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**Project Document  
of the Asian Infrastructure Investment Bank**

**Republic of India**

**Andhra Pradesh Urban Water Supply and Septage  
Management Improvement Project**

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## Currency Equivalents

(As of Sep. 7, 2018)

Currency Unit	–	Indian Rupee (INR)
INR69.00	=	USD1.00

## Abbreviations

AIIB	Asian Infrastructure Investment Bank
AMRUT	Atal Mission for Rejuvenation and Urban Transformation
APUWSSIP	Andhra Pradesh Urban Water Supply & Septage Management Improvement project; the Project
APUFIDC	Andhra Pradesh Urban Finance and Infrastructure Development Corporation
CIIP	Critical Infrastructure Investment Plan
CIM	Clean India Mission (Swachh Bharat)
DFI	Development Finance Institution
DMA	Directorate of Municipal Administration
DPR	Detailed Project Report
EIRR	Economic Internal Rate of Return
ENPV	Economic Net Present Value
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESIA	Environmental and Social Impact Assessment
ESP	Environmental and Social Policy
ESS	Environmental and Social Standards
FMA	Financial Management Assessment
GDP	Gross Domestic Product
GoAP	Government of Andhra Pradesh
GoI	Government of India
IA	Implementing Agency
IOCT	International Open Competitive Tendering
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
lpcd	liters per capita per day
MA&UD	Municipal Administration & Urban Development Department
NCT	National Competitive Tendering
PMC	Project Management Consultant
PMU	Project Management Unit
PHMED	Public Health and Municipal Engineering Department
RPF	Resettlement Policy Framework
SDG	Sustainable Development Goals
STP	Septage Treatment Plant
TPPF	Tribal Peoples Planning Framework
ULB	Urban Local Body
WWTP	Waste Water Treatment Plant

## Contents

<b>1.</b>	<b>Project Summary Sheet.....</b>	<b>1</b>
<b>2.</b>	<b>Strategic Context .....</b>	<b>4</b>
	A. Country Context .....	4
	B. Sectoral and Institutional Context .....	4
<b>3.</b>	<b>The Project.....</b>	<b>7</b>
	A. Rationale .....	7
	B. Objectives .....	9
	C. Project Description and Components .....	9
	D. Project Cost and Financing .....	11
	E. Implementation Arrangements.....	13
<b>4.</b>	<b>Project Assessment .....</b>	<b>18</b>
	A. Technical Assessment .....	18
	B. Economic and Financial Analysis .....	19
	C. Fiduciary and Governance .....	20
	D. Environmental and Social .....	23
	E. Risks and Mitigation Measures .....	25
	F. Next Steps .....	<b>Error! Bookmark not defined.</b>
	<b>Annex 1: Results Framework and Monitoring .....</b>	<b>28</b>
	<b>Annex 2: Map of Andhra Pradesh and the proposed 50 ULBs (Source: GoAP) .....</b>	<b>32</b>
	<b>Annex 3: Detailed Project Description .....</b>	<b>33</b>
	<b>Annex 4: Economic and Financial Analysis .....</b>	<b>43</b>
	<b>Annex 5: Sovereign Credit Fact Sheet.....</b>	<b>67</b>
	<b>Annex 6: Procurement Principles Checklist and Procurement Plan .....</b>	<b>69</b>
	<b>Annex 7: Organization of the Institutional Component .....</b>	<b>73</b>

## 1. Project Summary Sheet

### Republic of India

### Andhra Pradesh Urban Water Supply and Septage Management Improvement Project

Project Number	000079
Borrower	Republic of India
Project Implementing Entity	Government of Andhra Pradesh (GoAP), supported by Andhra Pradesh Urban Finance and Infrastructure Development Corporation (APUFDIC) and Public Health & Municipal Engineering Department (PHMED).
Sector / Subsector	Water / Water Supply and Sanitation.
Project Objectives / Brief Project Description	<p>The project objective is to provide safe drinking water through piped water supply to 3.3 million people in Andhra Pradesh, and to improve service levels and strengthen sustainable service delivery. The project is delivered as part of an integrated approach to water and sanitation comprising funding from the Asian Infrastructure Investment Bank (AIIB) as well as the Government of India through the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) and the Clean India Mission (CIM), and the Government of Andhra Pradesh Critical Infrastructure Investment Plan (CIIP) program.</p> <p>The AIIB-financed Project includes the following components:</p> <ol style="list-style-type: none"><li>1. Water Supply: The construction of water supply systems in the Project urban local bodies (ULBs), including intakes at raw water source, raw water transmission mains, water treatment plants, clear water transmission mains, treated water storage, distribution networks and household service connections with meters.</li><li>2. Sanitation and Drainage Pilots in five selected ULBs: Pilot Waste Water Treatment Plants for graywater treatment will be financed alongside critical drainage improvements by GoAP.</li><li>3. Institutional component: Capacity building to strengthen (i) overall project management and supervision and (ii) the institutional capacity in the ULBs in municipal services delivery and management, including financial, environmental and social aspects.</li></ol>

Project Implementation Period (Start Date and End Date)	Start date: January 2019 End date: December 2023
Expected Loan Closing Date	June 2024
Project Cost and Financing Plan	Project cost: USD570 million GoAP: USD170 million AIIB: USD400 million
AIIB Loan—Size and Terms	Size: USD400 million Sovereign-backed. Loan with a maturity of 30 years, including a 5-year grace period. Payment currency of the Loan will be U.S. Dollars and the interest payment dates selected will be February 15 and August 15 in each year.
Cofinancing—Size and Terms	None. It is a standalone project.
Environmental and Social Category	A
Project Risk (Low/Medium/ High)	High
Conditions for Effectiveness	<ul style="list-style-type: none"> <li>• Project Management Unit (PMU) to be established.</li> <li>• Adoption of Financial Management Manual.</li> <li>• Appointment of Project Management Consultant (PMC).</li> <li>• Grievance Redress Mechanism (GRM) to be established.</li> </ul>
Conditions for Disbursement	<ul style="list-style-type: none"> <li>• The tender documents for the water supply schemes for 29 ULBs of Phase 2 have been prepared, including all Safeguards Instruments in form and substance acceptable to the Bank.</li> <li>• The DPRs for the water supply schemes of Phase 2 have been sanctioned technically and administratively by the Project Implementing Entity.</li> </ul>
Key Covenants	<ul style="list-style-type: none"> <li>• Quarterly Project Implementation Reports, including follow-up on the Environmental Management Plan and the Social Management Plan.</li> <li>• Memorandum of Understanding / Implementation Partnership Agreement between PHMED and ULBs, including ULB's acceptance of establishing a designated account for water supply services shall be in place before start of construction works.</li> <li>• APUFDIC to report on progress on planned septage and drainage infrastructure development in 50 ULBs.</li> </ul>
Policy Assurance	To be confirmed prior to Board submission.

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## 2. Strategic Context

### A. Country Context

1. India is a lower-middle-income country, with a population of 1.3 billion accounting for 17 percent of the world's population<sup>1</sup> and the world's third largest economy based on gross domestic product (GDP)<sup>2</sup> measured in terms of purchasing power parity. The country has achieved an average GDP growth rate of around seven percent per annum in recent years. The GDP per capita in India is USD1,861<sup>3</sup>. Despite India's impressive growth, around 21 percent of India's population still lives below the poverty threshold limit of USD1.90 per day.

2. India's growth is projected to rise to 7.3 percent in 2018 and 7.5 percent in 2019, according to the World Bank (WB), due to the implementation of few comprehensive reforms such as the goods and services tax (GST). The current account deficit is projected to be 1.5 percent of GDP (2018-2019) and debt to GDP of 67.3 percent (2018-2019). The inflation in the long term is projected to trend around 4.8 percent.

3. **State Context.** The former state of Andhra Pradesh was bifurcated into two states; Telangana and Andhra Pradesh in June 2014. Andhra Pradesh, situated on the south-eastern coast of India, is the eighth largest state in terms of area (160,205 square kilometers) and the tenth most populous, with a population of around 49 million.<sup>4</sup> The state is divided into 13 districts having 110 ULBs with 29 percent of the state's population living in urban areas. Only 48 percent of those are connected to the piped water supply whereas the sewerage systems is almost nonexistent except in seven ULBs having partial coverage (15 percent of the population).<sup>5</sup> Unsafe water supply systems and inadequate sanitation constitute major health risks and hazards to the population. Improving water supply and sanitation thus is the key priority to the State's further socioeconomic development and improvement in public health standards.

### B. Sectoral and Institutional Context

#### Sectoral Context

4. The country is experiencing a trend of rapid urbanization. Urban areas account for 63 percent of India's GDP and are projected to account for 75 percent of GDP by 2021. The urban population is estimated to grow from 31 percent of total population in 2011 to 43 percent by 2031.<sup>6</sup> Urban sector growth has preceded the development of essential infrastructure. Water supply, waste water collection and treatment, drainage, solid waste and other essential infrastructures are inadequate to respond to the population pressure and economic demands. Water supply is characterized by low coverage, intermittent supply, poor standards and quality. Inadequate infrastructure is contributing to widespread pollution, environmental and health

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<sup>1</sup> Department of Economic and Social Affairs, Population Division, United Nations.

<sup>2</sup> World Development Indicators database, World Bank, December 2017.

<sup>3</sup> World Bank figures.

<sup>4</sup> Andhra Pradesh Urban Finance and Infrastructure Development Corporation.

<sup>5</sup> Andhra Pradesh Urban Finance and Infrastructure Development Corporation.

<sup>6</sup> Government of India, National Planning Commission, 2012. Report of the Steering Committee on Urbanization, Twelfth Five Year Plan (2012-2017). New Delhi.

problems and estimated to have a larger impact on the poor who represents nearly 25 percent of the urban population.<sup>7</sup>

5. In 2015, around 88 percent of the population in India had access to basic water supply services (93 percent in urban and 85 percent in rural areas), compared with 80 percent in 2000 (92 percent access in urban and 76 percent in rural areas).<sup>8</sup> In addition to improving access, water quality and continuity of services have been identified as key issues in the urban areas. For sanitation, the situation is more severe. Only 44 percent of India's population has access to basic sanitation (65 percent in urban areas and 34 percent in rural areas) and open defecation is still widespread.

6. Achieving universal coverage of water supply and sanitation in a sustainable manner in all urban areas, is a key priority of the GoI. Alongside access, improving the quality of services is also a challenge. The Ministry of Urban Development, GoI has adopted a set of national service level benchmarks for water supply, sewerage, solid waste management and storm-water drainage to shift the focus of investments toward service delivery. The financing requirements for improving existing urban areas as well as providing for orderly urban growth and expansions are enormous. The High-Powered Expert Committee established by the GoI, has estimated investment needs for a 20-year period in overall infrastructure development to the tune of around INR39 lakh crore (USD565 billion) which includes INR8 lakh crore (USD116 billion) for water supply, sanitation, solid waste and drainage.

7. Investments in water supply and sanitation in urban areas have increased in the last decade under the Jawaharlal Nehru National Urban Renewal Mission (2005-2014). In the former state of Andhra Pradesh, 50 water supply schemes were implemented under this scheme at a cost of INR2,164 crores (USD313 million).

8. **AMRUT and Swachh Bharat Abhiyan Mission.** The nationwide AMRUT program was launched in 2015 to provide basic services in cities with a population of more than 100,000 inhabitants. The GoI program provides grant financing of INR50,000 crore (USD7.2 billion) for investments in water supply, sewerage facilities, septage management, stormwater drains, public transport and parks in 500 cities for the period between 2015 to 2020. Alongside the investment in hard infrastructure, the program includes capacity building and reforms in 11 areas, including urban planning, improvement in levy and collection of user charges and energy and water audits. Around 89 cities in Andhra Pradesh, Gujarat and Rajasthan have been allocated funds under the first phase of the mission which includes 32 cities in Andhra Pradesh alone.<sup>9</sup> To address the issue of sanitation, the GoI has launched several other initiatives such as the Total Sanitation Campaign and the Swachh Bharat Abhiyan Mission (Clean India Mission), which aims to clean up cities, urban and rural areas and to end open defecation by 2019.

9. In Andhra Pradesh, around 71 percent of urban households have access to improved

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<sup>7</sup> ADB Sector Assessment.

<sup>8</sup> WHO/UNICEF (2017): JMP Report Progress on drinking water, sanitation and hygiene: 2017 update and SDG baselines.

<sup>9</sup>The Economic Times (2015), Water and sewerage plans worth Rs 2,786 crore in 89 AMRUT cities approved: <https://economictimes.indiatimes.com/news/economy/infrastructure/water-and-sewerage-plans-worth-rs-2786-crore-in-89-amrut-cities-approved/articleshow/49495568.cms> Oct. 23, 2015.



water supply. Out of the remaining 29 percent, 19 percent of the households do not have access to treated water supply. Most of the households which use untreated water supply, resides in the districts of Vishakhapatnam, Prakasam and Nellore and the four districts of Rayalaseema region, where 48 percent households have a house service connection, but water supply is intermittent, and the supplied quantity is well below the service level benchmarks. Out of a total of 110 ULBs, water supply is received once per day in 64 ULBs, every second day in 35 ULBs, every three days in six ULBs and once in four days in two ULBs. Currently, 1,060 MLD of water is produced against a demand of 1,358 MLD resulting in a gap of 298 MLD. Apart from seven ULBs, where sewerage coverage is partial (15 percent of households are connected), no sewerage system exists in other ULBs. Most of the households have toilets with onsite sanitation systems (individual septic tanks or holding tanks).

10. The GoAP is aiming to achieve universal coverage in water supply, septage management and sewerage in line with the national priorities by rolling out infrastructure in a phased manner in urban areas. The GoAP aims to provide continuous water supply of 135 liters per capita per day (lpcd) corresponding to the national service level benchmarks as compared to the current intermittent water supply of approximately 50 lpcd in the targeted ULBs. Currently, several initiatives to improve water supply and sanitation in urban Andhra Pradesh are ongoing. Under AMRUT, 55 water supply projects (USD388 million), 25 sewerage projects (USD120 million), seven stormwater drains (USD53.8 million) and nine parks at (USD14 million) are under implementation. A WB-funded project, covering water supply systems in 6 ULBs (USD161 million) is nearing its completion. Further, a sewerage system for Guntur at a cost of USD138.8 million, and a water and sewerage system for Nellore (USD174.8 million) are being financed under other programs. The ongoing projects generally target larger towns and do not provide coverage for ULBs with a population of less than 100,000 inhabitants leaving a significant share of the population underserved.

11. The GoAP, therefore, has decided to launch the AIIB-financed Andhra Pradesh Urban Water Supply & Septage Management Improvement project (APUWSSIP; the project), which aims to provide water supply to 50 underserved ULBs with a population of less than 100,000 inhabitants and supplement it with investments in sanitation infrastructure under the Clean India Mission and other proposed programs of the GoAP such as the Critical Infrastructure Investment Plan (CIIP) to address water and sanitation in an integrated approach.

## **Institutional Context**

12. In Andhra Pradesh, urban governance and urban infrastructure development are led by the Department of Municipal Administration and Urban Development (MA&UD). The key responsibilities of the MA&UD are urban planning and urban infrastructure development.

13. The Directorate of Municipal Administration (DMA) is the apex authority of MA&UD which provides guidance to ULBs in performing their day-to-day activities and coordinates with other departments regarding the delivery of urban civic services to the population. Under the DMA, there are 110 ULBs which are divided into 14 municipal corporations, 71 municipalities and 25 smaller city councils (*nagar panchayats*).<sup>10</sup>

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<sup>10</sup> The categorization is according to population size.

14. APUFIDC is under the administrative control of the MA&UD. APUFIDC acts as the nodal agency for planning and implementation of urban infrastructure projects in the ULBs that are funded by the GoI, GoAP and externally funded projects. APUFIDC also provides technical assistance to the ULBs in implementation of such projects.

15. The Public Health & Municipal Engineering Department (PHMED) is under the administrative control of MA&UD and is responsible for the implementation of new water supply and sewerage schemes in the 110 ULBs. PHMED approves technical designs, is the tendering authority, and carries out the construction supervision of engineering works in the ULBs. PHMED is led by the engineer-in-chief who is supported by around 1,100 engineers spread across the state.

16. After completion of the water supply and sewerage schemes under the supervision of the PHMED, the water supply schemes are handed over to the concerned ULBs. The capacity to operate and maintain the water supply and sewerage infrastructure differs considerably with larger ULBs having a higher capacity.

### 3. The Project

#### A. Rationale

17. **Strategic fit—Promoting sustainable infrastructure.** The investments under this project will increase access to safe drinking water and support the GoAP in addressing water supply and sanitation in an integrated approach. The pilots for graywater treatment and drainage will inform the GoAP's efforts under the CIIP to close the infrastructure gap for septage management, graywater treatment and drainage in all urban areas of Andhra Pradesh. The overall infrastructure developed is expected to be technically sustainable, environmentally safe, and financially viable by strengthening the capacity and business practices of the municipalities in the effective provision of water supply services and by involving end users to pay for the improved services, which overall aligns well with the key thematic priority of AIIB.

18. **Alignment with Country and State priorities.** The GoI has made substantial investments in the areas of water supply and sanitation through national schemes such as AMRUT, Swachh Bharat Abhiyan Mission, Smart Cities, which have been identified as core pillars to address the challenges in those areas. Thus, the proposed project builds on that solid technical foundation and fills a gap not covered by current government programs. The project therefore supplements the ongoing and proposed programs in the state such as AMRUT, CIM and CIIP. The GoAP has adopted the Sustainable Development Goals 2030 (SDG 2030)<sup>11</sup> as charted out by the members of the United Nations, and the project is expected to directly contribute to the achievement of SDG 6 to “ensure access to water and sanitation for all.”

19. **Ensuring universal coverage for drinking water.** The project aims to provide safe drinking water and improved sanitation services to a population of around 3.3 million in Andhra Pradesh. The project will increase the current drinking water service levels from an average of

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<sup>11</sup> On Sep. 25, 2015, countries adopted a set of goals to end poverty, protect the planet and ensure prosperity for all as part of a new sustainable development agenda. Each goal has specific targets to be achieved over the next 15 years. More information at <http://www.un.org/sustainabledevelopment/sustainable-development-goals/>

around 50 lpcd to 135 lpcd to reach the national service level benchmarks. The project is part of the GoAP's effort to achieve universal coverage of piped water supply by 2020 from the current levels of 40 percent.

### **Value addition by AIIB**

20. **Enhancing technical preparation and ensure financial viability.** During project preparation, the AIIB team provided substantial technical advice for the revision and updating of the detailed project reports (DPRs) for the 50 water supply schemes<sup>12</sup> and the implementation structure of the project to ensure quality and safety through better design and defining clear roles and responsibilities for effective implementation. Further, AIIB's input ensures financial sustainability of each water supply scheme at the ULB level through the establishment of designated accounts for water supply services so that a ring-fenced cost recovery mechanism is established to sustain operation and maintenance (O&M) requirements. The need for financing in the water and sanitation sector in India and the region is enormous, and AIIB will play a pivotal role in addressing the infrastructure gap.

21. **Providing an integrated technical solution to reap long-term benefits.** The original project scope proposed by the GoAP partially covered water supply services without a holistic solution including sanitation. To bring economic and health benefits and ensure a safe environment, it is essential that the investments in water supply, sanitation services and drainage be done as "one" integrated solution. The AIIB team has agreed with the GoAP to adopt an integrated solution. This is also required by the GoI's own National Water Policy from 2012, where it is stated in paragraph 9.5 that: "All components of water resources projects should be planned and executed in a *pari-passu* manner." Further, paragraph 11.5 stipulates that: "Urban water supply and sewage treatment schemes should be integrated and executed simultaneously. Water supply bills should include sewerage charges." These principles have guided the scope and approach of the Project.

22. **Enhancing quality of environmental and social management.** The AIIB team is providing inputs in the preparation of environmental and social safeguards framework for the project, identifying gaps and recommending mitigation measures. The Terms of Reference for the Environment and Social Management Framework (ESMF) has been reviewed by AIIB. The bank will encourage adoption of a participatory approach wherein the project affected community will be made aware of environmental hygiene conditions. A communication action plan will be implemented to garner public support to participate in the implementation process and disseminate good personal and community hygiene behavior.

23. **Adopting lessons learned.** AIIB is drawing lessons learned from similar projects implemented by other DFIs and taking steps to reflect them in the project design. As a proposed eligibility condition, before implementation starts, the PHMED shall obtain all regulatory clearances (for instance; clearance from National Highways Authority of India and Ministry of Railways for the right of way; Ministry of Irrigation and State Governments' Irrigation Department for the abstraction rights) and complete land acquisition, resettlement, if any, and land to be used by the project should be in the possession of the respective ULBs. Also, the importance

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<sup>12</sup> The DPRs for the 50 water supply schemes under this Project had been prepared by engineering consultants contracted by the ULBs.

of local ownership of the assets and then operations and maintenance is essential to ensure a match between the needs and the proposed investment program, and hence AIIB will ensure that the ULBs take an active role since beginning to meet the project objectives.

### **Value addition for AIIB**

24. This is AIIB's first standalone investment in developing infrastructure for safe drinking water and sanitation services in India. The project is a good opportunity for AIIB to gain experience in the water and sanitation sector, learning by doing, address new challenges and find solutions which can then be replicated in other states of India and in other countries having similar conditions.

### **B. Objectives**

25. The project objective is to provide safe drinking water through piped water supply to 3.3 million people in Andhra Pradesh, and to improve service levels and strengthen sustainable service delivery.

26. The specific objectives of the project are to (i) design and implement/rehabilitate water supply systems in 21 ULBs (Phase 1) and 29 ULBs (Phase 2) including waste water treatment plants (WWTPs), storage tanks, distribution system, pumps, household connections and meters; (ii) design and construct sanitation and drainage infrastructure for management and treatment of gray waste water in five pilot ULBs to support the GoAP CIIP and (iii) strengthen the institutional capacity in ULBs with respect to urban services delivery, O&M, cost recovery and management including financial, environmental and social aspects.

27. The proposed results are the following:

- Result 1: Increased access to safe drinking water supply and improved service quality.
- Result 2: Improved sanitation and drainage infrastructure in five selected pilot ULBs.
- Result 3: Strengthened institutional capacity of the ULBs in the management and of municipal services.

Results indicators, means of verification and assumptions are presented in Annex 1.

### **C. Project Description and Components**

28. The project supports the GoAP's effort to address water and sanitation in an integrated approach and has close links and interfaces with other programs financed by the GoI (in particular AMRUT, CIM) and GoAP (in particular CIIP).

29. The project will have three components:

- (i) **Component 1: Investment in Water Supply Infrastructure.** This will include construction of intakes at raw water source, raw water transmission mains, water treatment plants, clear water transmission mains, treated water storages, distribution networks and household service connections. In few project ULBs, the partial existing infrastructure will be rehabilitated and augmented to be used with the newly created infrastructure. Furthermore, installation of consumer meters at each household has been agreed with the APUFIDC as it complements with the other proposed programs of the GoAP.<sup>13</sup>
- (ii) **Component 2: Investment in five Sanitation and Drainage Pilot Projects.** Recognizing the increase in gray waste water<sup>14</sup> generated due to the increase of water supply from the current service level of 50 lpcd to a target level of 135 lpcd, it has been agreed to finance waste water treatment plants in five Pilot ULBs under this project, which is complemented by critical drainage improvement by GoAP in the same ULBs, to address sanitation and safely manage gray waste water and local overflow from septic tanks.<sup>15</sup>
- (iii) **Component 3: Technical Assistance, Institutional Development and Municipal Capacity Enhancement and Implementation Support.** The purpose of this component is to support the effective implementation of the Project and ensure long-term sustainability through the strengthening of technical and financial capacity of the ULBs in water service delivery. A PMC will be contracted to support the technical preparation of the project (DPRs, including tender documents for water supply systems, waste water treatment facilities, drainage infrastructure), provide technical advice (standard operating procedures and manuals for O&M), to support PHMED in construction supervision and the implementation and monitoring of safeguard-related activities.

The component will further include capacity building for the PHMED and ULB technical staff focusing on management and delivery of municipal services including financial and environmental aspects. Based on a needs assessment, this component may also consider (1) IT applications for water supply services building on the GoAP's e-Governance platform; (2) a project communication plan, awareness building campaigns to promote improved hygiene behavior by communities (3) citizens' satisfaction surveys to ensure efficient service delivery and delineate ULB report cards and (4) a pilot water demand and resources assessment for Andhra Pradesh.

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<sup>13</sup> During the pre-appraisal stage it was agreed to include installation of consumer meters within the current project scope. For Puttur ULB, where a relatively new distribution system with household connections already exists, the trunk infrastructure from source to reservoir will be constructed during Phase 1 while metering will be rolled out during the Phase 2 implementation.

<sup>14</sup> The additional quantity of gray waste water is estimated at about 80 percent of the additional water supplied.

<sup>15</sup> Based on the criteria of ownership (demonstrated leadership for addressing sanitation) and adequate geographic conditions for demonstrating successful implementation, the AIIB team and the client have agreed that the pilots for Sanitation and Drainage shall be implemented in the following five ULBs: 1. Allagadda, 2. Nandikotkur, 3. Kalyandurgam, 4. Kanigiri and 5. Sullurpeta. AIIB and the GoAP further agreed that all contracts under this component (WWTP and drainage improvements) shall be awarded prior to implementation of the Project in the 29 ULBs of Phase 2.

This component will also promote inclusive approaches and ensure that gender aspects and social inclusion are covered in all stages of the project life cycle.

30. During the concept stage, septage management and treatment was foreseen to be financed under this project. Given the advanced stage of preparation of this component, GoAP and AIIB have agreed that the GoAP may go ahead in implementing Septage Treatment Plants in all ULBs<sup>16</sup> targeted under this project with funding from the Clean India Mission based on a Design, Build, Operate and Transfer (DBOT) approach, whereby the contractors are paid on an annuity basis.<sup>17</sup>

31. To bridge the gap foreseen between the start of implementation of water supply infrastructure and commencement of the GoAP Septage and Drainage improvement under the CIM and CIIP, the Project includes targeted rehabilitation and construction of side drains in the five Pilot ULBs to safely carry gray waste water. In parallel, the component will include development and test of robust and effective local graywater treatment approaches that can be easily scaled up and implemented in the remaining ULBs.

