats, etc.	

FY = fiscal year, lpcd = liter per capita per day, MLD = million liters per day, Rs = rupees.

Source: Virar Municipal Council.

connections and public standposts. The total number of direct connections is 9,200, of which none is metered. A basic profile of the water supply system of VMC has been presented in Table 40.

Step 1: Identification of the Problem Area

As a first step to assessing the status of the water supply services in the city of Virar, a survey of problem areas in the existing system's services needs to be carried out. This would highlight the interventions required to improve the level of services. The first activity to undertake is a service assessment against a few key performance criteria. On the basis of the assessment, the key issues in the current system would need to be identified and existing projects reviewed. The assessment presented for Virar is based only on a few key parameters. For a detailed review discussed in Part I of the tool kit, the ULB would be required to carry out a consumer survey, water audit, leak detection survey, and energy audit for the entire value chain of water supply services.

Compiling Key Parameters

Based on the preliminary analysis of water supply service data[12] and discussions with VMC officials, CRISIL Risk and Infrastructure Solutions Limited (CRISIL) assessed the current water supply system in Virar. Table 41 presents the key indicators for assessing the water supply system at Virar.

Identification of Key Issues

After assessing the water supply and sewerage services in Virar, the next step is for the urban local body (ULB) to clearly list all the service and infrastructure-related issues being faced by the current water supply system in the city. Based on the status of the water supply system, key indicators, and the resultant inferences, the following areas appear to need investment on a priority basis:

(i) repair and rehabilitation of the identified stretch of distribution network to reduce losses due to pipeline leakages;
(ii) increased operational efficiencies especially at the distribution end; and
(iii) installation of meters at all points of bulk distribution and consumption, and adoption of a volumetric-based tariff system.

Review of Water Supply Projects

Having identified the key issues in the existing status of provisioning of water supply services in the city, the next activity is to undertake a brief review of the projects that have already been identified for Virar under various schemes for improvement of the water supply services. Table 42 lists the projects VMC has identified for the water supply sector.[13]

The source augmentation projects mentioned in Table 42 are currently under preparation and no approvals for either project have been received. Since the current proposal is, at best, an estimate and no decision has been taken, these projects have not been considered while exploring the public–private partnership (PPP) alternatives for water supply operations in Virar.

Step 2: Choice between Public Funding and the PPP Option

Having undertaken the assessment of the existing status of water supply services in the city, identified key issues, and briefly review of the projects identified by the city, the next stage involves choosing between the public mode of funding and implementation of the proposed project and the private or public–private partnership (PPP)-based mode of developing

[12] In the absence of a water or energy audit report, the data provided by the ULB representatives has been considered for all the assessments. The actual technical losses may be more or less than that stated and can be verified only through water audit.

[13] For the purpose of this assessment, a due diligence on the project components and costs has not been undertaken.

Table 41 Key Water Supply Indicators for Virar

Performance Area	Norm	Virar	Key Inference
Bulk Water			
Supply (per capita consumption)	135 lpcd	85 lpcd	Reduction of losses from 20% to 15% and utilization of the entire quota of 36 MLD increases water availability to 120 lpcd. Hence, there is no urgent need to augment water supply to Virar.
Treatment			
Water treatment plant capacity	100%	100%	There may be a need to increase the capacity of the water treatment plant if the water supply is increased. However, this is not urgent.
Treatment loss	Less than 3%	2%	Loss levels are as per acceptable standards.
Transmission and Distribution			
Losses	Less than 15%	22%[a]	The level of losses is moderate and distribution losses are primarily due to leaking pipelines. The loss level can be brought down by improved operational efficiency, including better leakage management.
Consumer			
Coverage	95%–100%	100%[b]	This is inclusive of only direct service connections.
Metering	100%	0%	No meters have been installed at the consumer end; a flat tariff structure is prevalent.
Duration of water supply	24 hours	3 hours each day	Supply hours are inadequate and need to be increased.
Operation and maintenance cost recovery	100%	94%	There is a deficit of Rs5 million largely on account of high energy bills. There is a need to implement energy-saving measures and ensure improved operational efficiencies. Illegal connections need to be identified and reduced.
Unit production cost Unit income		Rs8.93/kl Rs8.38/kl	Per unit revenue realization is at moderate levels; however, it can be further improved to ensure full-cost recovery.
Collection efficiency	100%	78%[c]	Collection efficiencies need to be improved substantially.

lpcd = liter per capita per day, MLD = million liters per day, Rs = rupees.

[a] The loss levels include transmission loss and distribution loss. Treatment and raw water transmission losses have been estimated to be at minimal acceptable levels as understood from VMC officials. In the absence of meters, the leakages in the distribution network cannot be accurately established.

[b] As per VMC officials, one connection serves 12 households.

[c] Figure refers to current revenue collections against current demand raised.

Sources: CRISIL analysis and discussions with Virar Municipal Council officials.

and implementation of the project. This decision requires a viability assessment to be undertaken.

However, as the project assessment shows, the council currently does not envisage undertaking any major capital investment work. Discussion with VMC officials indicate that to reduce distribution losses, the rehabilitation of 26 km of pipeline would be undertaken as a part of regular ongoing civil works of VMC, and a separate project does not need to be developed. This indicates that the current operations and management of the water supply by VMC is satisfactory.

Table 42 Proposed Water Supply Projects

Proposed Area of Investment	Scheme Proposed	Details
Augmentation of water supply under the current joint scheme (Surya headworks) for the four cities	Project for source augmentation of 125 MLD for supply to all the municipal councils, to be executed by MMRDA.	DPR cost: Rs6,729 million
Augmentation of water supply for Vasai–Virar municipal councils	Project for source augmentation of 300 MLD to be executed by MMRDA.	Capital cost: Rs11,000 million (approximate) DPR currently under preparation
Installation of meters	No proposed scheme	

DPR = detailed project report, MLD = million liters per day, MMRDA = Mumbai Metropolitan Regional Development Authority, Rs = rupees.

Sources: Virar Municipal Council and Maharashtra Jeevan Pradhikaran.

In such a scenario, the only area of improvement is installation of meters and improved efficiency in billing and collection. A preliminary financial analysis has been undertaken in the context of exploring PPP for undertaking the metering, billing, and collection.

The introduction of metering in the system may be done under a PPP structure in which the metering, billing, and collection of water supply charges is outsourced to a private operator. The viability assessment has been carried out to assess whether VMC should undertake the investments required for installation, operation, and management of meters, and generation of bills and collection, or whether these activities could be better managed by a private developer.

The key assumptions of the analysis are outlined in Table 43.

Based on the assumptions in Table 43, the preliminary financial assessment has been

Table 43 Key Assumptions

Particulars	Assumptions
Cost of a meter (including installation charges)	Rs4,000 per meter
Cost of computer software	Rs100,000 (one-time cost)
Maintenance cost of meters	8% of capital expenditure
Computer software maintenance cost	15% of capital expenditure.
Meter connection charges	Rs1,000 per meter
Increase in water tariff	3% per annum
Population growth rate (compounded annual growth rate)	9.5% per annum
Tariff	Volumetric tariff of Rs8/kl[a]
Collection efficiency	78% in case of Virar Municipal Council 95% in case of PPP
Period of contract/evaluation	Period of 5 years up to 2013
Cost reduction efficiency (O&M costs)	0% in case of Virar Municipal Council 20% in case of PPP

kl = kiloliter, O&M = operation and maintenance, PPP = public–private partnership, Rs = rupees.

[a] Virar Municipal Council has an existing tariff schedule of Rs8 per kiloliter volumetric tariff in case of metered connections.

undertaken to review the viability of undertaking the project under two scenarios: Option 1, where the investments identified for the proposed metering, billing, and collection are made by VMC; and Option 2, where the investments identified for the proposed metering, billing, and collection are fully funded by the private developer.

Under Option 1, VMC would have to invest a total capital expenditure of Rs50 million (in the first year) and also incur an operations cost of Rs13 million per annum. With metering and a volumetric tariff, VMC would earn water supply charges of Rs390 million by 2013. With a revenue surplus of just Rs3.9 million, VMC does not have the potential to incur this magnitude of expenditure and, therefore, it is not in a position to incur this investment on its own.

Under Option 2, where a private operator undertakes the metering, billing, and collection activity, the private operator would incur a total capital expenditure of Rs50 million (in the first year), in addition to an operation cost of Rs10 million per annum. The water supply charges generated would be Rs450 million by 2013. VMC would have to pay a minimum annuity to the private operator.

Thus, VMC can undertake the metering, billing, and collection through PPP wherein VMC need not incur an expenditure of Rs50 million up front and also earns additional revenue of about Rs100 million up to 2013 as a result of the operational and revenue collection efficiency of the private entity.

Step 3: Choice of PPP Structure

Having assessed the viability of developing the proposed project through a public-funded or PPP mode, the next step is to determine the choice of PPP structure that is best suited to address the overall needs of the proposed project.

Since the above-mentioned structure involves the private developer making the investments for installation of meters and also being responsible for overseeing their operations and generating and collecting bills, the PPP structure suitable is that of a PPP agreement for metering, billing, and collection.

Under the service management contract for metering, billing, and collection, the private developer would be required to undertake investments for installation of meters at the consumer end, oversee their O&M, maintain a computerized data recording system, generate bills, and collect user charges from consumers. The private developer would not be required to undertake any other activity in the entire chain of water supply services. The type of meter to be installed and the number of connections where the meter is to be installed would be specified by the ULB. The tariff to be levied would also be determined by the ULB. The performance standards laid out by the ULB would specify parameters, such as the revenue collections target to be achieved, and the extent of meter functional levels that need to be maintained. The cost of purchase and installation of the meter would be generally recovered by the private developer from the consumer as part of the water supply service bills.

For the operation and maintenance activity undertaken by the private developer, a fixed annuity payment is made by the ULB. This annuity amount would generally be the bidding parameter.

Step 4: Procurement

Having identified and finalized the PPP structure to be adopted for operating and maintaining the proposed project, the next stage is to plan the procurement process. To initiate the procurement process, VMC would need to develop a transaction structure that covers aspects relating to details on the parties involved in the contract. There include the contractual relationship between the parties, nature of the arrangement, risk allocation, tariff to be levied, duration of the contract, performance indicators, payment terms, award criteria, and contract management strategy. Details are given in the term sheet in Part IV.

VII Navghar Manikpur

Brief Introduction to Navghar Manikpur

The city of Navghar Manikpur forms a part of the Thane district of Maharashtra. Located in close proximity to the suburban city of Virar, the city has an area of 16.5 square kilometers and a current population of 216,000 residents (116,000 at the 2001 census). The city is managed by the Navghar Manikpur Municipal Council (NMMC) and has an estimated 54,000 households. The council has a total revenue budget of Rs600 million (fiscal year 2007) and a revenue surplus of Rs6.2 million.

Water supply works for Navghar Manikpur is managed as part of a joint scheme of 120 million liters per day (MLD) with three other cities: Vasai, Virar, and Nallasopara. Together, these four cities have a joint committee that manages the bulk water supply, treatment, and supply of treated water to the four cities. NMMC generates marginal revenues of Rs700,000 from its water supply operations.

Existing Water Supply System

Navghar Manikpur draws a total water supply of 24 MLD. However, its total quota available under both schemes is 32 MLD. The total treated water available for consumption to the citizens is 18.4 MLD (85 liters per capita per day [lpcd]). Water is available for 3 hours every day and is supplied through individual connections. The total number of direct connections in the city is 5,541, and these are all unmetered. A basic profile of the water supply system of the Council is presented in Table 44.

Table 44 Basic Profile of Water Supply Services in Navghar Manikpur

Navghar Manikpur Utility Profile			
Key infrastructure components	Bulk supply		24 MLD
	Treated water available for consumption	100 lpcd	
	Water treatment capacity	Surya headworks (joint scheme)	100 MLD
		Uzgaon	20 MLD
	Storage capacity	6 elevated storage reservoirs	2.6 MLD
		5 ground storage reservoirs	1.85 MLD
	Distribution network	108 km	
	Connections	5,541	
Water supply financials (FY2007)	Water account revenue	Rs77.5 million	
	Annual operation and maintenance costs	Rs76.8 million	
Tariff	Flat tariff structure	Rs120 per month for residential connections Rs1,500 per month for industrial connections	

FY = fiscal year, lpcd = liter per capita per day, MLD = million liters per day, Rs = rupees.

Source: Navghar Manikpur Municipal Council.

Step 1: Identification of the Problem Area

As a first step to assessing the status of water supply services in the city of Navghar Manikpur, an assessment of the problem areas in the existing system's services needs to be carried out. This would highlight the interventions required to improve the level of services. The first activity to undertake is a service assessment against a few key performance criteria. On the basis of the assessment, the key issues in the current system would need to be identified and the existing projects reviewed. It should be noted that the assessment presented here for Navghar Manikpur is based on only a few key parameters. For the detailed review discussed in Part I of the tool kit, the urban local body (ULB) would be required to carry out a consumer survey, water audit, leak detection survey, and energy audit for the entire value chain of water supply services.

Compiling Key Parameters

Based on the preliminary analysis of the water supply service data[14] of the NMMC and discussions with its officials, CRISIL Risk and Infrastructure Solutions Limited (CRISIL) assessed its current water supply system. Table 45 present the key indicators for assessing the system.

Table 45 Key Water Supply Indicators for Navghar Manikpur

Performance Area	Norm	Navghar Manikpur	Key Inference
Bulk Water			
Supply (per capita consumption)	135 lpcd	85 lpcd	Reduction of distribution losses from 20% to 15% and utilization of the entire water supply quota of 32 MLD increases the water availability to 120 lpcd. Hence, there is no urgent need to augment water supply to Navghar Manikpur.
Treatment			
Water treatment plant capacity	100%	100%	There is no urgent need for increasing the capacity of the water treatment plant.
Treatment loss	Less than 3%	2%	Loss levels are as per acceptable standards.
Transmission and Distribution			
Losses	Less than 15%	22%[a]	Loss levels are moderate. Primarily frictional losses and can be brought down by improved operational efficiency, including better leak management.
Consumer			
Coverage	95%–100%	100%[b]	This includes only direct service connections.
Metering	100%	0%	No meters have been installed at the consumer end; a flat tariff structure is prevalent.
Duration of water supply	24 hours	3 hours each day	Inadequate supply hours. The supply hours need to be increased.
Operation and maintenance cost recovery	100%	100%	Full-cost recovery indicates the implementation of rational tariff levels and an overall efficiency in management of water supply activity.

continued on next page

[14] In the absence of a water or energy audit report, the data provided by the municipal representatives has been considered for all the assessments. The actual technical losses may be more or less than that stated and can be verified only if water audit is undertaken along with consumer survey.

Table 45 *continued*

Performance Area	Norm	Navghar Manikpur	Key Inference
Unit production cost Unit income		Rs8.77/kl Rs8.85/kl	The current per unit (kl) revenue realization is at satisfactory levels.
Collection efficiency	100%	95%[c]	Collection efficiencies are at satisfactory levels.

kl = kiloliter, lpcd = liter per capita per day, MLD = million liters per day.

[a] The loss levels here take into account raw water transmission loss and pure water distribution loss. Treatment and raw water transmission loss has been estimated to be at minimal acceptable levels as understood from the officials. In the absence of meters, the leakages in the distribution network cannot be accurately established.

[b] As per Navghar Manikpur Municipal Council officials, one connection serves two households.

[c] Figure refers to current revenue collections against current demand raised.

Sources: CRISIL analysis and data from Navghar Manikpur Municipal Council.

Identification of Key Issues

After assessing the water supply services in Navghar Manikpur, the ULB should clearly list all the service and infrastructure-related issues being faced by the current water supply system in the city. Based on the status of the water supply system, key indicators, and resultant inferences, the following areas appear to need investment on a priority basis:

(i) undertake a leakage study to capture the losses in the distribution system, and
(ii) install meters to understand the pattern of consumption and levy an unbiased tariff.

Review of Water Supply Projects

Having identified the key issues in the existing status of provisioning of water supply services in the city, the next activity is to undertake a brief review of the projects that have already been identified for Navghar Manikpur under various schemes for improvement of the water supply services. From discussions with the officials at Navghar Manikpur, it is understood that the following project is being planned (Table 46).

The source augmentation project, mentioned in Table 46, is currently under preparation and no approval has been received. Since the current proposal is, at best, an estimate and no decision has been taken on it, this project has not been considered while exploring the PPP alternatives for water supply operations at Navghar Manikpur.

Step 2: Choice between Public Funding and the PPP Option

Having undertaken the assessment of the existing status of water supply services in the city, identified the key issues, and briefly

Table 46 Key Water Supply Projects Planned and Proposed

Proposed Area of Investment	Scheme Proposed	Details
Augmentation of water supply under the current joint scheme	Proposed project for source augmentation of 125 MLD for supply to all the municipal councils, to be executed by MMRDA	Capital expenditure required (DPR): Rs6,729 million
Installation of meters	No proposed scheme	

DPR = detailed project report, MLD = million liters per day, MMRDA = Mumbai Metropolitan Regional Development Authority, Rs = rupees.

Sources: Navghar Manikpur Municipal Council and Maharashtra Jeevan Pradhikaran.

Table 47 Key Assumptions

Particulars	Assumptions
Cost of a meter (including installation charges)	Rs4,000 per meter
Cost of computer software	Rs100,000 (one-time cost)
Maintenance cost of meters	8% of capital expenditure
Computer software maintenance cost	15% of capital expenditure
Meter connection charges	Rs1,000 per meter
Increase in water tariff	3% per annum
Population growth rate (compounded annual growth rate)	8.1% per annum
Tariff	Volumetric tariff of Rs8/kl[a]
Collection efficiency	95% in case of both ULB and PPP
Period of contract / evaluation	Period of 5 years up to 2013
Cost reduction efficiency (operation and maintenance costs)	0% in case of ULB 20% in case of PPP

kl = kiloliter, PPP = public–private partnership, Rs = rupees, ULB = urban local body.

[a] In the absence of any general body resolution, the volumetric tariff of a town of similar nature has been considered.

reviewed the projects identified by the city, the next stage involves choosing between the public mode of funding and implementation of the proposed project and the private or public–private partnership (PPP)-based mode of developing and implementation of the project.

The assessment shows that no major capital investment is needed and the operation of the water supply system is at a satisfactory level. In such a scenario, the only area of improvement needed is to ensure that all connections are metered and that the consumers are charged on the basis of their consumption. This will also reduce wastage of water. Such a scenario requires installation of meters and improved efficiency in billing and collection.

Improvement in the overall water supply services in Navghar Manikpur, through the introduction of metering in the system, may be done under a PPP structure in which metering, billing, and collection of water supply charges are outsourced to a private operator. A viability assessment has been carried out to assess whether the NMMC should undertake the investments required for installation, operation, and management of meters, and also generate bills and collect payments, or whether this can be better managed by a private developer.

The key assumptions used to undertake the preliminary financial analysis are indicated in Table 47.

Based on the assumptions in Table 47, the preliminary financial assessment has been undertaken to review the viability of undertaking the project under two scenarios: Option 1, where the investments identified for the proposed metering, billing, and collection are made by the NMMC; and Option 2, where the investments identified for the proposed metering, billing, and collection are fully funded by the private developer.

Under Option 1, the municipal council would have to invest a total capital expenditure of Rs40 million (in the first year) and incur an operations cost of Rs10 million per annum. With metering and a volumetric tariff, the municipal council would earn water supply charges of Rs480 million by 2013.

Under Option 2, since the NMMC is highly efficient in the management of its operations and has a high revenue collection efficiency, there is limited scope for a private operator to bring in further efficiency. Therefore, the private operator would incur the same amount of capital expenditure and generate almost equivalent water charges as the NMMC.

Hence, a PPP in metering, billing, and collection would not be highly beneficial to the NMMC. It can implement the metering activity by obtaining grants from government schemes, including Maharashtra Sujal Nirmal Abhiyan.

Step 3: Choice of PPP Structure

Having assessed the viability of developing the proposed project through a public-funded or PPP mode, the next step is to determine the choice of PPP structure that is best suited to address the overall needs of the proposed project.

Since the private developer would make the investments for installation of meters and would also be responsible for overseeing their operations, generating bills, and collecting payments, the suitable PPP structure is that of a PPP agreement for metering, billing, and collection.

Under the service management contract for metering, billing, and collection, the private developer would be required to undertake investments for installation of meters at the consumer end, overseeing their O&M, maintaining a computerized data recording system, generating bills, and collecting user charges from the consumers. The private developer would not be required to undertake any other activity in the entire chain of water supply services. The type of meter to be installed and the number of connections where the meter is to be installed would be specified by the ULB.

The tariff to be levied would also be determined by the ULB. The performance standards laid out by the ULB would specify parameters, such as the revenue collection target to be achieved and the extent of meter functional levels that needs to be maintained. The cost of purchase and installation of the meter would generally be recovered by the private developer from the consumers as part of the water supply service bills.

For the operation and maintenance activity undertaken by the private developer, a fixed annuity payment is made by the ULB. This annuity amount would generally be the bidding parameter.