32. GoAP and AIIB have agreed that the project be designed and implemented in a phased and integrated manner. Phase 1 will cover 21 ULBs (Anantapur and Nellore circles) and Phase 2 shall comprise of the remaining 29 ULBs totaling to 50 ULBs after completion of Phase 1 and 2.

33. The prioritization of the ULBs for Phase 1 was conducted by APUFIDC based on selection criteria prepared in consultation with AIIB. Under these criteria, priority has been given to those ULBs where: (a) revised DPRs satisfy AIIB's quality standards; (b) land required for the various project components is in the possession of the ULBs; (c) all regulatory clearances including water abstraction rights, right of way etc. have been obtained; (d) an integrated approach to implement both the water supply and sanitation can be taken simultaneously; (e) commitment of the respective ULBs to allocate sufficient resources for undertaking operations and maintenance and (f) related factors including local communities' demand for services and an agreed willingness to pay for the improved services etc. The 21 ULBs where DPRs are ready and thus to be included in Phase 1 are presented in Annex 3. During the implementation of the water schemes under Phase 1, the DPRs for the Phase 2 ULBs will be finalized and tender documents prepared.

#### **D. Project Cost and Financing**

34. The GoAP through the Gol, has requested for a sovereign-backed loan assistance of USD400 million (equivalent to INR2,606 crores) from AIIB.

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<sup>16</sup> Except three ULBs for which STPs already exist or are currently under construction. For Chittoor and Nellore merged villages fall under Chittoor and Nellore Corporation respectively and STPs are under construction with AMRUT financing. In Nellore the STP is nearing completion and in Chittoor construction has commenced. Among the 21 Phase 1 ULBs, for Yemmiganur an STP has already been constructed.

<sup>17</sup> The GoAP has invited tenders for the construction of STPs in 76 ULBs, including the ULBs under this Project. The subprojects were grouped in seven packages. Proposals for four out of the seven packages have been received. The remaining three packages are expected to be awarded before end of 2018.

35. The indicative total project cost for the 50 ULBs is USD570 million<sup>18</sup> and the corresponding indicative financing plan are as shown in Table 1. Although the number of ULBs in Phase 1 is only 21, the infrastructure costs make up more than 60 percent of the estimated total budget. The reason is that the water schemes in the most southern ULBs/districts (Phase 1) will be shifted from groundwater, which is depleting and of inadequate quality, to new surface water sources generally located relatively far away from the ULBs and therefore requiring long raw water mains.

**Table 1: Project Cost and Financing (USD million)**

Project Components	Project Cost	Phase 1 (21 ULBs)				Phase 2 (29 ULBs)			
		AIIB	Share	GoAP	Share	AIIB	Share	GoAP	Share
1. <b>Component 1</b> - Investment in Water Supply Infrastructure for 50 ULBs	534	220.0	70%	94.7	30%	154.5	70%	64.8	30%
2. <b>Component 2</b> - Investment in Sanitation and Drainage in five pilot ULBs	14	9.8	70%	4.2	30%				
3. <b>Component 3</b> - Technical Assistance, Institutional Development & Municipal Capacity Enhancement and Implementation Support	21	10.7	70%	4.6	30%	4.0	70%	1.7	30%
4. Front-end Fee	1	0.5				0.5			
<b>Total Project Cost and Financing Plan</b>	<b>570</b>	<b>241.0</b>	<b>70%</b>	<b>103.5</b>	<b>30%</b>	<b>159.0</b>	<b>70%</b>	<b>66.5</b>	<b>30%</b>
<b>Total Project Cost</b>		<b>344.5 (60%)</b>				<b>225.5 (40%)</b>			
# 1USD = INR69									

36. The project will be implemented in two phases; Phase 1 and Phase 2. Phase 1 will start immediately and include the water supply schemes for 21 ULBs under Component 1 as well as the Components 2 and 3. Phase 2 will comprise water supply schemes of the remaining 29 ULBs and shall start once the tender documents for the 29 ULBs of Phase 2 have been prepared, including all Safeguards Instruments in form and substance acceptable to the Bank, and the DPRs for the water supply schemes of Phase 2 have been sanctioned technically and administratively by the Project Implementing Entity.

37. The total loan assistance of the Bank for the overall project combining Phase 1 and 2, will be USD 400 million. The tabled costs for the Phase 1 ULBs have been based on the final DPRs, which have been sanctioned, both technically and administratively, by GoAP. DPRs for the Phase 2 water schemes have not yet been finalized and costs have therefore been estimated based on preliminary designs. If the updated and final Phase 2 DPRs result in a cost higher than what is currently envisaged, two alternative solutions have been agreed between GoAP and AIIB: (i) GoAP will close the financing gap using own funds, (ii) GoAP will request approval for additional financing from DEA and AIIB.

<sup>18</sup> While the cost estimate for the water supply schemes for the Phase I ULBs is based on detailed designs, the cost estimate for the Phase 2 ULBs is based on preliminary designs and will be revised to reflect the detailed designs once available.

38. **Financing terms.** The financing will be a sovereign-backed loan with a maturity of 30 years, including a five-year grace period. Payment currency of the loan will be U.S. Dollars and the interest payment dates selected will be February 15 and August 15 in each year.

## **E. Implementation Arrangements**

39. **Implementation Period.** The project, including both phases, is expected to be implemented from January 2019 to December 2023.

40. **Phased Implementation.** During Phase 1, water supply systems in 21 ULBs as well as five pilot projects for Sanitation and Drainage will be implemented.<sup>19</sup> In parallel, the DPRs for the water supply systems of the remaining 29 ULBs will be reviewed and revised with support of the PMC. The GoAP and the Bank agreed that the construction contracts for the Septage Management Plants, Waste Water Treatment Plants for graywater treatment and drainage infrastructure prepared under CIIP and CIM for the 21 Phase 1 ULBs shall be awarded prior to the start of Phase 2 implementation and shortly thereafter for the remaining 20 ULBs. At the end of Phase 2, all physical works and services under the integrated approach for water and sanitation in all 50 ULBs is planned to be completed. An illustration of the components, phasing, interfaces between the AIIB project and the GoAP's Critical Infrastructure Investment Plan (CIIP) is presented in Annex 3. The AIIB team will engage in a continuous dialogue with the Client on the scaling-up of the sanitation activities under other Government programs and monitor progress in the frame of its planned monitoring missions.

41. **Project Implementing Entity.** The GoAP is the Project Implementing Entity. The APUFIDC, GoAP, will lead and coordinate project preparation, pre- and post-implementation activities and monitor the overall implementation of the project with the support of the PMU. APUFIDC is the main focal agency for AIIB for the project. Details on the implementation arrangement and interfaces between the various entities is presented in Annex 3.

42. **Project Management Unit (PMU).** A core PMU has been established within APUFIDC for project preparation. The Managing Director of APUFIDC/Director Municipal Administration, is the de-facto Project Director. The PMU will be staffed with a full-time Project Additional Director and personnel with specialization in requisite disciplines such as water and sanitation engineering, hydrology, water quality, financial management, information technology, monitoring and evaluation, environment and social development, procurement etc. The PMU will be responsible for: (a) execution of the Implementation Partnership Agreement with the APUFIDC, PHMED and respective ULBs; (b) preparation of phased implementation as per the project delivery strategy; (c) selection of PMC, E&S consultant and any other consultants or individual experts and (d) oversight of project preparation activities, including but not limited to tendering, contract management, construction monitoring and supervision and safeguards implementation; (e) responsible for Financial and Accounting Management of the project, i.e. preparation of budget, releases, bills preparation, pre-audit, establishment charges, accounts maintenance etc., as per the financial rules/procedures of GoAP through Nodal Agency.

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<sup>19</sup> The DPRs for the pilot sanitation and drainage infrastructure will be prepared by the PMCs contracted by PHMED under AMRUT.



43. **Project Implementing Agency.** The PHMED is the Project Implementing Agency (PIA; IA) and is responsible for the technical implementation of the project in coordination with the respective ULBs. PHMED will report to APUFIDC for seamless project implementation. APUFIDC is the nodal agency and AIIB's official counterpart. PHMED approves ("technical sanction") the detailed engineering designs (DPRs), is the procuring authority for works and goods, undertakes construction monitoring and supervision, ensures the technical quality control, is responsible for safeguards implementation, approves payment certificates for works contracts, and undertakes regular reporting through IT based interface.

44. **City Management Unit.** At the ULB level, a city management unit (CMU) will be established, which will be headed by the Municipal Commissioner and staffed with one PHMED engineer, one representative from the PMC (staff of the PMC designated to the respective ULB), technical staff of the ULB, one public representative and one community member. The CMU shall coordinate project activities at the ULB level, partake in monitoring of implementation of works, build technical capacity within ULBs, ensure proper safeguards implementation, strengthen systems for revenue collection and business practices for effective delivery of municipal services and continuously engage with the communities to spread awareness of the long-term benefits of the project.

45. **PMC.** The PMC will report to the PMU and will support PHMED in project management from planning, revision, quality check, preparation of the DPRs (where not prepared), preparation of tender documents, supporting during the tendering process, and supervising contract execution including oversight of construction monitoring and quality control checks of the works, preparation of monitoring and action taken reports, and ensure full compliance of safeguards implementation. The PMC selection process is ongoing in accordance with the Bank's Procurement Policy and subject to prior review by AIIB. The EOI process has been finalized and 6 companies out of 20 interested companies will be invited to tender proposals. Terms of Reference of the PMC are under review by AIIB and it is expected that the PMC contract can be awarded in November 2018.

46. **Project Implementation Monitoring.** The APUFIDC is the main focal point for AIIB and being supported by the PMU. The PHMED is the subfocal point for AIIB. PHMED has shared a staffing plan with the bank which envisages deploying one dedicated assistant engineer at each ULB. The assistant engineer will report to a deputy executive engineer responsible for three to four ULBs, who reports to the executive engineer responsible for a district, who reports to a superintending engineer heading a circle, who finally reports to the engineer-in-chief. The respective ULB is the subfocal point for AIIB for activities at the ULB level.

47. Extensive Implementation monitoring is included in the Institutional Component and will be carried out at four levels. First, the responsibility of construction supervision is with the PHMED. Second, the PMC will support PHMED in construction supervision and in monitoring of implementation progress and will provide monthly monitoring and supervision reports. Third, incremental technical and administrative/procurements staff will be placed in the PMU and allocated to coordinate implementation and monitor overall progress, including environmental and social aspects. Finally, the AIIB team will undertake two to three implementation monitoring visits per year to oversee implementation progress and safeguards implementation.

48. A Results Framework has been developed (Annex 1), including baseline data, to support project monitoring. PMU, supported by the PMC, will be responsible for collecting data and reporting on implementation progress for each indicator in the Results Framework. The achievements of the indicators will be evaluated by comparing the actual results against planned targeted values. The Results Framework, with appropriate data and associated evaluations, will be incorporated into the Project's annual progress reports.

49. **Procurement.** The APUFIDC and PHMED are public entities and the provisions of AIIB's Procurement Policy and Interim Operational Directive on Procurement Instructions Section II apply to the procurement of goods, works and services for the project. The procurement of works, goods and services will follow NCT and IOCT as set out in paragraphs 10.4 and 10.1 of the bank's Procurement Policy, respectively. It is envisaged that there will be five tenders for works whose estimated value exceed USD75 million and USD50 million, respectively thus the IOCT procurement method will be followed; several contracts within the USD20 million threshold will instead follow NCT method. The thresholds are consistent with other IFIs. The Gol's e-tendering platform will be used. Recourse to Advance Procurement was also agreed with AIIB, as set out in the bank's PIR, Section II, para 8.2.

50. **Retroactive Financing.** There is a possibility that proposed contracts will be signed in advance of the loan signing date. Therefore, it is envisaged that some part of the financing will be provided for the financing of the already signed contracts under the Project. Depending on the size of financing requested from AIIB and availability of signed contracts, the retroactive financing amount will be decided during loan negotiations.

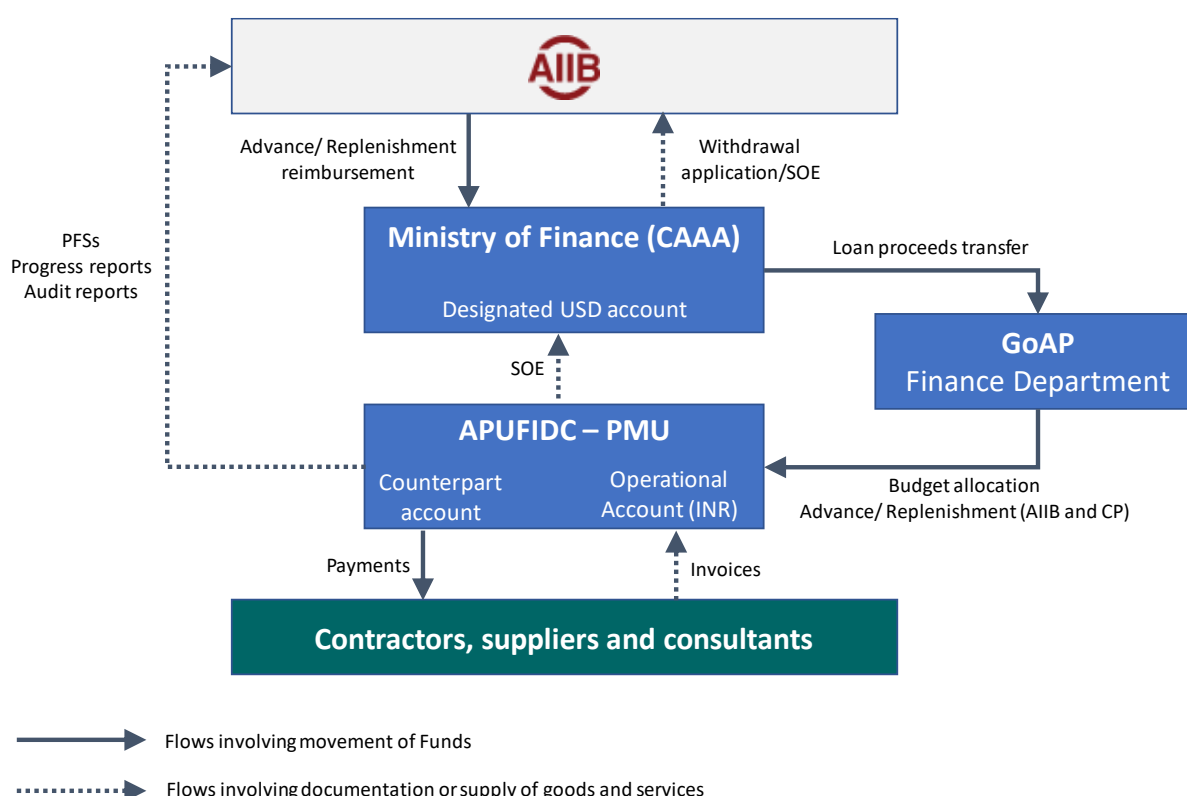
51. **Financial Management.** APUFIDC, as nodal agency, will monitor the overall funds flow arrangement. To assure that the bank loan is used for the purpose of the project, APUFIDC has developed a financial management system for the project which incorporates APUFIDC's financial management arrangements, which satisfies its business profile, into the Bank's financial management requirements. This project financial management system, which is reflected in the project financial management manual (FMM), includes staffing, budgeting, internal control, accounting, reporting and auditing.

- **Staffing.** APUFIDC has assigned existing financial staff to the project responsible for project financial management including project budget preparation and implementation, accounting and reporting, and disbursement. These financial staff were trained in the Bank financial management and disbursement procedures.
- **Budgeting.** The project budget will be based on project workplan and procurement plan and incorporated into APUFIDC's planning and budgeting system for preparation, approval, and monitoring. The annual budget of the project will be sent to AIIB for review and comments in September each year. The implementation of annual budget will be reviewed quarterly and revised budget, if any, will be sent to AIIB.
- **Internal Control.** The principles of the internal control of APUFIDC and PHMED respectively will be applied by the project including preparation, approval, and amendment of project workplan, budget, contract awards and payment, etc.

- **Accounting and Reporting.** GoAP's accounting principles, rules, and procedures will be applied to the project accounting and reporting. The receipts and payments of project funds including bank loan and counterpart funds will be recorded and reported. The quarterly interim financial statements of the project will be submitted to AIIB. The computerized accounting system will be customized to have the capacity to record the receipts and payments of project funds and generate project financial statements.
- **Auditing.** An internal audit will be conducted following the practice in other MDB's project and the internal audit report of the project will be submitted to AIIB for review and as an input to the monitoring report. The Statutory Auditor is appointed by the C&AG year by year for APUFIDC. After completion of the Statutory Audit (by chartered accountants) supplementary audit is conducted by the AG office. The auditor's report of the project will contain a single opinion on the project financial statements, the designated account, and the statement of expenditures, and a management letter on internal controls as well. The auditor's report will be submitted to AIIB within six months after the end of each fiscal year.

52. **Funds flow arrangements.** APUFIDC, based on its requirements, gets the appropriate budgetary allocation from GoAP to implement various infrastructure projects. Loan funds, which would be received by GoAP from GoI, would then be passed on to APUFIDC through budgetary allocations. After budget allocation the APUFIDC will advise the PMU to raise proposals for withdrawal of funds from GoAP Budget, i.e. obtaining of Budget Release Order and Administrative Sanction, and disbursement of funds to the concerned Drawal and Disbursing Officers, Executive Engineer and PHMED. AIIB will disburse loan proceeds to the GoI account in the Reserve Bank of India. GoI will make funds available to GoAP with its standard arrangements for development assistance to the states of India. GoAP will make the funds available to APUFIDC through budgetary allocations, for project expenditure comprising of the loan portion and GoAP (Figure 1).

**Figure 1: Funds flow arrangement**



53. **Disbursements.** The loan will adopt both the advance and reimbursement methods for payments. The advance payments, if requested, will be based either on the expenditure forecast by APUFIDC for the subsequent two quarters or it will be based on an appropriate ceiling to be decided by AIIB. The GoAP will provide the loan proceeds and the counterpart funds to the APUFIDC for project implementation, ensuring sufficient budget for payments to the contractors based on the submitted invoices. The APUFIDC will then submit the statement of expenses to GoI, who will in turn submit them to the bank. AIIB will disburse the loan proceeds to the borrower and the borrower will provide additional central assistance to the APUFIDC through GoAP. The GoAP will be responsible for meeting the financial responsibilities and obligations of the APUFIDC for the project. AIIB loan will be disbursed within 60 months, from March 2019 to February 2024. The expected disbursement of the bank loan is presented in Table 2.

**Table 2: Expected Disbursements in USD million**

Fiscal Year	2019	2020	2021	2022	2023	2024
Annual	60	100	80	60	60	40
Cumulative	60	160	240	300	360	400

## 4. Project Assessment

### A. Technical Assessment

54. **Project design.** The project will use surface water as a source which are either perennial rivers, dams/ reservoirs constructed across major rivers or canals fed by dams/ reservoirs with summer storage tanks for canal closure period. According to the national policy, drinking water has been given the highest priority for abstraction rights compared to other uses. DPRs have been prepared for each water supply scheme/ULB following the standard design procedure and approval/sanctioning procedures. Source sustainability has been assessed appropriate by the engineer-in-chief, PHMED, during the preparation of the DPRs for the individual ULBs/water supply schemes.

55. **Integrated solution.** For public health and environmental considerations, and in line with GoI policies, the Project has been structured so that the investments in water supply will be followed by investments in septage management, sanitation and drainage infrastructure to ensure “one” integrated solution. Accordingly, during the pre-appraisal stage, the project components and interfaces with other programs have been agreed between GoAP and the Bank depending upon technical requirements, market feasibility and interests, and as per the project delivery strategy. The design and construction of water supply, sanitation and drainage infrastructure are not technically complex, and it is well within the capabilities of the IA as it involves improved conventional technology. As per the implementation arrangement, PHMED will be responsible for the design and supervision of all the construction activities.

56. **Sanitation and drainage, including treatment of gray waste water.** The targeted substantial increase in water supply will correspondingly lead to a proportionate increase in gray waste water. At present, no sewerage network exists in the targeted ULBs and only about 30 percent to 40 percent of the ULB's areas are equipped with properly constructed roadside stormwater drains (mostly open) and the rest with earthen drains. The construction of a sewerage and a drainage network requires high capital investments and will be implemented under the CIIP. Given the priority of the GoAP for achieving universal access to safe drinking water, a medium-term interim solution has been identified to address the sanitation and drainage issues by testing local solutions in five pilot ULBs.

57. ULBs will be encouraged to engage with private contractors, which will undertake the septage collection and treatment, to participate across the sanitation value chain, assisted and regulated by the ULBs in terms of mandating regular emptying schedules, levy of liquid and solid waste collection and emptying charges, inspections and enforcement of public health rules.

58. **Operation and maintenance.** After the completion of the construction works and trial run, the assets will be handed over to the respective ULBs for O&M. The ULBs will sign separate contracts for O&M with the construction contractor and there will be two separate contracts, one for the bulk water system (source to reservoir) and one for the distribution system, including household connections and meters. These contracts will be monitored by the ULBs for compliance with performance-based criteria. ULBs will make payments to the O&M con-

tractors from their own funds and will pay for power charges directly to the electricity companies. Through Component 3 of the project, technical assistance will be provided to the ULBs to enhance their technical capacity, strengthen client service delivery orientation, business practices, billing and collection efficiency and IT based interfaces.

## **B. Economic and Financial Analysis**

59. **Project costs and benefits.** A cost-benefit analysis was carried out to assess the economic viability of the project comparing “with-” and “without-project” scenarios. The approach and detailed results are presented in Annex 4. The considered project costs include initial construction costs and annual O&M costs. The expected project benefits include: (a) cost savings from avoiding direct coping costs of inadequate water supply (purchase of water from water vendors at a price premium, investment, and O&M costs for private water rooftop storage); (b) time savings (through avoided time spent for water hauling from public taps or water purchase from water vendors); (c) health benefits and (d) increased availability of safe drinking water (incremental water). The above benefits (a)-(c) can be grouped as benefit due to the provision of safe and affordable non-incremental water.

60. **Economic Analysis.** The Economic Internal Rate of Return (EIRR) was estimated at 28.5 percent and Economic Net Present Value (ENPV) at USD1,693 million based on a 6-percent discount rate. Given the strong socioeconomic benefits of the project, the EIRR largely exceeds the social discount rate and the project demonstrates a strong economic viability. Sensitivity analysis of the EIRR and ENPV with respect to an increase in project costs by 20 percent, an increase in O&M costs by 20 percent and a 20-percent decrease in benefits as well as a combined worst-case scenario was carried out. The EIRR remains at or above 24 percent under all scenarios.

61. **Financial Analysis.** Conventional financial analysis (calculating the Financial Internal Rate of Return) was not performed during the project preparation, because the ULBs do not bear the capital investment costs for the planned water supply infrastructure. However, ULBs are responsible for the provision of the water supply services within their respective geographic areas, including for adequate O&M of the water supply systems. Achieving cost recovery of O&M expenditures through tariff revenue is essential to ensure the financial sustainability of the water supply services. A detailed cash-flow analysis comparing the revenue from the water tariff and connection fees with O&M expenditures was carried out for each ULB. The approach and analysis are presented in detail in Annex 4.

62. **O&M cost recovery:** Under the proposed flat tariff,<sup>20</sup> all 50 ULBs achieve cost-recovery throughout the period of analysis under two base case scenarios (flat tariff, volumetric tariff). Under the currently proposed flat tariff, average cost recovery is at 122.5 percent in the second year<sup>21</sup> of operation and gradually increases thereafter to reach 196.3 percent after 15

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<sup>20</sup> Based on the cost-recovery tariff methodology according to the Policy on fixation of user charges for water supply in the Urban Local Bodies and Guidelines on ease of getting water tap connections in ULBs, 17.05.2018.

<sup>21</sup> Cost recovery in the first year of operation is at an average of 920.2 percent due to the collection of connection fees after the completion of construction.

years. The minimum cost recovery through tariffs is at 103.1 percent.<sup>22</sup> An alternative base case scenario with a volumetric tariff was also considered under which cost recovery is slightly improved as compared to the flat tariff (average cost recovery: 132.9 percent in year 2, minimum cost recovery 104.29 percent). The collection of household connection fees for new connections allows the ULBs to create financial headroom during the first year of operation, during which revenue is estimated to exceed cost by a factor of 8.2. Such financial headroom may be used to finance small network extensions and absorb negative shocks. To ensure that revenue from the water tariff and connection fees are used for water-related expenses, ULBs are required to open and maintain a designated account for water supply services.

63. Sensitivity analysis was carried out with respect to (i) a decrease of the collection efficiency of water bills to 80 percent, (ii) an increase in O&M expenditures by 10 percent and (iii) a combined worst-case scenario. The sensitivity analysis reveals that recovery of O&M costs is sensitive to scenario ii) an increase in O&M expenditures and scenario iii) a combined decrease in collection efficiency and an increase in O&M expenditures. The initial financial headroom, stemming from the collection of connection fees, is sufficient to cover shortfalls in cost recovery throughout the period of analysis under all scenarios with the exception of the ULB Chittoor.<sup>23</sup> While the shortfall below cost recovery levels under the sensitivity scenario i) is only temporary, the cost recovery ratio under scenario ii) and iii) worsens over time. Under the latter two scenarios, in line with the recently approved cost-recovery tariff methodology, an upward revision of the tariffs based on the increased O&M costs would be advisable to ensure the long-term financial sustainability of the delivery of quality water supply services beyond the period of analysis.

### C. Fiduciary and Governance

64. **Procurement.** An assessment of the APUFIDC and PHMED experience and capacity of the dedicated staff as well as of the applicable procurement regulations/orders was conducted during appraisal. A Project Delivery Strategy (PDS) in accordance with the Procurement Instructions for Recipients (PIR) requirements, has been prepared by the PHMED in consultation with AIIB. The bank has agreed to it albeit adjustments continue to reflect the phased approach in implementation. APUFIDC has proposed a procurement approach that entails the use of IOCT and NCT based on cost estimate, risk and complexity considerations. APUFIDC will use WB's Standard Procurement Document modified to suit the bank's provisions and tendering requirement. The Gol's e-procurement platform will be used to manage the procurement process. It is envisaged that there will be two tenders (in Phase I) with individual contract values for works construction to cost USD75 million and USD50 million and the IOCT procurement will be followed and several contracts falling within the USD20 million threshold for the use of NCT, consistent with other IFIs. For the NCT a review of the procedures proposed to be used has confirmed that the bank's Core Procurement Principles and Standards are met, including the requirements for the use of NCT method. It has been deter-

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<sup>22</sup> Cost recovery in Chittoor ULB is estimated at 103.1 percent in the second year of operation, down from 743.8 percent in the first year when household service connection fees are collected, and continuously increases thereafter to reach 116.6 percent after 15 years.

<sup>23</sup> In the worst-case scenario, a combined decrease in collection efficiency and increase in O&M costs, revenue falls short of O&M costs by 6.98 percent over the period of analysis. In line with the cost-recovery tariff methodology, an upward revision of the tariff would be advisable should this worst-case scenario be realized.

mined that adequate notification is provided, competition to ensure reasonable prices is expected, all evaluation criteria to be applied are included in the tender document and the method for their application is clearly stipulated. The conditions of contract are deemed fair and appropriate, and foreign firms may participate on the same conditions applicable to the national firms. The use of NCT is found acceptable based on the above criteria.

65. The use of the Gol's e-tendering platform significantly enhances the efficiency, economy and transparency of the procurement process. The e-tendering platform is also allowed by other IFIs such as the WB and the ADB. It is deemed a proven, secure and robust system. AIIB was satisfied during appraisal of the platform's functionalities. AIIB found that, within the GoAP, APUFIDC and PHMED, the steps of the technical preparation phase and procurement process are well identified, and limits of responsibilities exist for the approvals, and it depends on the estimated value of the contracts.

66. A review of the procurement procedures proposed has confirmed that AIIB's Core Procurement Principles and Standards are met (Annex 6). Both methods will follow the single envelope without prequalification. The lowest evaluated, substantially responsive tender will be recommended for contract award, this is a well-established method and the e-procurement platform support it well and guarantees transparency throughout the entire process. Further, it has been agreed that the first IOCT tender will be subject to the Bank's prior review. Also, the procurement packages to procure the consultancy services to be financed out of the loan proceeds will be subject to AIIB's prior review. The APUFIDC will be refining the PDS, with the continued bank review. APUFIDC and PHMED intend to invite the tenders for the whole project in two phases. Phase I started in September 2018, following the Advance Contracting provisions under AIIB's PIR 8.2, and Phase II to be agreed based on the preparedness of the relevant technical documentation. A detailed procurement plan is included in the PDS included in Annex 6.

67. **Financial Management.** A financial management system of APUFIDC was assessed focusing on staffing, planning and budgeting, accounting policies and procedures, internal controls, financial reporting and monitoring and internal and external audits. A core PMU has been established within APUFIDC, responsible for project financial management. PMU will follow the financial management system of APUFIDC. In addition, AIIB's requirements on project financial management will be implemented through PMU. The specific arrangements for project financial management will be described in project financial management manual.

**Staffing.** APUFIDC has four financial staff including one financial manager, two financial analysts, and one accountant. They have worked in the Finance and Accounts Department of APUFIDC more than eight years. They have financial or commercial education background and one of them has the experience in WB-financed project. The financial management of the project will be currently carried out these existing financing staff. More qualified financial staff will be recruited subject to the real need of the project financial management.

**Planning and Budgeting.** The Budget Estimates in the state of Andhra Pradesh are prepared through online software APCFMS. The Budget Estimates in a year are initialized from the Drawing and Disbursing Officers (DDOs) level who is the first level



field entity. The Budget requirements of all DDOs is consolidated at Head of Department level and transmitted to Finance Department through respective Departmental Administrative Heads. The Finance Department consolidate all such requirements of the Departments holds, discussions at various levels with Principal Secretaries, Chief Secretary, Honorable Minister and Honorable Chief Minister. The final budget estimates are presented in the Honorable House of Legislative Assembly for approval. The annual planning and budgeting of the project will be included in the annual budget of APUFIDC with separate budget line.

**Accounting Policies and Procedures.** APUFIDC adopts the Double Entry Accrual Based Accounting System and prepares the Financial statements with Generally Accepted Accounting Principles. The transactions undergo four levels check before approval. Further for data entry into Accounting software undergoes three levels of check. All the accounting records, vouchers along with supporting documents are retained for a period of at least seven years. An off-the-shelf software is applied for financial accounting and reporting. These accounting policies and procedures will be used by the project and the accounting software will be customized to meet the requirements of the project.

**Internal Control.** APUFIDC is a fund channelizing agency and it is not a trading concern. It releases funds to ULBs based on the Government orders and sanctions, by duly following the prescribed procedure to release the funds. Only the managing director is the authorized signatories for bank accounts. The files are processed through e-office portal where each officer has been assigned a digital key in USB form. No online financial transactions are done at the entity level. More internal control policies and procedures for the project will be developed to meet the requirements of project financial management.

**Financial Reporting.** Monthly financial reports are produced by the computerized accounting and reporting system. These reports are produced in line with the Generally Accepted Accounting Principles. The system will be customized to meet the requirements of project financial management.

**Internal and External Audit.** APUFIDC has no internal audit unit. The Statutory Auditor is appointed by the C&AG every year. After completion of the Statutory Audit (by Chartered Accountants), a supplementary audit is conducted by the AG office. This practice will be followed by the project.

68. **Anticorruption.** AIIB is committed to preventing fraud and corruption in the projects it finances. The bank places the highest priority on ensuring that projects it finances are implemented in strict compliance with the bank's Policy on Prohibited Practices (2016). Implementation will be monitored regularly by AIIB staff. The bank reserves the right to investigate, directly or indirectly through its agents, any alleged corrupt, fraudulent, collusive, or coercive practices relating to the project and to take necessary measures to prevent and redress any issues in a timely manner, as appropriate. Detailed requirements will be specified in the Loan Agreement and the project tender documents. AIIB will monitor the work related to tender document preparation and tender/proposal evaluation under bank financing.

## **D. Environmental and Social**

69. The project has been screened and reviewed for concept with reference to the AIIB's Environmental and Social Policy (ESP). The project has been assigned Category "A" in accordance with the ESP and Environmental and Social Standards (ESS). The anticipated environmental and social risks and impacts of the project, implemented across 50 ULBs, are related to land acquisition, Indigenous Peoples (Scheduled Tribes), physical displacements and resettlement of both land owners and encroachers. Other temporary and reversible risks are envisaged during the construction of the water intake sources, water treatment plants, clear water transmission mains, treated water storages, and distribution networks. As required by AIIB's ESP for Category 'A' projects, an ESMF has been developed for the entire project comprising of 50 ULBs. The ESMF has a generic Environmental and Social Management Plan (ESMP). The ESMF provides guidance on preparation of Environmental and Social Impact Assessments (ESIA) for the ULBs and develop location specific ESMPs. All environmental and social risks and their mitigation measures has been identified and documented in the ESMF. To address issues of land acquisition, physical and economic displacements, either of temporary or permanent nature, a Resettlement Policy Framework (RPF) has been formulated. To address the potential impacts on Scheduled Tribe populations a Tribal Peoples Planning Framework (TPPF) has been developed.

70. ESS 1 (Environmental and Social Assessment and Management) is applicable to assess the environmental and social impacts of the project activities. ESS 2 (Involuntary Resettlement) will also be applicable, since it is anticipated that encroachment (in land earmarked for various project components) will have to be cleared. The possibility of land acquisition is not ruled out currently, moreover some temporary disruptions of livelihood activities may take place during the time of construction. ESS 3 (Indigenous Peoples) is applicable since Scheduled Tribe populations have been identified in some neighborhoods of the ULBs.

71. The project will have direct impact on the "standard of living" of the local population apart from building a solid foundation for the public health security in the project ULBs. The baseline survey indicated that only 34 percent households had Municipality water supply connections and 60 percent of these households had water supply every day. However, 94 percent of the connection holders paid their water bills to the Municipalities, at a flat rate between INR50 and INR100. The survey also indicated that households were willing to pay more, in case the services are improved. The survey also revealed substantial incidence of water borne diseases in the community, wherein nearly 50 percent of the families reported to have spent between INR2,500 to INR5,000 annually, on treatment of gastrointestinal diseases. Thus, the water supply program would provide public health security and improvements in quality of life.

72. The ESMP has suggested analysis of hydrology data, flood data, groundwater conditions, yield of the wells, precipitation data and climate data to ascertain the feasibility of the source. Additional source sustainability measures (reinforcing the source with water harvesting and conservation inputs) have also been included in the Contractor's EMP. Provisions has been put in place to analyze the water quality of the source and supply at the tail end (including various intermittent points) across different seasons. A baseline of the water quality will be generated and annual water quality data will be included in the biannual and annual monitoring reports.

73. The laying of the water pipelines is complex as it requires crossing roads, bridges, villages, semi urban areas, wet lands and farm lands. The RPF provides guidance to handle the infringements and construction related compliances. Most of the land through which the transmission alignment will be installed is either existing road alignment or farmlands; in this context the EIAs will specifically focus on critical habitats or natural habitats. In such cases, appropriate mitigation measures will be adopted to ensure that the environment is not adversely affected. Procedures have been put in place to ensure that the title of the land required for the project is appropriately transferred to the ULBs. Even if the location is within government establishments such as schools or hospitals, the title of the land should be transferred in the name of the ULBs for installation of the facilities. The EIA also has procedures to ensure that establishments/institutions of historical/cultural interests and archaeological sites are not affected/ impacted by the installation of the project facilities. The ESMF provides guidance to address situations where the project facilities are in the neighborhood of archaeological monuments or institutions of cultural or religious importance.

74. To address public health security of the community in a comprehensive manner, the Government of Andhra Pradesh will complement the Water Supply Project with a Septage and Sewerage Management Program, using its own funds. Under this project, WWTPs for gray-water treatment will be constructed in Phase 1 on a Pilot basis in 5 ULBs. Based on the outcome of the Pilot, the results will be scaled up to the 50 ULBs and critical improvements in drainage will be carried out under the CIIP. In parallel to this initiative, the Government has taken initiatives to set up Fecal Sludge Treatment Plants (FSTPs) in all 50 ULBs under the Clean India Mission (CIM) Program.

75. The ESMF/ESMPs contains detailed guidance on labor standards and safety, etc. Occupational health and safety issues to be addressed include adhering to national safety standards, ensuring use of personal protective equipment (PPE), holding safety toolbox talks, and conducting Hazard Identification Risk Assessment and Safety Reporting. All laborers will be provided safety orientation at the initiation of the construction work. The ESMF also have a very detailed description of requirements for migrant laborers camped in the vicinity of rural habitations, which specifies behavioral requirements for the laborers particular in relation to the surrounding community. Labor standards, health and safety, living conditions and adherence to the Code of Conduct will all be monitored by the PMU as part of monitoring of the Contractor's EMP.

76. Provisions have been made to hire NGOs to work on community level behavior change with respect to solid and liquid waste management. A plan will be developed to identify current behavior and belief pertaining to waste management and then introduce BCC (Behavior Change Communication) inputs to ensure that community actions supplement the project inputs directed towards public health security.

77. The draft ESMF has been discussed in a Public Consultations attended by local community members, representatives of the ULBs, NGOs and CSOs. The draft ESMF was disclosed on Sep. 4, 2018 and has been finalized after incorporating the feedback received from the participants on September 24, 2018, and disclosed on the website of APUFIDC and

PHMED on September 25, 2018. The Executive Summary of the ESMF has also been disclosed in English and Telegu. The ESMF has provisions for a Grievance Redress Mechanism which will include a Grievance Redress Committee (GRC) constituted at the ULB level. The GRC will comprise of local members of the PHMED, ULBs and influential people of the locality. Community members will be encouraged to access the GRC and submit their concerns regarding the project. The GRC will resolve the issues, if they have the necessary powers. If the GRC is not able to resolve the community's concerns, it will be escalated at a higher level in the PHMED, APUFIDC and MA&UD.

78. Given that women are the most significant beneficiaries of the project, a Gender Action Plan has been prepared to address the specific needs of the women, particularly the vulnerable and excluded women.

## **E. Risks and Mitigation Measures**

79. During the Concept Stage, AIIB has assigned an overall "High" risk rating to the Project based on the initial implementation plan proposing all 50 water supply schemes to be implemented in parallel. Most of these concerns have been mitigated. Following negotiations during the pre-appraisal stage, the Project implementation plan has been changed to a phased approach. Furthermore, GoAP has taken concrete steps to improve septage waste management as well as drainage and gray waste water in the ULBs. For that reason, the Bank has now assigned a "Medium" risk rating to the technical and implementation risk of project. There are, however, still two major social concerns (potential resettlement and potential effects on indigenous people). Hence, category A for environmental and social risks is maintained, which in turn and per definition, results in an overall "High" risk rating.

80. The possible risks and the mitigation measures are listed in Table 3. The implementation of the mitigation actions will be verified by the Bank during implementation through the reports from the PMC and during AIIB's supervision missions.

**Table 3: Summary of Risks and Mitigating Measures**

Description	Risk Assessment	Mitigation Measures taken
<p><b>1. Technical design: Water supply</b></p> <p>Key risks identified are:</p> <ul style="list-style-type: none"> <li>• Oversight of construction supervision in geographically scattered project locations may be challenging given hierarchical nature of IA</li> <li>• Large contract value and net worth requirement could reduce the level of competition and increase project costs</li> </ul>	Medium	<ul style="list-style-type: none"> <li>○ The Project will be implemented in a phased manner based on geographical considerations with 21 ULBs in Phase 1 (2 Circles) and 29 ULBs in Phase 2 (3 Circles).</li> <li>○ The works and goods have been packaged to strike a balance between ensuring effective implementation, adequate competition and attractiveness to large and competent contractors (i) five circle-wise packages for bulk water covering 12 to 9 ULBs, of which 2 circle-wise packages will be implemented in Phase 1 , and (ii) district-wise packages for water supply distribution systems = six contracts in Phase 1 and seven contracts in Phase 2. The number of packages has been reduced as compared to the previous arrangement to reduce supervision complexity and number of interfaces.</li> </ul>
<p><b>2. Technical design: Sanitation and Drainage</b></p> <p>Risk of delay or incomplete implementation of sanitation and drainage through other ongoing programs is outside the scope and control of this project, but is of paramount importance for public health.</p>	Medium	<ul style="list-style-type: none"> <li>○ During the pre-appraisal stage, GoAP has already taken specific actions on the septage management/STP component in all ULBs.</li> <li>○ To bridge any time gap and to test decentral solutions, AIIB has, after negotiations with GoAP, included pilot projects in five ULBs.</li> </ul>
<p><b>3. Environmental and Social</b></p> <p>Environmental risks (pollution) related to generation of gray/waste water.</p>	High	<ul style="list-style-type: none"> <li>○ The APUFIDC will address the issue of collection and treatment of gray/waste water through supplementary investments (Critical Infrastructure Investment Plan) in construction of STPs/ FSTPs and WWTPs.</li> <li>○ The environmental and the social expert of the APUFIDC and PMU will ensure that the contractors implement the ESMF and ESMP.</li> </ul>

<p>Social risks related to:</p> <ul style="list-style-type: none"> <li>• Land acquisition</li> <li>• Indigenous people</li> </ul>		<ul style="list-style-type: none"> <li>○ PMC will be responsible for monitoring of implementation of the ESMPs. A monitoring report will be submitted to the bank at the end of every quarter.</li> <li>○ AIIB's Environmental and Social Specialist will review progress of environmental and social mitigation measures during the implementation support missions.</li> </ul>
<p><b>4. Project implementation</b></p> <p>Quality of works and delays in construction.</p>	Medium	<ul style="list-style-type: none"> <li>○ The IA has been implementing projects of similar nature which demonstrates its technical and implementation capacity. The IA has shared a detailed project implementation staffing plan.</li> <li>○ The contractors who will be selected in line with AIIB's Procurement Policy will be reputable firms with sufficient experience of constructing large-sized similar projects.</li> <li>○ PMC will oversee the construction monitoring and quality control checks and prepare monitoring reports.</li> </ul>
<p><b>5. Procurement</b></p> <p>Transparency of procurement process.</p>	Low	<ul style="list-style-type: none"> <li>○ Procurement will be done using the Gol's electronic platform which has been widely used by various DFI's financed projects in India. The use of electronic platform greatly enhances the transparency.</li> <li>○ It is intended that AIIB would undertake procurement reviews during implementation as a part of the implementation support missions.</li> </ul>
<p><b>6. Procurement</b></p> <p>Delays in tendering, contract finalization and award of contract packages</p>	Medium	<ul style="list-style-type: none"> <li>○ A detailed procurement plan prepared by APUFIDC as part of the project delivery strategy is being reviewed and will be monitored by the Bank.</li> <li>○ The tendering process for a contract value of at least 30 percent of the project costs shall be ready for award at the time of negotiation as per Gol norms, a measure to ensure procurement progress prior to loan effectiveness.</li> </ul>

## Annex 1: Results Framework and Monitoring

### Andhra Pradesh Urban Water Supply and Septage Management Improvement Project

**Project Objective:** The project objective is to provide safe drinking water through piped water supply to 3.3 million people in Andhra Pradesh, and to improve service levels and strengthen sustainable service delivery

#### PROJECT DEVELOPMENT OBJECTIVE INDICATORS

Indicator Name	Core	Unit of Measure	Base-line 2018	Cumulative Target Values					Monitoring Frequency	Data Source/ Methodology	Responsibility for Data Collection	Description (indicator definition, etc.)
				2019	2020	2021	2022	2023				
<b>Specific objective 1:</b> Increased access to safe drinking water supply and improved service quality.									Quarterly	Progress Reports	PMU, ULBs	
<b>Indicators:</b>												
I1.1: Households with connection and meter.	X	1000 households	0	100	300	500	700	850				To be measured by the number of meters installed.
I1.2: Hours of water supplied per day.	X	Hours per day	4	8	12	16	20	24				WTP operation hours and spot checks/ interviews.
I1.3: Quantity of water supplied per day.	X	Liters per cap per day	50	60	80	100	120	135				The total production out of WTP divided by

												no of connections divided by 3.9 cap/HH.
I1.4: Quality of water supply according to CPHEEO standard.	X	% of ULBs	0%	0%	0%	25%	50%	100%				Water quality complies with CPHEEO standard; regular monitoring is carried out at the level of WTP, distribution network and household level.
<b>Specific objective 2:</b> Improved sanitation and drainage waste water treatment in the five pilot ULBs.									Quarterly	Progress Reports, Financial Statements	PMU, ULBs	
<b>Indicators:</b>												
I2.1: No of Pilot ULBs with drainage systems completed.	X	No	0	0	0	4	5	5				Progress reports and site visits. ULBs report via dashboard.
I2.2: Share of HHs in Pilot ULBs covered by rehabilitated drainage system and WWTP.	X	%	0	0%	0%	80%	100%	100%				Spot checks and interviews. ULBs report via dashboard.

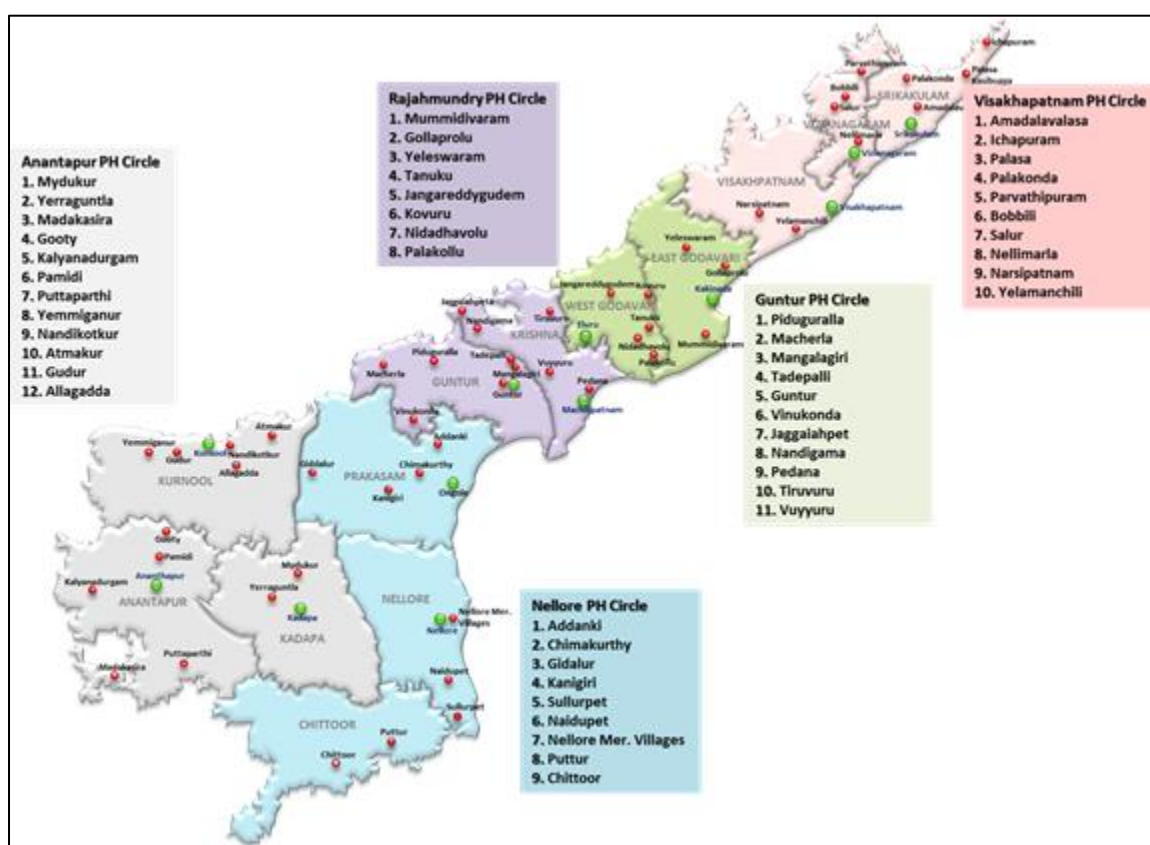


I2.3: Amount of treated waste water divided by water supply/use	X	%	0%	0%	0%	50%	70%	80%				WWTP operation report checked against records of water production and delivery (clarification: target: 80% of consumed water).
I2.4: Outflow concentration (TP) according to CPHEEO standard.	X	%	0%	0%	0%	80%	100%	100%				Supervision sampling after completion and during defect and liability period.
<b>Specific objective 3:</b> Strengthen the institutional capacity of the ULBs in municipal services delivery and management.									Quarterly	Progress Reports	PMU, ULBs	
<b>Indicators:</b>												
I3.1: Number of ULBs with computerized billing and cost accounting systems in operation.	X	No	0	0	10	50	50	50				Progress report and economic data from ULBs.

I3.2: Increase in revenues for the ULBs and cost recovery to sustain the O&M costs.	X	% out of 50 ULBs	0%	10%	20%	30%	50%	80%				Cost recovery = Revenues/ Supply costs.
I3.3: Implementation of a water supply and sanitation complaints system including feed-back	X	% out of 50 ULBs	0%	10%	20%	30%	50%	80%				Access to internet-based dashboards.

Note: All the Key Performance Indicators have been discussed and agreed with PMU.

**Annex 2: Map of Andhra Pradesh and the proposed 50 ULBs (Source: GoAP)**



## **Annex 3: Detailed Project Description**

### **A. Andhra Pradesh Water Sector**

81. The former state of Andhra Pradesh was bifurcated into Telangana and Andhra Pradesh states in June 2014. Andhra Pradesh, which is situated on the southeastern coast of India, is the eighth largest state in terms of area (162,970 square kilometers) and the tenth most populous, with a population of around 50 million. The state is divided into 13 districts having 110 ULBs. While 29 percent of the state's population is living in urban areas, only 48 percent of those are connected to the piped water supply whereas the sewerage systems is almost nonexistent except in seven ULBs having partial coverage (15 percent of the population).<sup>24</sup> Unsafe water supply systems and inadequate sanitation constitute major health risks and hazards to the population.

#### **Sectoral Context**

82. The country is experiencing a trend of rapid urbanization. Urban areas account for 63 percent of India's GDP and are projected to account for 75 percent of GDP by 2021. The urban population is estimated to grow from 31 percent of total population in 2011 to 43 percent by 2031.<sup>25</sup> Urban sector growth has preceded the development of essential infrastructures. Water supply, waste water collection and treatment, drainage, solid waste and other essential infrastructures are inadequate to respond to the population pressure and economic demands. Water supply is characterized by low coverage, intermittent supply, poor standards and quality. Inadequate infrastructure is contributing to widespread pollution, environmental and health problems and estimated to have a larger impact on the poor who represents nearly 25 percent of the urban population.<sup>26</sup>

83. In 2015, around 88 percent of the population in India had access to basic water supply services (93 percent in urban and 85 percent in rural areas), compared with 80 percent in 2000 (92 percent access in urban and 76 percent in rural areas).<sup>27</sup> In addition to improving access, water quality and continuity of services have been identified as key issues in the urban areas. For sanitation, the situation is more severe. Only 44 percent of India's population has access to basic sanitation (65 percent in urban areas and 34 percent in rural areas) and open defecation is still widespread.

84. Achieving universal coverage of water supply and sanitation in a sustainable manner in all urban areas, is a key priority of the GoI. Alongside access, improving the quality of services is also a challenge. The Ministry of Urban Development, GoI has adopted a set of national service level benchmarks for water supply, sewerage, solid waste management and storm-water drainage to shift the focus of investments towards service delivery. The financing requirements for improving existing urban areas as well as providing for orderly urban growth and expansions are enormous. The High-Powered Expert Committee established by the GoI, has

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<sup>24</sup> Andhra Pradesh Urban Finance and Infrastructure Development Corporation.

<sup>25</sup> Government of India, National Planning Commission, 2012. Report of the Steering Committee on Urbanization, Twelfth Five Year Plan (2012-2017). New Delhi.