Step 4: Procurement

Having identified and finalized the PPP structure to be adopted for operating and maintaining the proposed project, the next stage is to plan the procurement process. To initiate the procurement process, the NMMC would need to develop a transaction structure that would cover the aspects relating to details on the parties involved in the contract. This would include the contractual relationship between the parties, nature of the arrangement, risk allocation, the tariff to be levied, the duration of the contract, performance indicators, payment terms, award criteria, and contract management strategy. Details are given in the term sheet in Part IV.

VIII Shirpur

Brief Introduction to Shirpur

Shirpur is a city located in the Dhule district of Maharashtra. With a current population of 75,000 (61,294 at the 2001 census), the city, in recent years, has seen an increase in industrial activity. The city is spread over an area of 9 square kilometers and has an estimated 12,000 households. The city is managed by the Shirpur-Warvade Municipal Council (SWMC), which has a total revenue budget of Rs96.9 million and a surplus revenue account of Rs37.6 million (fiscal year 2007).

The water supply works in the city is managed by the SWMC, and it incurs a deficit of Rs900,000 from its water supply operations. The city has no unpaid liabilities on its water account.

Existing Water Supply System at Shirpur

Shirpur has a total water supply of 9 million liters per day (MLD). It has two main water sources: the Tapi River (at a distance of 8.5 kilometers) and the Karvand Dam (at a distance of 8 kilometers). The treated water available for consumption is 97 liters per capita per day (lpcd). Water is supplied daily for 1.5 hours. The total number of direct connections to the city is 9,249, all of which are unmetered. A basic profile of the water supply system of the SWMC is presented in Table 48.

Table 48 Basic Profile of Water Supply Services in Shirpur

Shirpur Utility Profile			
Key infrastructure components	Bulk supply		9 MLD
	Tapi River		4 MLD
	Karvand Dam		5 MLD
	Water availability after treatment		97 lpcd
	Water treatment capacity	Ganesh Colony and Wazari Road	12 MLD
	Storage capacity	4 elevated storage reservoirs	6.6 MLD
		2 ground storage reservoirs	2.3 MLD
	Distribution network	34 kilometers	
	Connections	9,249	
Water supply financials (FY2007)	Water account revenue	Rs9.7 million	
	Annual operation and maintenance costs	Rs10.6 million	
Tariff	Flat tariff (per annum)	Domestic	Rs1,000
		Nondomestic	Rs4,600
		Special categories	Rs2,000

FY = fiscal year, lpcd = liter per capita per day, MLD = million liters per day, Rs = rupees.

Source: Shirpur-Warvade Municipal Council.

Step 1: Identification of the Problem Area

As a first step in assessing the status of the water supply services in the city of Shirpur, an assessment of problem areas in the existing system's services needs to be carried out. This would highlight the interventions required to improve the level of services. The first activity to undertake is a service assessment against a few key performance criteria. On the basis of the assessment, the key issues in the current system would need to be identified and the existing projects reviewed. It should be noted that the assessment presented here for Shirpur is based on only a few key parameters. For a detailed review, as discussed in Part I of the tool kit, the urban local body (ULB) would be required to carry out consumer survey, water audit, leak detection survey, and energy audit for the entire value chain of water supply services.

Compiling Key Parameters

Based on the preliminary analysis of water supply service data[15] and discussions with SWMC officials, CRISIL Risk and Infrastructure Solutions Limited (CRISIL) assessed the current water supply system in Shirpur. Table 49 presents key indicators for assessing the water supply system at Shirpur.

Identification of Key Issues

After assessing the water supply services in Shirpur, the next step is for the ULB to clearly list all the water service and infrastructure issues faced by the city. Based on the status of the water supply system, key indicators, and the resultant inferences, the following areas appear to need investment on a priority basis:

(i) installation of meters and adoption of a volumetric-based tariff system, and
(ii) undertaking water supply and energy audits to ascertain loss levels.

Review of Water Supply Projects

As per discussions with SWMC officials, it is understood that currently no projects have been proposed in the water supply sector for Shirpur.

Step 2: Choice between Public Funding and the PPP Option

Having undertaken the assessment of the existing status of water supply services in the city, identified key issues, and briefly reviewed projects identified by the city, the next stage involves choosing between the public mode of funding and implementing the proposed project and the private or public–private partnership (PPP)-based mode of developing and implementation of the project.

As per the assessment, no major capital investment is needed and the operation of the water supply system is satisfactory. In this scenario, the only area of improvement is to ensure that all connections are metered and that consumers are charged on the basis of their consumption. Meters, therefore, need to be installed and the efficiency of billing and collection improved. This will also reduce wastage of water. This may be done under a PPP structure wherein the activity of metering, billing, and collection of water supply charges is outsourced to a private operator.

A viability assessment was undertaken to assess whether the SWMC should undertake the investments required for installation, operation, and management of meters, and generating bills and collecting service fees; or whether the same activity could be managed better by a private developer. The key assumptions of the analysis are outlined in Table 50.

Based on the assumptions in Table 50, a preliminary financial assessment has been undertaken to review the viability of undertaking

[15] In the absence of a water or energy audit report, the data provided by the municipal representatives has been considered for all the assessments. The actual technical losses may be more or less than that stated and can be verified only if water audit is undertaken along with consumer survey.

Table 49 Key Water Supply Indicators for Shirpur

Performance Area	Norm	Shirpur	Key Inference
Bulk Water			
Supply (per capita treated water available for consumption)	70 lpcd	97 lpcd	The treated water available for consumption is 97 lpcd (7.3 MLD), which is higher than the CPHEEO norm of 70 lpcd for towns with piped water supply without sewerage systems. The city, therefore, does need to augment its bulk water supply.
Treatment			
Water treatment plant capacity	100%	100%	The current installed water treatment plant capacity is sufficient and has been operating as per the required standards.
Treatment loss	Less than 3%	3%	The treatment loss levels are considered to be as per norm.
Transmission and Distribution			
Losses	Less than 15%	15%[a]	Minimal transmission losses. The current levels do not, therefore, require replacement or rehabilitation of pipelines.
Consumer			
Coverage (connections/total households)	100%	100%[b]	On average in SWMC, each connection serves five households. Therefore, the existing connections indicate full coverage. The city has no public standposts.
Metering/Total connections	100%	0%	No meters are installed at the consumer end. A flat tariff system based on pipe diameter is prevalent.
Duration of water supply	24 hours	1.25 hours each day	The number of supply hours needs to be increased.
Operation and maintenance cost recovery	100%	91%	The current cost recovery levels need to be improved. It would be important to review the flat rates and adopt a volumetric tariff structure to reflect more accurate revenue demand levels.
Unit production cost Unit income		Rs3.24/kl Rs2.95/kl	There is a need to increase operational efficiency and reduce energy costs in order to improve cost recovery.
Collection efficiency	100%	93%[c]	Collection efficiency level is satisfactory.

CPHEEO = Central Public Health and Environmental Engineering Organisation, kl = kiloliter, lpcd = liter per capita per day, MLD = million liters per day, SWMC = Shirpur-Warvade Municipal Council.

[a] As per SWMC officials, there is no loss at the distribution end. In the absence of bulk meters and consumer end meters, there is no accurate method to ascertain the loss level. It is assumed that minimum of 15% losses are inevitable due to friction and leakages. For the purpose of analysis, therefore, the minimal loss levels have been considered.

[b] SWMC officials indicate that one connection serves five households. However, it would be prudent for the SWMC to undertake water supply audits and maintain detailed consumer database to ensure full coverage levels.

[c] Collection efficiency has been measured against current demand raised vis-à-vis the current collections.

Sources: CRISIL analysis and discussion with Shirpur-Warvade Municipal Council officials.

Table 50 Key Assumptions

Particulars	Assumptions
Cost of a meter (including installation charges)	Rs4,000 per meter
Cost of computer software	Rs100,000 (one-time cost)
Maintenance cost of meters	8% of capital expenditure
Computer software maintenance cost	15% of capital expenditure
Meter connection charges	Rs1,000 per meter
Increase in water tariff	3% per annum
Population growth rate (compounded annual growth rate)	2.55% per annum
Tariff	Volumetric tariff of Rs8/kl[a]
Collection efficiency	93% in case of both SWMC and PPP
Period of contract	Period of 5 years up to 2013
Cost reduction efficiency (operation and maintenance costs)	0% in case of SWMC 20% in case of PPP

kl = kiloliter, PPP = public–private partnership, Rs = rupees, SWMC = Shirpur-Warvade Municipal Council.

[a] In the absence of any general body resolution, the volumetric tariff of a town of similar nature has been considered.

the project under two scenarios: Option 1, where the investments identified for the proposed metering, billing, and collection are made by SWMC; and Option 2, where the investments identified for the proposed metering, billing, and collection are fully funded by the private developer.

Under Option 1, the SWMC would have to invest a total capital expenditure of Rs50 million (in the first year) and also incur an operations cost of Rs10 million per annum. With metering and a volumetric tariff, the SWMC would earn water supply charges of Rs50 million by 2013. With a revenue surplus of Rs37.6 million, the SWMC has the capacity to install and maintain meters.

Under Option 2, since the SWMC is highly efficient in the management of its operations and has high revenue collection efficiency, there is limited scope for the private operator to bring in further efficiencies. The private operator would incur the same capital expenditure and generate almost equivalent water charges, as stated under Option 1.

Hence, the SWMC would not derive substantial benefits from PPP in metering, billing, and collection. It could implement metering through funding from internal funds or by obtaining a grant from government schemes, including Maharashtra Sujal Nirmal Abhiyan.

IX Akot

Brief Introduction to Akot

The city of Akot is a B-class municipal council in the Akola district of Maharashtra. The city is governed by the Akot Municipal Council (AMC) and encompasses an area of 14.34 square kilometers. With a current population of 100,000 (81,000 at the 2001 census), the city has an estimated 18,600 households. AMC has a total revenue budget of Rs72.1 million (fiscal year 2007) and generates a revenue surplus of Rs0.4 million.

The water supply works, including billing and collection, are currently operated and managed by Maharashtra Jeevan Pradhikaran (MJP). All the revenue income and expenditure for the water supply works are, therefore, fully overseen by MJP.

Existing Water Supply System

Akot draws a total water supply of 3.4 million liters per day (MLD) primarily from the Wan Dam. It receives water from a joint scheme (including Akot and 84 villages in the surrounding areas) operated by MJP. The total treated water available for the citizens is 2.8 MLD (27.4 liters per capita per day [lpcd]). Water is available for 3 hours each day and is supplied through individual connections and public standposts. A basic profile of the water supply system of AMC is presented in Table 51.

Table 51 Basic Profile of Water Supply Services in Akot

Akot Utility Profile			
Key infrastructure components	Bulk supply		3.4 MLD
	Wan Dam		1.9 MLD
	Bore well		1.5 MLD
	Water availability for consumption		27.4 lpcd
	Water treatment capacity (for the joint scheme)		16 MLD
	Storage capacity	Elevated storage reservoirs	1.81 MLD
	Distribution network	38 kilometers	
	Connections	6,913	
Water supply financials (FY2007)	Water account revenue	Rs4.6 million	
	Annual operation and maintenance costs	Rs14.4 million	
Tariff	Flat tariff (annual)	Domestic	15 mm: Rs300 20 mm: Rs460 25 mm: Rs890

continued on next page

Table 51 *continued*

Akot Utility Profile			
Tariff		Commercial	15 mm: Rs100 20 mm: Rs205 25 mm: Rs385
	Volumetric tariff	Domestic	Rs10.20/kl
		Commercial	Rs46.20/kl

FY = fiscal year, kl = kilo liters, lpcd = liter per capita per day, MLD = million liters per day, mm = millimeter, Rs = rupees.

Sources: Maharashtra Jeevan Pradhikaran and Akot Municipal Council.

Step 1: Identification of the Problem Area

As a first step to assessing the status of the water supply services in the city of Akot, an assessment of the problem areas in the existing system's services needs to be carried out. This would highlight the interventions required to improve the level of services. The first activity to undertake is a service assessment against a few key performance criteria. On the basis of the assessment, the key issues in the current system would need to be identified and the existing projects reviewed. It should be noted that the assessment for Akot is based on only a few key parameters. For a detailed review, as discussed in Part I of the tool kit, the ULB would be required to carry out consumer survey, water audit, leak detection survey, and energy audit for the entire value chain of water supply services. The key performance parameters used are presented in Table 52.

Compiling Key Parameters

Based on the preliminary analysis of water supply service data[16] and discussions with AMC officials, CRISIL Risk and Infrastructure Solutions Limited (CRISIL) assessed the current water supply system in Akot. Table 52 presents the indicators for assessing the water supply system at Akot and the resultant inferences.

Identification of Key Issues

After assessing the water supply services in Akot, the next step is for the urban local body (ULB) to clearly list all the service and infrastructure-related issues being faced by the current water supply system in the city. Based on the status of the water supply system, key indicators, and the resultant inferences, the following areas appear to need investment on a priority basis:

(i) augmentation of bulk water supply to the city,
(ii) 100% metering, and
(iii) improvement in the overall operational efficiencies of the system.

Review of Water Supply Projects with Approved Detailed Project Reports

Having identified the key issues in the existing status of provisioning of water supply services in the city, the next activity is to undertake a brief review of the projects that have already been identified for Akot under various schemes for improving the water supply services. AMC and MJP have, under the Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT) scheme, identified the project for the water supply sector (see Table 53).[17]

[16] In the absence of any general body resolution, the volumetric tariff of a town of similar nature has been considered for all the assessments. The actual technical losses may be more or less than that stated and can be verified only if water audit is undertaken along with consumer survey.

[17] For the purpose of this assessment, due diligence on the project components and costs has not been undertaken.

Table 52 Key Water Supply Indicators for Akot

Performance Area	Typical Norm	Akot	Key Inference
Bulk Water			
Supply (per capita treated water available for consumption)	70 lpcd	29 lpcd	The level of water supply to the city is highly inadequate. The city needs to augment its bulk water supply immediately. The carrying capacity of the raw water transmission lines is inadequate to source additional raw water from the source. The size of the transmission lines needs to be augmented.
Treatment			
WTP capacity	100%	100%	The installed capacity of WTP is part of the combined scheme for Akot and 84 surrounding villages. Of the total installed capacity of the WTP, 22% is utilized for Akot. If the bulk water supply to the city is augmented significantly, capacity of the WTP may need to be augmented.
Treatment loss	Less than 3%	3%	Current loss levels are as per minimal acceptable standards.
Transmission and Distribution			
Losses	Less than 15%	15%[a]	The current loss levels are as per minimal acceptable levels.
Consumer			
Coverage	95%–100%	74%	Assuming that each connection serves two households, the city should have at least 9,300 connections. Coverage needs to be improved.
Metering	100%	10%	All the connections should be metered.
Duration of water supply	24 hours	3 hours	The supply hours are inadequate.
Operation and maintenance cost recovery	100%	32%	The high production cost, coupled with poor collection efficiency, results in a poor level of recovery.
Unit production cost Unit income		Rs11.24/kl Rs3.60/kl	Per unit realization is extremely low.
Collection efficiency	100%	18%	The level of collection efficiency is extremely poor and needs to be improved drastically.

kl = kiloliter, lpcd = liter per capita per day, Rs = rupees, WTP = water treatment plant.

[a] In the absence of 100% metering, it is not possible to accurately estimate the actual levels of distribution loss. The loss level assumed here is as per MJP officials.

Source: CRISIL analysis based on data given by Maharashtra Jeevan Pradhikaran and Akot Municipal Council.

Table 53 Proposed Water Supply Projects for Akot

Potential Area of Investment	Scheme Proposed	Details
Augmentation of bulk water supply to Akot city from the existing Wan Dam source and expansion of the distribution network in the city	Proposed under UIDSSMT scheme It includes augmentation of water supply by 21 MLD, construction of raw water rising mains, augmentation of the WTP capacity to 21 MLD, and expansion of the distribution network by 80 kilometers	DPR cost: Rs450 million, of which Rs200 million is approved Total capital cost (including escalation): Rs540 million UIDSSMT grant: Rs180 million AMC's contribution: Rs360 million

AMC = Akot Municipal Council, DPR = detailed project report, MLD = million liters per day, UIDSSMT = Urban Infrastructure Development Scheme for Small and Medium Towns, WTP = water treatment plant.

Sources: Maharashtra Jeevan Pradhikaran and Akot Municipal Council.

Step 2: Choice between Public Funding and the PPP Option

Having undertaken the assessment of the existing status of the water supply services in the city, identified key issues, and briefly reviewed projects identified by the city, the next stage involves choosing between the public mode of funding and implementing the proposed project and the private or public–private partnership (PPP)-based mode of developing and implementing the project. This requires a viability assessment to be undertaken.

A preliminary financial analysis has already been undertaken to assess the viability of the projects identified. The purpose of this assessment is to assess the commercial viability of the project if it is developed as a PPP. The viability assessment undertaken in the following sections is largely focused on determining whether the public sector, i.e., AMC, or the private sector has the financial wherewithal to undertake the project. The investment need under each scenario has been looked at. In addition, the option of Viability Gap Fund (VGF) support has also been considered to help assess the viability of the project from the private sector perspective.

From the detailed project report (DPR) review presented, it can be observed that Akot plans to undertake projects worth Rs540 million by fiscal year 2011. CRISIL undertook a preliminary financial analysis to understand the applicability of PPP to these projects. The set of key assumptions used in undertaking the financial analysis are indicated in Table 54.

Based on the assumptions in Table 54, a preliminary financial assessment has been undertaken to review the viability of undertaking the project under two scenarios: Option 1, where the investments identified for the proposed projects are made by AMC; and Option 2, where the investments identified for the proposed projects are fully funded by the private developer.

AMC would have to invest a total of Rs360 million (excluding grant amount) and, in addition, incur the operations cost of an average of Rs35 million per annum.[18] This results in a net cash flow (in net present values) of Rs370 million. However, AMC has a revenue surplus of Rs0.4 million only; thus, it is not in a position to undertake such investment.

Under Option 2, if the investment gap of Rs360 million and the year-on-year operation cost of Rs13.5 million (considered up to 2030) is incurred by the private developer, then the private developer would require viability gap funding of Rs230 million. This is in spite of improved operational and managerial efficiencies brought in and revenue retained

[18] The operations cost incurred by AMC is higher than that incurred by the private operator since it does not have cost efficiency.

Table 54 Assumptions of Preliminary Financial Analysis

Particulars	Assumptions
Phasing of capital expenditure	Over a period of 4 years
Raw water transmission losses	2%
Treatment losses	2%
Distribution losses	20% in case managed by AMC
	15% in case managed by AMC
Tariff[a]	Rs4.20/kl[b] with 3% revision every year
Collection efficiency	Phased from 18% to 70% in case of AMC Phased from 30% to 90% in case of private developer
Cost reduction efficiency (on operations)	0% in case managed by AMC 20% in case managed by private party (only up to 2015)

AMC = Akot Municipal Council, kl = kiloliter, Rs = rupees.

[a] It is the weighted volumetric tariff calculated on the basis of the current tariff structure.

[b] As per MJP officials, Rs4.20 has been currently decided to be the new tariff rate post implementation of the scheme. The current tariff of Rs10.2/kl shall be applicable only up to FY2011.

Table 55 Investment Requirement with a PPP

Particulars	Capital Expenditure (Rs million)	In Case of Investment and Operations by AMC	In Case of Investment and Operations by Private Operator
Detailed project report cost	456		
Escalated cost	535		
Grant	176		
AMC share (expected) but envisaged to be sourced from private operator (A)	19.5		
Viability gap from private sector (B)		(Net present value: 14%)	(Net present value: 14%)
Total investment required (A+B)	359	Rs370 million	Rs230 million

AMC = Akot Municipal Council, PPP = public–private partnership, Rs = rupees.

by the developer. The existing UIDSSMT grant of Rs176 million and the VGF requirement of Rs230 million indicate that 76% of the total project cost would be funded by the government. This high grant requirement would, therefore, defeat the purpose of taking up the project on a PPP basis; hence, it is not advisable to undertake the project on a PPP basis. Table 55 presents the investment requirement under each of the options.

AMC may find it difficult to implement the project on its own, and it does not have the financial capability to meet the investment gap. Similarly, even if a private developer were to undertake the investments, the overall account would continue to be in a deficit and it would not be profitable for the private developer either. With 76% funding from the government, it is not feasible to have a concession for this project on a PPP basis.

Step 3: Choice of PPP Structure

Having assessed the viability of developing the proposed project through a public-funded or PPP mode, the next step is to choose the PPP structure best suited to addressing the overall needs of the proposed project.

From the viability assessment undertaken, it is observed that the investment requirements for the project are large and AMC, on its own, would not be able to develop, operate, and manage the project. Also, assessment of the private sector viability for undertaking the project indicates that the project is not commercially feasible for a private developer given the current investment requirements and the operation costs involved.

Under such a scenario, the state government would have to provide additional financial support to put in place the physical infrastructure for the project. However, for the operation and management of the water supply system, a private developer can be appointed under a performance-based management agreement.

In a performance-based management contract, the private developer is required to undertake the operation and maintenance of the entire water supply system from source to consumer, including metering, billing, and collection of revenues. All capital investments needed to improve the water supply and sewerage services would have to be borne by the public sector. The operating standards are as prescribed by the ULB. The private developer is given the rights to levy the user charges set by the ULB, and collect and hand over the charges to the ULB. For the activities carried out, the ULB would make a performance-based payment to the private developer.

The details of the obligations, risks, and payment arrangements under the performance-based management contract are provided in Part II of this tool kit, and the term sheet for this contract structure is in Part IV.

Step 4: Procurement

Having identified and finalized the PPP structure to be adopted for operating and maintaining the proposed project, the next stage is to plan the procurement process. To initiate the procurement process, AMC would need to develop a transaction structure that would cover the aspects relating to details on the parties involved in the contract, contractual relationship between the parties, nature of the arrangement, risk allocation, tariff to be levied, duration of the contract, performance indicators, payment terms, award criteria, and contract management strategy. Details can be found in the term sheet in Part IV.

X Saoner

Brief Introduction to Saoner

Saoner is a town and a *tehsil*/administrative headquarters of the north part of Nagpur district in the state of Maharashtra. The town has an area of 3.8 square kilometers and a current population of 30,000 (28,712 at the 2001 census). The town is managed by the Saoner Municipal Council (SMC) and has an estimated 8,000 households.

The water supply works are managed by SMC, which incurred a deficit of Rs3.9 million on its water supply operations in fiscal year 2007. The council has no unpaid liabilities on its water account.

Existing Water Supply System

Saoner has a total water supply of 1.86 million liters per day (MLD), of which 1 MLD is from the Kanan River (12 kilometers from the city) and 0.86 MLD is from the Kolar River (2 kilometers from the city). There are three water treatment plants: two at the Kolar headworks site, and another at Khapar road.

Saoner receives a treated water supply of approximately 47 liters per capita per day (lpcd) at the consumption point. Water supply is provided on an average of 1 hour each day and is supplied through individual connections and public standposts. The town has 3,694 direct service connections. A basic profile of the water supply system of SMC is presented in Table 56.

Step 1: Identification of the Problem Area

As a first step to assessing the status of the water supply services in the city of Saoner, an assessment of the problem areas in the existing system's services needs to be carried out. This would highlight the interventions required to improve the level of services. The first activity to undertake is a service assessment against a few key performance criteria. On the basis of the assessment, the key issues in the current system would need to be identified and the existing projects reviewed. It should be noted that the assessment presented here for Saoner is based on only a few key parameters. For a detailed review, as discussed in Part I of the tool kit, the urban local body (ULB) would be required to carry out consumer survey, water audit, leak detection survey, and energy audit for the entire value chain of water supply services.

Compiling Key Parameters

Based on the preliminary analysis of water supply service data[19] of SMC and discussions with SMC representatives, a few key indicators of the efficiency and adequacy of water supply services have been developed. These indicators highlight the key issues faced by SMC in the water supply sector (Table 57).

[19] In the absence of a water or energy audit report, the data provided by the municipal representatives has been considered for all the assessments. The actual technical losses may be more or less than that stated and can be verified only if water audit is undertaken along with consumer survey.

Table 56 Basic Profile of Water Supply Services in Saoner

Saoner Utility Profile			
Key infrastructure components	Bulk supply		1.86 MLD
		Kanan River	1 MLD
		Kolar River	0.86 MLD
	Water treatment capacity	Kolar River	1.89 MLD
		Khapar road	5 MLD
	Water availability after treatment	46 lpcd	
	Storage capacity	2 elevated storage reservoirs	11.5 MLD
	Distribution network	32 kilometers	
	Connections	3,694	
Water supply financials (FY2007)	Water account revenue		Rs3.1 million
	Annual operation and maintenance costs		Rs5.2 million
Tariff	Flat tariff (per annum)	Domestic	0.5 inch: Rs926 0.75 inch: Rs1,795 1 inch: Rs4,022
		Nondomestic	0.5 inch: Rs4,060 0.75 inch: Rs7,738 1 inch: Rs16,872

FY = fiscal year, lpcd = liter per capita per day, MLD= million liters per day, Rs = rupees.

Source: Saoner Municipal Council.

Table 57 Key Water Supply Indicators for Saoner

Performance Area	Typical Norm	Saoner	Key Inference
Bulk Water			
Supply (per capita treated water available for consumption)	70 lpcd[a]	47 lpcd	The water available for consumption is very low. The sand content at the source is extremely high. As a result, the jack well gets blocked and SMC is unable to draw sufficient water. There is no need for augmentation of the source. The necessary machinery for sorting of sand needs to be set.
Treatment			
WTP capacity	100%	100%	The capacity of the existing treatment plant exceeds the requirement. Since the current bulk supply is much lower than the installed capacity, the utilization of the WTP is limited to 27%. Currently, there is no need for augmenting the WTP capacity.
Loss	Less than 3%	2%	Loss levels are as per norms.

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Table 57 *continued*

Performance Area	Typical Norm	Saoner	Key Inference
Transmission and Distribution			
Losses	Less than 15%	25%	There are moderate transmission losses. However, raw water transmission loss levels are high due to corroded pipelines that need to be repaired or replaced to contain the losses in line with minimum acceptable standards. In the absence of consumer meters, accurate estimates of the distribution loss cannot be ascertained.
Consumer			
Coverage (connections/ total households)		46%[b]	Coverage levels are poor. The low coverage has been attributed to the inadequate distribution network. The current distribution network is a part of a 40-year-old scheme and requires expansion. Additional direct connections need to be provided.
Metering/total connections	100%	0%	All water connections need to be provided with meters.
Duration of water supply	24 hours	1 hour supply on an average	Current levels are not adequate and need to be increased.
Operation and maintenance cost recovery	100%	25%	Cost recovery levels are poor. The current tariff levels require revision. In addition, SMC needs to pursue cost reduction efficiency measures to contain the expenditure incurred.
Unit production cost Unit income		Rs7.66/kl Rs1.91/kl	There is a need to increase operational efficiency and reduce energy costs in order to improve cost recovery.
Collection efficiency	100%	87%	The figure indicates scope for improvement in collection efficiency.

kl = kiloliter, lpcd = liter per capita per day, Rs = rupees, SMC = Saoner Municipal Council, WTP = water treatment plant.

[a] As per CPHEEO norms, the total water supplied to consumers after treatment should be 70 lpcd for towns with piped water supply and no sewerage system.

[b] As per SMC officials, one connection serves one household unit.

Source: CRISIL analysis and data provided by Saoner Municipal Council.

Identification of Key Issues

After assessing the water supply services in Saoner, the next step is for the ULB to clearly list all the water service and infrastructure issues faced by the city. Based on the status of the water supply system, key indicators, and the resultant inferences, the following areas appear to need investment on a priority basis:

(i) augmentation of bulk water supply,
(ii) increasing the water supply by setting up sand-sifting machinery near the source,
(iii) rehabilitation and/or replacement of existing raw water transmission lines and expansion of distribution network, and
(iv) establishment of meters for all water connections.

Table 58 Proposed Water Supply Projects

Potential Area of Investment	Scheme Proposed	Details
Water supply augmentation, raw water transmission, and expansion of the distribution network	Proposed under the Sujal Nirmal Abhiyaan scheme: 7.5 MLD source augmentation scheme, including raw water rising main, pure water pumping main, 42 kilometers of distribution network	Capital expenditure required (DPR): Rs73.9 million Government of Maharashtra grant: Rs67 million SMC contribution: Rs7.3 million

DPR = detailed project report, MLD = million liters per day, Rs = rupees, SMC = Saoner Municipal Council.

Source: Data provided by Saoner Municipal Council.

Review of Water Supply Projects with Approved Detailed Project Reports

Having identified the key issues in the existing status of provisioning of water supply services in the city, the next activity is to undertake a brief review of the projects that have already been identified for Saoner under various schemes for improvement of water supply services. In the context of the issues faced at Saoner, SMC has proposed a water supply project. The detailed project report (DPR) for the proposed project is in its final stages of completion and the project is yet to be submitted for approval. The details of the proposed water supply projects are shown in Table 58. Since the proposal is currently being prepared, there are no escalation costs to be considered.

Step 2: Choice between Public Funding and the PPP Option

Having undertaken the assessment of the existing status of the water supply services in the city, identified key issues, and briefly reviewed the projects identified by the city, the next stage involves choosing between the public mode of funding and implementing the proposed project and the private or public–private partnership (PPP)-based mode of developing and implementing the project. This requires a viability assessment to be undertaken.

A preliminary financial analysis has already been undertaken to assess the viability of the projects identified and their commercial viability if developed in a PPP mode. The viability assessment undertaken (discussed in the following sections) largely focuses on determining whether the public sector, i.e., SMC, or the private sector has the financial wherewithal to undertake the project. The investment need under each scenario has been looked at and, to assess the viability of the project from the private sector perspective, the option of support through the Viability Gap Fund (VGF) has also been considered.

From the project details, it can be observed that Saoner plans to undertake projects worth Rs73.9 million up to fiscal year 2011. At the same, SMC needs to arrange for a capital investment of Rs7.3 million. It is understood in discussion with SMC officials that the project is already under way and the investment gap will be met by SMC.

Since SMC has already arranged the funding for the proposed projects and investment has already been undertaken, the project cannot be undertaken on a PPP basis. However, the operations and management of the water supply system (on completion of this project) on a PPP basis can be explored.

CRISIL Risk and Infrastructure Solutions Limited (CRISIL) undertook a preliminary financial analysis to understand the applicability of PPP for the operations and management of the water supply system. The key assumptions of the analysis have been outlined in Table 59.

Given that the investment needs of SMC are being met, we have undertaken an analysis to review the possibility of a PPP in operations and management of the water supply system alone.

Table 59 Assumptions of Preliminary Financial Analysis

Particulars	Assumptions
Raw water transmission losses	2%
Treatment losses	2%
Distribution losses	20% in case of SMC 15% in case of private operator
Tariff[a]	Rs3.01[b] with 3% revision every year
Collection efficiency	92% in case of SMC 95% in case of private operator
Cost reduction efficiency	0% in case of SMC 20% in case of private operator

Rs = rupees, SMC = Saoner Municipal Council.

[a] It is the weighted volumetric tariff calculated on the basis of the current tariff structure.

[b] As per SMC officials post implementation of the proposed scheme, a tariff rate of Rs3.01/kl has been estimated to be implemented. From the year of implementation of the scheme an operation and maintenance of Rs0.36 million has been estimated by SMC. This estimate has been taken up as the base year operation and maintenance and escalated for the subsequent years.

Source: Preliminary financial analysis.

Two options have been considered for the same: Option 1, in which operation and management is undertaken by SMC itself; and Option 2, where operation and management is handed over to a private developer.

Under Option 1, if the water supply operations were to be undertaken by SMC for the period up to 2030, the council would generate a net revenue (net present value) of Rs11.4 million.

Under Option 2, if the water supply operations were to be undertaken by private operator for the period up to 2030, the council would generate a net revenue (net present value) of Rs22.3 million.

It can be seen that undertaking the operations of the water supply system on a PPP basis provides a benefit to SMC of only Rs11.0 million. If SMC increases its collection efficiency from 87% to 95% and undertakes measures to reduce expenditure on energy and staffing, it can bridge this gap. Therefore, there is limited scope for PPP for investment and/or operations of the water supply system in Saoner.

XI Chiplun

Brief Introduction to Chiplun

The city of Chiplun forms a part of the Ratnagiri district of Maharashtra. The city has a total area of 14.69 square kilometers and a population of 55,000 (46,000 at the 2001 census). It is managed by the Chiplun Municipal Council (CMC) and has a revenue budget of Rs184.6 million (fiscal year 2007), with a revenue deficit of Rs20.7 million. The city has 4,935 households. With respect to its water account, the city has a deficit to the tune of Rs13.8 million. There are no unpaid liabilities in the water account of CMC.

Existing Water Supply System

Chiplun draws 9 million liters per day (MLD) of raw water from the Vashisti River, located at 0.5 kilometer from the city. Of the 9 MLD, approximately 7 MLD of water is supplied from the Kherdi headworks and 2 MLD come from the Govalkot headworks. Raw water is treated at the water treatment plants located at the site of the two headworks and is transmitted to the city. The treated water is supplied to end consumers through a 30-kilometer distribution network.

The total treated water available for consumption is 6.9 MLD (126 liters per capita per day [lpcd]). Water is available for 2 hours every day. The city has 5,668 individual connections. A basic profile of the water supply system of Chiplun is presented in Table 60.

Step 1: Identification of the Problem Area

As a first step to assessing the status of the water supply services in the city of Chiplun, an assessment of the problem areas of the existing system's services needs to be carried out. This would highlight the interventions required to improve the level of services. The first activity is to undertake a service assessment against a few key performance criteria. On the basis of this assessment, the key issues in the current system would need to be identified and existing projects reviewed. It should be noted that the assessment presented here for Chiplun is based on only a few key parameters. For a detailed review, as discussed in Part I of the tool kit, the urban local body (ULB) would be required to carry out consumer survey, water audit, leak detection survey, and energy audit for the entire value chain of water supply services.

Compiling Key Parameters

Based on the preliminary analysis of water supply service data[20] and discussions with CMC officials, CRISIL Risk and Infrastructure Solutions Limited (CRISIL) assessed the current water supply system in Chiplun. Table 61 presents the key indicators for assessing the water supply system at Chiplun.

[20] In the absence of a water or energy audit report, the data provided by the municipal representatives has been considered for all the assessments. The actual technical losses may be more or less than that stated and can be verified only if water audit is undertaken along with consumer survey.

Table 60 Basic Profile of Water Supply Services in Chiplun

Chiplun Utility Profile			
Key infrastructure components	Bulk supply		9 MLD
	Treated water available for consumption		125 lpcd
	Water treatment capacity	Kherdi headworks	7 MLD
		Govalkot headworks	2 MLD
	Storage capacity	2 elevated storage reservoirs	0.67 MLD
		2 ground storage reservoirs	4.90 MLD
	Distribution network	30 kilometers	
	Connections	5,668	
Water supply financials (FY2007)	Water account revenue	Rs6.8 million	
	Annual operation and maintenance costs	Rs20.6 million	
Tariff	Flat tariff structure (per annum)	Residential	
		15 mm	Rs806
		20 mm	Rs1,550
		Commercial	
		15 mm	Rs3,500
		20 mm	Rs4,000

FY = fiscal year, lpcd = liter per capita per day, MLD = million liters per day, mm = millimeter, Rs = rupees.

Source: Chiplun Municipal Council.

Table 61 Key Water Supply Indicators for Chiplun

Performance Area	Norm	Chiplun	Key Inference
Bulk Water			
Supply (per capita consumption)	70 lpcd	126 lpcd	The supply of water to the citizens is very high compared to the norms for a town with piped water supply and no sewerage system, as per the CPHEEO norms. This indicates that the city has ample water supply and there is no need for source augmentation.
Treatment			
WTP capacity	100%	100%	Existing installed capacity of the treatment plants is sufficient. However, the WTP at Bawada, being obsolete, is not functioning properly and requires upgrading.
Treatment loss	Less than 3%	2%	Treatment loss is within the norms.
Transmission and Distribution			
Losses	Less than 15%	22%	Loss levels are moderate. The existing lines are approximately 30 years old and corroded and need replacement. An accurate estimate on distribution loss can be provided only once the meters are installed.

continued on next page

Table 61 *continued*

Performance Area	Norm	Chiplun	Key Inference
Consumer			
Coverage	95%–100%	100%[a]	This is inclusive of only direct service connections.
Metering	100%	0%	No meters have been installed at the consumer end; a flat tariff system is prevalent.
Duration of water supply	24 hours	2 hours each day	The supply hours and frequency are not adequate. CMC officials are of the opinion that lack of staff is an issue, resulting in poor service delivery in spite of abundant water supply.
Operation and maintenance cost recovery	100%	33%	High operation and maintenance costs primarily due to high energy costs. CMC needs to undertake an energy audit and implement cost reduction measures.
Unit production cost Unit income		Rs6.27/kl Rs2.07/kl	Per unit revenue realization is very low, primarily due to the high operations cost.
Collection efficiency	100%	95%[b]	The collection efficiency level is high.

CMC = Chiplun Municipal Council, CPHEEO = Central Public Health and Environmental Engineering Organisation, kl = kiloliter, lpcd = liter per capita per day, Rs = rupees, WTP = water treatment plant.

[a] It has been assumed that one water supply connection serves two households. It is important for CMC to maintain a detailed consumer database with details of each connection. In the absence of accurate database, the water supply coverage levels would be only estimates.

[b] Figure refers to current revenue collections against current demand raised.

Source: CRISIL analysis and data provided by Chiplun Municipal Council.

Identification of Key Issues

Following the assessment of the water supply services in Chiplun, the next step is for the ULB to clearly list all the service and infrastructure-related issues being faced by the current water supply system in the city. Based on the status of the water supply system, key indicators, and the resultant inferences, the following areas appear to need investment on a priority basis:

(i) undertaking rehabilitation and repair works for the distribution network pipelines,
(ii) increasing the staff and service quality,
(iii) undertaking leak detection study to ascertain the extent of technical and commercial losses, and
(iv) installing meters and adoption of volumetric tariff.

Review of Water Supply Projects with Approved Detailed Project Reports

Having identified the key issues in the existing status of provisioning of water supply services in the city, the next activity is to undertake a brief review of the projects that have already been identified for Chiplun under various schemes for improvement of water supply services. CMC has identified the following project for the water supply sector (Table 62).[21]

In spite of abundant water supply, Chiplun has proposed a project for water source augmentation. This is with the objective of utilizing the opportunity of the Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT) funding and catering to its future needs. This includes the construction of a new jack well at the current offtake point for reducing the energy costs.

[21] For the purpose of this assessment, a due diligence on the project components and costs has not been undertaken.

Table 62 Key Water Supply Project Planned and Proposed

Proposed Area of Investment	Scheme Proposed	Details
Augmentation of water supply, water treatment system, rehabilitation of distribution system	UIDSSMT: 7.5 MLD source augmentation, including jack well, intake well and pump house, pure water rising main works, and distribution network rehabilitation	Capital expenditure required (DPR): Rs95.6 million Capital expenditure required (escalated): Rs150 million UIDSSMT grant: Rs86 million CMC contribution: Rs9.5 million plus escalation: Rs64 million

CMC = Chiplun Municipal Council, DPR = detailed project report, MLD = million liters per day, Rs = rupees, UIDSSMT = Urban Infrastructure Development Scheme for Small and Medium Towns.

Source: Chiplun Municipal Council.

The project is expected to be completed by January 2010. CMC is currently in the process of arranging its contribution to the project. Alternative arrangements—chiefly external borrowings—are under way to meet the remaining investment requirement.

Step 2: Choice between Public Funding and the PPP Option

Having undertaken the assessment of the existing status of the water supply services in the city, identified the key issues, and briefly reviewed the projects identified by the city, the next stage is to choose between public funding and implementing the proposed project and the private or public–private partnership (PPP)-based mode of developing and implementing the project. This decision requires a viability assessment to be undertaken.

From the project analysis, it can be observed that Chiplun is currently in the process of implementing projects to the tune of Rs150 million, due to be completed by 2010. For the same, CMC needs to arrange for a capital investment of Rs70 million. It is understood in discussion with CMC officials that the project is already under way and the investment gap would be met by CMC.

Since CMC has already arranged the funding for the proposed projects and investment has already been undertaken, the project cannot be undertaken on a PPP basis. However, the operations and management of the water supply system of the completed project on a PPP basis can be explored.

CRISIL undertook a preliminary financial analysis to understand the applicability of PPP for the operations and management of the water supply system. The key assumptions of the analysis are outlined in Table 63.

The analysis to review the possibility of a PPP in operations and management of the water supply system considered two scenarios: Option 1, where the investments identified for the proposed projects are made by CMC; and Option 2, where the investments identified for the proposed projects are fully funded by the private developer.

Under Option 1, if the water supply operations were to be undertaken by CMC for the period up to 2030, the council would have to bear a net loss (net present value) of Rs43.1 million.

Under Option 2, if the water supply operations were to be undertaken by private operator for the period up to 2030, the council would generate a net revenue (net present value) of Rs16.8 million. This is primarily due to the reduction of distribution losses and operations cost as a result of operational efficiencies introduced by the private developer.

Table 63 Assumptions of Preliminary Financial Analysis

Particulars	Assumptions
Raw water transmission losses	2%
Treatment losses	2%
Distribution losses	20% in case of CMC 15% in case of private developer
Tariff	Rs3.5/kl[a] with 3% revision every year
Collection efficiency	98% in case managed by CMC 98% in case managed by private developer 10%[b] in case managed by CMC
Cost reduction efficiency	20% in case managed by private party

CMC = Chiplun Municipal Council, kl = kiloliter, Rs = rupees.

[a] The current tariff structure is on a flat rate basis. The volumetric tariff has been arrived at after computing the per kiloliter cost of production. The tariff assumed here is an average of production cost of three consecutive years for the initial 3 years.

[b] With the replacement of the jack well, the energy costs will be reduced.

It can be seen that undertaking the operations of the water supply system on a PPP basis provides a benefit to CMC of Rs60 million. Therefore, CMC can undertake the operations and management of the water supply system on a PPP basis.

Step 3: Choice of PPP Structure

Having assessed the viability of developing the proposed project through a public-funded or PPP mode, the next step is to determine the choice of PPP structure that is best suited to addressing the overall needs of the proposed project.