<sup>26</sup> ADB Sector Assessment.

<sup>27</sup> WHO/UNICEF (2017): JMP Report Progress on drinking water, sanitation and hygiene: 2017 update and SDG baselines.

estimated investment needs in overall infrastructure development, for a period of 20 years, to around INR39 lakh crore (USD565 billion) which includes INR8 lakh crore (USD116 billion) for water supply, sanitation, solid waste and drainage.

85. In Andhra Pradesh, around 71 percent of urban households have access to improved water supply. Out of the remaining 29 percent, 19 percent of the households do not have access to treated water supply. Most of the households which use untreated water supply, resides in the districts of Vishakhapatnam, Prakasam and Nellore and the four districts of Rayalaseema region, where 48 percent households have a house service connection, but water supply is intermittent, and the supplied quantity is well below the service level benchmarks. Out of a total of 110 ULBs, water supply is received once per day in 64 ULBs, every second day in 35 ULBs, every three days in six ULBs and once in four days in two ULBs. Currently, 1,060 MLD of water is produced against a demand of 1,358 MLD resulting in a gap of 298 MLD. Apart from seven ULBs, where sewerage coverage is partial (15 percent of households are connected), no sewerage system exists in other ULBs. Most of the households have toilets with onsite sanitation systems (individual septic tanks or holding tanks).

86. The Government of Andhra Pradesh (GoAP) is aiming to achieve universal coverage in water supply, septage management and sewerage in line with the national priorities by rolling out infrastructure in a phased manner in urban areas. The GoAP aims to provide continuous water supply of 135 lpcd corresponding to the national service level benchmarks as compared to the current intermittent water supply of up to 87 lpcd. Currently, four initiatives are ongoing such as - under AMRUT, 55 water supply projects (USD388 million), 25 sewerage projects (USD120 million), seven stormwater drains (USD53.8 million) and nine parks at (USD14 million) are under implementation. A WB-funded project, covering water supply systems in six ULBs (USD161 million) is nearing its completion. Further, a sewerage system for Guntur at a cost of USD138.8 million, and a water and sewerage system for Nellore (USD174.8 million) are being financed under other programs.

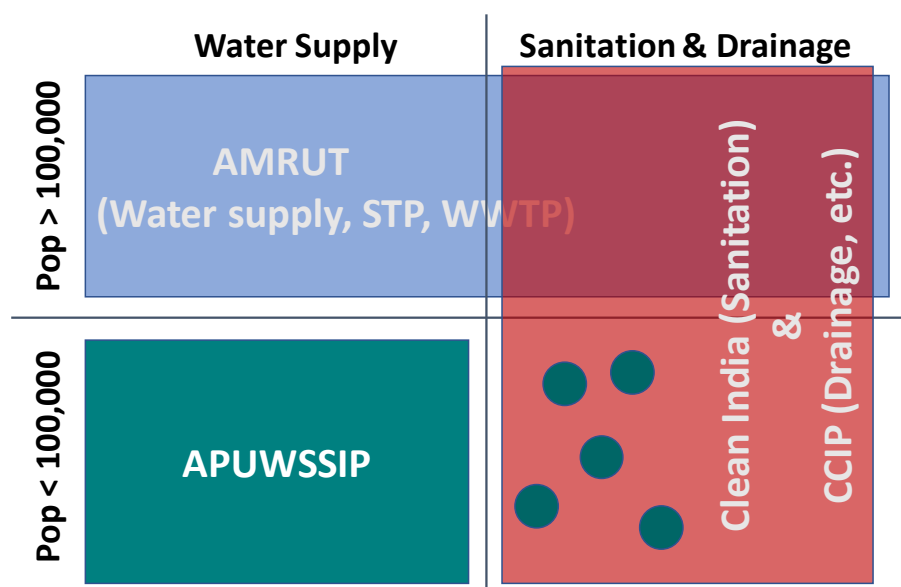
### **Current investment initiatives**

87. Investments in water supply and sanitation in urban areas have increased in the last decade under the Jawaharlal Nehru National Urban Renewal Mission (2005-2014). In the former state of Andhra Pradesh, 50 water supply schemes were implemented under this scheme at a cost of INR2,164 crores (USD335 million).

88. The AMRUT nationwide program was launched in 2015 to provide basic services in cities with a population of more than 100,000 inhabitants. The GoI program provides grant financing of INR50,000 crore (USD7.6 billion) for investments in water supply, sewerage facilities, septage management, stormwater drains, public transport and parks in 500 cities for the period between 2015 to 2020. Alongside the investment in hard infrastructure, the program includes capacity building and reforms in 11 areas, including urban planning, improvement in levy and collection of user charges, and energy and water audits. Around 89 cities in Andhra Pradesh, Gujarat and Rajasthan have been allocated funds under the first phase of the mission

which includes 32 cities in Andhra Pradesh alone.<sup>28</sup> To address the issue of sanitation, the GoI has launched several other initiatives such as the Total Sanitation Campaign and the Swachh Bharat Abhiyan Mission (Clean India Mission), which aims to clean up cities, urban and rural areas and to end open defecation by 2019. An overview is shown in Figure 2.

**Figure 2:** The links between the Project and current programs in Andhra Pradesh



89. The AMRUT program does not provide coverage for ULBs with a population of less than 100,000 inhabitants leaving a significant share of the population uncovered. The GoAP, therefore, has decided to launch the Andhra Pradesh Urban Water Supply & Septage Management Improvement project (APUWSSIP; the project) and supplement it with Clean Indian Mission and other proposed programs of the GoAP such as the Critical Infrastructure Investment Plan (CIIP) to fill the gap.

## B. Institutional Structure

90. In Andhra Pradesh, urban governance and urban infrastructure development are led by the Department of Municipal Administration and Urban Development (MA&UD). The key responsibilities of the MA&UD are town and country planning, development of urban schemes, implementing planning layouts for new urban infrastructure development etc.

91. The Directorate of Municipal Administration (DMA) is the apex authority of MA&UD which provides guidance to ULBs in performing their day to day activities and coordinates with other departments to enable seamless delivery of urban civic services to the population. Under the DMA, there are 110 ULBs which are divided into 14 municipal corporations, 71 municipalities and 25 *nagar panchayats* based on their population.

<sup>28</sup> The Economic Times (2015), Water and sewerage plans worth Rs 2,786 crore in 89 AMRUT cities approved: <https://economictimes.indiatimes.com/news/economy/infrastructure/water-and-sewerage-plans-worth-rs-2786-crore-in-89-amrut-cities-approved/articleshow/49495568.cms> Oct. 23, 2015.

92. APUFIDC is under the administrative control of the MA&UD. APUFIDC acts as the nodal agency for planning and implementation of urban infrastructure projects in the ULBs that are funded by the GoI, GoAP and externally aided agencies. It also provides technical assistance to the ULBs in implementation of such projects.

93. PHMED is under the administrative control of MA&UD and is responsible for construction and execution of all water supply and sewerage schemes in 110 ULBs. PHMED has the technical control over all the engineering works in these ULBs and is being led by the engineer-in-chief who is supported by around 1,100 engineers spread across the state.

94. After completion of the water supply and sewerage schemes by the PHMED, the projects/schemes are being handed over to the concerned ULBs. The capacity to operate and maintain the water supply and sewerage infrastructure differs considerably with larger ULBs having a higher capacity. PHMED engineers will be posted as ULB engineers whose responsibility includes O&M of Water Supply.

### **C. Project Objectives**

95. The project objective is to provide safe drinking water through piped water supply to 3.3 million people in Andhra Pradesh, and to improve service levels and strengthen sustainable service delivery.

96. **The specific objectives of the project are to:**

- (i) Design and implement/rehabilitate water supply systems in 21 ULBs (Phase 1) and 29 ULBs (Phase 2) including WTPs, storage tanks, distribution system, pumps, household connections and meters.
- (ii) Design and construct sanitation and drainage infrastructure for management and treatment of gray waste water in five pilot ULBs to support the GoAP CIIP.
- (iii) Strengthen the institutional capacity in the ULBs with respect to urban services delivery, O&M, cost recovery and management including financial, environmental and social aspects.

### **D. Project Description and Components**

97. During the preparation stage, GoAP and the AIIB team have agreed that the project shall be designed and implemented in a phased and integrated manner. Phase 1 will cover 21 ULBs (Anantapur and Nellore circles) and Phase 2 shall comprise the remaining 29 ULBs, totaling 50 ULBs after completion of Phase 1 and 2. While Phase 1 is implemented, the DBRs for the Phase 2 ULBs will be finalized and prepared for tender.

98. The selection of the ULBs for Phase 1 has been done by APUFIDC based on a set of selection criteria (see Section F). Under these criteria, priority has been given to those ULBs where: (a) existing DPRs address the deficits noted by AIIB; (b) land required for the various project components is in the possession of the ULBs; (c) all regulatory clearances including water abstraction rights, right of way etc. have been obtained; (d) an integrated approach to implement both the water supply and sanitation can be taken simultaneously; (e) commitment

of the respective ULBs to allocate sufficient resources for undertaking operations and maintenance and (f) related factors including local communities' demand for services and an agreed willingness to pay for the improved services, etc.

99. The project is composed of three components:

**Component 1: Investment in Water Supply Infrastructure** will include construction of intakes at raw water source, raw water transmission mains, water treatment plants, clear water transmission mains, treated water storages, distribution networks and household service connections. In some project ULBs, the partial existing infrastructure will be rehabilitated and augmented to be used with the newly created infrastructure. Installation of consumer meters at each household is included in the project scope allowing GoAP to implement the new water policy on moving from fixed household-based tariffs to volumetric tariffs. Installation of bulk flow meters, SCADA for automated flow and level control at service reservoirs, including online water quality monitoring, will ensure, equitable distribution of water, water and energy auditing and web-based service delivery monitoring (quantity and quality).

**Component 2: Sanitation and Drainage Infrastructure Pilots.** Recognizing the increase in gray waste water<sup>29</sup> generated due to the increase of water supply from the current 35 - 50 lpcd to a target level of 135 lpcd, it has been agreed to include targeted rehabilitation and construction of side drains in the five Pilot ULBs to safely carry gray waste water. In parallel, the component will include development of robust and effective local graywater treatment approaches that can be easily scaled up and implemented in the remaining ULBs under the CIIP-program, which is under preparation. Pilot projects shall be implemented in five ULBs: Allagadda, Nandikotkor, Kalyandurgam, Kanigiri and Sullurpeta. Septage management and treatment will be implemented under the Clean India Mission, where tenders already have been launched for 70 ULBs, including the 50 project ULBs.

**Component 3: Technical Assistance, Institutional Development and Municipal Capacity Enhancement and Implementation Support.** The component will provide technical assistance and implementation support to the APUFIDC, PHMED and ULBs to successfully implement the above three project components under both phases. The project will support establishment of a project management unit (PMU) at state level and a CMU in each of the 50 Project ULBS. The PMU and CMUs will be supported by a PMC to undertake the following: a) review the DPRs for the Phase 2 water supply infrastructure; b) assist in implementation of septage management, septage treatment plants, drainage infrastructure, standard operating procedures and O&M manuals; c) assist the implementation of the findings of the ESMF and d) undertake monitoring and supervision of the construction works.

Environmental and Social Specialists are included in the PMU (and PMC) with the specific purpose of supporting GoAP with: a) a project communication plan, b) awareness generation campaign, c) promotion of improved hygiene behavior by communities and

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<sup>29</sup> The additional quantity of graywater and waste water is estimated at about 80 percent of the additional water supplied.



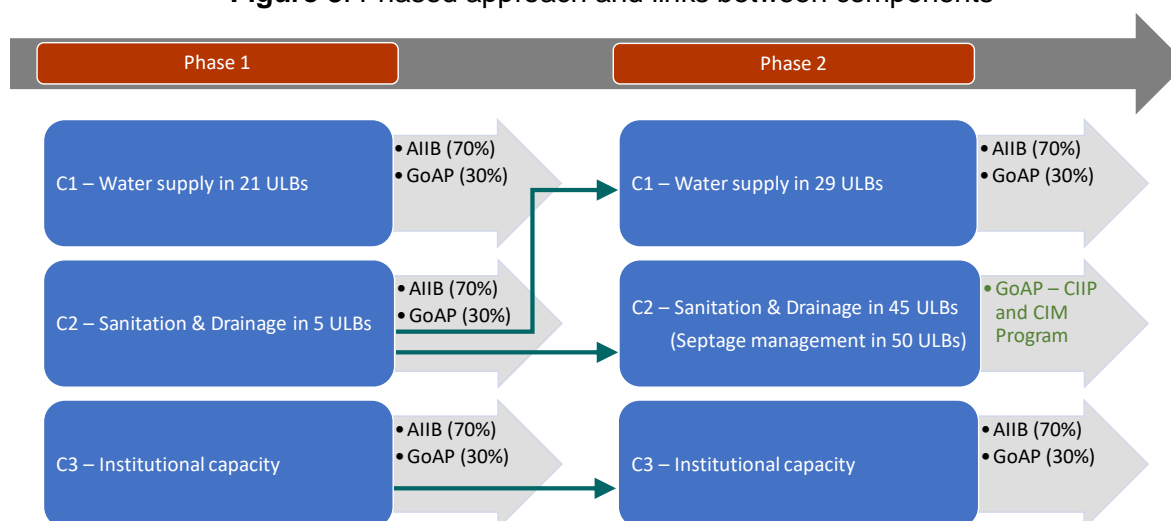
d) undertake citizens' satisfaction surveys to ensure efficient service delivery and delineate ULB report cards. This component will also address the inclusive approaches and ensure that gender aspects and social inclusion are covered in all stages of the project life cycle.

Finally, Component 3 will include capacity building for the PMU, PHMED and ULBs technical staff focusing on urban services delivery and management of performance-based O&M contracts with energy and water auditing, including financial and environmental aspects. Based on the identification of the need, the Component will include: a) development of IT based applications to integrate with the ongoing GoAP's web-based e-Governance interfaces (dashboards), b) support to targeted training in water and sanitation related issues, and c) an introductory assessment of future water demand and resources availability in Andhra Pradesh.

## E. Implementation arrangements

100. **Phased approach.** Component 2 addresses the integrated approach in the GoAP's current project proposal to AIIB, which aligns with National and State Water Policies. It has been agreed between APUFIDC and AIIB that parts of the Project will be executed through other programs of the GoAP (Figure 3).

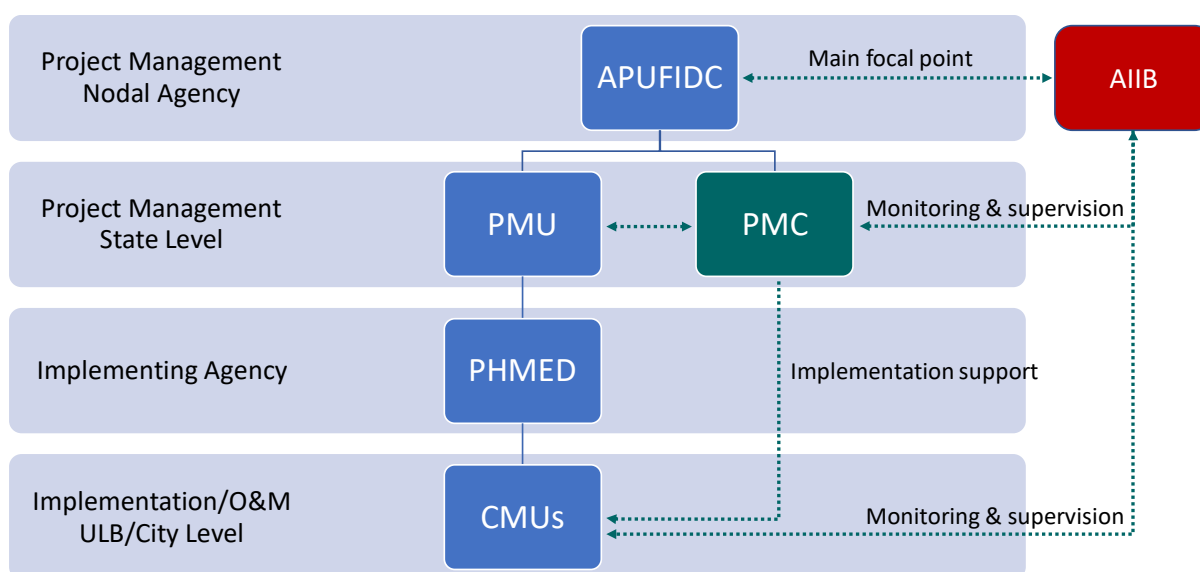
**Figure 3: Phased approach and links between components**



101. During Phase 1, water supply systems in 21 ULBs as well as 5 pilot projects for Sanitation and gray waste water treatment will be implemented. In parallel, the DPRs for the water supply systems of the remaining 29 ULBs will be finalized and reviewed with support of the PMC to be contracted under the project. The DPRs for the drainage rehabilitation and gray-water treatment plants will be developed by the existing PMC under AMRUT. Prior to the start of Phase 2, the contracts for the Sanitation and Drainage infrastructure for the Phase 1 ULBs will be awarded ("trigger" for the start for Phase 2 implementation). At the end of Phase 2, all physical works and services for the two infrastructure components in all 50 ULBs would have been completed.

102. **Project Implementation Organization and Monitoring.** The APUFIDC is the main focal point for AIIB for overall coordination and implementation monitoring. APUFIDC is being supported by the project director of the already established core PMU (Figure 4). PHMED is the implementing agency (led by the engineer-in-chief) and is the sub-focal point for AIIB. PHMED has shared a staffing plans with AIIB which envisages deploying one dedicated assistant engineer at each ULB. The assistant engineer will report to a deputy executive engineer responsible for three to four ULBs, who reports to the executive engineer responsible for a district, who reports to a superintendent engineer heading a circle, who finally reports to the engineer-in-chief.

**Figure 4: Project Implementation Organization**



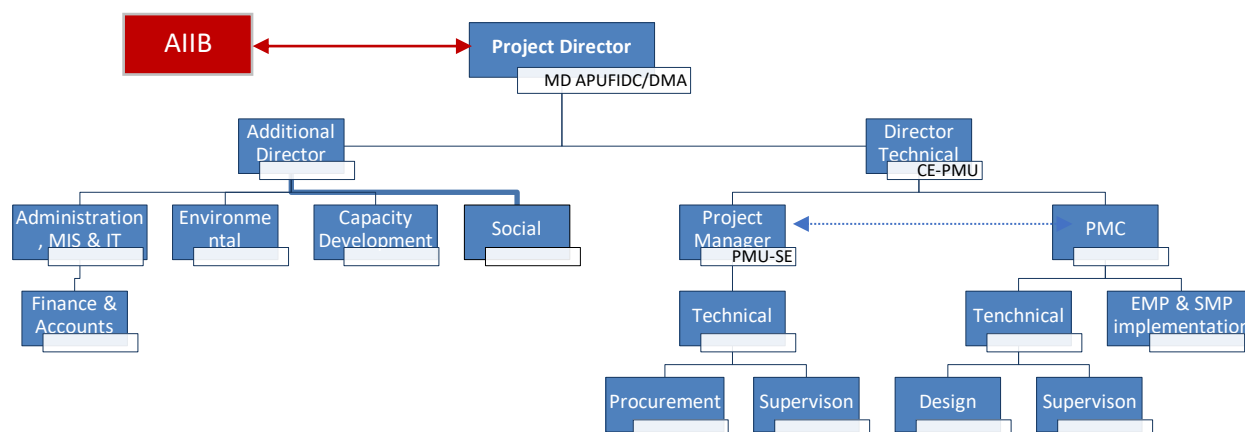
103. The Municipal Commissioner of the ULB is the sub-focal point for AIIB at the ULB level. The AIIB team will also undertake quarterly implementation support visits, including monitoring visits to selected CMUs, to further strengthen the monitoring process interface and safeguards implementation. Once the e-Governance part of the Institutional Component has been launched, project implementation progress can be monitored via the internet (dashboards) and the planned drone program.

104. **Project Management Unit (PMU).** A core PMU has been established, which shall be fully operational before the loan becomes effective. Managing Director APUFIDC/Director Municipal Administration, GoAP, is the de-facto Project Director. The PMU will comprise of one full-time Project Additional Director and personnel with specialization in requisite disciplines such as water and sanitation engineering, hydrology, water quality, financial management, information technology, monitoring and evaluation, environment and social development, procurement etc. Few personnel have been posted from PHMED, others recruited from the open market and few will be hired soon.

105. The PMU will be responsible for (a) execution of the Implementation Partnership Agreement with the APUFIDC, PHMED and respective ULBs before credit effectiveness; (b) preparation of phase wise projects and subprojects as per the project delivery strategy; (c)

selection of PMC, E&S consultant and any other consultants or individual experts; (d) undertaking and oversight of pre- and post-implementation project preparation activities including but not limited to tendering, contract management, construction monitoring and supervision and safeguards implementation; and (e) responsible for Financial and Accounting Management of the project, i.e preparation of budget, releases, bills preparation, pre-audit, establishment charges, accounts maintenance etc., as per the financial rules/procedures of GoAP through Nodal Agency. The organization chart of the PMU is shown in Figure 5.

**Figure 5 – PMU Organization Chart**



106. **Project Implementing Agency.** The PHMED is the Project Implementing Agency (PIA; IA) and will implement the project in coordination with the respective ULBs. PHMED will report to APUFIDC for seamless project implementation. The role of the PHMED will be to provide technical sanctions to DPRs and final design, procurement and tendering for works and goods, construction monitoring and supervision, ensuring quality controls, approval of payment certificates for works contracts, authorizations for payment supervision, MIS reporting through IT based interface and safeguards implementation.

107. **PMC.** The PMC will report to the PMU and be responsible for all aspects of the project management from planning, revision, quality check, preparation of the DPRs (where not prepared), preparation of tender documents, supporting the tender process, and until implementation which includes oversight of construction monitoring and quality control checks of the works undertaken by the PHMED, preparation of monitoring and action taken reports, and ensure full compliance of safeguards implementation. The Terms of Reference of the PDMC is being reviewed by the Bank and the procurement will be done as per AIIB's policy.

108. **City Management Unit.** At each ULB level, a CMU will be established which will be headed by the Municipal Commissioner and staffed with one Water Supply and Design Engineer, one PHMED engineer, one PMC consultant, technical staff of the ULB, and one community member. The CMU will be involved in addressing bottlenecks to ensure smooth implementation of works, build technical capacity within ULBs, ensure proper safeguards implementation and continuously engage with the communities to spread awareness of the long-term benefits of the project.

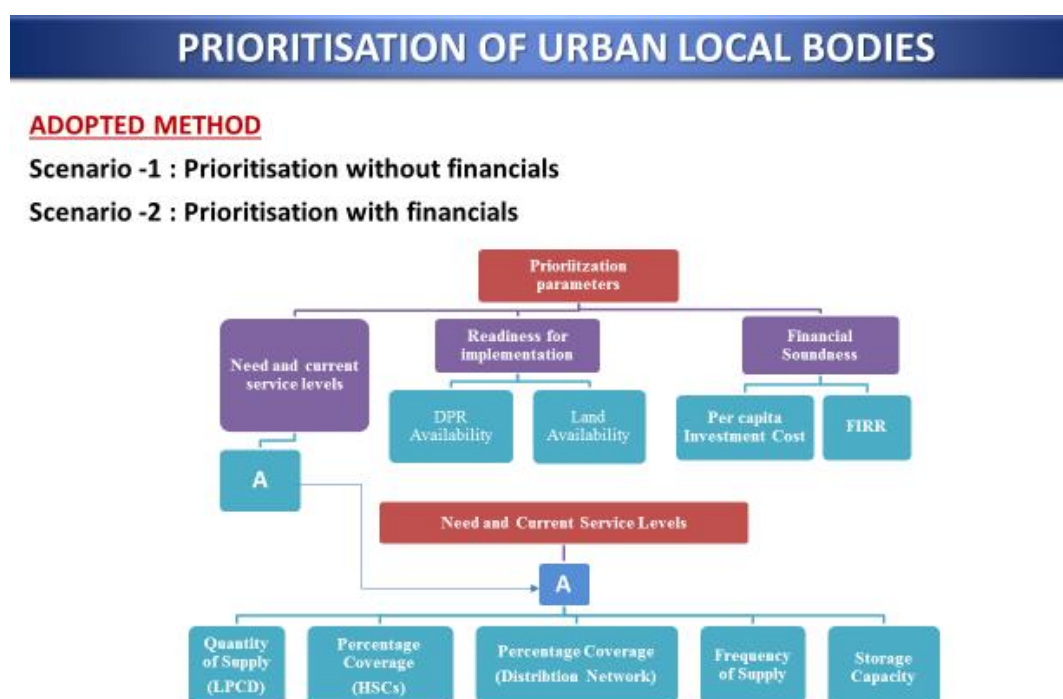
109. **Procurement.** The PMU had prepared a project delivery strategy that has been discussed with the Bank and has been updated and finalized to reflect the phasing approach. The Bank, drawing on its experience and the lessons learnt from other projects in India, has advised the PMU to organize the packages in circles for efficient procurement and effective monitoring. It has been decided to bundle the tendering for construction of bulk water works (supply system from sources to clear water reservoir) in five tenders (International Open Competitive Tendering, IOCT) based on slice and packages corresponding to the five administrative circles each headed by the Superintending Engineer of the PHMED. The distribution systems will be tendered in 13 packages (National Competitive Tendering, NCT) corresponding to one package per district. The project will use the GoI's e-tendering platform which will enhance the transparency in procurement.

110. **Financial Management.** The PHMED and the State Finance Department, GoAP, will have overall accountability for maintaining the financial management system of the project and will ensure that the activities are carried out in accordance with the project's legal agreements.