From the preliminary financial analysis, it has been observed that for the improvement to the water supply and sewerage projects in the Chiplun, the suitable form of PPP contract is that of a performance-based management contract.

In a performance-based management contract, the private developer is required to undertake the operation and maintenance of the entire water supply system from source to consumer, including metering, billing, and collection of revenues. All the capital investments needed to improve to the water supply and sewerage services would have to be borne by the public sector. The operating standards are as prescribed by the ULB. The private developer is given the rights to levy the user charges set by the ULB, collect the charges, and hand them over to the ULB. The ULB would make a performance-based payment to the private developer for the activities carried out.

The details of the obligations, risks, and payment arrangements under the performance-based management contract (Option 2[b]), are provided in Part II of this report, and the term sheet for this contract structure can be found in Part IV.

Step 4: Procurement

Having identified and finalized the PPP structure to be adopted for operating and maintaining the proposed project, the next stage is to plan the procurement process. To initiate the procurement process, CMC would need to develop a transaction structure that would cover aspects relating to details on the parties involved in the contract. These include the contractual relationship between the parties, nature of the arrangement, risk allocation, tariff to be levied, duration of the contract, performance indicators, payment terms, award criteria, and contract management strategy. Details are given in the term sheet in Part IV.

XII Kulgaon-Badlapur

Brief Introduction to Kulgaon-Badlapur

The city of Kulgaon-Badlapur is a part of the Thane district of Maharashtra. The city is managed by the Kulgaon-Badlapur Municipal Council (KBMC) and encompasses an area of 35.69 square kilometers. It has a current population of 191,000 (97,948 at the 2001 census). The revenue budget of KBMC (fiscal year [FY] 2007) is Rs246 million, with a revenue surplus of Rs117.6 million.

The water supply works are managed by the Maharashtra Jeevan Pradhikaran (MJP) as a combined scheme for the towns of Kulgaon-Badlapur and Ambernath. The water account for Kulgaon-Badlapur faces a deficit of Rs1.6 million (FY2007).

Water Supply System at Kulgaon-Badlapur

Kulgaon-Badlapur draws 28 million liters per day (MLD) of raw water from the Ulhas River, 3 kilometers from the city. The total quota available to the city is 35 MLD. The scheme from source to consumer is operated and managed by MJP. Therefore, the onus of the entire scheme, including the operation and maintenance costs, rests purely with MJP.

As a part of the joint scheme, the city has one water treatment plant. The citizens receive 93 liters per capita per day (lpcd) of treated water for consumption. Four wards in the city receive water supply for 24 hours. The supply hours in the remaining wards vary from 3 hours to 8 hours. The total number of direct connections in the city is 12,523, all of which are metered. A basic profile of the water supply system of KBMC is presented in Table 64.

Step 1: Identification of the Problem Area

As a first step to assessing the status of the water supply services in the city of Kulgaon-Badlapur, a survey of problem areas in the existing system's services needs to be carried out. This would highlight the interventions required to improve the level of services. The first activity, which needs to be undertaken, is a service assessment against a few key performance criteria. On the basis of the assessment, the key issues in the current system would need to be identified and existing projects reviewed. It should be noted that the assessment for Kulgaon-Badlapur is based on only a few key parameters. For a detailed review, as discussed in Part I of the tool kit, the urban local body (ULB) would be required to carry out a consumer survey, water audit, leak detection survey, and energy audit for the entire value chain of water supply services.

Compiling Key Parameters

Based on the preliminary analysis of water supply service data[22] and discussions with KBMC officials, CRISIL Risk and Infrastructure Solutions Limited (CRISIL) assessed the current water supply system in Kulgaon-Badlapur. Table 65 presents the key indicators for assessing the water supply system at Kulgaon-Badlapur.

[22] In the absence of a water or energy audit report, the data provided by the municipal representatives has been considered for all the assessments. The actual technical losses may be more or less than that stated and can be verified only if water audit is undertaken along with the consumer survey.

Table 64 Basic Profile of Water Supply Services in Kulgaon-Badlapur

Kulgaon-Badlapur Utility Profile			
Key infrastructure components	Bulk supply		28 MLD
	Water treatment capacity		52 MLD
	Treated water available for consumption		93 lpcd
	Storage capacity	1 elevated storage reservoir	10.1 MLD
		4 ground storage reservoirs	4.55 MLD
	Distribution network	114 kilometers	
	Connections	12,523	
Water supply financials (FY2007)	Water account revenue	Rs59.2 million	
	Annual operation and maintenance costs	Rs53.1 million	
Tariff	Flat tariff	Domestic	Rs7.6/kl
		Nondomestic	Rs34.65/kl

kl = kiloliter, lpcd = liter per capita per day, MLD = million liters per day, Rs = rupees.

Source: Kulgaon-Badlapur Municipal Council.

Table 65 Key Water Supply Indicators for Kulgaon-Badlapur

Performance Area	Typical Norm	Kulgaon-Badlapur	Key Inference
Bulk Water			
Supply (per capita treated water available for consumption)	135 lpcd	93 lpcd	As per CPHEEO norms, the total water supplied to consumers after treatment should be 135 lpcd. The bulk supply currently has an average of 93 lpcd. If the transmission losses are reduced from the existing level of 33% to an average of 20%, the water supply available for consumption would increase by 4 MLD, and raise the per capita availability of water to 110 lpcd at the consumers' end. This indicates that the city does have an immediate need to augment its bulk water supply.
Treatment			
WTP capacity	100%	100%	The current installed WTP capacity is sufficient and has been operating as per required standards.
Treatment loss	Less than 3%	2%	The treatment losses are within the norms.

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Table 65 *continued*

Performance Area	Typical Norm	Kulgaon-Badlapur	Key Inference
Transmission and Distribution			
Losses	Less than 15%	33%	There are high transmission losses due to leakages from old, corroded pipes. Current pipelines are 35 years old and have a high extent of leakages.
Consumer			
Coverage (connections/total households)	100%	100%[a]	On an average in KBMC, each connection serves five households. Therefore, the existing connections indicate full coverage. The city has no public standposts.
Metering/total connections	100%	100%	All the existing connections are metered and a volumetric tariff system is in operation.
Duration of water supply	24 hours	5 hours each day	Duration of supply is insufficient and needs to be improved. This calls for a reduction in losses and more efficient operations of the system.
Operation and maintenance cost recovery	100%	100%	The cost recovery levels are satisfactory.
Unit production cost Unit income		Rs5.20/kl Rs5.80/kl	The revenue realizations against per unit production costs are high.
Collection efficiency	100%	97%[b]	The collection efficiency level is satisfactory.

CPHEEO = Central Public Health and Environmental Engineering Organisation, kl = kiloliter, KBMC = Kulgaon-Badlapur Municipal Council, lpcd = liter per capita per day, Rs = rupees, WTP = water treatment plant.

[a] KBMC officials indicate that one connection serves five households. However, it would be prudent for Maharashtra Jeevan Pradhikaran and KBMC to maintain a detailed consumer database to estimate the actual number of households served by each connection.

[b] Collection efficiency has been measured against current demand raised vis-à-vis the current collections.

Source: CRISIL analysis and data provided by Kulgaon-Badlapur Municipal Council and Maharashtra Jeevan Pradhikaran.

Identification of Key Issues

Following the assessment of the water supply services in Kulgaon-Badlapur, the next step is for the ULB to clearly list all the key service and infrastructure-related issues being faced by the current water supply system in the city. However, the assessment undertaken, so far, indicates a largely satisfactory level of operations and management of the water supply services in the city. The only issue that requires attention is the distribution losses, which exceed acceptable standards.

Review of Water Supply Projects

Having identified the key issues in the existing status of provisioning of water supply services in the city, the next activity to undertake is a brief review of the projects that have already been identified for Kulgaon-Badlapur under various schemes for improvement of the water supply services. In the context of the issues faced at by the city, KBMC has proposed a project for rehabilitation of the distribution network. The project has been proposed under the Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT).

Step 2: Choice between Public Funding and the PPP Option

Having undertaken the assessment of the existing status of the water supply services in the city, identified key issues, and briefly reviewed the projects identified by the city, the next step is

Table 66 Proposed Water Supply Projects

Potential Area of Investment	Scheme Proposed	Details
Rehabilitation and/or replacement of existing transmission and distribution infrastructure to reduce technical losses to minimum acceptable standards	Project proposed under UIDSSMT scheme. It includes rehabilitation of distribution network pipelines, repairs to the main balancing reservoir, a 24-MLD water treatment plant, and a consumer survey.	Capital expenditure required (DPR): Rs268.5 million. In 2009, when the project was under review and had not received the requisite approvals. If approved, KBMC's share of the project is expected to be Rs26.8 million.

DPR = detailed project report, KBMC = Kulgaon-Badlapur Municipal Council, MLD = million liters per day, Rs = rupees, UIDSSMT = Urban Infrastructure Development Scheme for Small and Medium Towns.

Source: Kulgaon-Badlapur Municipal Council.

to choose between the public mode of funding and implementing the proposed project and the private or public–private partnership (PPP)-based mode of developing and implementing the project.

The city has limited scope for PPP since no major capital investment is required and the operational efficiencies are satisfactory. Also, if any investments are needed for source augmentation in the future, KBMC, with a revenue surplus of Rs117.6 million, has the financial capability to undertake such investment.

Therefore, there is no scope for PPP-based intervention in supply of water supply services in Kulgaon-Badlapur.

XIII Ambernath

Brief Introduction to Ambernath

The city of Ambernath is a part of the Thane district of Maharashtra. Managed by the Ambernath Municipal Council, the city encompasses an area of 38 square kilometers and has a current population of 250,000 (203,000 at the 2001 census). The council has a revenue account budget of Rs580 million (fiscal year 2007), and a revenue surplus of Rs22.7million.

The water supply works are managed by the Maharashtra Jeevan Pradhikaran (MJP) as a combined scheme for the towns of Kulgaon-Badlapur and Ambernath. With respect to expenses incurred on Ambernath by MJP, the water account generates a surplus of Rs60 million.

Existing Water Supply System

Ambernath draws a total water supply of 39 million liters per day (MLD) from three water sources—the Chikhaloli Dam, the Ulhas River, and the Barvi River. Of the total, 28 MLD is supplied by MJP, 5 MLD by the Maharastra Industrial Development Corporation (MIDC), and the balance of 6 MLD by the Ambernath Municipal Council.

The city receives a treated water supply of 106 liters per capita day (lpcd) for consumption. Water is available for 4 hours each day and is supplied through individual connections. A basic profile of the water supply system of Ambernath is presented in Table 67.

Table 67 Basic Profile of Water Supply Services in Ambernath

Ambernath Utility Profile			
Key infrastructure components	Bulk supply		39 MLD
	Chikhaloli Dam		6 MLD
	Ulhas River		32 MLD
	Barvi River		5 MLD
	Water treatment capacity	Chikhaloli, Belavali	6 MLD
	Water availability after treatment		150 lpcd
	Storage capacity	2 elevated storage reservoirs	3.5 MLD
		2 ground storage reservoirs	4.42 MLD
	Distribution network	64 kilometers	
	Connections	6,000	
Water supply financials (FY2007)	Water account revenue	Rs113.3 million	
	Annual operation and maintenance costs	Rs47.1 million	
Tariff	Flat tariff (per annum)	Domestic	Rs7.6/kl
		Nondomestic	Rs35.4/kl

FY = fiscal year, kl = kiloliter, lpcd = liter per capita per day, MLD = million liters per day, Rs = rupees.

Source: Ambernath Municipal Council.

Step 1: Identification of the Problem Area

As a first step to assessing the status of the water supply services in the city of Ambernath, an assessment of the problem areas in the existing system's services needs to be carried out. This would highlight the interventions required to improve the level of services. The first activity to undertake is a service assessment against a few key performance criteria. On the basis of the assessment, the key issues in the current system would need to be identified and existing projects reviewed. It should be noted that the assessment presented here for Ambernath is based on only a few key parameters. For a detailed review, as discussed in Part I of the tool kit, the urban local body (ULB) would be required to carry out consumer survey, water audit, leak detection survey, and energy audit for the entire value chain of water supply services.

Compiling Key Parameters

Based on the preliminary analysis of water supply service data[23] and discussions with Ambernath and MJP officials, CRISIL Risk and Infrastructure Solutions Limited (CRISIL) assessed the current water supply system of the city. Table 68 presents the key indicators for assessing the water supply system at Ambernath and the resultant inferences.

Identification of Key Issues

The next stage following the assessment of the water supply services in Ambernath is for the ULB to clearly list down all the service and infrastructure-related issues being faced by the current water supply system in the city. Based on the status of water supply operations, key water supply indicators, and key inferences, it can be seen that the overall water supply operations in the city are satisfactory. However, there is scope for further improvement, such as ensuring 100% coverage of the water supply services, higher frequency of supply, and 100% metering of all the connections.

Review of Water Supply Projects with Approved Detailed Project Reports

Having identified the key issues in the existing status of provisioning of water supply services in the city, the next activity is to undertake a brief review of the projects that have already been identified for Ambernath under various schemes for improvement of the water supply services. MJP has identified the following projects for the water supply sector (Table 69).[24]

As of August 2009, works on phase 1 of the project were under way, and the costs were being borne by Ambernath Municipal Council. For phase 2 of the project, the detailed project report has been prepared. However, no approvals have been received.

Step 2: Choice between Public Funding and the PPP Option

Having undertaken the assessment of the existing status of the water supply services in the city, identified key issues, and briefly reviewed the projects identified by the city, the next stage involves choosing between the public mode of funding and implementing the proposed project and the private or public–private partnership (PPP)-based mode of developing and implementing the project.

The city has limited scope for PPP since the current water supply issues are adequately addressed by the ongoing project of Maharashtra Sujal Nirmal Abhiyaan. The proposed water source augmentation project is not an immediate need of the city and is currently under preparation. The detailed

[23] In the absence of a water or energy audit report, the data provided by the municipal representatives has been considered for all the assessments. The actual technical losses may be more or less than that stated and can be verified only if water audit is undertaken along with consumer survey.

[24] Note that for the purpose of this assessment, a due diligence on the project components and costs has not been undertaken.

Table 68 Water Supply Indicators and Inference

Performance Area	Typical Norm	Ambernath	Key Inference
Bulk Water			
Supply (per capita treated water available for consumption)	135 lpcd	106 lpcd	As per CPHEEO norms, the total water supplied to consumers after treatment should be 135 lpcd. Ambernath supplies 106 lpcd (30 MLD). If transmission losses are reduced from the existing level of 22% to an average of 20%, the water supply available for consumption would increase by 1.8 MLD, and raise the per capita availability of water to 112 lpcd at the consumer end. Though the supply levels do not meet the requisite norm the availability can be considered adequate and not requiring any immediate source augmentation.
Treatment			
Water treatment plant capacity	100%	100%	The bulk of the treated water is supplied from the treatment plant at Kulgaon-Badlapur. Though the utilization of the water treatment plant is more than the installed capacity, there is no adverse effect on the quality of treated water supply.
Loss	Less than 3%	2%	Loss levels meet the norm.
Transmission and Distribution			
Losses	Less than 15%	22%	The extent of transmission losses is moderate.
Consumer			
Coverage (connections/ total households)	100%	88%	Assuming that one connection caters to two households, existing coverage levels need to be improved.
Metering/total connections	100%	78%	The connections provided by MJP are fully metered. However, those provided by AMC are metered only to the extent of 5%. The remaining connections need to be metered.
Duration of water supply	24 hours	4 hours	Supply duration is insufficient and needs to be improved. This calls for reduction in losses and more efficient operations.
Operation and maintenance cost recovery	100%	100%	The high recovery levels indicate satisfactory levels of operational efficiency.
Unit production cost Unit income		Rs7.70/kl Rs9.70/kl	Revenue realization per unit against cost of production is high, indicating satisfactory levels of operational efficiency.
Collection efficiency	100%	93%[a]	The current collections are high; however, further improvements can be made.

AMC = Ambernath Municipal Council, CPHEEO = Central Public Health and Environmental Engineering Organisation, kl = kiloliter, lpcd = liter per capita per day, MJP = Maharashtra Jeevan Pradhikaran, Rs = rupees.

[a] This includes efficiency of current collections only. Arrears of water account are Rs250 million. This is on inclusion of a number of villages to the jurisdiction. These arrears are spread over several years.

Source: CRISIL analysis on the basis of data provided by Maharashtra Jeevan Pradhikaran and Ambernath Municipal Council.

Table 69 Proposed Water Supply Projects

Potential Area of Investment	Scheme Proposed	Details
Augmentation of water supply; improvements to the existing water supply system, including metering and repairs.	Proposed under the Sujal Nirmal Abhiyaan scheme Phase 1: installation of bulk meters, reassessment of properties to reduce illegal connections, implementation of spot billing, replacement of distribution lines, replacement of faulty consumer meters, and replacement of old transmission pipelines Phase 2: water supply augmentation scheme	Capital expenditure required (DPR): Rs40 million Capital expenditure required (escalated): Rs48 million Sujal Nirmal grant: Rs36.0 million Ambernath contribution: Rs4.0 million plus escalation of Rs8.0 million Capital expenditure required (DPR): Rs155.6 million[a]

DPR = detailed project report, Rs = rupees.

[a] Phase II of the project has not been considered as the DPR and the project cost are not approved as yet.

Sources: Maharashtra Jeevan Pradhikaran and Ambernath Municipal Council.

project report and project cost of the proposed project are yet to be finalized. Given that there is no immediate need to undertake any capital project, and also accounting for the current satisfactory levels of operations, it can be concluded that there is limited scope or need for PPP-based intervention to improve the water supply service delivery in the town.

XIV Navi Mumbai

Brief Introduction to Navi Mumbai

The city of Navi Mumbai, previously known as New Bombay, is a part of the Mumbai conurbation. With a total area of 344 square kilometers (km^2), Navi Mumbai was developed as a twin city of Mumbai, and is considered to be one of the largest planned cities in the world. Of the total city limits, an area of 108.63 square kilometers is managed by the Navi Mumbai Municipal Corporation (NMMC). The part of the city managed by the NMMC has a current population of approximately 1.2 million. In fiscal year 2008, the NMMC had a revenue account budget of Rs4,800 million and a revenue surplus of Rs1,300 million.

Existing Water Supply System

Navi Mumbai has a total water supply of 317 million liters per day (MLD). Water is supplied from three sources: Morbe Dam, Hetvane Dam, and Barvi Dam. The NMMC purchases 32 MLD of potable water from the City and Industrial Development Corporation of Maharashtra; the water supply of 67 MLD from Barvi Dam is a backup arrangement in case of a temporary shutdown of the Morbe Dam.

The city has a water treatment plant (WTP) of 450 MLD capacity within the municipal limits, a second WTP with an installed capacity of 50 MLD at the Hetvane site, and a third WTP with an installed capacity of 160 MLD at the Barvi site. The city receives a treated water supply of 200 liters per capita per day (lpcd) on average. The supply hours vary between a minimum daily supply of 4 hours to a maximum of 24 hours in a few wards. Water is supplied through 115,264 direct house service connections, of which 75% are currently metered. A basic profile of the water supply system of Navi Mumbai is presented in Table 70.

Assessment of the Water Supply System

Based on the preliminary analysis of water supply service data[25] and discussions with NMMC officials, CRISIL Risk and Infrastructure Solutions Limited (CRISIL) assessed the current water supply system of the city. Table 71 presents the key indicators for assessing the water supply system at Navi Mumbai and the resultant inferences.

The water supply service of Navi Mumbai has been assessed as performing at a fairly good level. On all the key indicators of water supply services, the NMMC has delivered as per the required norms and standards. In the instances where there has been a shortfall, such as metering levels, efforts are being made to achieve the required standards.

The NMMC has been able to sustain good service delivery standards on account of a combination of reforms and stringent measures to improve operational efficiency standards. One such measure is the use of geographic information system-based software for tracking cases of illegal connections.

[25] In the absence of a water or energy audit report, the data provided by the municipal representatives has been considered for all the assessments. The actual technical losses may be more or less than that stated and can be verified only if water audit is undertaken along with consumer survey.

Table 70 Basic Profile of Water Supply Services in Navi Mumbai

Navi Mumbai Utility Profile			
Key infrastructure components	Bulk supply		317 MLD
	Morbe Dam		218 MLD
	CIDCO Hetvane		32 MLD
	MIDC Barvi		67 MLD
	Water treatment capacity	Navi Mumbai	450 MLD
		CIDCO Hetvane	50 MLD
		MIDC Barvi	160 MLD
	Water availability after treatment		200 lpcd
	Storage capacity	Elevated storage reservoirs	74.95 MLD
		Ground storage reservoirs	124.50 MLD
	Distribution network	721 kilometers	
	Connections	115,264	
Water supply financials (FY2007)	Water account revenue	Rs548.9 million	
	Annual operation and maintenance costs	Rs143.4 million	
Tariff	Volumetric tariff	Residential	Rs4.75/m^3
		Commercial	Rs30.00/m^3
		Institutional	Rs11.00/m^3

CIDCO = City and Industrial Development Corporation, FY = fiscal year, lpcd = liter per capita per day, m^3 = cubic meter, MIDC = Maharashtra Industrial Development Corporation, MLD = million liters per day, Rs = rupees.