## F. Prioritization of ULBs

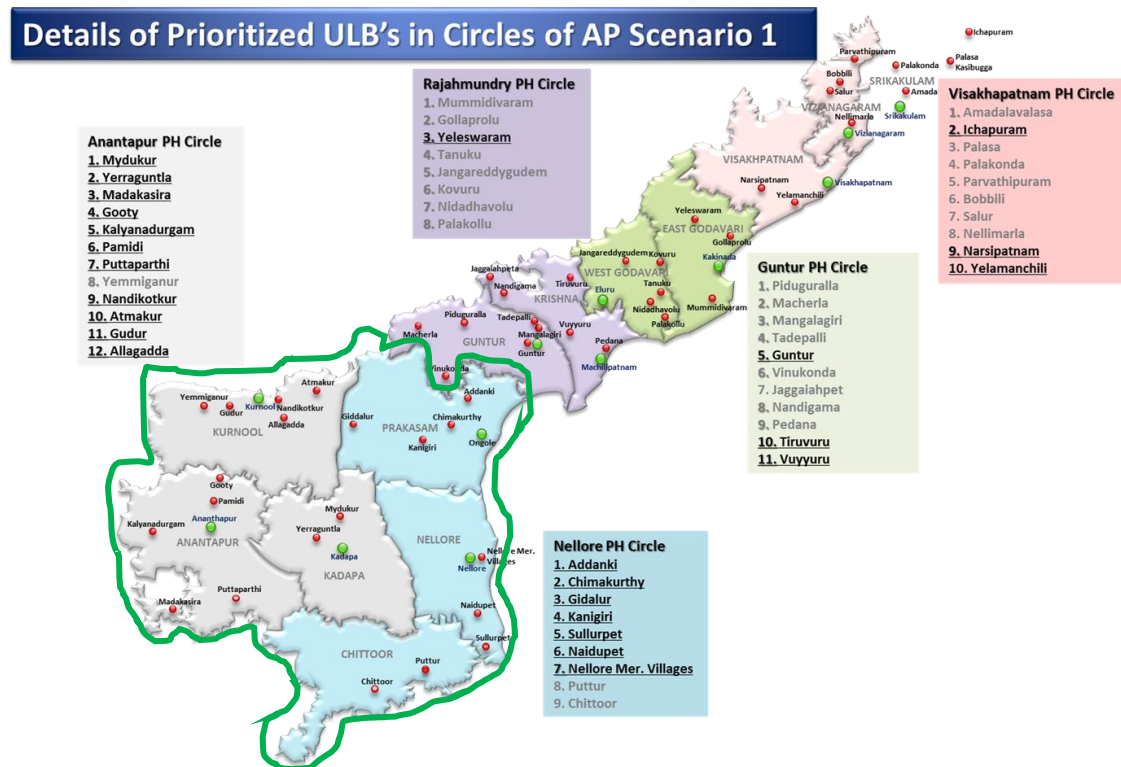
111. Given that the level of preparedness is uneven between the 50 ULBs it was decided to implement the Project in two Phases allowing GoAP to start work immediately on the ULBs where DPRs are close to ready for preparation of BOQs and bid-documents. The selection of ULBs for the first phase, however, did not only depend on DPR readiness. Following a request by the Bank team, APUFIDC prepared a methodology for the selection of the ULBs for the first phase, including the criteria of need, current service levels, readiness for implementation and financial soundness (see Figure 6).

**Figure 6 – Prioritization of ULBs**



112. Based on this approach, AIIB and the client agreed to include the 21 ULBs of the Circles Anantapur and Nellore in the first phase of the project. These two circles include the highest number of priority ULBs as compared to the other circles. For efficiency reasons, all ranking ULBs within these two circles would be included in Phase 1 (indicated by the green boundary in Figure 7). The remaining 29 ULBs will be included in the second implementation phase, designated Phase 2.

**Figure 7 – Phase 1 ULBs (Source: GoAP)**



113. DPRs for the first 21 ULBs has been finalized and has now been organized in the first two IOCT-packages (bulk water for each of the two circles) and six NCT-packages for the distribution systems on district level (three districts in each circle).

## G. Operation and Maintenance

114. Tendering for construction contracts along with O&M contracts for the bulk water systems (from source to reservoir) and for distribution system shall be the responsibility of PHMED on circle-level. After the completion of the construction works and trial run, the assets will be handed over to the respective ULBs for O&M. O&M shall be undertaken by construction contractors for a period of seven years including two years of defect liability period. The ULB will sign two performance-based O&M contracts separately for bulk water systems and distribution systems, respectively. Through Component 3 of the project scope, technical assistance will be provided to the ULBs to enhance their technical capacity, strengthen client service delivery orientation, business practices, billing and collection efficiency and IT-based interfaces.

## Annex 4: Economic and Financial Analysis

### Economic Analysis

#### Background

115. The Government of Andhra Pradesh (GoAP) aims to extend universal piped water supply to the urban population and to improve the service quality of the water services in the State's 110 ULBs. Under the AMRUT program, water supply and sanitation services are extended to 32 cities, with a population of more than 100,000 inhabitants. Through the Critical Infrastructure Investment Plan (CIIP) and this Project, the GoAP intends to improve the water supply and sanitation services in the remaining ULBs of the State.

116. This project will finance the construction of water supply systems in 50 ULBs (from source to household connection with water meter) providing piped water supply to a total population of 3.3 million people. Construction is planned to commence in 2019 and the implementation period is estimated at five years.

117. To maximize socioeconomic benefits, the Project is delivered as part of an integrated approach including water supply, septage management and stormwater drainage, which is rolled out in a phased manner under different programs (AMRUT, CIIP and this Project).

#### Approach and methodology

118. A cost-benefit analysis was carried out to assess the economic viability of the Project comparing "with-" and "without-project" scenarios. The Economic Internal Rate of Return (EIRR) and Economic Net Present Value (ENPV) of the Project was estimated based on a discounted cashflow analysis considering costs and benefits. Sensitivity Analysis was performed taking into consideration (i) increased investment costs, (ii) increased O&M costs and (iii) decreased benefits, and (iv) a worst-case scenario, which combines the three previous scenarios.

119. **Data.** Primary information on project cost, households' current water consumption, expenditures and coping cost related to inadequate water supply was collected during the preparation of the technical designs<sup>30</sup> through engineering consultants, the seconded PHMED staff in the ULBs as well as municipal employees in the ULBs. The primary data was complemented with demographic information, public health data, other household characteristics, and technical assumptions. Secondary sources include the baseline survey for the Environmental and Social Framework (ESMF), a representative socioeconomic household survey,<sup>31</sup> municipal public health

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<sup>30</sup> 50 Detailed Project Reports were prepared by engineering firms describing the current situation in the ULBs in terms of water supply and outlining the detailed design for the future water supply schemes. Information on current O&M cost was collected and future O&M costs were estimated.

<sup>31</sup> International Institute for Population Sciences (IIPS) and ICF. 2018 National Family Health Survey (NFHS-4), India, 2015-2016: Andhra Pradesh. Mumbai: IIPS.

statistics and expert opinions on technical assumptions. A data verification process was jointly conducted by the client and the AIIB team.

**Key assumptions:**

- Population growth: 1.2 percent p.a.
- Standard Conversion Factor was assumed to be 0.85.<sup>32</sup>
- Shadow Wage rate: 80 percent of unskilled wage for household members who engage in paid work outside the household and 64 percent of unskilled wage for household members who carry out domestic work.
- Project duration is assumed to be 25 years.
- Project implementation period is assumed to be five years.
- The benefits are assumed to accrue after completion of all construction works (year 6).
- The discount rate is 6 percent.

**Key technical assumptions are summarized below:**

- Lifetime of household storage and pumps: 15 years.
- Lifetime of civil works: 30 years.
- Lifetime of electro-mechanical equipment 20 years.
- Service level benchmark: 135 liters per capita per day.

120. **Project Benefits.** The expected project benefits include improved health outcomes (reduced water-related morbidity and mortality, reduced malnutrition in children), increased economic productivity, increased school attendance, improved scholastic achievement, reduced malnutrition, time savings from water hauling, cost savings from reduced coping costs (overhead storage tanks and pumps) and water purchase from water vendors.<sup>33</sup> As women and girls carry a disproportionate time share in water hauling and handling and are more exposed to water-related disease, a larger share of the health and time-related benefits are expected to be accrued by women and girls.<sup>34</sup> Similarly, children carry a disproportionate burden of water-related disease, which is one of the major preventable causes of death in children under five years of age in developing countries.<sup>35</sup> Only a part of the above-described benefits were quantified in this economic analysis, which can hence be interpreted as a conservative or lower bound estimate of the net economic benefit of this Project.

121. For the purpose of valuation, the benefits of the Project are distinguished benefits stemming from non-incremental water and incremental water. The valuation of project benefits is summarized in Table 5.

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<sup>32</sup> The same conversion factor as for other projects in Andhra Pradesh, notably the Andhra Pradesh Rural Roads Project was applied.

<sup>33</sup> Waddington et al. (2009) provide a comprehensive overview of rigorous impact evaluations in the water sector. Moore et al. (2001) and Niehaus et al. (2002) show negative long-term consequences of early childhood diarrhea on nutritional status and cognitive development.

<sup>34</sup> Waddington et al. (2009).

<sup>35</sup> World Health Organization (2018), Drinking-water: <http://www.who.int/news-room/fact-sheets/detail/drinking-water>



122. Benefits from non-incremental water supply include the avoidance of direct and indirect coping costs from inadequate water supply. Household expenditures such as purchasing water from water vendors at higher prices, installation and operation of private water wells, water tanks and pumps are considered direct coping costs. Indirect coping costs comprise the time value lost through water hauling or sickness (or caretaking of sick family members) related to water-related disease. The lost time is valued at the shadow wage for unskilled labor, which is assumed at 80 percent of an unskilled wage, for household members that engage in economic activity outside the household. For household members who undertake domestic work or home-based economic activity, the shadow wage is assumed at 80 percent of the shadow wage of an employed household member, i.e., at 64 percent of an unskilled wage.

123. **Benefits from incremental water supply.** Households, which receive a household service connection or increased service quality through the Project, are expected to consume more water than previously when water demand exceeded the supply of water. The additional or incremental water is valued at the revised water tariff, which reveals the observed willingness to pay of the household. Given that water tariff, even after the upward revision as per the most recent tariff policy of May 17, 2018, is low in international comparison, the analysis underestimates the true willingness to pay of households, and hence, the economic value of the incremental water supply.

**Table 5:** The valuation of economic benefits

<b>A. Value of non-incremental water</b>	Valued at average cost of consumption in without project scenario, including tariffs paid and coping costs (both direct and indirect)
<b>a. Direct coping costs</b>	
- Installation and operation of private water tanks and water pumps	Proportion of households using private water tanks and pumps and average investment and O&M costs
- Purchase of water from water vendors (tanker trucks and bottled water)	Cost difference of purchasing water through water vendor (additional cost)
<b>b. Indirect coping costs</b>	
- Time	Time savings for hauling water x shadow wage
- Health	Time saving for caregiving of mothers x shadow wage & adult sick days avoided x shadow wage
<b>B. Value of incremental water</b>	
- Increase in supply duration and available quantity	Valued at cost of water consumption of the piped water supply tariff scheme in with project scenario. Additional available quantity x willingness to pay or cost of production.



124. Estimated value and breakdown of benefits: Project benefits are estimated at USD251.1 per year and household totaling to USD224.0 million per year. The detailed composition of benefits is reported in the Table 6 below. The benefits from safe and affordable non-incremental water supply accounts for most of the benefits of the Project. Direct coping costs cumulatively account for 41.3 percent of the benefit, which can be broken down in avoided costs of purchasing and maintaining private rooftop water storage (3.9 percent) and reduced cost of water purchasing from tanker trucks and water vendors (37.4 percent). Indirect coping costs, avoided through access to piped safe water supply at the household level, accounts for 50.2 percent of the project benefits. The targeted households are expected to save almost one hour per day on average<sup>36</sup> in hauling and handling water (31.8 percent of estimated project benefit). In addition, households are expected to benefit from improved health, resulting in reduced time lost for productive and domestic use due to sickness, corresponding to 18.5 percent of the total project benefit.<sup>37</sup> In addition, the households benefit from increased availability of water quantity and continuity in water supply, which is valued at 8.5 percent of the total benefit. Water supply is estimated to increase from 49 liters per person per day to 135 liters per person and day, which corresponds to the Indian service level benchmark. The increased quantity is valued through the revealed willingness to pay of the household, i.e., the revised tariff. Given the relatively low level of water tariffs in India, the estimate can be interpreted as a lower bound of the economic benefit of the increased water quantity, which can be expected to have a higher economic value.

125. **Project Costs.** The total project cost is estimated at USD570 million. For this cost-benefit analysis, only capital investment cost for the water supply systems under Component 1 is considered<sup>38</sup> and is estimated at USD515 million (see Table 7). The costs of the pilot projects for improved graywater treatment and septage management<sup>39</sup>, the institutional component<sup>40</sup> and project management have been excluded. The lifecycle O&M cost for the planned water supply schemes has been included in the project costs.<sup>41</sup> To convert financial costs to economic costs, GST has been removed and a standard conversation factor has been applied to correct for other taxes and distortions in the economy.

<sup>36</sup> On average, a household will save 0.93 hours per day for water hauling and handling. In the median ULB, households save 0.75 hours per day. It was assumed that 20 percent of sick days are adult sick days leading to a direct loss in income and 80 percent of the sick days are spent by a non-salaried household member caretaking for sick family members (mostly children).

<sup>37</sup> Households currently report on average 14 water-related sick days per year for household members.

<sup>38</sup> Excluding the sanitation pilot, the institutional component, project management consultant and taxes.

<sup>39</sup> Under this Project, five pilots for graywater treatment and drainage and septage treatment will be implemented. Learning from the experience of the five pilots, the Government of Andhra Pradesh has committed to extend graywater treatment and drainage and the treatment of septage to all 50 ULBs, which are targeted under this project, through its own programs, particularly the Critical Infrastructure Investment Plan. The costs and benefits of this component have been excluded in this analysis.

<sup>40</sup> While the institutional component contributes to improving the effective delivery of water supply services, the benefits of this component go beyond the water sector (e.g. improved municipal administration, improved governance systems at State level) and its direct impacts are difficult to quantify. For these reasons, the costs and benefits of the institutional component are not considered.

<sup>41</sup> The investment costs and O&M costs are based on the detailed engineering designs as reported in the DPRs. Whereby the DPRs for 21 ULBs have been finalized, the DPRs for the remaining 29 ULBs are currently being revised. While project costs for investment and O&M for the latter 29 ULBs are not final, the draft DPRs constitute a good estimate of the actual project costs.

**Table 6:** Break-down of project benefits

<b>Economic benefit</b>	<b>Benefit per household and month</b>	<b>Benefit per household per year</b>	<b>Benefit per year</b>	<b>Benefit as share of total benefit</b>
	<b>(in USD)</b>	<b>(in USD)</b>	<b>(in USD million)</b>	<b>(in percent)</b>
<b>1. Value of non-incremental water</b>	<b>19.15</b>	<b>229.86</b>	<b>204.97</b>	<b>91.49%</b>
<b>1.1. Direct coping costs</b>				
Installation and O&M cost of private water tanks and water pumps	<b>0.81</b>	<b>9.71</b>	<b>8.66</b>	<b>3.87%</b>
Purchasing of water from water vendors	<b>7.83</b>	<b>93.94</b>	<b>83.77</b>	<b>37.39%</b>
<b>1.2. Indirect coping costs</b>				
Time value of water hauling	<b>6.65</b>	<b>79.78</b>	<b>71.14</b>	<b>31.75%</b>
Time value of sick-days and caregiving	<b>3.87</b>	<b>46.43</b>	<b>41.40</b>	<b>18.48%</b>
<b>2. Value of incremental water</b>				
Increased supply duration and quantity of water	<b>1.78</b>	<b>21.39</b>	<b>19.07</b>	<b>8.51%</b>
<b>Total economic benefit</b>	<b>20.94</b>	<b>251.25</b>	<b>224.04</b>	<b>100.00%</b>

**Table 7: Project costs**

	ULB	Investment Cost					Annual O&M Costs				
		Financial Cost			Economic Cost		Financial Cost			Economic Cost	
		Investment Cost INR Million	Investment Cost excl. GST INR Million	USD Million	INR Million	USD Million	Investment Cost INR Million	O&M Cost excl. GST INR Million	USD Million	INR Million	USD Million
Nellore Circle	Addanki	811.21	713.87	10.35	606.79	8.79	8.95	7.87	0.11	6.69	0.10
	Chimakurthy	532.37	468.49	6.79	398.21	5.77	6.10	5.37	0.08	4.56	0.07
	Giddalur	814.04	716.35	10.38	608.90	8.82	63.74	56.09	0.81	47.68	0.69
	Kanigiri	1,283.76	1,129.71	16.37	960.25	13.92	29.93	26.34	0.38	22.39	0.32
	Sullurpet	1,400.00	1,232.00	17.86	1,047.20	15.18	2.00	1.76	0.03	1.50	0.02
	Naidupet	1,273.97	1,121.10	16.25	952.93	13.81	12.00	10.56	0.15	8.98	0.13
	Nellore Merged Villages	1,117.20	983.14	14.25	835.67	12.11	171.00	150.48	2.18	127.91	1.85
	Puttur	1,387.20	1,220.74	17.69	1,037.63	15.04	11.30	9.94	0.14	8.45	0.12
Ananthapuramu Circle	Chittoor	339.42	298.69	4.33	253.88	3.68	141.40	124.43	1.80	105.77	1.53
	Mydukur	607.00	534.16	7.74	454.04	6.58	0.00	0.00	0.00	0.00	0.00
	Yerraguntla	994.15	874.85	12.68	743.62	10.78	0.00	0.00	0.00	0.00	0.00
	Madakasira	531.92	468.09	6.78	397.88	5.77	16.12	14.19	0.21	12.06	0.17
	Gooty	1,648.94	1,451.06	21.03	1,233.40	17.88	21.60	19.01	0.28	16.16	0.23
	Kalyanadurgam	1,186.67	1,044.27	15.13	887.63	12.86	43.80	38.54	0.56	32.76	0.47
	Pamidi	649.74	571.77	8.29	486.00	7.04	8.34	7.34	0.11	6.24	0.09
	Puttaparthi	940.60	827.73	12.00	703.57	10.20	22.08	19.43	0.28	16.52	0.24
	Yemmiganur	1,378.03	1,212.67	17.57	1,030.77	14.94	0.00	0.00	0.00	0.00	0.00
	Nandikotkur	1,000.32	880.28	12.76	748.24	10.84	15.00	13.20	0.19	11.22	0.16
	Atmakur	1,071.92	943.29	13.67	801.80	11.62	6.60	5.81	0.08	4.94	0.07
	Gudur	367.49	323.39	4.69	274.88	3.98	10.77	9.47	0.14	8.05	0.12
Visakhapatnam Circle	Allagadda	1,005.57	884.91	12.82	752.17	10.90	15.00	13.20	0.19	11.22	0.16
	Amadalavalasa	620.00	545.60	7.91	463.76	6.72	7.08	6.23	0.09	5.30	0.08
	Ichapuram	330.00	290.40	4.21	246.84	3.58	6.60	5.81	0.08	4.94	0.07
	Palasa	220.00	193.60	2.81	164.56	2.38	2.86	2.52	0.04	2.14	0.03
	Palakonda	390.00	343.20	4.97	291.72	4.23	6.42	5.65	0.08	4.80	0.07
	Parvathipuram	720.00	633.60	9.18	538.56	7.81	7.03	6.19	0.09	5.26	0.08
	Bobbili	490.73	431.84	6.26	367.06	5.32	14.40	12.67	0.18	10.77	0.16
	Salur	886.40	780.03	11.30	663.03	9.61	12.20	10.74	0.16	9.13	0.13
	Nellimarla	401.00	352.88	5.11	299.95	4.35	7.88	6.94	0.10	5.90	0.09
	Narsipatnam	488.34	429.73	6.23	365.27	5.29	25.22	22.19	0.32	18.86	0.27
	Yelamanchili	390.00	343.20	4.97	291.72	4.23	5.40	4.75	0.07	4.04	0.06
Rajahmundry Circle	Mummidivaram	395.32	347.89	5.04	295.70	4.29	6.60	5.81	0.08	4.94	0.07
	Gollaprolu	336.90	296.47	4.30	252.00	3.65	4.00	3.52	0.05	2.99	0.04
	Yeleswaram	564.30	496.58	7.20	422.10	6.12	5.90	5.19	0.08	4.41	0.06
	Tanuku	368.50	324.28	4.70	275.64	3.99	6.00	5.28	0.08	4.49	0.07
	Jangareddygudem	1,033.19	909.20	13.18	772.82	11.20	2.00	1.76	0.03	1.50	0.02
	Kovuru	2,257.39	1,986.50	28.79	1,688.52	24.47	23.60	20.77	0.30	17.65	0.26
	Nidadavolu	434.34	382.22	5.54	324.89	4.71	4.70	4.14	0.06	3.52	0.05
	Palakollu	440.00	387.20	5.61	329.12	4.77	9.00	7.92	0.11	6.73	0.10
Guntur Circle	Piduguralla	585.68	515.40	7.47	438.09	6.35	6.00	5.28	0.08	4.49	0.07
	Macherla	491.51	432.53	6.27	367.65	5.33	6.06	5.34	0.08	4.54	0.07
	Mangalagiri	401.39	353.22	5.12	300.24	4.35	2.40	2.11	0.03	1.80	0.03
	Tadepalli	529.70	466.13	6.76	396.21	5.74	1.00	0.88	0.01	0.75	0.01
	Guntur	400.21	352.19	5.10	299.36	4.34	3.90	3.43	0.05	2.92	0.04
	Vinukonda	1,005.30	884.66	12.82	751.96	10.90	3.24	2.85	0.04	2.42	0.04
	Jaggiahpet	1,012.03	890.58	12.91	757.00	10.97	4.70	4.14	0.06	3.52	0.05
	Nandigama	820.00	721.60	10.46	613.36	8.89	6.00	5.28	0.08	4.49	0.07
	Pedana	844.81	743.43	10.77	631.92	9.16	12.00	10.56	0.15	8.98	0.13
	Tiruvuru	426.47	375.29	5.44	319.00	4.62	3.00	2.64	0.04	2.24	0.03
	Vuyyuru	2,832.56	2,492.66	36.13	2,118.76	30.71	228.50	201.08	2.91	170.92	2.48
<b>Total</b>		<b>40,457.58</b>	<b>35,602.67</b>	<b>515.98</b>	<b>30,262.27</b>	<b>438.58</b>	<b>1,039.43</b>	<b>914.70</b>	<b>13.26</b>	<b>777.49</b>	<b>11.27</b>

## Results of Economic Analysis

126. The analysis underlines the high economic value of this Project. The EIRR is estimated at 28.5 percent clearly exceeding the social discount rate of six percent. The Economic Net Present Value is estimated at USD1,693 million, based on a six-percent discount rate. Given the strong socioeconomic benefits of providing access to safe water supply and improved service quality through household connections to a large and currently underserved population in Andhra Pradesh, the high economic evaluation is in line with theoretical expectations. The results are summarized in Table 8.

**Table 8:** Results of Cost Benefit Analysis

	NPV in million USD
<b>Project costs</b>	<b>414</b>
Construction	375
Operation and Maintenance	39
<b>Project benefits</b>	<b>2,107</b>
Non-incremental water supply	1,928
Incremental water supply	179
<b>Economic Valuation of the Project</b>	
Net present value	1,693
Internal Rate of Return (percent)	28.5%

127. Sensitivity Analysis was performed taking into consideration (i) a cost overrun in investment costs by 20 percent, (ii) a cost overrun in O&M costs by 20 percent, (iii) lower than expected benefits by 20 percent and (iv) a worst-case scenario, which combines all three previous scenarios. The cashflow of costs and benefits and the net-flow under the sensitivity analysis are presented in Table 9. The sensitivity analysis shows that the project remains economically viable under all sensitivity analysis scenarios. The economic viability of the project is most sensitive to a decrease in project benefits, followed by cost overrun in investment costs. Increased O&M costs only marginally affect the EIRR and ENPV of the project.

**Table 9: Cashflow and Sensitivity Analysis**

USD in million	Cost		Economic benefits			Base Case	Sensitivity Analysis			
Year	Construction	Operation & Maintenance	Non-incremental water supply	Incremental water supply	Total Benefits	Net Benefits	20% increase in investment cost	20% increase in O&M cost	20% decrease in benefits	Combined effect - worst case scenario
2018	22	0	0	0	0	-22	-26	-22	-22	0
2019	175	0	0	0	0	-175	-211	-175	-175	-211
2020	175	0	0	0	0	-175	-211	-175	-175	-211
2021	44	0	0	0	0	-44	-53	-44	-44	-53
2022	22	0	0	0	0	-22	-26	-22	-22	-26
2023	0	5	205	19	224	219	219	219	175	174
2024	0	5	207	19	227	222	222	221	177	176
2025	0	5	210	20	229	225	225	224	179	178
2026	0	5	212	20	232	228	228	227	181	180
2027	0	5	215	20	235	230	230	230	183	183
2028	0	5	218	20	238	233	233	232	186	185
2029	0	5	220	20	241	236	236	235	188	187
2030	0	5	223	21	244	239	239	238	190	189
2031	0	5	225	21	246	242	242	241	193	192
2032	0	5	228	21	249	245	245	244	195	194
2033	0	5	231	21	252	248	248	247	197	196
2034	0	5	234	22	255	251	251	250	200	199
2035	0	5	237	22	259	254	254	253	202	201
2036	0	5	239	22	262	257	257	256	205	204
2037	0	5	242	23	265	260	260	259	207	206
2038	0	5	245	23	268	263	263	262	210	209
2039	0	5	248	23	271	267	267	266	212	211
2040	0	5	251	23	274	270	270	269	215	214
2041	0	5	254	24	278	273	273	272	218	217
2042	0	5	257	24	281	276	276	276	220	219
Total	439	91	4,602	428	5,030	4,500	4,413	4,482	3,494	3,415
NPV	375	39	1,928	179	2,107	1,693	1,618	1,685	1,271	1,213
IRR						28.5%	25.2%	28.4%	24.5%	22.6%

## Financial Analysis

128. The objective of this financial analysis is to assess the financial viability of the Project financed by this loan. Total project cost is estimated at USD570 million, which is financed by a loan amount of USD400 million provided by AIIB and a counterpart contribution of USD170 million provided by the GoAP. The loan amount as well as the financing from the GoAP will be transferred to the ULBs as a grant. The ULBs will not face any financing costs for the planned infrastructure investment but are responsible for the O&M of the water supply systems. For this reason, a conventional financial analysis, including the estimation of a Financial Internal Rate of Return and Financial Net Present Value, was not conducted. Instead, the analysis focuses on the financial sustainability of the planned water supply infrastructure and assesses whether the tariff revenue from the provision of the water supply services is sufficient to cover the O&M costs to sustain the provision of water supply services at adequate levels.

129. A financial analysis comparing tariff revenue to the required costs for adequate O&M was conducted by APUFIDC and reviewed by AIIB. Further, affordability analysis was carried out to ensure that households are able and willing to pay the revised tariff levels after the implementation of the project. A sensitivity analysis was carried out with respect to i) decreased collection efficiency of water bills, ii) increased O&M costs, and iii) a worst-case scenario combining the previous two cases.

## Data and approach

130. The data for the financial and economic analyses were collected jointly. Primary information on project cost, households' current water consumption, expenditures and coping cost related to inadequate water supply was collected during the preparation of the technical designs<sup>42</sup> through engineering consultants, the seconded PHMED staff in the ULBs as well as municipal employees in the ULBs. The primary data was complemented with demographic information, other household characteristics, and technical assumptions. Secondary sources include the baseline survey for the Environmental and Social Framework (ESMF) and expert opinions on technical assumptions. A data verification process was jointly conducted by the client and the Bank's team.

131. APUFIDC conducted a cash flow analysis comparing the tariff revenue with the estimated costs<sup>43</sup> required for adequate O&M for each ULB for a period of 15 years after completion of the construction works. A construction period of three years was assumed, which reflects the estimate of implementation period by the PHMED. For the revenue stream, the revised tariff methodology, including an initial connection fee and a monthly flat tariff as defined per water tariff policy, dated May 17, 2018, was considered. In line with the intention of the GoAP to move to a volumetric tariff,

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<sup>42</sup> 50 Detailed Project Reports were prepared by engineering firms describing the current situation in the ULBs in terms of water supply and outlining the detailed design for the future water supply schemes. Information on current O&M cost was collected and future O&M costs were estimated.

<sup>43</sup> The estimated O&M costs from the Detailed Project Reports prepared by the engineering consultants in the frame of the technical preparation of the project were used.

after improved service levels will have stabilized, a volumetric tariff was considered as part of the sensitivity analysis.

**Key assumptions:**

- The following key assumptions were used in the analysis.
- Population growth: 1.2 percent.
- Collection efficiency: 90 percent.
- Household service connection rate: 95 percent.
- Household size: 4 to 5.
- Sensitivity scenario i) Collection rate decreased to 80 percent.
  - ii) O&M cost increases by 10 percent.
  - iii) Collection rate decreased to 80 percent and O&M cost increases by 10 percent.

**Reforms under AMRUT and approved revised tariff methodology**

132. As part of the AMRUT program, which is financed by the GoI, all participating States and 500 Mission Cities are obliged to implement a set of 11 reforms before the end of the financial year 2018-2019. The reforms include the “improvement in levy and collection of user charges.”<sup>44</sup> Further reforms under AMRUT aim at improving service delivery, mobilization of resources and increasing transparency and accountability in the municipal administrations.

133. In line with the required reforms under AMRUT and to ensure the financial sustainability of the water supply systems under this Project, the GoAP has revised its tariff policy for water user charges as per Government Order NO. 159, dated May 17, 2018. The tariff policy outlines a methodology to set a full cost recovery tariff in terms of O&M costs based on a differential tariff for residential buildings, non-residential buildings (commercial businesses such as small shops and restaurants) and bulk supply to industry. As per current policy, the residential water users are charged according to a flat rate per month and the latter two categories according to metered consumption of water. New residential water connections will be provided with a water meter to prepare the envisaged transition to a volumetric tariff.

134. For the residential category, the current residential flat rate tariff ranges from INR30 per household per month to INR150 in the ULBs under the project, whereby the median tariff in the 50 ULBs is fixed at INR60 per household and months—roughly corresponding to USD1 per household and month. The revised tariff according to the approved tariff methodology will lead to an increase of the residential water tariff from a median INR60 per household a month to a median tariff of INR180 per household a month—corresponding to USD2.6 per household a month. Vulnerable sections of the population, as defined per level of property tax paid, pay 50 percent of the regular tariff and a reduced connection fee of INR2001. The current and future tariff level is illus-

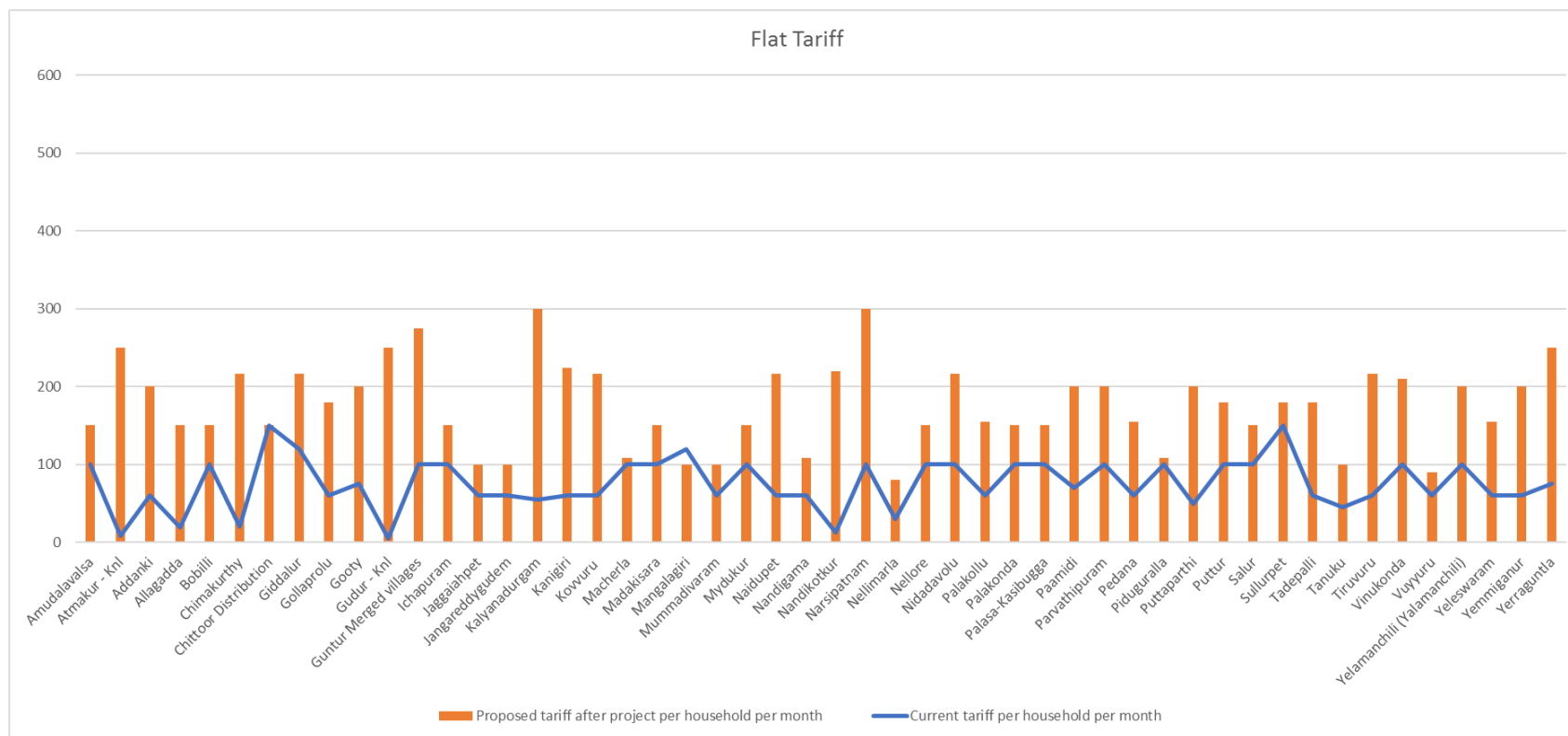
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<sup>44</sup> Item 8(b) of the required reforms under AMRUT.

trated in Figure 7. To ensure the sustainability of the water supply systems over the asset-lifecycle, the tariff methodology foresees a periodical annual revision of the water tariff by 5 percent per year.



**Figure 7:** Current tariff and proposed revised tariff according to approved tariff methodology



## Affordability of proposed water tariffs and savings

135. The affordability of the proposed water tariffs was assessed by calculating what proportion of household income will be spent on water after the tariff revision for a median household income and a poor household. The proposed average tariff paid will be INR228.

136. The analysis reveals that the proposed tariff accounts for less than 0.91 percent of median household income and 1 percent of the income of a poor household, taking into account the reduced water tariff paid by poor households. The results of the analysis are summarized in the Table 10. The analysis also demonstrates that a typical household will save about 50 percent as compared to its current expenditure for water when considering water purchases of water cans.

**Table 10: Affordability Analysis**

	Cost	Average tariff	Savings
Compare current household expenditure on water with future tariff - cost savings? How much on average	<p>Current household expenditure on water expenses in purchasing of drinking water from water vendors in terms of water cans is on the average INR20-30 per 20 liters of water.</p> <p>Monthly 15 to 20 cans are used by the household, so the amount spent for canned water is INR500-600 (20 cans * cost of can at INR30)</p>	The average monthly tariff charged by the ULB is INR228—which is less than 50% of the amount they are spending at present for water	Saving for house hold per month is INR250-350
Proposed tariff as % of median household income			Note
Median household income	Varies from INR25,000 to INR30,000 per month		
Average monthly tariff/median income	228/25000*100=0.91%		Less than 1%

Proposed tariff as % of BPL household income			Note
Household income for BPL household	Varies from INR10,000 to INR12,000 per month		
Average monthly tariff/monthly income	120/12000*100= 1%		Almost 1 %

Note: as per the current tariff policy BPL households are charged 50 percent of regular tariff

137. In conclusion, the proposed water tariff is assessed affordable. Households will reduce their costs for water supply by relying on the new water supply schemes and the water tariff only accounts for one percent or less of household expenditure, which is considered affordable as compared to international benchmarks<sup>45</sup>.

<sup>45</sup> The following expenditure shares for water supply are considered affordable by the respective institutions: California Department of Public Health: 1.5 percent, US Environmental Protection Agency (USEPA): 2-2.5 percent, and United Nations Development Program (UNDP): 3 percent.

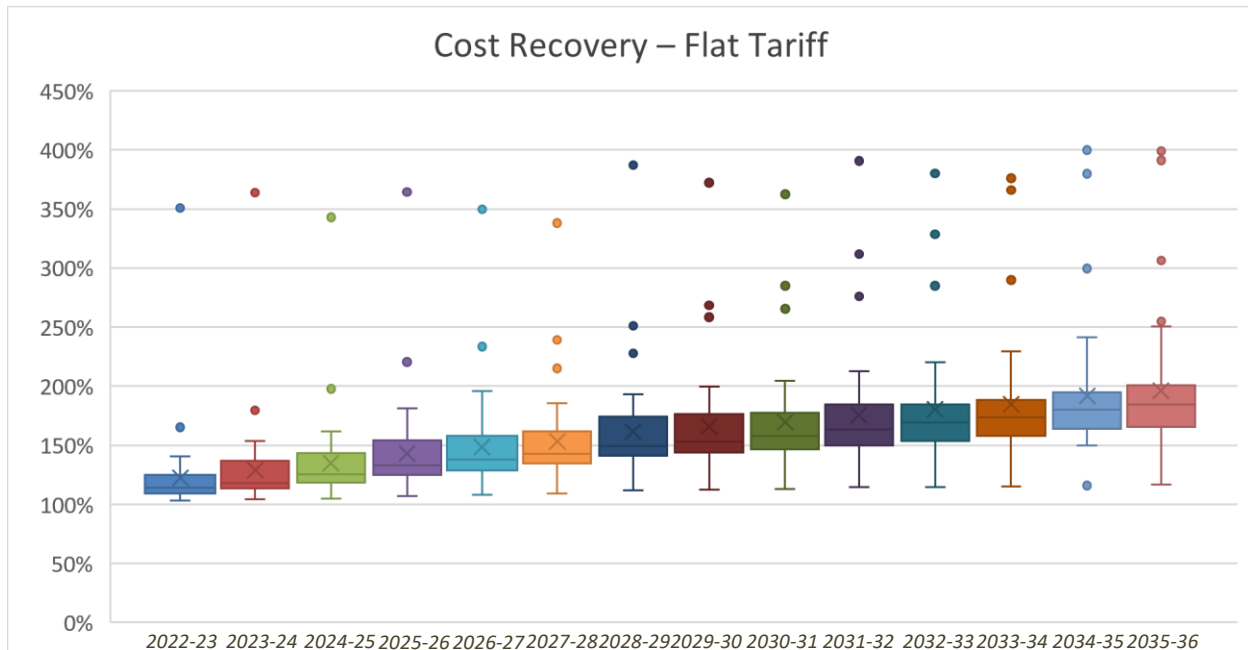
## Results of financial analysis

138. The financial analysis was conducted for each ULB by comparing the cashflow of tariff revenue and O&M expenditures for a period of 15 years after the completion of the project. Under the base case scenario, the proposed flat tariff after project as per current policy (95 percent connection rate, 90 percent collection rate) was considered. The alternative base case scenario applies a volumetric tariff instead of the flat tariff. With the provision of water meters for new household connections under the Project and given the intention of the GoAP to transition to a volumetric tariff, after the stabilization of the improved service level, this scenario seems a likely scenario for the future.

139. Currently, the financial performance of the ULBs with respect to water supply services is poor. Population-weighted average cost recovery is at 56 percent. Only four out of 50 ULBs can currently cover the operating expenses for water supply from tariff revenue. In the remaining 46 ULBs, water supply related expenditures are cross-subsidized through municipal funds. Through the Project, new water supply systems will be constructed, the effective service delivery and business practices will be strengthened through capacity building and the proportion of households with a household service connection is expected to increase from currently 41 percent to 95 percent after the Project.

140. Under the base case scenario with a flat tariff as per approved tariff policy of May 17, 2018, all ULBs under the project achieve a cost recovery above 100 percent throughout the period of analysis. Due to the periodical revision of the water tariff, the cost recovery rate is expected to improve continuously. During the first year after the completion of construction, the connection fees allows the ULB to collect water charges largely exceeding cost recovery levels. During this year, revenues exceed costs by a factor of 8.2 on average allowing the ULBs to build a capital buffer for unforeseen maintenance expenditures or network expansion. During the second year, the cost recovery drops from an average rate of 920 percent to 123 percent to continuously increase thereafter year by year. Minimum cost recovery is recorded at 103 percent in the second year. Figure 8 reports the detailed results of the base case scenario.

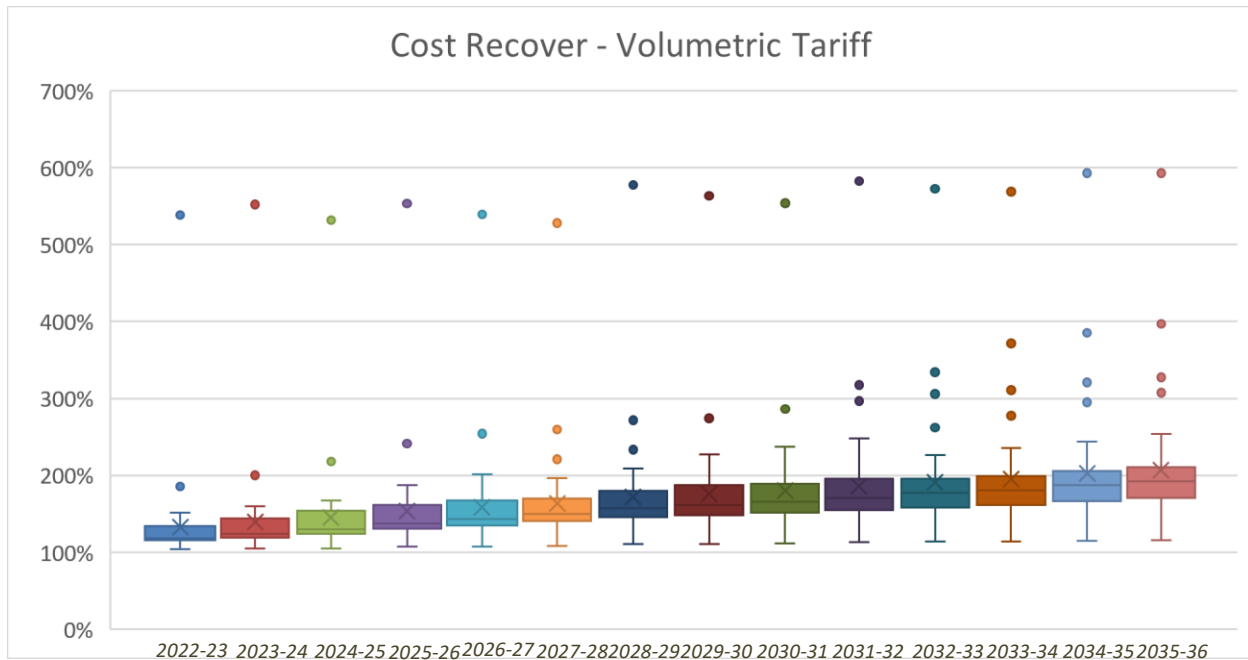
**Figure 8: Cost Recovery under Flat Rate Tariff**



**Boxplot of cost recovery under Flat Rate Tariff for 50 ULBs.** The first year after the completion of construction has been omitted from the graph. The collection of the connection fee in the first year leads to a stark increase in the cost recovery rate (average of 920 percent).

141. **Volumetric tariff.** If the proposed volumetric tariff scheme is adopted, the cost recovery of water supply services slightly improves as compared to the flat tariff. Due to the connection charges collected in the first year, the cost recovery is initially expected at 931 percent, largely exceeding O&M expenditures. In the second year, the average cost recovery rate drops to 133 percent to continuously increase thereafter throughout the period of analysis due to the periodical revision of the water tariff. Minimum cost recovery is at 104 percent in the second year. Figure 9 reports the detailed results of the base case scenario with a volumetric tariff.

**Figure 9: Cost Recovery under Volumetric Tariff**

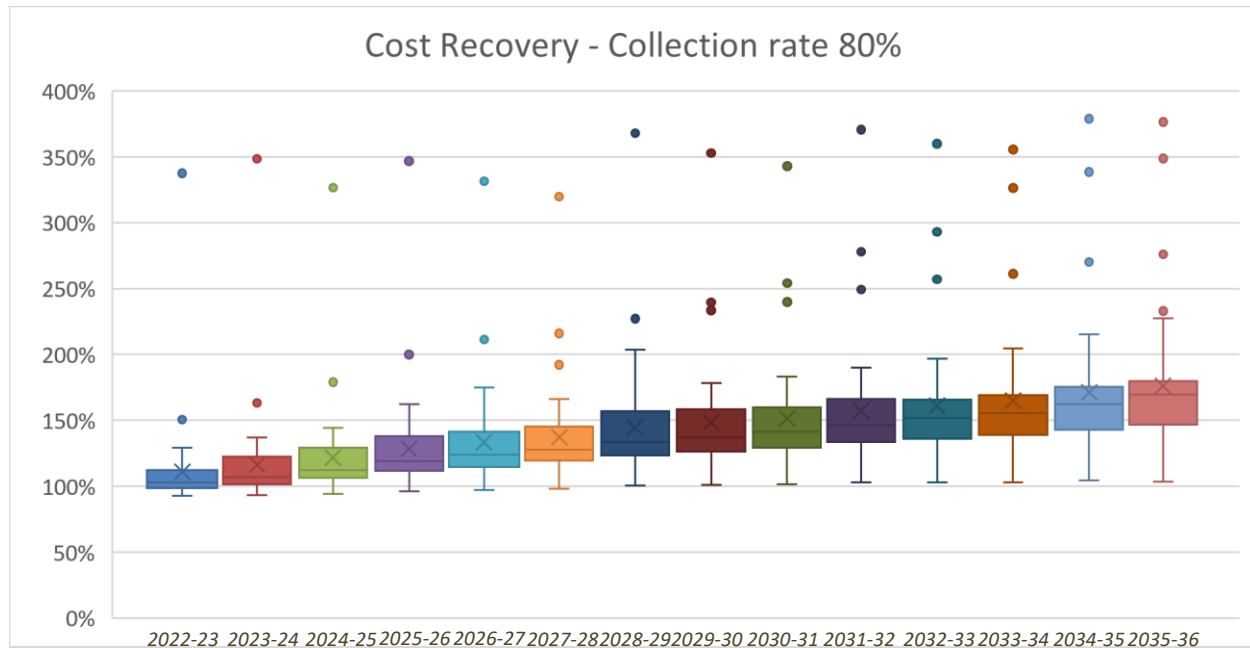


**Boxplot of cost recovery when Volumetric Tariff instead of Flat Tariff for 50 ULBs.** The first year after the completion of construction has been omitted from the Graph. The collection of the connection fee in the first year leads to a stark increase in the cost recovery rate (average of 931 percent).

142. Sensitivity analysis was conducted with respect to three scenarios (i) a decrease in the collection rate of water bills to 80 percent, (ii) an increase of O&M cost by 10 percent and (iii) a worst-case scenario combining the previous two cases. The results are summarized in Figure 10, Figure 11 and Figure 12 and detailed results are reported in the Tables 13, Table 14 and Table 15. The analysis confirms that the financial sustainability of the project is indeed sensitive to a decrease in collection rate and an increase in O&M costs.

143. Under the sensitivity scenario (i), the revenue from tariffs and connection charges exceeds the O&M costs by a factor of 8.1 in the initial year, which can allow the ULBs to build a capital buffer to compensate for later temporary shortfalls in cost recovery. Cost recovery drops to an average rate of 110 percent in the second year with 10 ULBs falling short of cost recovery levels. With the periodical revision of the tariff, the cost recovery rate improves continuously thereafter with all ULBs achieving cost recovery after year 7. If the surplus of the initial year is used to buffer the shortfall in subsequent years, all 50 ULBs would be able to cover the expenses for O&M from the tariff and connection fee revenue throughout the period of analysis.

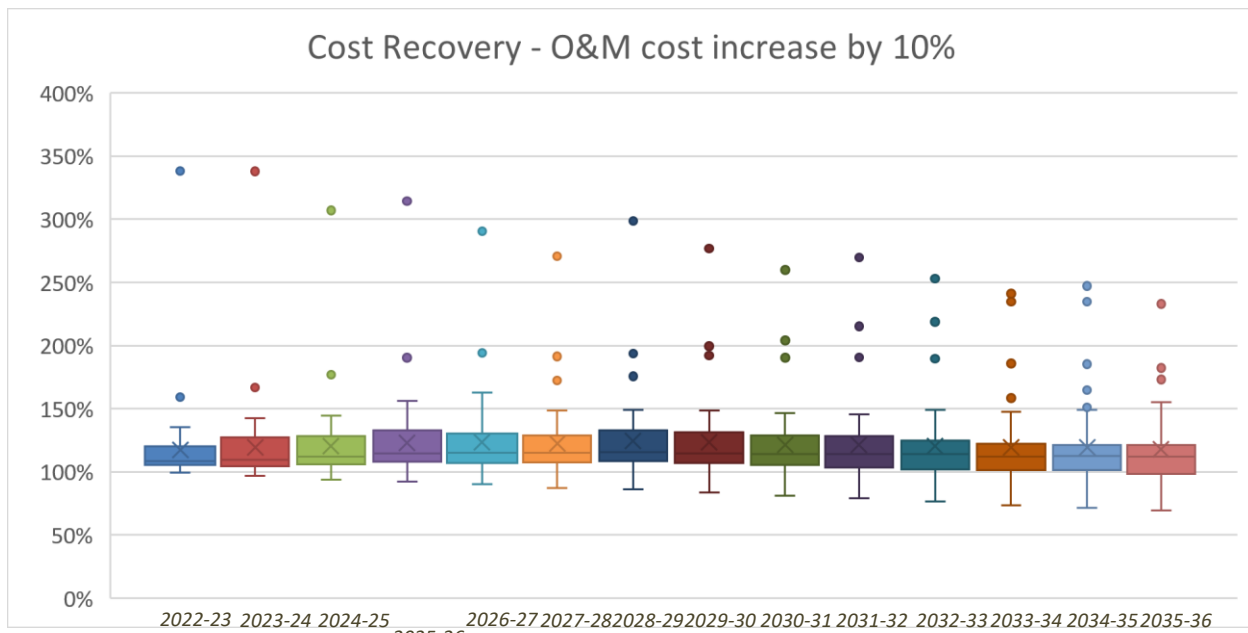
**Figure 10:** Cost recovery under sensitivity scenario (i) decrease of collection rate to 80%



**Boxplot of cost recovery under sensitivity scenario decrease of collection rate to 80% for 50 ULBs.** The first year after the completion of construction has been omitted from the Graph. The collection of the connection fee in the first year leads to a stark increase in the cost recovery rate (average of 911 percent).

144. Under sensitivity scenario (ii), revenue from connection fees and tariff in the first year exceed the O&M expenditures by a factor of 9.2. In the second year after the completion of construction, average cost recovery is estimated at 118 percent. Despite the increase in O&M expenditure by 10 percent as compared to the base case, 49 of 50 ULBs still achieve cost recovery of the O&M expenditures from tariff revenue and only one ULB falls short of cost recovery by 0.61 percent. However, due to the higher cost base of O&M expenditure and subsequent cost escalation, the future trend is negative, and the progressive cost escalation exceeds the revenue from the periodically revised tariff. This leads to a progressive worsening of the cost recovery ratio whereby most ULBs maintain a cost recovery above 100 percent throughout the period of analysis. The ULBs, which experience a shortfall in tariff revenue as compared to their O&M expenditures, would be able to cover the deficits throughout the period of analysis from the surplus revenue collected during the first year (connection charges). However, for the long-term sustainability of the system beyond the period of analysis, an upward revision of the tariff level according to the cost-recovery tariff policy would be advisable.