Source: Navi Mumbai Municipal Corporation.

Table 71 Water Supply Indicators and Inferences

Performance Area	Typical Norm	Navi Mumbai	Key Inference
Bulk Water			
Supply (per capita treated water available for consumption)	135 lpcd	200 lpcd	The treated water supply at Navi Mumbai is high at 200 lpcd levels, much higher than the 135 lpcd norms set by CPHEEO. Current levels of losses in the system are minimal and offer limited scope for reduction. The current water supply levels are assessed to be adequate and, therefore, there is no immediate need for bulk water supply augmentation.
Treatment			
WTP capacity	100%	100%	The installed WTP capacity is 450 MLD, of which only 250 MLD is currently being utilized. The current WTP availability is sufficient and, hence, does not require augmentation.
Loss	Less than 3%	2%	Loss levels meet the norm.

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Table 71 *continued*

Performance Area	Typical Norm	Navi Mumbai	Key Inference
Transmission and Distribution			
Losses	15%	17%	Minimal acceptable levels of transmission losses. Of these losses, approximately 4% are attributed to theft. NMMC can take measures to check these instances of theft and further reduce losses.
Consumer			
Coverage (connections/ total households)	100%	100%	Individual connections are provided to all units within the municipal area.
Metering/total connections	100%	78%	Though the current extent of metering is less than the required norm, NMMC is currently undertaking measures to achieve 100% metering within the following 6 months. With effective operations of the metering system and rational tariff levels, per capita water consumption is reported to have been reduced.
Duration of water supply	24 hours	4 hours–24 hours	Most wards receive 24 hours of uninterrupted water supply. Only a few wards receive water for 4 hours. However, in these wards, the supply frequency is twice a day.
Operation and maintenance cost recovery	100%	100%	The high recovery levels indicate that operational efficiency is satisfactory.
Unit production cost Unit income		Rs1.27/kl Rs9.70/kl	High revenue realization per unit against cost of production indicates satisfactory levels of operational efficiency.
Collection efficiency	100%	97%	Current collections are high; however, further improvements can be made. Total collections include an arrears component of Rs240 million. However, these are one-time accumulated arrears from areas that were previously not included in NMMC municipal limits and have been recently included.

CPHEEO = Central Public Health and Environmental Engineering Organisation, kl = kiloliter, lpcd = liter per capita per day, NMMC = Navi Mumbai Municipal Corporation, Rs = rupees, WTP = water treatment plant.

Source: CRISIL analysis on the basis of data provided by Navi Mumbai Municipal Corporation.

Proposed Water Supply Project

To further improve its water supply services, the NMMC has proposed a project under the Jawaharlal Nehru National Urban Renewal Mission (Table 72).

To manage its water supply services, the NMMC has engaged a private developer to operate and maintain the entire water supply system. The type of public–private partnership (PPP) contract implemented by the NMMC is a performance-based service contract for the operation and maintenance (O&M) of water supply services.

Table 72 Proposed Water Supply Projects

Potential Area of Investment	Scheme Proposed	Details
Improvements to the existing water supply services through measures, such as increasing coverage, improving metering systems, and rehabilitating the distribution network	Development of Supervisory Control and Data Acquisition (SCADA) system Remote reading system for meters Additional 42,000 meters in the slums Rehabilitation of 150 kilometers of distribution network 150-MLD WTP	Capital expenditure required (DPR): Rs2,300 million

DPR = detailed project report, MLD = million liters per day, Rs = rupees, WTP = water treatment plant.

Source: Navi Mumbai Municipal Corporation.

For a clear understanding on how the current contract oversees and ensures efficient management of water supply services in the city, details of the PPP structure are now presented.

About the PPP Structure

The performance-based operation and management contract requires the private operator to operate and manage the water supply services from the point of the elevated and ground storage reservoirs to the consumer end. The operator would be supplied with treated water from the treatment plant through the pure water transmission lines, and from that point on, all activities would be managed by the operator.

Therefore as per the contract, the NMMC is responsible for bulk water supply sourcing, raw water transmission, and treatment at the WTP. The focus of this contract is to ensure improved services at the distribution end, inclusive of metering, billing, and collection. The private operator is, therefore, not required to make any capital-based improvements to the water supply system, such as augmentation, and replacement or rehabilitation. Under this agreement, the following activities have to be performed by the private operator:

(i) operations and management of elevated and ground storage reservoirs, pumps, and distribution network;
(ii) maintenance of water supply pressures and chlorination of water at the distribution end;
(iii) operation and maintenance of the distribution network, including leak detection and management;
(iv) provision of new water connections as per the urban local body's directions;
(v) installation of bulk and consumer-end metering, billing, and collection;
(vi) civil works, including repairs and maintenance of the water assets from the elevated storage reservoir point to the distribution end, including meters, bore wells, and public standposts; and
(vii) consumer redress.

The NMMC will set the user charges to be levied and collected, and the private operator will be required to generate the bills as per the set tariff structure, and collect and hand over the revenues to the NMMC. The private operator would be paid, on an annuity basis, a fixed contract price for these activities. In addition, the contract offers incentives for performance over the set standards. With reference to the expenditure incurred on O&M of the water supply services, as per the agreement, the NMMC would be required to bear the expenses for purchase of bulk water, energy charges, chemicals, and any major capital investment work to the existing water assets. The expenses on labor engaged for O&M and civil works would be borne by the private operator.

Key Roles and Responsibilities of the Navi Mumbai Municipal Corporation and the Private Operator

The key roles and responsibilities of the stakeholders are given in Table 73.

Figure 18 presents a holistic view of the entire transaction under a distribution-cum-revenue collection contract.

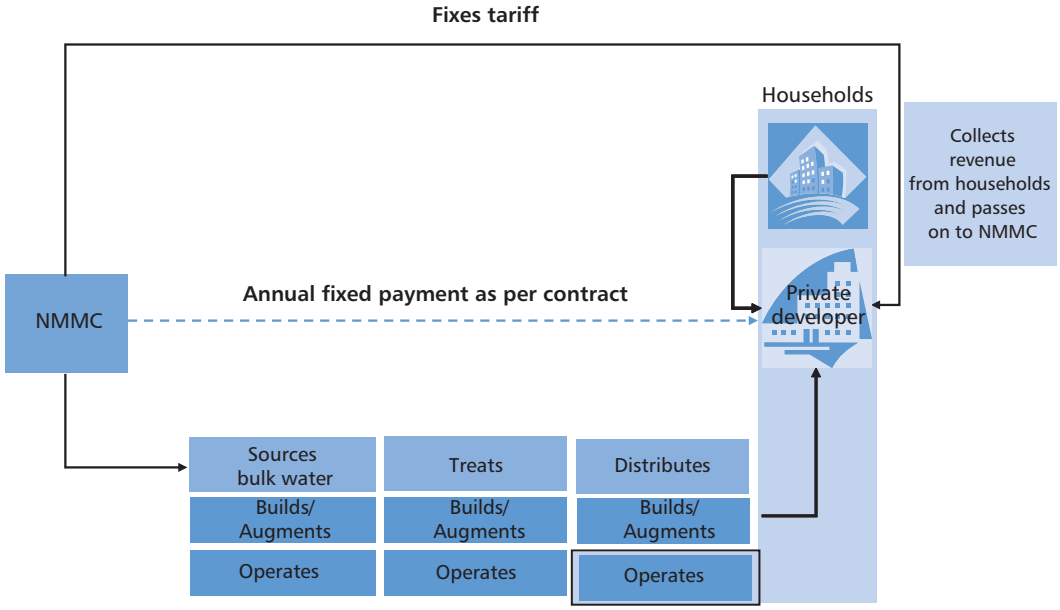
Though the NMMC would facilitate obtaining necessary clearances and permits required for operations, the final responsibility for obtaining all the applicable permits would rest with the private developer. In addition, during the period of the contract, if there are any disruptions in supply of bulk water, electricity, etc., the private developer is obligated to make the requisite interim arrangements.

As per the contract, in addition to carrying out the O&M activity, the private developer is required to undertake overall system and energy audits on a regular basis. The contract specifies the potential increase in the scope of work, which may be asked of the private developer. The NMMC may need to increase the length of the existing distribution pipelines, and the number of connections and critical pressure points. The contract specifies the maximum range by which these could increase, beyond which the contract price or the annual payment would be revised for the private developer.

Table 73 Key Roles and Responsibilities of the Private Developer and the Urban Local Body

Particulars	Private Operator	Navi Mumbai Municipal Corporation
Primary task	Operates and maintains the distribution network inclusive of operation of pumps, elevated and ground storage reservoirs, chlorination, civil works, metering, billing, and collection	Operates and manages the water supply system up to the point of the elevated or ground storage reservoir Undertakes major capital investment works for the entire water supply system Provides permits and rights of operation to private developer
	Provides all necessary equipment required for operation and maintenance	Oversees operation and maintenance of distribution network
Tariff	Generates bills as per set tariff	Determines user charges and tariff structure
Operating expense	Pays all expenses related to labor employed Bears expenses on repair of assets Installs meters and incurs operation and maintenance expense on meters Bears any other operation and maintenance expense related to distribution network	Pays for raw water purchase, water testing charges, and electricity consumption Bears expenses on chlorination of water
Capital expense		Bears all capital expenditure works, including augmentation of the existing system, replacement and/or complete rehabilitation of the distribution network
Asset ownership	Only gets rights of operation of the assets, and is required to hand over the assets at the end of the tenure of the contract	Takes over assets at the end of the contract period

Figure 18 Structure of Water Supply Performance Management Contract for Operation and Maintenance



NMMC = Navi Mumbai Municipal Corporation.

Key Features of Navi Mumbai Municipal Corporation's Performance Management Contract

Some of the unique features and risk mitigation measures, which form part of the existing contract, are as follows:

(i) The contract clearly lists down the performance criteria, which are to be met by the private developer for operations and management of the system. For instance, along with the regular tasks, the operator is required to undertake energy and system audits. These audits are intended to facilitate leak detection, fix incorrect connections, reduce power consumption, etc. Against these measures, the private developer is provided with a clear system of incentives. For example, for every kiloliter reduction in water loss beyond the benchmark, a per unit revenue incentive of Rs2 is mentioned. Similarly, for detection of each illegal connection, an incentive value has been fixed. Such revenue-linked incentives have been built-in to encourage better operation of the system by the private developer.

(ii) Stringent penalties have also been built into the contract. For instance, the penalty value has been fixed, in case the private developer exceeds the specified number of reports for failing to provide water supply at specified pressure levels. Such penalties are applicable for any deviation in water quality levels, loss levels, increased power consumption, inadequate system maintenance, delay in meter reading, unauthorized sale of water or provision of new connections, non-attendance to customer complaints within the prescribed timelines, etc. If penalty charges exceed 10% of the contract price for the concerned operating year, the NMMC would review whether the contract needs to be continued with the operator or terminated.

(iii) To be able to ensure effective implementation of the incentives and penalties, the NMMC has also detailed

in the contract the system of regulation and monitoring. The NMMC would compare the water bill amount generated at each zone with the amount of water supplied as per records and, in case of any difference in the expected and actual bill amount, seek a detailed explanation from the private operator.

(iv) In its effort to ensure implementing consumer responsibility, the NMMC has authorized the private operator to impose stringent penalties. For example, if a water tank is found to be overflowing, a penalty of 100% of average amount of 4 months would be imposed.

(v) Failure of the operator to dispense any of the required duties would result in the NMMC undertaking the same service at the operator's cost.

Risk Sharing between the Navi Mumbai Municipal Corporation and the Private Developer

The apportioning of key risks between the private developer and the urban local body is shown in Table 74.

Table 74 Key Risk Sharing

Risks	Private Operator	NMMC
Commissioning risk		✓
Design risk		✓
Operations risk	✓	
Financial risk	✓	
Payment risk		✓
Performance risk	✓	
Change in law risk	✓	✓
Force majeure risk		✓

NMMC = Navi Mumbai Municipal Corporation.

PART IV

Term Sheets

I Introduction

Part IV of this report presents the detailed term sheets prepared for the public–private partnership (PPP) options identified for the cities analyzed in Part III. In Part III, the sample set of cities of Maharashtra—Jalna, Sangli-Miraj-Kupwad, Kolhapur, Virar, Navghar Manikpur, Chiplun, Akot, Saoner, Shirpur, Kulgaon-Badlapur, and Ambernath—were studied to assess the status of their water supply and sewerage services and choose an appropriate PPP structure for the projects identified as necessary to improve the water supply and sewerage services. The PPP structures recommended are based on the study of a sample of PPP projects that have been implemented in India. These PPP structures can be modified according to the unique requirements of a project and may be further refined to address the needs of the urban local body (ULB) or state agency and the project. Detailed term sheets, their objectives, and contents are presented in this part of the report.

Objective of the Term Sheet

The term sheet is a reference guide for understanding the key clauses applicable under a specific PPP structure. The clauses presented in the term sheet would help the ULB or state agency in drafting a contract for the PPP structure selected for implementation of the identified projects in the water supply and sewerage sector. The term sheets presented have been developed for those PPP structures that have been found to be best suited for the cities studied in Part III.

The ULB or state agency can refer to the detailed set of clauses, which have been listed in order to develop a comprehensive PPP contract. It should be noted that the clauses mentioned are generic in nature and would vary according to the unique characteristics of the PPP structure finalized for a specific city. The roles, responsibilities, and risk mitigation measures are subject to change, depending upon the output from the detailed analysis, which the ULB or state agency would carry out.

Contents of the Term Sheet

As indicated, the term sheet is expected to offer the user with broad guidelines for the preparation of a comprehensive contract for the PPP structure identified. The term sheet broadly covers the following areas:

(i) list of preparatory work to be undertaken by the ULB or state agency before the commencement of the PPP contract,
(ii) list of information to be provided by the ULB to the private developer,
(iii) tenure of the PPP contract,
(iv) roles and responsibilities of the developer, and
(v) ULB's obligations.

- Project monitoring mechanism
- Performance standards
- Payment terms
- Risk Mitigation strategies
- Consequences of default
- RFQ criteria
- Bidding parameter

The details of the above-mentioned contents are as presented in the term sheets in the following sections of this report.

II Term Sheets

Performance Management Contract for the Entire Water Supply System

Problem Definition

The urban local body (ULB) has low levels of overall operational efficiencies. Under the current supply of water, although the existing infrastructure is satisfactory, the ULB is unable to fully recover operation and maintenance (O&M) costs incurred. The low cost recoveries may be attributed partly to low tariff levels, but are also affected by inefficient management of the water supply services, such as inadequate monitoring, a high extent of theft, poor leak detection and management, and low levels of collection efficiency. In addition, the entire water supply system may not have an adequate extent of metering. As a result, the ULB would require better management of the entire water supply system with a single focus on improvisation of operational efficiencies and full cost recovery.

Need for PPP

The ULB needs public–private partnership (PPP) largely to improve the service delivery mechanism. The ULB has, historically, seen poor-to-moderate operational standards and or has seen minimal year-on-year operational improvement to the water supply system. The ULB, therefore, needs an improvement in current operational levels, including reduction of energy costs, reduction of transmission and distribution losses, and improvement in collection efficiency. Therefore, the ULB needs a private operator to bring about operational efficiencies in the overall management and provisioning of water supply services.

PPP Structure

The PPP structure designed to address the state's problem is a performance management contract for O&M of the entire water supply system. Under such a structure, the private developer would be required to carry out all the water supply operations, starting from sourcing of bulk water from the existing source, to transmission to the treatment plant, treatment, storage, and supply through the existing distribution network. In addition, in the absence of bulk meters and meters at the consumer end, the private developer would also be required to install these, operate and maintain the meters, read and record data, generate bills, and undertake collection. The private developer would be paid, on an annuity basis, for the activities undertaken. This annuity sum is to be treated as the important financial bid parameter.

Objective of the PPP Structure

This PPP structure aims to improve the operational efficiencies of the water supply system by ensuring improved operational recoveries, reduced losses, and improved collection efficiency.

Integrated Concession and Management of the Entire Water Supply and Sewerage System

Problem Definition

The ULB faces a dual problem of poor water supply coupled with absence of a sewerage system. There exists a shortage of the current water source, highly corroded raw water and pure water transmission mains, high treatment losses, and an old distribution network with leakages and high number of illegal connections. The ULB is unable to recover its operational costs from the current water revenue due to inadequate tariffs, insufficient direct connections, and poor collection efficiency. As a result, the ULB needs to invest in the

Sl No.	Item	Description
1	Preparatory work by urban local body (ULB)	1. Undertake a consumer survey to gauge the number of direct connections, unauthorized connections, etc. 2. Undertake a technical survey (including water audit study, leak detection study, and energy audit study) to gauge the current status of the water supply system, including the technical losses in the system 3. Analyze the efficiency of the treatment plant and collect detailed information on the number of pumps and staff 4. Decide on the quality and type of meters to be installed in the city 5. Undertake a survey of the raw water transmission, pure water transmission, and distribution network on a geographic information system (GIS) platform 6. Undertake a valve operation study 7. Undertake a customer regularization plan
2	Information to be provided to the private operator by the ULB	1. Contract of ULB with the Water Resource Department for drawing of water source 2. Contract of ULB with the Electricity Board for supplying power to the water supply system and the tariff details 3. Design of the water supply system, including jack well, elevated storage reservoirs, main balance reservoirs, water treatment plant (WTP), raw water transmission lines, and distribution network 4. Details of the existing connections—number and type 5. Details of quality of bulk meters and customer meters 6. Details of quality of leak detection equipment 7. Tariff structure of water connection charges, water supply charges, penalties for illegal connection and nonpayment of water supply charges and escalations to both, if applicable 8. Contour maps and network maps 9. Quality standards of water to be maintained 10. Disposal standards for the inert matter generated at water treatment plant 11. Operation and maintenance standards of reservoirs 12. Specifications and standards of handover of assets at the end of the contract period
3	Tenure of the PPP contract	Generally 5–10 years, depending on the financial feasibility of the project, the life of the water assets, and political will
4	Roles and responsibilities of the developer	1. Takeover of all the water supply systems from source to distribution point, including jack wells, pipelines, WTPs, electrical substations, storage reservoirs, pumping stations, meters, and valves 2. Operate pumping stations and jack wells for drawing of bulk water from the source

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Table *continued*

Sl No.	Item	Description
		3. Operate and maintain the pumping stations 4. Operate and maintain the main balancing reservoir 5. Operate valves for raw water transmission from the source to the WTP 6. Repair and maintain the raw water transmission pipelines 7. Operate and maintain the WTP as per the procedure and quality standards specified by the ULB 8. Operate and maintain the storage reservoirs; operate outlet valves of elevated storage reservoirs (ESRs) and/or ground storage reservoirs (GSRs) to supply water as per operating schedules 9. Operate and maintain the existing connections 10. Operate valves in the distribution network for efficient and equitable water distribution 11. Carry out minor repairs to the water supply assets for a period of ___ years 12. Conduct daily checks to water pressure levels 13. Establish bulk meters at the WTP and storage reservoirs, and measure the input and output volumes 14. Maintain overall cleanliness and hygiene standards for all water supply assets being maintained; avoiding conditions of waterlogging and mosquito breeding in ESR, GSR, and GSR complexes 15. Dispose the waste generated and other inert matter from the WTP as per applicable environmental norms 16. Check quality of treated water and operating chlorinators to add chlorine dosage as required; collect the water samples from various locations and submit it to the laboratory for testing on a daily basis 17. Record and report the readings of bulk flow meters at various inlets and outlets on a daily basis 18. Establish meters for all the consumer connections, operate and maintain the meters (100% metering) 19. Record, on a monthly basis, water meter readings of customer and register these in an appropriate computer database, and print and distribute water bills and notices to consumers as per instructions of the engineer-in-charge 20. Provide and maintain new connections to households 21. Provide security for facilities and/or system at all times

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Table *continued*

Sl No.	Item	Description
		22. Conduct daily data recording regarding working hours of each pump, power factor, power consumption to be collected; record and submit to the executive engineer-in-charge of the ULB (water supply) 23. Undertake an overall system and connection audit, including leak detection, recording and rectification of incorrect customer connections, detection of faulty meters, detection of illegal use of water, and regulation of meters to reduce energy consumption once every ___ years 24. Undertake replacement of damaged or leaking pipelines up to ___ meters 25. Undertake maintenance of public wells and bore wells, including de-silting, disinfection, and any repair 26. Develop and maintain a public awareness system to inform about system breakdown, shutdown, and supply shortage 27. Arrange water tankers for the public in times of water crises or power failure 28. Pay the Water Resources Department for offtake of water from the water resource, in accordance with the contract between the Water Resources Department and the ULB 29. Pay for electricity consumed for the operation and maintenance (O&M) of the water supply system and bear power tariff escalations, if any 30. Bear all expenses for chemicals required for operating WTPs 31. Arrange for staffing for the O&M of the water assets as per the contract and for undertaking the scope of work as defined in the contract. Bear all establishment expenses for operating and maintaining the water assets, including the salaries and wages of the staff deployed by the developer, uniforms, and safety equipment; undertake medical tests at pre-described intervals, etc. 32. Ensure that the raw water transmission losses are within the range specified in the performance standards 33. Submit records on water quality maintained at different points in the value chain to the ULB 34. Ensure that O&M standards are as per specified levels 35. Submit a plan to the ULB outlining the details of the O&M activities timelines and the phasing of metering, reducing unauthorized connections, etc. 36. Charge penalty to consumers if the water supply charges and water connection fees are not paid within the specified time limit 37. Operate and maintain the existing connections