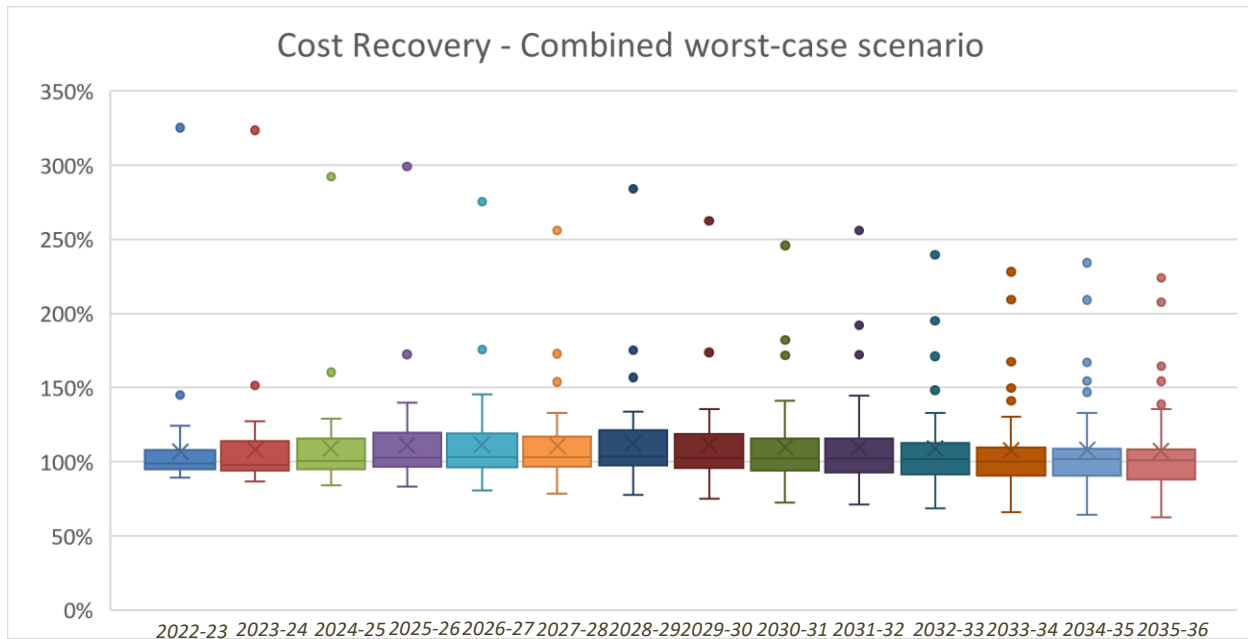
**Figure 11: Cost recovery under sensitivity scenario (i) increase in O&M cost by 10%**



**Boxplot of cost recovery under sensitivity scenario increase in O&M cost by 10% for 50 ULBs.** The first year after the completion of construction has been omitted from the Graph. The collection of the connection fee in the first year leads to a stark increase in the cost recovery rate (average of 920 percent).

145. Under the sensitivity scenario (iii), which combines the two previous scenarios in a worst-case scenario, revenue from connection charges and tariff exceeds the O&M costs in the initial year by a factor of 8.1. Cost recovery in the second year is at an average of 106 percent with 27 ULBs falling short of cost recovery. Due to the increased cost base for O&M expenditure and subsequent cost escalation, the cost recovery ratio increasingly worsens throughout the period of analysis. The surplus revenue from the collection of the connection charges in the first year would be sufficient to cover the deficit throughout the period of analysis except for the ULB of Chittoor for which revenue falls short of expenditure by 6.9 percent. However, for the long-term sustainability of the system, an upward revision of the tariff level, in line with the cost-recovery tariff policy, would be advisable.

**Figure 12: Cost recovery under combined worst-case scenario**



**Boxplot of cost recovery under combined worst-case scenario for 50 ULBs.** The first year after the completion of construction has been omitted from the Graph. The collection of the connection fee in the first year leads to a stark increase in the cost recovery rate (average of 912 percent).

146. **Conclusion:** The proposed water tariff schedule according to the revised tariff methodology, dated May 17, 2019, allows the ULBs to fully recover the cost of O&M expenditures throughout the period of analysis under the two base case scenarios (flat tariff, volumetric tariff). The initial collection of the connection fee for new household connections provides financial headroom to the ULBs to cover small network extensions or absorb adverse shocks. The sensitivity analysis shows that the cost recovery rate is sensitive to a decrease in the collection efficiency of water bills and increased O&M costs whereby the latter has a more severe and lasting impact on cost recovery. A decrease of the collection efficiency to 80 percent leads to 23 ULBs temporarily falling short of cost recovery levels in the second year, but the shortfall can be covered with the initial capital buffer and 46 ULBs reach cost recovery levels in the third year and the remaining ULBs by year 8 at the latest. The sensitivity analysis further shows that an increase in O&M expenditure by 10 percent and the combined effect of an increase of O&M expenditure by 10 percent and a decrease in collection efficiency to 80 percent would set the cost recovery rate on a negative trend. Even though the initial capital buffer is sufficient to cover the O&M cost recovery gap throughout the period of analysis, except for the ULB of Chittoor under the worst-case scenario, an upward revision of the tariff reflecting the increased O&M cost would be advisable for scenarios (ii) and (iii) to ensure the long-term sustainability of the water supply service provision.



**Table 11: Cost Recovery under Flat Rate Tariff**

Sl.No.	ULB Name	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
		2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34	2034-35	2035-36
1	Amudalavalsa	625.83%	108.43%	112.50%	117.97%	129.07%	131.43%	134.92%	142.21%	147.71%	149.21%	154.00%	155.59%	158.89%	166.85%	168.24%
2	Atmakur - Knl	378.88%	107.31%	111.26%	119.86%	126.79%	132.98%	141.04%	145.44%	153.29%	158.69%	164.95%	170.38%	175.50%	183.00%	191.65%
3	Addanki	662.27%	109.23%	111.01%	116.70%	119.29%	126.00%	129.45%	134.26%	140.35%	141.91%	147.27%	149.60%	153.60%	156.93%	161.24%
4	Allagadda	629.44%	113.31%	116.78%	125.20%	132.84%	141.18%	148.79%	153.94%	159.31%	164.45%	171.45%	176.69%	181.45%	189.21%	197.67%
5	Bobilli	581.67%	117.02%	124.40%	128.20%	133.08%	136.65%	140.89%	148.71%	151.63%	157.63%	161.69%	165.80%	167.46%	172.79%	173.98%
6	Chimakurthy	435.76%	111.35%	114.42%	121.87%	126.25%	132.83%	138.79%	145.24%	151.98%	156.28%	161.33%	167.82%	173.61%	180.94%	189.69%
7	Chittoor Distribution	743.76%	103.14%	104.01%	104.89%	107.13%	108.30%	109.11%	111.84%	112.35%	112.90%	114.65%	114.77%	114.85%	116.00%	116.56%
8	Giddalur	334.84%	121.86%	127.35%	142.36%	153.32%	166.47%	178.97%	184.80%	194.05%	203.03%	212.89%	220.32%	227.34%	240.36%	255.02%
9	Gollaprolu	492.68%	114.46%	117.80%	123.66%	130.59%	138.47%	143.96%	148.90%	151.28%	153.82%	160.38%	166.05%	169.75%	173.61%	178.69%
10	Gooty	350.68%	106.89%	112.42%	125.85%	134.41%	148.01%	165.29%	175.63%	189.75%	196.55%	206.39%	215.60%	228.24%	241.46%	249.60%
11	Gudur - Knl	687.85%	109.60%	112.21%	115.99%	117.96%	122.03%	125.60%	130.70%	134.23%	137.41%	139.12%	143.17%	145.62%	149.61%	154.77%
12	Guntur Merged villages	179.88%	106.21%	113.81%	124.74%	132.99%	140.91%	150.32%	157.33%	163.97%	171.33%	175.45%	181.85%	186.41%	192.71%	208.91%
13	Ichapuram	519.46%	116.18%	123.47%	129.03%	133.29%	136.90%	140.46%	145.27%	147.94%	153.15%	157.05%	160.92%	162.69%	167.03%	168.45%
14	Jaggiahpet	12181.95%	350.94%	363.82%	343.00%	364.47%	349.76%	338.17%	387.05%	372.26%	362.49%	390.55%	380.14%	376.07%	399.99%	399.19%
15	Jangareddygudem	393.96%	138.45%	153.33%	161.59%	181.27%	195.71%	215.16%	227.78%	268.45%	284.94%	311.76%	328.65%	366.01%	379.76%	391.30%
16	Kalyanadurgam	292.40%	108.01%	117.89%	129.01%	139.21%	153.08%	166.48%	176.11%	184.84%	193.41%	202.48%	216.19%	229.41%	238.67%	250.76%
17	Kanigiri	498.01%	107.78%	114.02%	122.50%	129.44%	137.83%	145.75%	152.36%	157.89%	163.32%	169.57%	179.14%	186.11%	193.47%	202.01%
18	Kovvuru	701.84%	131.68%	143.94%	155.27%	165.08%	176.61%	185.35%	193.16%	198.94%	204.63%	210.29%	219.14%	225.31%	234.57%	241.53%
19	Macherla	933.92%	130.23%	138.59%	143.14%	156.36%	160.36%	162.02%	174.43%	177.72%	179.52%	188.99%	189.67%	194.01%	205.62%	207.78%
20	Madakisara	952.83%	110.41%	115.73%	121.67%	123.93%	128.72%	134.60%	141.84%	147.93%	151.72%	154.85%	161.67%	163.84%	171.33%	178.88%
21	Mangalagiri	1434.09%	133.96%	142.79%	149.35%	158.24%	161.91%	161.59%	174.09%	177.46%	176.96%	184.09%	183.46%	187.64%	194.90%	195.85%
22	Mummadivaram	544.34%	109.83%	114.51%	116.04%	125.42%	128.15%	134.97%	144.60%	145.31%	150.36%	152.65%	153.94%	159.50%	165.42%	165.51%
23	Mydukur	628.68%	109.10%	114.62%	121.92%	128.66%	136.54%	143.83%	150.29%	155.20%	160.02%	166.14%	174.75%	182.71%	189.12%	196.68%
24	Naidupet	584.67%	109.34%	111.35%	116.63%	122.03%	127.53%	132.28%	136.13%	139.45%	142.57%	147.60%	151.07%	154.06%	159.14%	164.50%
25	Nandigama	523.87%	126.61%	140.59%	147.27%	156.28%	159.94%	160.42%	171.28%	174.68%	174.98%	180.86%	181.05%	185.10%	191.97%	193.36%
26	Nandikotkur	489.59%	105.64%	109.82%	115.74%	120.81%	126.57%	131.89%	136.75%	140.47%	144.13%	148.73%	155.42%	161.63%	166.83%	172.76%
27	Narsipatnam	388.11%	106.72%	112.34%	115.63%	121.43%	125.29%	128.38%	133.63%	138.68%	139.31%	143.21%	148.07%	148.94%	154.79%	158.22%
28	Nellimaria	1593.52%	140.70%	145.16%	143.24%	156.65%	155.04%	153.83%	167.30%	166.09%	166.16%	177.20%	174.01%	176.79%	187.21%	186.91%
29	Nellore	444.57%	110.71%	112.54%	115.44%	122.28%	125.90%	129.19%	135.91%	140.79%	143.81%	149.54%	151.12%	152.41%	155.06%	157.76%
30	Nidadavolu	789.91%	129.07%	137.96%	144.31%	156.04%	165.15%	175.24%	183.23%	189.11%	193.49%	202.80%	211.03%	220.00%	228.59%	235.61%
31	Palakollu	361.05%	124.29%	136.68%	151.04%	165.85%	175.94%	180.94%	190.26%	199.67%	203.08%	210.53%	216.28%	223.20%	228.58%	232.99%
32	Palakonda	577.94%	115.84%	121.47%	125.47%	132.97%	137.18%	139.75%	147.37%	151.31%	153.66%	159.34%	161.42%	165.73%	173.32%	175.10%
33	Palasa-Kasibugga	416.29%	114.94%	120.27%	124.65%	128.35%	131.15%	133.90%	138.14%	140.15%	144.27%	147.68%	150.36%	151.63%	154.92%	155.89%
34	Paamidi	687.85%	109.60%	112.21%	115.99%	117.96%	122.03%	125.60%	130.70%	134.23%	137.41%	139.12%	143.17%	145.62%	149.61%	154.77%
35	Parvathipuram	529.60%	120.40%	126.68%	131.35%	135.70%	138.70%	141.66%	146.94%	149.05%	153.60%	157.65%	161.08%	162.37%	166.91%	167.89%
36	Pedana	521.53%	112.86%	116.31%	122.24%	129.15%	136.65%	141.74%	146.53%	148.47%	150.52%	157.00%	162.09%	165.13%	168.87%	173.46%
37	Piduguralla	1697.31%	137.91%	146.37%	152.83%	161.72%	165.06%	164.53%	177.82%	180.86%	180.14%	187.72%	186.87%	190.94%	198.52%	199.17%
38	Puttaparthi	415.74%	110.90%	117.64%	122.98%	129.66%	137.98%	139.80%	143.31%	144.83%	147.67%	150.00%	151.98%	155.97%	158.59%	160.95%
39	Puttur	831.24%	109.61%	111.57%	114.71%	119.55%	125.09%	129.87%	133.66%	136.37%	138.91%	143.29%	146.74%	149.80%	153.72%	157.88%
40	Salur	588.52%	116.83%	125.30%	130.84%	135.28%	137.95%	141.47%	149.24%	152.87%	155.80%	160.34%	168.49%	170.61%	178.82%	180.58%
41	Sullurpet	2175.40%	129.43%	132.42%	140.35%	145.30%	150.61%	154.47%	159.46%	162.13%	166.80%	170.78%	178.55%	180.78%	187.96%	193.74%
42	Tadepalli	521.39%	118.77%	127.41%	135.34%	142.02%	145.34%	150.29%	155.64%	157.63%	161.21%	166.89%	172.57%	174.11%	178.83%	180.47%
43	Tanuku	2419.21%	165.15%	179.66%	197.69%	220.63%	233.62%	239.15%	251.14%	258.42%	265.63%	276.00%	284.96%	289.84%	299.75%	306.33%
44	Tiruvuru	294.35%	123.22%	137.04%	143.53%	150.49%	156.62%	158.22%	165.43%	166.74%	170.52%	172.48%	181.03%	184.10%	188.11%	191.28%
45	Vinukonda	521.54%	123.18%	137.12%	144.46%	153.51%	157.58%	158.27%	168.35%	172.13%	172.65%	178.17%	178.57%	182.62%	189.16%	190.88%
46	Vuyyuru	1073.73%	139.60%	148.20%	151.95%	159.93%	166.04%	166.33%	176.58%	175.98%	182.82%	185.51%	191.37%	190.14%	194.90%	200.30%
47	Yelamanchili	514.10%	109.92%	114.54%	118.85%	122.25%	125.74%	129.15%	131.84%	133.53%	136.18%	140.35%	142.99%	145.23%	149.60%	151.50%
48	Yeleswaram	806.74%	116.14%	122.00%	130.32%	135.33%	141.74%	149.61%	156.61%	159.65%	162.83%	167.61%	175.41%	180.13%	185.64%	192.35%
49	Yemmiganur	677.35%	110.52%	114.46%	117.94%	123.41%	125.85%	127.86%	132.54%	133.98%	137.92%	143.07%	146.15%	147.23%	150.58%	152.59%
50	Yerraguntla	381.68%	109.40%	116.28%	121.63%	131.84%	136.80%	141.91%	147.63%	152.09%	156.48%	159.89%	164.65%	170.58%	177.63%	181.77%
Min		179.88%	103.14%	104.01%	104.89%	107.13%	108.30%	109.11%	111.84%	112.35%	112.90%	114.65%	114.77%	114.85%	116.00%	116.56%
Max		12181.95%	350.94%	363.82%	343.00%	364.47%	349.76%	338.17%	387.05%	372.26%	362.49%	390.55%	380.14%	376.07%	399.99%	399.19%
Average		920.24%	122.45%	129.08%	135.04%	142.91%	148.48%	153.22%	161.19%	165.66%	169.33%	175.63%	180.24%	184.81%	191.62%	196.26%
Median		561.14%	113.88%	117.85%	125.33%	132.98%	137.96%	142.87%	149.07%	153.08%	158.16%	163.32%	169.43%	173.86%	179.89%	184.34%

**Table 12: Cost Recovery under Volumetric Tariff**

Sl.No.	ULB Name	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
		2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34	2034-35	2035-36
1	Amudalavalsa	633.81%	116.43%	120.52%	126.02%	137.13%	139.51%	143.02%	150.34%	155.85%	157.37%	162.18%	163.79%	167.11%	175.09%	176.49%
2	Atmakur - Knl	418.62%	141.31%	145.34%	154.03%	161.04%	167.32%	175.46%	179.95%	187.88%	193.37%	199.70%	205.21%	210.41%	217.99%	226.72%
3	Addanki	669.18%	116.16%	117.95%	123.66%	126.27%	133.00%	136.47%	141.29%	147.40%	148.97%	154.35%	156.69%	160.71%	164.06%	168.38%
4	Allagadda	635.97%	118.10%	121.64%	128.37%	135.23%	141.36%	148.38%	153.64%	159.69%	163.97%	170.27%	175.63%	180.51%	186.80%	193.82%
5	Bobilli	590.30%	125.67%	133.08%	136.90%	141.80%	145.39%	149.65%	157.49%	160.44%	166.45%	170.54%	174.66%	176.35%	181.70%	182.91%
6	Chimakurthy	438.78%	114.38%	117.46%	124.91%	129.30%	135.89%	141.85%	148.31%	155.06%	159.37%	164.42%	170.93%	176.72%	184.06%	192.82%
7	Chittoor Distribution	744.95%	104.29%	104.62%	105.19%	107.10%	107.73%	108.22%	110.65%	110.86%	111.48%	113.24%	113.70%	114.24%	115.32%	115.87%
8	Giddalur	320.68%	105.53%	108.88%	121.80%	130.70%	140.77%	150.26%	154.17%	161.54%	168.67%	176.72%	181.38%	185.68%	197.02%	209.25%
9	Gollaprolu	494.62%	116.40%	119.75%	125.61%	132.55%	140.43%	145.92%	150.87%	153.26%	155.80%	162.36%	168.03%	171.74%	175.61%	180.70%
10	Gooty	362.72%	122.46%	129.31%	147.91%	158.06%	175.63%	196.80%	208.59%	227.49%	237.30%	248.46%	262.21%	277.69%	295.29%	307.73%
11	Gudur - Knl	694.36%	116.14%	118.76%	122.55%	124.54%	128.63%	132.21%	137.33%	140.88%	144.07%	145.79%	149.86%	152.33%	156.33%	161.51%
12	Guntur Merged villages	180.82%	107.15%	114.75%	125.68%	133.93%	141.86%	151.27%	158.28%	164.93%	172.29%	176.41%	182.81%	187.37%	193.67%	209.88%
13	Ichapuram	520.39%	117.11%	124.40%	129.97%	134.23%	137.84%	141.40%	146.22%	148.89%	154.10%	158.01%	161.88%	163.64%	167.99%	169.41%
14	Jaggaiahpet	12369.30%	538.74%	552.09%	531.74%	553.67%	539.42%	528.29%	577.64%	563.32%	554.02%	582.51%	572.54%	568.89%	593.25%	592.88%
15	Jangareddygudem	399.54%	144.04%	158.94%	167.21%	186.91%	201.36%	220.82%	233.45%	274.14%	290.64%	317.47%	334.37%	371.75%	385.51%	397.06%
16	Kalyanadurgam	295.61%	111.22%	121.11%	132.24%	142.45%	156.33%	169.74%	179.38%	188.11%	196.69%	205.77%	219.48%	232.71%	241.98%	254.07%
17	Kanigiri	501.98%	111.76%	118.01%	126.49%	133.45%	141.85%	149.78%	156.40%	161.94%	167.38%	173.64%	183.21%	190.20%	197.57%	206.12%
18	Kovvuru	708.54%	138.40%	150.67%	162.02%	171.85%	183.40%	192.15%	199.98%	205.78%	211.48%	217.16%	226.02%	232.21%	241.48%	248.46%
19	Macherla	950.09%	146.44%	154.85%	159.43%	172.69%	176.74%	178.43%	190.89%	194.22%	196.05%	205.56%	206.28%	210.65%	222.30%	224.50%
20	Madakisara	960.92%	118.51%	123.85%	129.81%	132.09%	136.91%	142.81%	150.07%	156.17%	159.99%	163.13%	169.97%	172.16%	179.67%	187.24%
21	Mangalagiri	1450.78%	150.69%	159.55%	166.16%	175.10%	178.81%	178.53%	191.07%	194.48%	194.02%	201.19%	200.60%	204.81%	212.12%	213.10%
22	Mummadivaram	549.84%	115.35%	120.04%	121.59%	130.97%	133.72%	140.56%	150.20%	150.92%	155.99%	158.29%	159.59%	165.16%	171.10%	171.20%
23	Mydukur	634.94%	115.37%	120.90%	128.22%	134.97%	142.87%	150.18%	156.65%	161.57%	166.41%	172.54%	181.17%	189.15%	195.57%	203.15%
24	Naidupet	591.85%	116.54%	118.56%	123.86%	129.28%	134.79%	139.56%	143.43%	146.77%	149.90%	154.95%	158.44%	161.45%	166.55%	171.92%
25	Nandigama	531.10%	133.85%	147.86%	154.55%	163.58%	167.26%	167.76%	178.64%	182.05%	182.37%	188.27%	188.48%	192.54%	199.43%	200.83%
26	Nandikotkur	489.06%	105.11%	109.29%	115.21%	120.28%	126.04%	131.35%	136.22%	139.94%	143.59%	148.19%	154.88%	161.09%	166.29%	172.21%
27	Narsipatnam	391.27%	109.88%	115.51%	118.81%	124.61%	128.48%	131.58%	136.84%	141.89%	142.54%	146.44%	151.31%	152.18%	158.05%	161.48%
28	Nellimarla	1604.38%	151.59%	156.08%	154.18%	167.62%	166.03%	164.85%	178.35%	177.17%	177.27%	188.33%	185.16%	187.97%	198.41%	198.14%
29	Nellore	446.59%	112.73%	114.57%	117.48%	124.31%	127.94%	131.24%	137.97%	142.85%	145.88%	151.61%	153.19%	154.48%	157.14%	159.85%
30	Nidadavolu	804.76%	143.96%	152.89%	159.27%	171.04%	180.19%	190.31%	198.34%	204.25%	208.67%	218.02%	226.28%	235.29%	243.91%	250.97%
31	Palakollu	367.66%	130.92%	143.32%	157.69%	172.52%	182.63%	187.64%	196.98%	206.40%	209.84%	217.30%	223.06%	230.00%	235.40%	239.82%
32	Palakonda	596.22%	134.16%	139.84%	143.88%	151.43%	155.69%	158.30%	165.97%	169.96%	172.34%	178.07%	180.19%	184.54%	192.18%	193.99%
33	Palasa-Kasibugga	419.47%	117.93%	123.49%	127.93%	131.69%	134.55%	137.36%	141.66%	143.72%	147.91%	151.37%	154.11%	155.43%	158.78%	159.80%
34	Paamidi	694.36%	116.14%	118.76%	122.55%	124.54%	128.63%	132.21%	137.33%	140.88%	144.07%	145.79%	149.86%	152.33%	156.33%	161.51%
35	Parvathipuram	540.52%	131.34%	137.65%	142.34%	146.72%	149.75%	152.74%	158.04%	160.18%	164.75%	168.83%	172.29%	173.60%	178.17%	179.18%
36	Pedana	526.54%	117.88%	121.34%	127.29%	134.21%	141.72%	146.82%	151.62%	153.58%	155.64%	162.13%	167.24%	170.28%	174.04%	178.64%
37	Piduguralla	1704.39%	145.01%	153.49%	159.96%	168.87%	172.23%	171.72%	185.02%	188.09%	187.38%	194.98%	194.14%	198.23%	205.82%	206.49%
38	Puttaparthi	420.34%	115.50%	122.26%	127.61%	134.30%	142.63%	144.46%	147.98%	149.52%	152.36%	154.71%	156.70%	160.70%	163.32%	165.69%
39	Puttur	836.23%	114.62%	116.58%	119.74%	124.60%	130.14%	134.93%	138.74%	141.46%	144.02%	148.41%	151.87%	154.94%	158.87%	163.04%
40	Salur	597.27%	125.61%	134.10%	139.65%	144.11%	146.81%	150.35%	158.14%	161.79%	164.75%	169.30%	177.47%	179.62%	187.85%	189.63%
41	Sullurpet	2177.26%	131.31%	134.30%	142.24%	147.18%	152.50%	156.37%	161.36%	164.03%	168.71%	172.69%	180.47%	182.71%	189.89%	195.67%
42	Tadepalli	528.59%	125.98%	134.64%	142.59%	149.29%	152.62%	157.59%	162.96%	164.97%	168.56%	174.26%	179.95%	181.51%	186.25%	187.91%
43	Tanuku	2439.63%	185.62%	200.18%	218.27%	241.25%	254.29%	259.87%	271.92%	279.24%	286.51%	296.92%	305.93%	310.86%	320.81%	327.44%
44	Tiruvuru	296.20%	125.08%	138.90%	145.40%	152.36%	158.49%	160.10%	167.32%	168.63%	172.41%	174.38%	182.93%	186.01%	190.03%	193.20%
45	Vinukonda	522.43%	124.07%	138.01%	145.36%	154.41%	158.48%	159.17%	169.25%	173.04%	173.56%	179.08%	179.48%	183.53%	190.07%	191.80%
46	Vuyyuru	1085.14%	151.04%	159.67%	163.45%	171.46%	177.59%	177.91%	188.19%	187.62%	194.48%	197.21%	203.09%	201.88%	206.67%	212.10%
47	Yelamanchili	517.95%	113.78%	118.41%	122.72%	126.13%	129.63%	133.05%	135.75%	137.45%	140.11%	144.29%	146.94%	149.19%	153.57%	155.48%
48	Yeleswaram	808.92%	118.32%	124.18%	132.51%	137.52%	143.94%	151.82%	158.82%	161.87%	165.05%	169.84%	177.65%	182.37%	187.88%	194.60%
49	Yemmiganur	703.51%	116.78%	120.74%	124.23%	129.71%	132.17%	134.20%	138.89%	140.35%	144.31%	149.47%	152.56%	153.66%	157.02%	159.04%
50	Yerraguntla	389.89%	117.63%	124.53%	129.90%	140.13%	145.11%	150.24%	155.98%	160.47%	164.87%	168.30%	173.08%	179.03%	186.10%	190.25%
Min		180.82%	104.29%	104.62%	105.19%	107.10%	107.73%	108.22%	110.65%	110.86%	111.48%	113.24%	113.70%	114.24%	115.32%	115.87%
Max		12369.30%	538.74%	552.09%	531.74%	553.67%	539.42%	528.29%	577.64%	563.32%	554.02%	582.51%	572.54%	568.89%	593.25%	592.88%
Average		931.17%	132.88%	139.51%	145.52%	153.38%	158.94%	163.71%	171.69%	176.26%	179.95%	186.26%	190.94%	195.55%	202.41%	207.08%
Median		570.07%	118.02%	124.02%	129.94%	137.33%	143.41%	150.25%	157.07%	161.55%	165.73%	170.40%	177.56%	181.01%	187.32%	192.31%