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Table *continued*

Sl No.	Item	Description
		38. Maintain a record of all assets purchased by the private developer 39. Assess the gross yearly demand of raw water and submit it to the ULB for approval, and facilitate the further submission to the Water Resources Department 40. Abide by all applicable bylaws, notifications, amendments to labor laws, etc. 41. Provide a superintendent to be an authorized representative of the private developer and key point of contact for the ULB 42. Undertake extensive campaigning and awareness programs for metering of connections 43. Supervise procurement or supply chain management 44. Define and implement customer service policy applicable to the developer's employees
5	ULB's obligations	1. Responsible for signing the contract with the Water Resources Department for offtake of water from the water source 2. Responsible for signing contract with the Electricity Department for supply of electricity for the water supply operations 3. Replacement of pumping stations, as needed 4. Ensure that the pipes for raw water transmission are closed in order to avoid raw water transmission losses due to evaporation and theft 5. Replacement of the raw water transmission pipelines, distribution network pipes, WTP augmentation, major repairs, and reconstruction works, etc., as needed 6. Fix the tariff for water supply for the consumer and determine the escalations 7. Facilitate approvals needed 8. Monitor the operations of the developer 9. Maintain administrative control over the personnel, facilities, and/or system 10. Alter water supply timings, quantities, pressures, and zoning 11. Provide tentative list of staff and labor required 12. Implement capital expenditure as per the Capital Investment Plan 13. Enable access to the water assets, free from encumbrances 14. Permit peaceful use of the water assets 15. Provide support to the developer for regularizing illegal connections 16. Disconnect the water connection if the consumer does not pay the water supply charge and the penalty within the specified time limit

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Table *continued*

Sl No.	Item	Description
6	Monitoring mechanism	1. Developer shall undertake periodic inspection of water assets and submit reports to an independent engineer; the independent engineer shall review the maintenance reports and inspect the water assets at least once in 3 months and submit an O&M inspection report to the ULB. 2. The private developer would have to undertake quality assurance tests for the construction activity under way or already completed, at the behest of the ULB. 3. The developer would oversee the performance standards being met, and maintain records of the same, and provide access to the development authority or ULB as and when required.
7	Performance standards	1. Performance standards shall be set up on the basis of the existing baseline figures 2. Water treatment plant to function at a minimum capacity of ___% 3. Coverage: cover a minimum of ___% of total households in the range of the main trunk line 4. Water supply should be minimum ___ liters per day (lpcd). It shall be measured as [(quantity measured at ESR)* (1– distribution loss(%)] 5. Raw water transmission loss should be in the range of ___% to ___%. It shall be measured as [((1– quantity of water received at WTP)/quantity of water pumped at intake works)*100] 6. Water treatment loss should be in the range of ___% to ___%. It shall be measured as [((1– quantity of water discharged from WTP)/quantity of water received at WTP)*100] 7. Pure water transmission loss should be in the range of ___% to ___%. It shall be measured as [((1– quantity of water discharged from ESR)/quantity of water discharged from WTP)*100] 8. Distribution loss should be in the range of ___% to ___%. It shall be measured as [((1– quantity of water billed in a zone)/ quantity of water discharged from ESRs)*100] 9. Supply water for minimum ___ hours per day 10. Frequency of supply should be minimum ___ days a week 11. The pressure of water supply should be maintained at ___ such that it fills a ___ liter bucket in less than ___ seconds 12. Consumer complaints not to exceed ___ per month 13. Consumer complaints to be redressed within 24 hours from the time the complaint is lodged

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Table *continued*

Sl No.	Item	Description
		14. Water quality to be maintained as per the norms of the Central Public Health and Environmental Engineering Organisation (CPHEEO) 15. Frequency of billing should be 2 months 16. Collection efficiency to increase to ___ within ___ years 17. Quality of meters as per ___ standards
8	Payments	1. As per the financial feasibility, the private developer would be required to make a fixed license fee payment to the ULB every ___ months. 2. The private developer shall have to submit a performance security in the form of a bank guarantee, which the ULB has the right to encash in case of nonadherence to performance standards and in the event of default. 3. All the operational expenses of the water assets would have to be borne by the private developer.
9	Risk mitigation strategies	1. The second-ranked bidder shall be issued the letter of award, if the developer does not sign the agreement within ___ days of acceptance of the letter of award. 2. If the developer does not pay the fixed payment, then the ULB shall encash the equivalent amount due from the payment security. The developer is to replenish the payment security within ___ days from such encashment. If the developer fails to replenish the security, then it shall be an event of default. 3. The developer shall have to submit a plan to the ULB outlining details of the O&M plan. The developer shall be allowed to commence operations only once the ULB approves the plan. 4. The liabilities of the bulk water supply contract between the Water Resources Department and the ULB shall rest with the developer (except changes in the tariff paid to the Water Resources Department, as the case may be). If the supply of water falls short and is not available, then the developer shall have to arrange for water supply through private tankers for the citizens. 5. In case the developer does not pay the Water Resources Department and/or state electricity department, then the ULB shall encash the equivalent amount due from the performance security. 6. In the event of the developer not confirming to and meeting the performance standards, the ULB is liable to declaring the same as an event of default and use the performance guarantee sum against the same. 7. If the developer ceases to operate all or any substantial part of the water supply and distribution assets for a period of ___ consecutive hours without prior consent of the ULB, then the ULB can immediately enter any or all of the water supply assets and operate the system.

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Table *continued*

Sl No.	Item	Description
		8. Any delay in payment to the ULB shall attract a penal interest of ___% per annum quarterly compounded. 9. The ULB is liable to impose an event of default notice in the case of the developer selling treated water to any party other than the ULB. 10. If the private developer underreports the revenue from sale of surplus water and/or does not share the prescribed amount as per agreement from this sale to the ULB, then it would be considered as an event of default.
10	**Consequences of default**	
	a) Developer: event of default	1. The ULB has the right to make good any shortfall from the performance security. 2. The ULB reserves the right to claim from the developer any costs, expenses, or loss it may have incurred by reason of breach or failure on part of the Developer. 3. Developer shall deliver to the ULB all papers, including forms used, receipt books, promotional materials, and other documents. 4. The developer shall hand over all assets to the ULB.
	b) ULB: event of default	The ULB shall pay the developer an amount equal to Rs___ lakhs, book value of developer's assets, and payments for payments outstanding from the ULB
11	**Qualification criteria** (request for qualification or request for proposal [RFQ/RFP])	Technical criteria ▪ Developer should have undertaken a similar project for a population size of ___. ▪ Developer should have operated and managed ___ water supply project/s from bulk supply to distribution end for a city with water supply of ___ MLD. ▪ Developer should have operated and managed one project requiring installation or operation and management of ___ number of meters. Financial criteria ▪ Developer should have a minimum net worth equivalent to 25% of the estimated project cost for which bids have been invited. ▪ Developer should have average net cash accruals over the past 3 years of Rs___ million. Holding companies with a direct holding of more than 50% equity in the lead consortium member can be considered for the evaluation of financial criteria.
12	**Bidding parameter**	1. If the private developer is given the right to collect and retain the user charges, the bidding parameter would be the highest bimonthly or annual fixed payment to be paid as royalty or license fee to the ULB. 2. If the private developer is not given the right to retain the user charges, the bidding parameter would be the lowest price at which the private developer would undertake the O&M activity.

Sl = serial.

augmentation and upgrading of the entire water supply system and improvement in operational efficiencies.

In addition to poor water supply, the city also lacks an adequate sewerage system. A miniscule percentage of the total area and population is covered through an underground sewerage network. Sewage flow through open drains is quite common. In major parts of the city, the ULB has set septic tanks, which are cleaned periodically. The city does not have a sewage treatment plant, and the entire sewage that is generated is disposed into the river or sea. This results in contamination of water and at times also affects the quality of water supplied to the citizens.

Need for PPP

The ULB needs PPP to enhance the public resources and improve the service delivery for the water supply and sewerage systems. The ULB needs to undertake huge amount of investment to augment the bulk water source, rehabilitate water pipelines, set up a sewerage network, and establish sewage pumping stations and sewage treatment plants. The ULB does not have the required investment capacity to arrange for funds for the planned capital investment (in spite of government grants). Also, the ULB needs to improve current operational levels, including reduction of energy costs, reduction of transmission and distribution losses, and improvement in collection efficiency. Thereby, the ULB needs a private operator to bring in investments to undertake the outlined projects and to bring in efficiencies.

PPP Structure

The PPP structure designed for this problem definition is an Integrated Concession and Management contract for the entire water supply and sewerage system of the city. In such a structure, the private operator will invest capital to augment and upgrade the entire water supply system and establish the sewerage system as outlined in the detailed project report, establish meters, and manage the entire system. The PPP operator shall also undertake the billing and collection for water supply, as well as sewerage system, and retain the revenue collected. If the project is financially viable, the bidder shall make an annual payment to the ULB. If the project is not financially viable and needs Viability Gap Fund (VGF) support, the private operator shall quote the VGF amount. It is possible that the VGF needed for the project shall exceed the cap of 40%. In such a scenario, the ULB or state government shall need to pay a shadow tariff to the private operator.

Objective of the PPP Structure

This PPP structure aims to augment the current capacity of the water supply system, reduce the technical and commercial losses in the entire water supply system, and establish a complete network of sewerage system and treated disposal of the sewage generated in the city.

Detailed Term Sheet

The following term sheet outlines the detailed working of an integrated concession and management contract for the entire water supply and sewerage system, including the preparatory work to be undertaken by the ULB, key obligations of the developer and the ULB, monitoring mechanism, payment structure, performance standards to be adhered to by the private operator, and key clauses for risk mitigation related to the PPP structure.

Management Contract for Metering, Billing, and Collection

Problem Definition

The ULB has sufficient and frequent water supply coupled with an efficient transmission and distribution system. The ULB may need investment in upgrading the system, but is financially capable of undertaking the same. However, the ULB is not in a position to recover its operational cost as a result of low revenue demand, high commercial loss, and poor collection efficiency. As a result, in order to understand the water actually consumed by the customers and increase the revenue from water, the ULB needs to establish meters and undertake measures to improve its efficiencies in billing and collection.

Sl No.	Item	Description
1	Preparatory work by urban local body (ULB)	1. Undertake a technical survey to gauge the current status of the water supply system, including the technical losses in the system 2. Undertake a technical survey to gauge the characteristics of the sewage generated, the design of the sewerage network, and the technology to be adopted for the sewage treatment plant (STP) 3. Design, in detail, the sewerage network considering the contours and physical features of the city 4. Undertake a consumer survey to gauge the number of direct connections, unauthorized connections, etc. 5. Analyze the efficiency of the water treatment plant (WTP) and collect detailed information on the number of pumps and staff 6. Decide on the quality and type of meters to be installed in the city 7. Undertake a survey of the raw water transmission, pure water transmission, and distribution network on a geographic information system (GIS) platform 8. Undertake a valve operation study 9. Undertake a customer regularization plan 10. Prepare a comprehensive metering policy 11. Prepare the performance criteria as per the current levels of performance
2	Information to be provided to the private operator by the ULB	For water supply system 1. Contract of ULB with Water Resources Department for tapping of water source 2. Contract of ULB with the Electricity Board for supplying power to the water supply system and the tariff details 3. Design of the water supply system, including jack well, elevated storage reservoirs, main balance reservoirs, WTP, raw water transmission lines, distribution network, etc. 4. Condition of the water assets for quantifying the cost required for rehabilitation and/or renovation of assets 5. Details of quality of bulk meters and customer meters 6. Details of quality of leak detection equipment 7. Tariff structure of water connection charges, water supply charges, penalties for illegal connection, and/or nonpayment of water supply charges and escalations, if applicable 8. Detailed project report (DPR) of the projects to be undertaken 9. Contour maps and network maps 10. Quality standards of water to be maintained 11. Disposal standards for the inert matter generated at the WTP 12. Operation and maintenance (O&M) standards for all the water supply assets in the value chain

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Sl No.	Item	Description
		13. Specifications and standards of handover of assets at end of the contract period 14. History of payments of end users, if available For sewerage system 1. Design of the sewerage system, including sewerage network, pumping stations, STP, rising mains, etc. 2. Technology specifications of the STP 3. Condition of the sewerage assets for quantifying the cost required for rehabilitation and/or renovation of assets 4. Tariff structure of sewerage connection charges, sewerage charges, penalties for illegal connection, and/or nonpayment of sewerage charges and escalations, if applicable 5. DPR of the projects to be undertaken 6. Disposal standards for the inert matter generated at the STP 7. O&M standards 8. Specifications and standards of handover of assets at end of the contract period
3	Tenure of the PPP contract	The tenure of the PPP contract is generally defined in terms of the years of operation and ranges between 25 years and 30 years.
4	Roles and responsibilities of the developer	1. Development; design; engineering; finance; procurement; construction; completion; commissioning; implementation; management; administration; O&M of the water supply source; WTP; water supply network; sewerage network, including pumping stations, STP, and meters 2. Taking over the existing assets of the water supply scheme, including the jack well, pumping stations, electrical installations, WTPs, water storage reservoirs, connecting pipelines, and distribution system, from source to tap for the operation, maintenance, and repairs 3. Construction of raw water intake pumps, jack wells, suction mains, transmission pipelines, WTPs, and other works as per the DPR specifications 4. Extraction of raw water from the source and supply the required levels to the city 5. O&M of the newly constructed WTP and the old WTP 6. Undertake extensive campaigning and awareness programs for metering of connections 7. Increasing the piped water supply by providing new connections 8. Treat the water and ensure that there are no impurities in water at the point of sale 9. Maintenance of a minimum average water supply level of ___ liters per capita per day (lpcd) with due pressure and required quality

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Sl No.	Item	Description
		10. Construction and maintenance of sewerage rising mains, transmission pipelines, pumping stations, STP, and other works as per DPR specifications 11. Dispose of the sewage-treated effluents in the water body specified by the ULB and as per technical specifications 12. Construct, operate, and maintain the STP in accordance with applicable laws related to pollution control environmental standards as applicable 13. Prepare detailed designs with all requisite specifications for the construction works and obtain approval for the same 14. Procure all the necessary raw materials for the construction works, hire labor, or subcontract the construction activity 15. Undertake rehabilitation works for operating and maintaining the assets for a period of ___ years 16. Manage regularization of illegal connections and impose penalties in case of illegal connections 17. Establish meters, read meters, and record the water consumption 18. Deploy O&M staff 19. Develop and maintain a consumer redress system 20. Collect water supply system and sewerage system related data and performance reporting to the ULB 21. Obtain the necessary approvals 22. Ensure financial closure of the project 23. Pay for the electricity consumption for the O&M of the project and bear power tariff escalations, if any; arrange for power supply backup in case of power failure 24. Provide access to the officials of the ULB to carry out inspection of the construction activity and operations and management works 25. Be solely and exclusively responsible for recruitment; transport; accommodation; payment of salaries, wages, and taxes as applicable 26. Define and implement procurement policy for the employees of the developer 27. Select suppliers and subcontractors for the project as per the terms and conditions of the concession agreement 28. Manage subcontracts as per the terms and conditions of the concession agreement
5	ULB's obligations	1. Responsible to sign the contract with the Water Resources Department for offtake of water from the water source; ensure supply of water to the developer at a pre-decided tariff as the case may be 2. Facilitate or assist in obtaining necessary or applicable permits

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Table *continued*

Sl No.	Item	Description
		3. Provide land to the developer on lease basis or on terms agreed upon for the period of concession for undertaking construction activity, operation, and management of the water and sewerage assets 4. Provide necessary permissions for possession and access of the site to the private developer 5. Ensure that all necessary authority required by the private developer for drawing of raw water in the quantity required by the developer is provided 6. Undertake independent supervision of the construction activity under way and monitor the operations 7. Provide all necessary accounts, invoices, statements, demands, notices, insurance demands, and other correspondence that are applicable to assets under private developer's possession during concession period 8. Grant right-of-way to the site to the developer 9. Undertake independent checks at frequent intervals to assess the water quality standards of the treated water supplied from the treatment plant and the disposal standards of the treated sewage 10. Authorize the developer to collect, retain, appropriate, recover, and enforce water supply and sewerage charges from the consumers 11. Grant the right to charge a penalty to consumers in case of nonpayment of water supply and sewerage charges 12. Provide a capital grant to the developer on the completion of specified milestones (applicable only if funding through the Jawaharlal Nehru National Urban Renewal Mission [JNNURM] or viability gap funding is being provided to the project) 13. Obtain permission from the concerned authority for discharge of sewage in a water body adjacent to the STP 14. Issue a notification banning the use of groundwater after the developer is in a position to offer water connections to all consumers, and cancel all existing permissions given for extraction of groundwater 15. Assist the bidder in obtaining uninterrupted electric power supply from the State Electricity Board for the implementation of the project. In case of any interruption in the power supply beyond ___ hours continuously or ___ hours per month, the cost incurred by the developer for the generators shall be borne by the ULB
6	Monitoring mechanism	1. Construction would be overseen by an independent consultant appointed by the ULB, and quarterly progress reports of the same would be generated. 2. The developer shall undertake periodic inspection of water assets and submit reports to an independent engineer. The independent engineer shall review the maintenance reports and inspect the water and sewerage assets at least once in 3 months and submit an O&M inspection report to the ULB.

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Table *continued*

Sl No.	Item	Description
		3. The developer would have to undertake quality assurance tests for the construction under way or already completed, at the behest of the ULB. 4. The developer would oversee the performance standards being met, maintain records of the same, and provide access to the development authority or ULB as and when required. 5. The ULB shall, at all times, have access to the project site to inspect and examine the works, materials, equipment, and workmanship.
7	Performance standards	Performance standards shall be set up on the basis of the existing baseline figures 1. Construction of the required assets to be completed as per the phasing of the detailed project report (DPR) 2. Raw water transmission loss should be in the range of ___% to ___%. It shall be measured as [((1– quantity of water received at WTP)/quantity of water pumped at intake works)*100] 3. WTP to function at a minimum capacity of ___% 4. Water treatment loss should be in the range of ___% to ___%. It shall be measured as [((1– quantity of water discharged from WTP)/quantity of water received at WTP)*100] 5. Pure water transmission loss should be in the range of ___% to ___%. It shall be measured as [((1– quantity of water discharged from ESR)/quantity of water discharged from WTP)*100] 6. Water quality to be maintained as per the norms of the Central Public Health and Environmental Engineering Organisation (CPHEEO) 7. Quality of meters as per ___ standards 8. Coverage (water supply and sewerage) should be a minimum of ___% of total households in the range of the main trunk line 9. Distribution loss should be in the range of ___% to ___%. It shall be measured as [((1– quantity of water billed in a zone)/ quantity of water discharged from ESRs)*100] 10. Water should be supplied for minimum ___ hours per day and minimum ___ days a week 11. The pressure of water supply should be maintained at ___ such that it fills a ___ liter bucket in less than ___ seconds 12. Treated sewage disposed should be as per specified CPHEEO norms 13. Frequency of billing should be 2 months 14. Revenue collection efficiency at ___% of the total bills generated

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Table *continued*

Sl No.	Item	Description
		15. Consumer complaints not to exceed ___ per month 16. Consumer complaints to be redressed within 24 hours from the time of lodge of complaint 17. All performance standards to be achieved within the set time frame by the ULB
8	Payments	1. If the project is financially feasible: the private developer shall pay the ULB a fixed royalty of Rs___ per month. In this case, the private developer shall also have to submit a payment security in the form of _____ equivalent to 3 months of fixed payment payable to the ULB. 2. If the project needs VGF: the ULB shall pay the private developer the amount of VGF in installments on the completion of specified milestones. The private operator shall retain the water revenue and make no payment to the ULB. 3. In all cases, the private developer shall have to submit a performance security in the form of a bank guarantee, which the ULB has the right to encash in case of nonadherence to performance standards and in the event of default. 4. All the operational and capital expenditures for design, construction, and operation of the water assets would have to be borne by the private developer.
9	Risk mitigation strategies	1. The second-ranked bidder shall be issued the letter of award if the developer does not sign the agreement within the ___ days of acceptance of letter of award. 2. If the developer does not pay the fixed payment, then the ULB shall encash the equivalent amount due from the payment security. Developer is to replenish the payment security within ___ days from such encashment. If the developer fails to replenish the security, then it shall be an event of default. 3. The developer shall have to submit a plan to the ULB outlining, in details, the construction plan and the O&M plan. The developer shall be allowed to commence construction and operations only once the ULB approves the plan. 4. The ownership of the project assets constructed during the concession period would be transferred to the ULB on the completion of the assets. 5. If the developer does not undertake construction or operations as per the specified schedule, the ULB would issue a notice of default and a cure period would be given to the developer for course correction. In case the developer fails to respond to the notices issued within 30 days of issue date, the contract would stand terminated. 6. The liabilities of the bulk water supply contract between the Water Resources Department and the ULB shall rest with the developer (except changes in the tariff paid to the Water Resources Department, as the case may be). If the supply of water falls short and is not available, then the developer shall have to arrange for water supply through private tankers for the citizens.

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Table *continued*

Sl No.	Item	Description
		7. In case the developer does not pay the Water Resources Department and/or the state electricity department, then the ULB shall encash the equivalent amount due from the performance security. 8. In the event of the developer not confirming to and meeting the performance standards, the ULB is liable to declaring the same as an event of default and use the performance guarantee sum against the same. 9. If the developer ceases to operate all or any substantial part of the water supply and distribution assets for a period of ___ consecutive hours without prior consent of the ULB, then the ULB can immediately enter any or all of the water supply assets and operate the system. 10. Any delay in payment to the ULB shall attract a penal interest of ___% per annum quarterly compounded. 11. The ULB is liable to impose an event of default notice in the case of the developer selling treated water to any party other than the ULB. 12. If the private developer underreports the revenue from sale of surplus water and/or does not share the prescribed amount as per agreement from this sale to the ULB, then it would be considered an event of default. 13. In case of any decrease or increase in the cost of the running of the project due to escalation in power tariff by the State Electricity Board beyond ___% in any given year and variation in the cost of Rs___/kl of bulk water purchased, the proportionate additional cost shall be borne by the ULB. 14. The consumer shall be liable to pay water supply and sewerage charges, irrespective of whether consumer avails both water supply and sewerage connection facilities or not. 15. Consumer shall be responsible for the safety of the meter and shall be responsible for the loss of meter due to theft, damage by fire, or accident.
10	Consequences of default	
	a) Developer: event of default	1. The ULB has the right to make good any shortfall from the performance security. 2. The ULB reserves the right to claim from the developer any costs, expenses, or loss it may have incurred by reason of breach or failure on the part of the developer. 3. The developer shall deliver to the ULB all papers, including forms used, receipt books, promotional materials, and other documents. 4. All assets shall be handed over to the ULB. 5. All rights, titles, and interest in the project assets shall be handed over to the ULB.

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Sl No.	Item	Description
	b) ULB: event of default	1. The ULB shall pay the developer an amount equal to Rs___ lakhs, book value of developer's assets, and payments for payments outstanding from the ULB. This amount paid shall be after deducting the grant or viability funding. 2. The ULB shall return the performance security to the developer.
11	Qualification criteria	Technical criteria ▪ Developer should have experience in construction of one water supply project ▪ The developer should have handled O&M of water supply services for a city with 50% of ____ direct connections ▪ The developer should have undertaken one project requiring construction of __ MLD WTP, ___ kilometers of water transmission pipelines ▪ The developer should have undertaken one project requiring construction and O&M of ____ MLD of STP with ___ kilometers of network line Financial criteria ▪ Developer should have a minimum net worth equivalent to 25% of the estimated project cost for which bids have been invited ▪ Developer should have an average net cash accruals over 3 years of Rs___ million Holding companies with a direct holding of more than 50% equity in the lead consortium member can be considered for the evaluation of financial criteria.
12	Bidding parameter	1. If the project is financially feasible, the bidding parameter shall be the fixed royalty of Rs___ per month payable to the ULB. The private developer quoting the highest royalty shall be selected as the successful bidder. 2. If the project needs VGF support, the bidding parameter shall be the total amount of VGF support payable by the ULB to the private developer. The private developer quoting the least VGF support shall be selected as the successful bidder.
13	Staffing	The deployment of staff to private operator by the ULB shall be the decision of the ULB. The ULB may explore the transfer of employees on deputation for a year and, on the completion of a year, the employees can be provided with an option of continuing to work with the developer or returning to the ULB. This shall need to be further detailed in the contract documents during the tendering process.

Sl = serial.

Need for PPP

Since the ULB has a fairly well managed transmission and distribution system and the water supply is sufficient, the only scope for PPP is in establishing a metering system and bringing in operational and management efficiencies in billing and collection. The need for PPP is not urgent but is desirable from the point of view of increasing the revenue potential of the ULB.

PPP Structure

The PPP structure designed for this problem definition, is a Metering, Billing, and Collection contract for the entire city. In such a structure, the private operator shall establish bulk water meters, meters at important points in the distribution network, and meters at consumption points. The private operator shall also be responsible for regular maintenance and repairs of such meters. Further, the operator shall also read the meters, prepare bills, issue the bills, and collect the money from the customers. A computerized system containing a detailed database on the number and type of meters, the consumption patterns, the functionality of meters, the revenue demand, the collections due, etc., shall be maintained by the private operator. However, the tariff for the water consumption, fees for establishing meters, and the penalty for absence of or non-functioning of meters shall be set by the ULB. The private operator shall transfer the revenue collected from the users to the ULB. In return for the service, the ULB shall pay a fixed annual payment to the private operator.

Objective of the PPP Structure

This PPP structure aims to reduce the commercial losses in the system and bring in operational efficiencies in the revenue management of the water supply system.

Detailed Term Sheet

The following term sheet outlines the detailed working of a metering, billing, and collection contract for the entire water supply system, including the preparatory work to be undertaken by the ULB, the key obligations of the developer and the ULB, the monitoring mechanism, payment structure, performance standards to be adhered to by the private operator, and key clauses for risk mitigation related to the PPP structure.

Sl No.	Item	Description
1	Preparatory work by urban local body (ULB)	1. Undertake a water audit 2. Decide on the most suitable and affordable type of meter to be installed in the city 3. Undertake a consumer survey to gauge the number of direct connections, unauthorized connections, slum connections, connections charged by general rates, metered connections, etc. 4. Undertake a technical survey of all the existing water supply distribution lines 5. Undertake leak tests 6. Undertake a valve operation study 7. Undertake a customer regularization plan 8. If meters are existing, then prepare a list of functional meters
2	Information to be provided to the private operator by the ULB	1. Details of the number and type of bulk meters and customer meters to be established 2. Tariff structure of water supply charges, penalties for illegal connection and nonpayment of water supply charges and escalations, if applicable 3. Contour maps and network maps 4. Details of existing meters, if any, their functionality, cost, and usage

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Sl No.	Item	Description
		5. A database of consumers, their current status of billing, and water consumed 6. Regularization plan, if any 7. Meter replacement policy, if any 8. Meter reading policy, if any 9. Current billing and collection policy, if any
3	Tenure of the PPP contract	The tenure of the PPP contract is generally defined in terms of the years of operation and ranges between 5 years and 7 years.
4	Roles and responsibilities of the developer	1. Procure and establish bulk flow meters and consumption meters at households 2. The meters installed should be as per the technical specifications provided by the ULB 3. Record, on a monthly basis, water meter readings of the consumer and register the same in an appropriate computer database 4. Undertake extensive campaigning and awareness programs for metering of connections 5. Print bills and distribute water bills and notices to the concerned consumer as per the instruction of the ULB 6. Collect from consumers as per the billing procedure 7. Collect arrears from consumers due to the ULB for the period prior to the signing of the contract 8. Operate and maintain the meters 9. Deploy staff for operation and maintenance (O&M) of meters and billing and collection 10. Record and report the reading of the bulk flow meters at the various inlets and outlets on a daily basis 11. Make announcements for the recovery of water bills, shut down of water supply, and public awareness as guided from ULB from time to time 12. Obtain the necessary approvals 13. Develop a database of consumers using appropriate software technology, and provide hardware and set up a billing system for the water consumed by the consumers 14. Bill collection arrangements shall include arrangements with local banks having branch offices at suitable locations in project area; in addition, the private operator shall make its own arrangements for water supply bill collections at various locations in the project area
5	ULB's obligations	1. Facilitate procuring, obtaining, and maintaining applicable permits 2. Provide all necessary accounts, invoices, statements, demands, notices, and other correspondence that are applicable

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Sl No.	Item	Description
		3. Prepare a list of arrears and credit balance of consumers due to the ULB and hand this over to the developer 4. Pay the bulk water charges, energy charges, and the water testing charges 5. Responsible for supply of adequate water for distribution 6. Adherence to water supply timings, quantities, pressures, and zoning 7. Grant the right to the private operator to charge delayed payment interest up to ___% per month on the principal amount outstanding from consumers; private developer shall not be allowed to charge interest on the delayed payment charge 8. Disconnect water supply connection of any consumer delaying payment of water supply bill beyond ___ months from the due date of the payment of bills
6	Monitoring mechanism	1. The ULB shall supervise the operations of the private developer at all times and notify the operator of any defects that are found. 2. The developer shall undertake periodic inspection of meters and submit reports to the engineer-in-charge. The engineer-in-charge shall review the maintenance reports and inspect the meters at least once in 3 months and submit an O&M inspection report to the ULB. 3. The developer would oversee the performance standards being met, maintain records of the same, and provide access to the development authority or ULB as and when required.
7	Performance standards	1. Quality of meters as per ___ standards 2. Frequency of billing: ___ months 3. Revenue collection efficiency at ___% of the total bills generated 4. 100% of all property connections (individual and shared) must be metered, and computerized records of the readings must be maintained 5. All performance standards to be achieved within the set time frame by the ULB 6. Performance standards shall be set up on the basis of the existing baseline figures
8	Payments	1. The revenue from water supply charges collected by the private developer shall be transferred to the ULB. 2. The ULB shall pay a fixed amount of Rs___ per month to the private developer. 3. In all cases, the private developer shall have to submit a performance security in the form of a bank guarantee, which the ULB has the right to encash in case of nonadherence to performance standards and in the event of default.

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Sl No.	Item	Description
		4. All operational and capital expenditures for the scope of work assigned to the private developer would have to be borne by the private developer. 5. The ULB may provide for a bonus to the developer if the performance standards are met before the time limits and as per the quality specifications. This shall be as per the terms and conditions of the agreement and will be the choice of the ULB.
9	Risk mitigation strategies	1. The second-ranked bidder shall be issued the letter of award, if the developer does not sign the agreement within ___ days of acceptance of letter of award. 2. If the developer does not transfer the revenues to the ULB, or there is a shortfall in the revenue transferred, the ULB shall encash the equivalent amount due from the performance security. The developer is to replenish the performance security within ___ days from such encashment. If the developer fails to replenish the security, then it shall be an event of default. 3. The developer shall have to submit a plan to the ULB outlining, in detail, the plan for establishing meters, the billing procedure, and the detailed computerized system to be established. 4. The meters established during the contract period would be transferred to the ULB on the expiry or termination of the agreement. 5. If the developer does not undertake the operations as per the specified schedule, the ULB would issue a notice of default and a cure period would be given to the developer for course correction. In case the developer fails to respond to the notices issued within 30 days of issue date, the contract would stand terminated. 6. In the event of the developer not conforming to the performance standards, the ULB is liable to declare the same as an event of default and to use the performance security sum against the same. 7. Any delay in payment to the ULB shall attract a penal interest of ___% per annum quarterly compounded. 8. If the private developer underreports the revenue from sale of surplus water and/or does not share the prescribed amount as per agreement from this sale to the ULB, then it would be considered an event of default.
10	Consequences of default	
	a) Developer: event of default	1. The ULB has the right to make good any shortfall from the performance security. 2. The ULB reserves the right to claim from the developer any costs, expenses, or losses it may have incurred by reason of breach or failure on the part of the developer. 3. The developer shall deliver to the ULB all papers, including forms used, receipt books, promotional materials, and other documents.

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Sl No.	Item	Description
		4. The developer shall hand over all assets to the ULB. 5. The ULB shall not make any payment to the developer.
	b) ULB: event of default	1. The ULB shall return the performance security to the developer after deducting any payments due from the private developer to the ULB.
11	RFQ criteria	Technical criteria ▪ The developer should have undertaken one project installation and O&M of ___ meters Financial criteria ▪ The developer should have a minimum net worth equivalent to 25% of the estimated project cost for which bids have been invited ▪ The developer should have an average net cash accruals over 3 years of Rs___ million
12	Bidding parameter	The bidding parameter shall be the fixed payment of Rs___ per month payable to the private developer by the ULB. The private developer quoting the least fixed payment per month shall be selected as the successful bidder.

Sl = serial.

Concession Agreement for the Development, Operation, and Maintenance of the Bulk Water Supply System

Problem Definition

The ULB faces the problem of inadequate water supply in the service area. This is primarily because of shortage of current water source, highly corroded transmission mains—both carrying raw water and pure water and high treatment losses. As a result, the ULB needs to invest in the augmentation of the bulk water supply system and rehabilitate the raw and pure water transmission mains, and the WTP.

Need for PPP

The ULB needs PPP to enhance the public resources and improve the service delivery for the water supply. The ULB needs to undertake huge amount of investment to augment the bulk water source and rehabilitate water pipelines. The ULB does not have the required investment capacity to arrange for funds for the planned capital investment (in spite of government grants). Also, the ULB needs to improve current operational levels, including reduction of energy costs and reduction of transmission losses. Thereby, the ULB needs a private operator to bring in investments to undertake the outlined projects and to bring in efficiencies.

PPP Structure

The PPP structure designed for this problem definition is the Concession Agreement for the Development, Operation and Maintenance of the Bulk Water Supply System. In such a structure, the private developer is required to undertake the design, construction, finance, operation, and management of water supply services from raw water source to the distribution point. The augmentation activity includes construction of the raw water offtake machinery; installation of electrical substations and raw water transmission lines; and the construction of WTPs, pure water transmission lines up to the point of the storage reservoir, and storage tanks. The capital investment required for the augmentation works needs to be borne by the private developer.

The private operator will invest capital to augment and upgrade the bulk water supply system as outlined in the detailed project report, establish bulk meters, and manage the bulk water system. The ULB, on its part, would specify the quantity of treated water, which would have to be made available by the private developer at all times. For the treated water produced, the private developer is paid a water charge by the ULB. The unique feature of this contract is that for all the activities required to be undertaken by the private entity, it is assured of a minimum fixed payment by the utility.

If the project is not financially viable and needs Viability Gap Fund (VGF) support, the private operator shall quote the VGF amount. It is possible that the VGF needed for the project may exceed the cap of 40%. In such a scenario, the ULB may have to provide necessary concessions to the private operator in terms of land parcel at reduced lease rentals, reduced per unit raw water charges, and other such alternatives that would contribute to reducing the overall project cost.

Objective of the PPP Structure

This PPP structure aims to augment the current capacity of the water supply system, reduce the technical and commercial losses in the bulk water supply system.

Detailed Term Sheet

The following term sheet outlines the detailed working of a concession agreement for the development, operation, and maintenance of the bulk water supply system, the preparatory work to undertaken by the ULB, the key obligations of the developer and the ULB, the monitoring mechanism, payment structure, performance standards to be adhered to by the private operator, and key clauses for risk mitigation related to the PPP structure.

Sl No.	Item	Description
1	Scope of the project	1. Prepare detailed designs with all requisite specifications for the construction of the water treatment plant (WTP) 2. Undertake detailed engineering for the approved designs of the WTP 3. Procure all the necessary raw materials for the construction of the raw water intake wells, pipelines, and the WTP 4. Arrange for construction of the raw water intake and the WTP; hire labor or subcontract the construction activity 5. Construct raw water intake pumps, jack wells, suction mains, transmission pipelines, WTP, installation of electrical substation, boundary wall with gate and guardroom, and all related electrical works 6. Construct a tank for storage of treated water 7. Extract raw water from the source and supply the required levels to the city 8. Install bulk meters, reading meters, and record the water intake and output levels 9. Treat the raw water as per process and standards specified 10. Transmit treated water to the storage reservoir 11. Arrange for disposal of brine and other wastes generated from the WTP as per environmental norms and standards specified

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Sl No.	Item	Description
		12. Operate and maintain the raw water intake equipment and the newly constructed WTP 13. Ensure an agreed production capacity and treated water at all times 14. Deploy operation and maintenance (O&M) staff 15. Adhere to water quality norms at all times 16. Undertake rehabilitation works for operating and maintaining the assets for a period of ___ years 17. Collect water supply system-related data and report performance to the urban local body (ULB) 18. Levy and collect water charges from the ULB for supply of treated water
2	Preparatory work by the ULB	1. Determine the quantity of bulk water demand and the extent of offtake permissible 2. Undertake a technical survey to gauge the current status of the bulk water supply system, including the technical losses in the system 3. Analyze the efficiency of the treatment plant and collect detailed information on the number of pumps and staff 4. Determine the water quality standards to be adhered to 5. Decide on the quality, type, and number of bulk meters to be installed 6. Undertake a survey of the raw water transmission network on a geographic information system (GIS) platform 7. Undertake a valve operation study
3	Information to be provided to the private operator by the ULB	1. Contract of ULB with Water Resources Department for drawing of water source 2. Contract of ULB with the Electricity Board for supplying power to the water supply system and the tariff details 3. Design of the water supply system, including jack well, elevated storage reservoirs, main balance reservoirs, WTP, and raw water transmission lines 4. Details of quality of bulk meters 5. Details of quality of leak detection equipment 6. Contour maps and network maps 7. Water quality standards to be maintained 8. Disposal standards for the inert matter generated at the WTP 9. O&M standards for the bulk water supply treatment system 10. Specifications and standards of handover of assets at the end of the contract period

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Sl No.	Item	Description
4	Tenure of the PPP contract	The tenure of the PPP contract is generally defined in terms of the years of operation and ranges between 25 years and 30 years.
5	Roles and responsibilities of the developer	1. Draw necessary permit applications with all particulars to be submitted to relevant government authorities for clearances, no objection certificates, and all necessary approvals 2. Arrange for all the finance required for design, engineering, procurement, construction, operation, and maintenance of the WTP and the raw water intake assets 3. Obtain the necessary approvals from concerned departments and submit copies to the ULB 4. Provide to the ULB all necessary documents to facilitate financial closure 5. Furnish the ULB all details of the institutional arrangement being developed for construction, operation, and management of the water assets as required; details of special purpose vehicles being formed, if any; details on partners, technology partners, the equity stake of the partners, etc. 6. Takeover of the site from the ULB for construction and development of the WTP 7. Prepare detailed designs of the raw water intake systems, the WTP, and all other technical specifications of all the machinery to be used for offtake of water and treatment of the raw water, and obtain approvals from the ULB for the designs 8. Prepare a capital investment plan and submit to the ULB for review 9. Provide project cost estimates and obtain approvals 10. Assess the gross yearly demand of raw water and submit it to the ULB for approval and facilitate the further submission to the Water Resources Department. 11. Arrange for supply of power for raw water intake, construction activity, and O&M of the WTP during the period of contract 12. In case of power failure, arrange for backup power supply 13. Undertake all raw material procurement as per the prescribed standards 14. Make all necessary arrangements for transport of raw material to the site; bear all expenses for purchase and transport of raw materials; in case of escalations in costs of raw inputs due to delays, bear the increased cost 15. Arrange for subcontracting of construction for the WTP and laying of transmission lines, if required 16. Monitor work and progress achieved by subcontractors of construction activity, if applicable

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Table *continued*

Sl No.	Item	Description
		17. Undertake construction of all internal roads, guardhouse, etc., at the site of the WTP 18. Establish bulk meters at the WTP and measure the input and output volumes 19. Arrange for removal of all construction debris, raw materials, hazardous waste, and other materials to ensure the project site is kept neat and clean 20. Pay for the electricity consumption for the O&M of the water supply system and bear power tariff escalations, if any 21. Bear all charges, if any, for temporary or permanent access to the site, e.g., lease rentals 22. Bear all expenses for chemicals required for operating the WTPs, and maintaining water quality standards 23. Arrange staffing for the O&M of the water assets as per the contract and for undertaking the scope of work as defined in the contract. Bear all the establishment expenses for operating and maintaining the water assets, including the salaries and wages of the staff deployed by the developer 24. Operate and maintain the storage reservoirs 25. Operate and maintain the pumping stations 26. Ensure that the raw water transmission losses are within the range specified in the performance standards 27. Repair and maintain the raw water transmission pipelines 28. Operate and maintain the WTP as per the procedure and quality standards specified by the ULB 29. Submit records on water quality maintained at different points in the value chain to the ULB 30. Ensure that the water treatment losses are within the range specified in the performance standards 31. Dispose of the waste generated at the WTP as per the norms of the Central Public Health and Environmental Engineering Organisation (CPHEEO) 32. Bear all expenses involved in safe and effective disposal of waste generated from the waste treatment procedure 33. Install meters to read the input and output volume at the storage reservoirs, operate the meters, and replace them, if need be 34. Undertake frequent quality checks at the storage tanks and maintain security 35. If the pumping station breaks down, the developer should reroute the water to another pumping station or supply water through tankers

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Table *continued*

Sl No.	Item	Description
		36. Maintain a record of all assets purchased by the developer 37. Carry out an annual energy audit at all pumping stations and an annual water audit at the WTPs 38. Undertake all necessary safety precautions for prevention of accidents at the project site 39. Undertake all necessary obligations of the ULB, which are applicable at the site 40. Ensure that the site handed over by the ULB for construction and operations is used only for activities as stated by the ULB in the agreement 41. Provide access to the officials of the ULB to carry out inspection of the construction activity and operations and management works
6	ULB's obligations	1. Responsible to sign the contract with the Water Resources Department for offtake of water from the water source; ensure supply of water to the developer free of cost or at a pre-decided tariff, as applicable 2. Provide permissions to undertake any technical site survey without causing disruption to existing water supply system 3. Provide land to the developer on a lease basis or on terms agreed upon for the period of concession for undertaking construction, operation, and management of the water asset 4. Provide necessary permissions for possession and access of the site to the private developer 5. State the activities for which the land or site handed over to the private developer can be used 6. Ensure that all necessary authority required by the private developer for drawing of raw water in quantities as required by the developer is provided 7. Undertake independent supervision of the construction activity under way 8. Facilitate or assist in obtaining necessary or applicable permits 9. Ensure the developer has access to a supply of electricity for the O&M of the WTP 10. Provide all necessary accounts, invoices, statements, demands, notices, insurance demands, and other correspondence that are applicable to assets under the private developer's possession during concession period 11. Provide guidelines and/or norms to be followed for the water treatment process 12. Guarantee purchase or payment of ___ installed capacity of treated water from the treatment plant

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Table *continued*

Sl No.	Item	Description
		13. Fix the water production capacity level for the take or pay arrangement. State the minimum treated water supply against which payment is guaranteed 14. Fix the tariff for treated water supply by the private developer. State both the fixed amount and the variable factor and the margin or range for tariff escalations is suggested 15. Monitor the operations of the developer 16. State if the private developer has the right to sell surplus treated water beyond required capacity to any third party 17. Undertake independent checks at frequent intervals to assess the water quality standards of the treated water supplied from the treatment plant 18. Enable access to the water assets free from encumbrances 19. Permit peaceful use of the water assets 20. Provide technical or other assistance if requested for by the private developer 21. Impose penalties on default by the developer 22. Undertake or facilitate dispute resolution in instances of differences arising between the developer and any third party
7	Monitoring mechanism	1. The developer shall undertake periodic inspection of water assets and submit reports to an independent engineer. The independent engineer shall review the maintenance reports and inspect the water assets at least once in 3 months and submit an O&M inspection report to the ULB. 2. The developer would have to undertake quality assurance tests for the construction activity under way or already completed, at the behest of the ULB. 3. The developer would oversee the performance standards being met, maintain records of the same, and provide access to the development authority or ULB as and when required.
8	Performance standards	1. Construction of the required assets to be completed within ___ months of the date of commencement 2. Time frame for achievement of the performance standards 3. Raw water transmission loss should be in the range of ___% to ___%. It shall be measured as [((1– quantity of water received at WTP)/quantity of water pumped at intake works)*100] 4. WTP to function at a minimum capacity of ___% 5. Water treatment loss should be in the range of ——% to ——%. It shall be measured as [((1– quantity of water discharged from WTP)/quantity of water received at WTP)*100]

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Table *continued*

Sl No.	Item	Description
		6. Pure water transmission loss should be in the range of ___% to ___%. It shall be measured as [((1– quantity of water discharged from elevated storage reservoir)/quantity of water discharged from WTP)*100]
		7. Water quality to be maintained as per the CPHEEO norms
		8. Quality of meters as per ___ standards
9	Payments	1. The ULB has to make a minimum fixed payment for ___ million liters per day (MLD) of treated water made available by the private developer at all times. For every additional MLD over the fixed quantity, a predetermined variable charge has to be paid by the ULB to the private developer.
		2. The private developer shall have to submit a performance security in the form of a bank guarantee, which the ULB has the right to encash in case of nonadherence to performance standards and in the event of default.
		3. All the capital costs and operational expenses of the water assets would have to be borne by the private developer.
10	Risk mitigation strategies	1. The second-ranked bidder shall be issued the letter of award if the developer does not sign the agreement within the ___ days of acceptance of letter of award.
		2. If the ULB does not pay the fixed payment to the private developer for the fixed quantity of treated bulk water supplied by the private operator, then it shall be an event of default.
		3. The developer shall have to submit a plan to the ULB outlining details of the construction, operations, and maintenance plan. The developer shall be allowed to commence construction and operations only once the ULB approves the plan.
		4. The liabilities of the bulk water supply contract between the Water Resources Department and the ULB shall rest with the developer (except changes in the tariff paid to the Water Resources Department, as the case may be). If the supply of water falls short and is not available, the developer shall have to arrange for water supply through private tankers for the citizens.
		5. In case the developer does not pay the Water Resources Department and/or state electricity department, then the ULB shall encash the equivalent amount due from the performance security.
		6. In the event of the developer not conforming to and meeting the performance standards, the ULB is liable to declare an event of default and use the performance guarantee sum against the same.

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Table *continued*

Sl No.	Item	Description
		7. If the developer ceases to operate all or any substantial part of the water supply and distribution assets for a period of ___ consecutive hours without prior consent of the ULB, the ULB can immediately enter any or all of the water supply assets and operate the system. 8. Any delay in payment by the ULB shall attract a penal interest of ___% per annum quarterly compounded. 9. The ULB is liable to impose an event of default notice in the case of the developer selling treated water to any party other than the ULB.
11	Consequences of default	
	a) Developer: event of default	1. The ULB has the right to make good any shortfall from the performance security. 2. The ULB reserves the right to claim from the developer any costs, expenses, or losses it may have incurred by reason of breach or failure on the part of the developer. 3. The developer shall deliver to the ULB all papers, including forms used, receipt books, promotional materials, and other documents. 4. The developer shall hand over all assets to the ULB.
	b) ULB: event of default	The ULB shall pay the developer an amount equal to Rs___ lakhs, book value of developer's assets.
12	Bidding parameter	The lowest per kiloliter treated water supply charge to be levied by the private developer would be the key bidding parameter.
13	Staffing	The deploying of staff to private operator by the ULB shall be the decision of the ULB. The ULB may explore the transfer of employees on deputation for a year and, on the completion of a year, the employees can be provided with an option of continuing to work with the developer or returning to the ULB. These shall need to be further detailed in the contract documents during the tendering process.
14	Qualification criteria	Technical criteria ▪ The developer should have experience in construction of one water supply project for source augmentation of ___ MLD ▪ The developer should have undertaken one project requiring construction of ___ MLD WTP Financial criteria ▪ The developer should have a minimum net worth equivalent to 25% of the estimated project cost for which bids have been invited ▪ The developer should have an average net cash accruals of over 3 years of Rs___million Holding companies with a direct holding of more than 50% equity in the lead consortium member can be considered for the evaluation of financial criteria.

Sl = serial.

Concession Agreement for Development of the Bulk Water Supply System and Operation and Maintenance of the Entire Water Supply System

Sl No.	Item	Description
1	Scope of the project	1. Take over the existing assets of ___ water supply scheme, comprising sources at ___ with all pumping stations, electrical installations, water treatment plants (WTPs), water storage reservoirs, connecting pipelines, and distribution system from source to tap for operation, maintenance, and repairs. 2. Extract raw water from the source and supply at the required levels to the city. 3. Design and construct new WTP as per capacity specified, including raw water intake pipes, pump houses, suction mains, structures for crossing of drains, roads, electrical substation, boundary wall with gate and guardroom, and all related electrical works. 4. Construct and lay transmission lines as per design capacity specified. 5. Upgrade works for the existing WTP. 6. Operate and maintain the newly constructed WTP and the old WTP. 7. Undertake effective disposal of waste generated from the WTP. 8. Deploy operation and maintenance (O&M) staff. 9. Maintain a minimum average water supply level of ___ liters per capita per day (lpcd) with due pressure and required quality. 10. Undertake rehabilitation works for operating and maintaining the assets for a period of ___ years. 11. Manage the existing distribution network and undertake expansion. 12. Increase the piped water supply by providing new connections. 13. Manage regularization of illegal connections and impose penalties in case of illegal connections. 14. Establish meters, read meters, and record water consumption. 15. Reduce water losses in distribution of water. 16. Undertake billing and collect water revenues. 17. Recover the cost of supply of water from the consumers as per the tariff set by the urban local body (ULB) or development authority. 18. Develop and maintain a consumer redress system.

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Table *continued*

Sl No.	Item	Description
		19. Collect water supply system-related data and report performance to the ULB. 20. Undertake efficient O&M by institutional strengthening, and business process and distribution improvement.
2	Preparatory work by the ULB	1. Undertake an assessment to determine the quality of the bulk water supply system, determine the augmentation and replacement works required, and identify the overall losses in the system 2. Undertake a consumer survey to gauge the number of direct connections, unauthorized connections, etc. 3. Undertake a technical survey to gauge the current status of the water supply system, including the technical losses in the system 4. Analyze the efficiency of the treatment plant and collect detailed information on the number of pumps and staff 5. Decide on the quality and type of meters to be installed in the city 6. Undertake a survey of the raw water transmission, pure water transmission, and distribution network on a geographic information system (GIS) platform 7. Undertake a valve operation study 8. Undertake a customer regularization plan
3	Information to be provided to the private operator by the ULB	1. Contract of ULB with the Water Resources Department for drawing of water source 2. Contract of ULB with the Electricity Board for supplying power to the water supply system and the tariff details 3. Design of the water supply system, including jack wells, elevated storage reservoirs, main balance reservoirs, WTP, raw water transmission lines, and distribution network 4. Details of the existing connections 5. Details of quality of bulk meters and customer meters 6. Details of quality of leak detection equipment 7. Tariff structure of water connection charges, water supply charges, penalties for illegal connection and nonpayment of water supply charges, and escalations, if applicable 8. Site details in terms of area of operation 9. Contour maps and network maps 10. Water quality standards to be maintained 11. Disposal standards for the inert matter generated at the WTP 12. O&M standards of reservoirs

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Table *continued*

Sl No.	Item	Description
		13. Information on existing points of chlorination in the distribution network 14. Capital investment plan for the distribution system and expansion plan 15. Manuals for consumer service standards 16. Water demand projections 17. Information on potential bulk consumers outside the project site where water can be sold 18. Specifications and standards of handover of assets at end of the contract period
4	Tenure of the PPP contract	Generally 25–30 years, depending on the financial feasibility of the project, the life of the WTP, the distribution network, demographic growth pattern, and political will
5	Roles and responsibilities of the developer	1. Draw necessary permit applications with all particulars to be submitted to relevant government authorities for clearances, no objection certificates, and all necessary approvals 2. Provide to the development authority all necessary documents to facilitate financial closure 3. Prepare necessary designs, detail all other technical specifications of all the machinery to be used for offtake of water and treatment of the raw water, and obtain approvals from the development authority or ULB for the designs and construction plans 4. Undertake extensive campaigning and awareness programs for metering of connections 5. Provide project cost estimates and obtain approvals 6. Provide the development authority capital investment plan for undertaking construction work of the WTP and laying of transmission lines 7. Assess the gross yearly demand of raw water and submit it to the ULB for approval and facilitate further submission to the Water Resources Department 8. Undertake all raw material procurement as per the prescribed standards 9. Arrange for removal of all construction debris, raw materials, hazardous waste, and other materials to ensure the project site is kept neat and clean 10. Arrange for subcontracting of construction for WTP and laying of transmission lines, if required 11. Monitor work and progress achieved by subcontractors of construction activity, if applicable 12. Undertake construction of all internal roads, guardhouse, etc., at the site of the WTP

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Sl No.	Item	Description
		13. Establish bulk meters at the WTP and measure the input and output volumes
		14. Make monthly payments of the fixed license fee to the ULB or development authority, as agreed to in the contract
		15. Pay for the electricity consumption for the O&M of the water supply system and bear power tariff escalations, if any
		16. Bear all charges, if any, for temporary or permanent access to the site
		17. Bear all expenses for chemicals required for operating WTPs and maintaining water quality standards
		18. Arrange staffing for the O&M of the water assets as per the contract and for undertaking the scope of work as defined in the contract. Bear all the establishment expenses for operating and maintaining the water assets, including salaries and wages of staff deployed by the developer
		19. Operate and maintain the main balancing reservoir
		20. Operate and maintain the storage reservoirs
		21. Operate and maintain the pumping stations
		22. Repair and maintain the raw water transmission pipelines
		23. Operate and maintain the WTP as per the procedure and quality standards specified by the ULB and maintain permissible loss levels
		24. Submit records on water quality maintained at different points in the value chain to the ULB
		25. Dispose the waste generated at the WTP as per the norms of the Central Public Health and Environmental Engineering Organisation (CPHEEO)
		26. Establish meters to read the input and output volume at the storage reservoirs, operate the meters, and replace, if need be
		27. Undertake frequent quality checks at the storage reservoirs and maintain security
		28. If the pumping station breaks down, the developer should reroute the water to another pumping station or supply water through tankers
		29. Chlorinate the water at points specified by the ULB
		30. Submit a plan to the ULB outlining the details of the O&M timelines and the phasing of metering, reducing unauthorized connections, etc.
		31. Provide and maintain new connections to households
		32. Operate and maintain the existing connections
		33. Establish consumer meters, provide 100% metering, read the meters, and operate and maintain the meters

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Table *continued*

Sl No.	Item	Description
		34. Levy water charges from consumers 35. Charge a penalty to consumers if the water supply charges and/or water connection fees are not paid within the specified time limit 36. Maintain a record of all assets purchased by the developer 37. Carry out an annual energy audit at all pumping stations and an annual water audit at the WTPs 38. Undertake debt service payments as per financial agreements 39. Undertake all necessary safety precautions for the prevention of accidents at the project site
5	ULB's obligations	1. Sign the contract with the Water Resources Department for offtake of water from the water source 2. Bear cost escalations in the tariff of bulk water supply as charged by Water Resources Department 3. Arrange for the supply of electricity for the O&M of the water supply system 4. Replace pure water pumping stations, if need be 5. Ensure that the pipes for raw water transmission are closed in order to avoid raw water transmission losses due to evaporation and theft 6. Replace distribution network pipes, expansion of the distribution network, major repairs, etc., if need be 7. Fix the tariff and escalations for water supply to consumers 8. Facilitate approvals needed 9. Monitor the operations of the developer 10. Maintain administrative control over the personnel, facilities, and/or system 11. Alter water supply timings, quantities, pressures, and zoning 12. Provide tentative list of staff and labor required 13. Implement capital expenditure as per capital investment plan 14. Enable access to the water assets free from encumbrances 15. Permit peaceful use of the water assets 16. Provide support to the developer for regularizing illegal connections 17. Disconnect the water connection if the consumer does not pay the water supply charge and penalty within the specified time limit

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Sl No.	Item	Description
6	Monitoring mechanism	1. The developer shall undertake periodic inspection of water assets and submit reports to an independent engineer. The independent engineer shall review the maintenance reports and inspect the water assets at least once in 3 months and submit an O&M inspection report to the ULB. 2. The developer would have to undertake quality assurance tests for the construction under way or already completed, at the behest of the ULB. 3. The developer would oversee the performance standards being met, maintain records of the same, and provide access to the development authority or ULB as and when required.
7	Performance standards	1. Construction of the required assets to be completed within ___ months of the date of commencement 2. Time frame for achievement of the performance standards 3. Raw water transmission loss should be in the range of ___% to ___%. It shall be measured as [((1– quantity of water received at WTP)/quantity of water pumped at intake works)*100] 4. WTP to function at a minimum capacity of ___% 5. Water treatment loss should be in the range of ___% to ___%. It shall be measured as [((1– quantity of water discharged from WTP)/quantity of water received at WTP)*100] 6. Water supply should be minimum ___ lpcd. It shall be measured as [(quantity measured at elevated storage reservoir)*(1– distribution loss (%)] 7. Pure water transmission loss should be in the range of —— % to ——%. It shall be measured as [((1- quantity of water discharged from elevated storage reservoir)/quantity of water discharged from WTP)*100] 8. Coverage: cover a minimum of ___% of total households in the range of the main trunk line 9. Distribution loss should be in the range of ___% to ___%. It shall be measured as [((1– quantity of water billed in a zone)/quantity of water discharged from elevated storage reservoirs)*100] 10. Supply water for a minimum of ___ hours per day 11. Frequency of supply should be a minimum of ___ days a week 12. The pressure of water supply should be maintained at ___ such that it fills ___ liter buckets in less than ___ seconds 13. Consumer complaints to be redressed within 24 hours from the time the complaint is lodged 14. Water quality to be maintained as per the CPHEEO norms

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Sl No.	Item	Description
		15. Frequency of billing should be 2 months 16. Collection efficiency to increase to ___ within ___ years 17. Quality of meters as per ___ standards 18. Consumer complaints not to exceed ___ per month 19. Revenue collection efficiency at ___% of the total bills generated
8	Payments	1. The private developer shall pay the ULB a bimonthly license fee. 2. The private developer shall have to submit a performance security in the form of a bank guarantee, which the ULB has the right to encash in case of nonadherence to performance standards and in the event of default. 3. All the operational expenses of the water assets would have to be borne by the private developer. 4. Private developer to share ___% of the revenue earned from the sale of surplus water to consumers other than those identified by the ULB
9	Staffing	The deploying of staff to the private operator by the ULB shall be the decision of the ULB. The ULB may explore the transfer of employees on deputation for a year and, on the completion of a year, the employees can be provided with an option of continuing to work with the developer or returning to the ULB. This shall need to be further detailed in the contract documents during the tendering process.
10	Risk mitigation strategies	1. The second-ranked bidder shall be issued the letter of award if the developer does not sign the agreement within the ___ days of acceptance of letter of award. 2. If the developer does not pay the fixed payment, the ULB shall encash the equivalent amount due from the payment security. The developer is to replenish the payment security within ___ days from such encashment. If the developer fails to replenish the security, it shall be an event of default. 3. The developer shall have to submit a plan to the ULB outlining details of the O&M plan. The developer shall be allowed to commence operations only once the ULB approves the plan. 4. The liabilities of the bulk water supply contract between the Water Resources Department and the ULB shall rest with the developer (except changes in the tariff paid to the Water Resources Department, as the case may be). If the supply of water falls short and is not available, the developer shall have to arrange for water supply through private tankers for the citizens. 5. In case the developer does not pay the Water Resources Department and/or state electricity department, the ULB shall encash the equivalent amount due from the performance security.

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Table *continued*

Sl No.	Item	Description
		6. In the event of the developer not meeting the performance standards, the ULB is liable to declare the same as an event of default and use the performance guarantee sum against the same. 7. If the developer ceases to operate all or any substantial part of the water supply and distribution assets for a period of ___ consecutive hours without prior consent of the ULB, the ULB can immediately enter any or all of the water supply assets and operate the system. 8. Any delay in payment to the ULB shall attract a penal interest of ___% per annum quarterly compounded. 9. The ULB is liable to impose an event of default notice in the case of the developer selling treated water to any party other than the ULB. 10. If the private developer underreports the revenue from sale of surplus water and/or does not share the prescribed amount as per agreement from this sale to the ULB, then it would be considered an event of default.
11	**Consequences of default**	
	a) Developer: event of default	1. The ULB has the right to make good any shortfall from the performance security. 2. The ULB reserves the right to claim from the developer any costs, expenses, or losses it may have incurred by reason of breach or failure on the part of the developer. 3. The developer shall deliver to the ULB all papers, including forms used, receipt books, promotional materials, and other documents. 4. The developer shall hand over all assets to the ULB.
	b) ULB: event of default	The ULB shall pay the developer an amount equal to Rs___ lakhs, book value of developer's assets, and payments for payments outstanding from the ULB.
12	**Bidding parameter**	The bidding parameter would be the highest bimonthly or annual fixed payment to be paid as royalty to the ULB

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Table *continued*

Sl No.	Item	Description
13	Qualification criteria	Technical criteria ▪ The developer should have experience in construction of one water supply project for source augmentation of ___ MLD ▪ The developer should have undertaken one project requiring construction of ___ MLD WTP ▪ The developer should have operated and managed ___ water supply project from the bulk supply to distribution end for a city with water supply of ___ MLD
		Financial criteria ▪ The developer should have a minimum net worth equivalent to 25% of the estimated project cost for which bids have been invited ▪ The developer should have an average net cash accruals over 3 years of Rs____ million Holding companies with a direct holding of more than 50% equity in the lead consortium member can be considered for the evaluation of financial criteria.

Sl = serial.

Tool Kit for Public–Private Partnerships in Urban Water Supply for the State of Maharashtra, India

Several challenges in service delivery confront municipal water supply in India. This is driven by a number of issues, including rising demand due to larger and denser urban populations. The levels of investment in the water sector are lagging the required demands; coupled with inefficiencies and institutional issues, these will likely impact unsustainable exploitation of water resources. International experience suggests that public–private partnerships (PPPs) can meet these challenges in the sector, both through investments and particularly through efficiencies in performance parameters.

Under the joint initiative of the Government of India and the Asian Development Bank (ADB), "Mainstreaming PPPs in India," ADB supports state PPP cells in several challenging sectors in state-specific activities to arrive at possible PPP structures.

In Maharashtra, ADB supported the Department of Urban Development and Water Supply and Sanitation to develop possible PPP structures in the water supply and sanitation sector. After studying possible PPP structures, their applicability in the context of selected sample cities were assessed leading to the development of proposed term sheets, which were identified as suitable and feasible for implementation.

This tool kit is expected to assist the relevant public entities in Maharashtra state for developing PPP-based projects in water supply and sanitation, and may also be used as reference by similar other cities across the country.

About the Asian Development Bank

ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to two-thirds of the world's poor: 1.8 billion people who live on less than $2 a day, with 903 million struggling on less than $1.25 a day. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

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