**Table 13: Cost recovery under sensitivity scenario (i) decrease of collection rate to 80%**

Sl.No.	ULB Name	Year 1 2021-22	Year 2 2022-23	Year 3 2023-24	Year 4 2024-25	Year 5 2025-26	Year 6 2026-27	Year 7 2027-28	Year 8 2028-29	Year 9 2029-30	Year 10 2030-31	Year 11 2031-32	Year 12 2032-33	Year 13 2033-34	Year 14 2034-35	Year 15 2035-36
1	Amudalavalsa	615.53%	97.37%	100.92%	105.77%	115.86%	117.76%	120.85%	127.49%	132.37%	133.59%	137.96%	139.31%	142.22%	149.39%	150.53%
2	Atmakur - Knl	368.58%	96.01%	99.47%	107.11%	113.33%	118.83%	125.97%	129.95%	136.91%	141.67%	147.30%	152.12%	156.65%	163.33%	171.02%
3	Addanki	651.74%	98.22%	99.72%	104.82%	107.15%	113.18%	116.16%	120.60%	126.08%	127.27%	132.19%	134.18%	137.74%	140.69%	144.56%
4	Allagadda	619.20%	102.08%	105.07%	112.52%	119.46%	126.87%	133.57%	138.30%	143.02%	147.52%	153.90%	158.53%	162.69%	169.64%	177.14%
5	Bobilli	570.92%	105.00%	111.46%	114.74%	119.16%	122.30%	126.04%	133.16%	135.68%	141.00%	144.68%	148.29%	149.70%	154.52%	155.50%
6	Chimakurthy	425.12%	99.73%	102.38%	108.99%	112.93%	118.80%	124.06%	129.92%	135.89%	139.63%	144.19%	149.99%	155.10%	161.63%	169.41%
7	Chittoor Distribution	733.47%	92.71%	93.43%	94.16%	96.29%	97.30%	97.97%	100.57%	100.96%	101.40%	103.08%	103.14%	103.15%	104.24%	104.70%
8	Giddalur	323.78%	109.07%	113.90%	127.23%	137.04%	148.74%	159.82%	165.07%	173.26%	181.21%	190.06%	196.65%	202.86%	214.45%	227.48%
9	Gollaprolu	481.93%	102.81%	105.62%	110.81%	117.08%	124.11%	128.92%	133.38%	135.43%	137.64%	143.61%	148.65%	151.88%	155.31%	159.83%
10	Gooty	340.41%	95.62%	100.47%	112.46%	120.08%	132.19%	147.54%	156.77%	169.35%	175.32%	184.13%	192.32%	203.51%	215.32%	222.51%
11	Gudur - Knl	677.51%	98.56%	100.69%	104.00%	105.83%	109.45%	112.57%	117.30%	120.37%	123.13%	124.73%	128.37%	130.51%	134.10%	138.68%
12	Guntur Merged villages	169.13%	94.59%	101.33%	111.06%	118.40%	125.43%	133.80%	140.04%	145.94%	152.48%	156.14%	161.83%	165.87%	171.48%	185.87%
13	Ichapuram	508.71%	104.17%	110.53%	115.40%	119.22%	122.40%	125.52%	129.92%	132.24%	136.89%	140.40%	143.80%	145.30%	149.23%	150.42%
14	Jaggiahpet	12170.39%	337.44%	348.45%	326.51%	346.81%	331.44%	319.69%	367.95%	352.78%	342.86%	370.55%	360.01%	355.57%	378.93%	376.35%
15	Jangareddygudem	382.48%	123.94%	137.08%	144.36%	162.04%	174.80%	192.09%	203.36%	239.64%	254.13%	278.10%	293.06%	326.30%	338.47%	348.67%
16	Kalyanadurgam	282.17%	96.48%	105.23%	115.10%	124.22%	136.55%	148.44%	157.06%	164.80%	172.39%	180.51%	192.69%	204.42%	212.66%	223.40%
17	Kanigiri	487.69%	96.46%	101.96%	109.48%	115.72%	123.18%	130.19%	136.14%	141.02%	145.81%	151.44%	159.95%	166.11%	172.67%	180.25%
18	Kovvuru	690.86%	118.60%	129.32%	139.26%	148.11%	158.37%	166.05%	173.13%	178.21%	183.20%	188.36%	196.25%	201.65%	209.97%	216.08%
19	Macherla	922.87%	117.85%	125.16%	128.94%	141.04%	144.37%	145.69%	157.16%	159.89%	161.38%	170.14%	170.53%	174.32%	184.84%	186.62%
20	Madakisara	942.49%	99.51%	104.21%	109.46%	111.49%	115.77%	120.99%	127.65%	133.02%	136.27%	139.14%	145.27%	147.04%	153.86%	160.55%
21	Mangalagiri	1434.09%	121.30%	128.94%	134.71%	142.62%	145.70%	145.29%	156.85%	159.66%	159.09%	165.68%	164.99%	168.65%	175.28%	175.95%
22	Mummadivaram	533.59%	98.42%	102.52%	103.82%	112.31%	114.66%	120.72%	129.44%	129.94%	134.42%	136.53%	137.63%	142.56%	147.87%	147.88%
23	Mydukur	618.40%	97.94%	102.79%	109.26%	115.35%	122.36%	128.79%	134.64%	138.96%	143.20%	148.74%	156.40%	163.43%	169.14%	175.85%
24	Naidupet	574.53%	98.57%	100.25%	104.92%	109.87%	114.76%	118.92%	122.48%	125.38%	128.08%	132.71%	135.77%	138.37%	142.93%	147.67%
25	Nandigama	523.87%	113.94%	126.36%	132.08%	140.15%	143.26%	143.61%	153.56%	156.44%	156.63%	162.02%	162.10%	165.67%	171.90%	173.01%
26	Nandikotkur	479.27%	94.62%	98.29%	103.53%	108.12%	113.23%	117.93%	122.34%	125.60%	128.82%	132.99%	138.94%	144.42%	149.06%	154.32%
27	Narsipatnam	377.36%	95.27%	100.24%	103.15%	108.36%	111.76%	114.50%	119.24%	123.71%	124.23%	127.76%	132.07%	132.80%	138.05%	141.07%
28	Nellimarla	1582.72%	128.97%	132.67%	130.23%	142.88%	140.83%	139.38%	152.24%	150.68%	150.53%	161.08%	157.69%	160.12%	169.84%	169.25%
29	Nellore	434.23%	99.69%	101.17%	103.70%	109.98%	113.12%	115.97%	122.17%	126.48%	129.07%	134.32%	135.62%	136.68%	139.11%	141.48%
30	Nidadavolu	778.41%	116.29%	124.06%	129.59%	140.24%	148.30%	157.22%	164.46%	169.61%	173.42%	181.90%	189.18%	197.10%	204.77%	210.96%
31	Palakollu	349.45%	111.40%	122.40%	135.13%	148.38%	157.28%	161.62%	170.06%	178.41%	181.32%	188.06%	193.13%	199.26%	204.07%	232.99%
32	Palakonda	567.19%	103.93%	108.81%	112.26%	119.05%	122.74%	124.96%	131.91%	135.35%	137.38%	142.55%	144.34%	148.15%	173.32%	175.10%
33	Palasa-Kasibugga	416.29%	103.12%	107.74%	111.57%	114.92%	117.36%	119.77%	123.68%	125.41%	129.08%	132.17%	134.51%	135.58%	138.57%	139.37%
34	Paamidi	677.51%	98.56%	100.69%	104.00%	105.83%	109.45%	112.57%	117.30%	120.37%	123.13%	124.73%	128.37%	130.51%	134.10%	138.68%
35	Parvathipuram	518.85%	108.48%	113.91%	117.95%	121.90%	124.51%	127.09%	131.99%	133.77%	137.83%	141.52%	144.51%	145.56%	149.69%	150.47%
36	Pedana	521.53%	108.75%	108.00%	109.39%	111.36%	113.55%	113.49%	113.06%	110.39%	107.85%	108.40%	107.85%	105.87%	104.33%	103.27%
37	Piduguralla	1697.31%	125.25%	132.53%	138.19%	146.09%	148.85%	148.23%	160.57%	163.06%	162.27%	169.31%	168.40%	171.95%	178.89%	179.27%
38	Puttaparthi	405.44%	99.40%	105.30%	109.97%	116.00%	123.41%	124.89%	128.11%	129.42%	131.92%	134.06%	135.79%	139.34%	141.68%	143.74%
39	Puttur	820.92%	98.74%	100.37%	103.12%	107.58%	112.51%	116.70%	120.20%	122.56%	124.76%	128.80%	131.83%	134.49%	138.03%	141.70%
40	Salur	577.89%	105.32%	112.83%	117.63%	121.65%	123.96%	127.03%	134.22%	137.35%	139.88%	144.05%	151.33%	153.07%	160.50%	161.93%
41	Sullurpet	2175.40%	118.21%	120.60%	127.62%	132.24%	136.84%	140.16%	144.96%	147.23%	151.27%	155.09%	162.06%	163.80%	170.42%	175.43%
42	Tadepalli	510.34%	106.44%	114.05%	121.07%	127.08%	129.96%	134.36%	139.20%	140.90%	144.08%	149.24%	154.24%	155.52%	159.79%	161.19%
43	Tanuku	2419.21%	150.49%	163.21%	179.13%	199.98%	211.29%	215.87%	227.11%	233.50%	239.72%	249.32%	257.17%	261.28%	270.31%	276.00%
44	Tiruvuru	283.30%	110.01%	122.23%	127.94%	134.15%	139.56%	140.96%	147.46%	148.57%	151.92%	153.70%	161.33%	164.00%	167.61%	170.39%
45	Vinukonda	510.49%	110.53%	122.89%	129.29%	137.39%	140.91%	141.48%	150.65%	153.92%	154.32%	159.35%	159.64%	163.21%	169.11%	170.56%
46	Vuyyuru	1073.73%	126.36%	133.72%	136.83%	144.06%	149.32%	149.44%	158.99%	158.24%	164.28%	166.83%	172.13%	170.77%	175.19%	179.86%
47	Yelamanchili	503.35%	98.39%	102.44%	106.22%	109.29%	112.38%	115.38%	117.85%	119.32%	121.66%	125.45%	127.75%	129.71%	133.66%	135.29%
48	Yeleswaram	796.04%	104.44%	109.57%	116.94%	121.48%	127.21%	134.16%	140.50%	143.12%	145.89%	150.28%	157.24%	161.35%	166.27%	172.23%
49	Yemmiganur	667.08%	99.65%	103.05%	106.05%	111.09%	113.16%	114.86%	119.23%	120.42%	123.92%	128.64%	131.30%	132.15%	135.23%	136.93%
50	Yerraguntla	371.25%	97.95%	103.98%	108.70%	117.87%	122.23%	126.74%	131.92%	135.85%	139.73%	142.81%	147.04%	152.30%	158.60%	162.22%
Min		169.13%	92.71%	93.43%	94.16%	96.29%	97.30%	97.97%	100.57%	100.96%	101.40%	103.08%	103.14%	103.15%	104.24%	103.27%
Max		12170.39%	337.44%	348.45%	326.51%	346.81%	331.44%	319.69%	367.95%	352.78%	342.86%	370.55%	360.01%	355.57%	378.93%	376.35%
Average		911.28%	110.73%	116.44%	121.52%	128.57%	133.33%	137.36%	144.63%	148.41%	151.49%	157.17%	161.11%	165.00%	171.44%	175.87%
Median		550.39%	102.97%	106.68%	112.36%	119.11%	123.68%	127.94%	133.80%	137.13%	141.34%	145.99%	151.72%	155.31%	162.48%	169.33%

**Table 14: Cost recovery under sensitivity scenario (ii) increase in O&M cost by 10%**

Sl.No.	ULB Name	Year 1 2021-22	Year 2 2022-23	Year 3 2023-24	Year 4 2024-25	Year 5 2025-26	Year 6 2026-27	Year 7 2027-28	Year 8 2028-29	Year 9 2029-30	Year 10 2030-31	Year 11 2031-32	Year 12 2032-33	Year 13 2033-34	Year 14 2034-35	Year 15 2035-36
1	Amudalavalsa	625.83%	104.48%	104.47%	105.56%	111.29%	109.21%	108.03%	109.73%	109.83%	106.91%	106.33%	103.52%	101.87%	103.09%	100.16%
2	Atmakur - Knl	378.88%	103.41%	103.32%	107.25%	109.33%	110.50%	112.93%	112.22%	113.98%	113.70%	113.89%	113.36%	112.52%	113.06%	114.10%
3	Addanki	662.27%	105.26%	103.08%	104.43%	102.86%	104.70%	103.65%	103.60%	104.36%	101.68%	101.68%	99.53%	98.48%	96.96%	96.00%
4	Allagadda	629.44%	109.19%	108.45%	112.03%	114.55%	117.31%	119.14%	118.78%	118.45%	117.83%	118.38%	117.56%	116.34%	116.90%	117.68%
5	Bobilli	581.67%	112.76%	115.52%	114.72%	114.75%	113.55%	112.81%	114.74%	112.74%	112.94%	111.64%	110.31%	107.37%	106.75%	103.58%
6	Chimakurthy	435.76%	107.30%	106.25%	109.05%	108.87%	110.37%	111.13%	112.07%	113.01%	111.97%	111.39%	111.66%	111.31%	111.79%	112.94%
7	Chittoor Distribution	743.76%	99.39%	96.59%	93.85%	92.38%	89.99%	87.37%	86.30%	83.54%	80.89%	79.16%	76.36%	73.63%	71.67%	69.40%
8	Giddalur	323.78%	105.10%	105.76%	113.84%	118.17%	123.59%	127.97%	127.37%	128.83%	129.84%	131.23%	130.84%	130.06%	132.50%	135.43%
9	Gollaprolu	492.68%	110.30%	109.39%	110.66%	112.61%	115.06%	115.27%	114.89%	112.48%	110.21%	110.73%	110.48%	108.84%	107.26%	106.39%
10	Gooty	350.68%	103.00%	104.39%	112.62%	115.90%	122.99%	132.35%	135.51%	141.09%	140.83%	142.50%	143.45%	146.33%	149.18%	148.60%
11	Gudur - Knl	687.85%	105.62%	104.20%	103.79%	101.72%	101.40%	100.57%	100.85%	99.81%	98.46%	96.05%	95.25%	93.36%	92.43%	92.15%
12	Guntur Merged villages	179.88%	102.35%	105.68%	111.62%	114.67%	117.09%	120.36%	121.40%	121.92%	122.76%	121.14%	120.99%	119.52%	119.06%	124.38%
13	Ichapuram	519.46%	111.95%	114.65%	115.46%	114.93%	113.76%	112.47%	112.09%	110.00%	109.74%	108.44%	107.07%	104.31%	103.20%	100.29%
14	Jaggaiahpet	12181.95%	338.17%	337.84%	306.93%	314.28%	290.63%	270.78%	298.65%	276.79%	259.73%	269.66%	252.93%	241.12%	247.13%	237.66%
15	Jangareddygudem	393.96%	133.42%	142.38%	144.60%	156.31%	162.62%	172.28%	175.75%	199.61%	204.16%	215.25%	218.66%	234.67%	234.63%	232.96%
16	Kalyanadurgam	292.40%	104.08%	109.47%	115.44%	120.04%	127.20%	133.31%	135.89%	137.44%	138.58%	139.81%	149.27%	158.39%	164.79%	173.14%
17	Kanigiri	498.01%	103.86%	105.88%	109.61%	111.62%	114.53%	116.70%	117.56%	117.40%	117.02%	117.08%	119.19%	119.33%	119.53%	120.27%
18	Kovvuru	701.84%	126.89%	133.66%	138.94%	142.35%	146.75%	148.41%	149.04%	147.92%	146.62%	145.19%	145.80%	144.46%	144.92%	143.80%
19	Macherla	933.92%	125.49%	128.70%	128.08%	134.83%	133.25%	129.73%	134.59%	132.15%	128.63%	130.49%	126.20%	124.39%	127.04%	123.71%
20	Madakisara	952.83%	106.39%	107.46%	108.87%	106.86%	106.96%	107.78%	109.45%	109.99%	108.71%	106.92%	107.57%	105.04%	105.85%	106.50%
21	Mangalagiri	1434.09%	129.09%	132.59%	133.64%	136.45%	134.54%	129.39%	134.33%	131.95%	126.79%	127.10%	122.06%	120.30%	120.42%	116.60%
22	Mummadivaram	544.34%	105.84%	106.34%	103.84%	108.15%	106.48%	108.07%	111.58%	108.04%	107.74%	105.40%	102.42%	102.26%	102.20%	98.54%
23	Mydukur	628.68%	105.13%	106.43%	109.10%	110.94%	113.46%	115.17%	115.96%	115.39%	114.65%	114.71%	116.27%	117.14%	116.84%	117.10%
24	Naidupet	584.67%	105.37%	103.40%	104.36%	105.23%	105.97%	105.92%	105.04%	103.69%	102.15%	101.91%	100.51%	98.78%	98.32%	97.94%
25	Nandigama	523.87%	122.00%	130.55%	131.78%	134.76%	132.90%	128.45%	132.16%	129.88%	125.37%	124.88%	120.46%	118.67%	118.61%	115.12%
26	Nandikotkur	489.59%	101.80%	101.98%	103.57%	104.18%	105.17%	105.60%	105.52%	104.45%	103.27%	102.69%	103.41%	103.63%	103.07%	102.85%
27	Narsipatnam	388.11%	102.84%	104.32%	103.47%	104.71%	104.10%	102.80%	103.11%	103.11%	99.82%	98.88%	98.52%	95.49%	95.64%	94.20%
28	Nellimarla	1593.52%	135.58%	134.80%	128.17%	135.08%	128.83%	123.17%	129.09%	123.50%	119.06%	122.35%	115.78%	113.35%	115.67%	111.28%
29	Nellore	444.57%	106.68%	104.50%	103.30%	105.44%	104.61%	103.45%	104.87%	104.68%	103.04%	103.25%	100.55%	97.71%	95.80%	93.93%
30	Nidadavolu	789.91%	124.38%	128.11%	129.13%	134.55%	137.23%	140.32%	141.38%	140.61%	138.64%	140.02%	140.41%	141.05%	141.23%	140.28%
31	Palakollu	361.05%	119.77%	126.92%	135.15%	143.01%	146.19%	144.88%	146.81%	148.46%	145.51%	145.36%	143.90%	143.10%	141.23%	138.71%
32	Palakonda	577.94%	111.63%	112.79%	112.27%	114.66%	113.99%	111.90%	113.71%	112.51%	110.10%	110.02%	107.40%	106.26%	107.08%	104.25%
33	Palasa-Kasibugga	416.29%	110.76%	111.68%	111.54%	110.68%	108.97%	107.22%	106.59%	104.20%	103.37%	101.97%	100.04%	97.22%	95.72%	92.81%
34	Paamidi	687.85%	105.62%	104.20%	103.79%	101.72%	101.40%	100.57%	100.85%	99.81%	98.46%	96.05%	95.25%	93.36%	92.43%	92.15%
35	Parvathipuram	529.60%	116.02%	117.63%	117.53%	117.01%	115.25%	113.43%	113.38%	110.82%	110.05%	108.85%	107.17%	104.10%	103.12%	99.96%
36	Pedana	521.53%	101.23%	104.18%	109.43%	115.67%	122.36%	126.82%	131.15%	132.82%	134.60%	140.48%	145.01%	147.65%	150.98%	155.06%
37	Piduguralla	1697.31%	132.89%	135.92%	136.75%	139.45%	137.16%	131.74%	137.20%	134.48%	129.07%	129.61%	124.33%	122.42%	122.65%	118.58%
38	Puttaparthi	415.74%	106.86%	109.24%	110.05%	111.81%	114.65%	111.94%	110.58%	107.69%	105.80%	103.57%	101.12%	100.00%	97.98%	95.82%
39	Puttur	831.24%	105.63%	103.60%	102.64%	103.09%	103.94%	103.99%	103.13%	101.39%	99.53%	98.94%	97.63%	96.04%	94.97%	94.00%
40	Salur	588.64%	112.71%	116.48%	117.19%	116.76%	114.74%	113.38%	115.25%	113.76%	111.73%	110.80%	112.19%	109.47%	110.57%	107.59%
41	Sullurpet	2175.40%	124.73%	122.96%	125.59%	125.29%	125.15%	123.69%	123.04%	120.55%	119.51%	117.91%	118.80%	115.91%	116.13%	115.34%
42	Tadepalli	521.39%	114.45%	118.31%	121.11%	122.46%	120.77%	120.34%	120.09%	117.21%	115.51%	115.23%	114.82%	111.63%	110.49%	107.45%
43	Tanuku	2419.21%	159.15%	166.83%	176.90%	190.25%	194.12%	191.49%	193.78%	192.15%	190.33%	190.56%	189.60%	185.83%	185.19%	182.38%
44	Tiruvuru	294.35%	118.74%	127.25%	128.43%	129.76%	130.14%	126.69%	127.65%	123.98%	122.18%	119.09%	120.44%	118.03%	116.22%	113.88%
45	Vinukonda	521.54%	118.70%	127.33%	129.27%	132.37%	130.94%	126.73%	129.90%	127.99%	123.70%	123.02%	118.81%	117.08%	116.87%	113.64%
46	Vuyyuru	1073.73%	134.53%	137.62%	135.97%	137.91%	137.97%	133.18%	136.25%	130.85%	130.99%	128.09%	127.32%	121.91%	120.41%	119.25%
47	Yelamanchili	514.10%	105.93%	106.36%	106.35%	105.41%	104.48%	103.41%	101.73%	99.28%	97.57%	96.90%	95.14%	93.11%	92.43%	90.20%
48	Yeeswaram	806.74%	111.92%	113.29%	116.61%	116.69%	117.78%	119.80%	120.84%	118.71%	116.67%	115.73%	116.71%	115.49%	114.69%	114.52%
49	Yemmiganur	677.35%	106.50%	106.29%	105.53%	106.41%	104.57%	102.38%	102.27%	99.62%	98.82%	98.78%	97.24%	94.40%	93.03%	90.85%
50	Yerraguntla	381.68%	105.42%	107.97%	108.84%	113.68%	113.67%	113.63%	113.91%	113.09%	112.12%	110.39%	109.55%	109.37%	109.75%	108.22%
Min		179.88%	99.39%	96.59%	93.85%	92.38%	89.99%	87.37%	86.30%	83.54%	80.89%	79.16%	76.36%	73.63%	71.67%	69.40%
Max		12181.95%	338.17%	337.84%	306.93%	314.28%	290.63%	270.78%	298.65%	276.79%	259.73%	269.66%	252.93%	241.12%	247.13%	237.66%
Average		920.02%	117.61%	119.54%	120.57%	123.04%	123.26%	122.65%	124.43%	123.32%	121.55%	121.59%	120.46%	119.24%	119.35%	118.03%
Median		561.14%	108.25%	109.32%	112.15%	114.71%	114.90%	115.22%	115.61%	114.68%	114.18%	114.30%	114.09%	112.08%	112.43%	112.11%

**Table 15: Cost recovery under (iii) combined worst-case scenario**

Sl.No.	ULB Name	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
		2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34	2034-35	2035-36
1	Amudalavalsa	625.83%	93.83%	93.71%	94.65%	99.91%	97.85%	96.77%	98.37%	98.42%	95.71%	95.26%	92.69%	91.18%	92.30%	89.62%
2	Atmakur - Knl	368.58%	92.52%	92.37%	95.84%	97.72%	98.74%	100.87%	100.27%	101.80%	101.51%	101.70%	101.21%	100.43%	100.91%	101.82%
3	Addanki	651.74%	94.65%	92.60%	93.79%	92.40%	94.04%	93.01%	93.06%	93.74%	91.19%	91.27%	89.28%	88.31%	86.92%	86.07%
4	Allagadda	619.20%	98.36%	97.56%	100.69%	103.01%	105.42%	106.95%	106.71%	106.34%	105.70%	106.26%	105.47%	104.31%	104.81%	105.46%
5	Bobilli	570.92%	105.00%	111.46%	114.74%	119.16%	122.30%	126.04%	133.16%	135.68%	141.00%	144.68%	148.29%	149.70%	154.52%	155.50%
6	Chimakurthy	425.12%	96.11%	95.07%	97.53%	97.38%	98.71%	99.33%	100.24%	101.04%	100.05%	99.56%	99.79%	99.44%	99.86%	100.86%
7	Chittoor Distribution	733.47%	89.33%	86.76%	84.26%	83.03%	80.85%	78.44%	77.60%	75.07%	72.65%	71.17%	68.62%	66.14%	64.40%	62.33%
8	Giddalur	323.78%	105.10%	105.76%	113.84%	118.17%	123.59%	127.97%	127.37%	128.83%	129.84%	131.23%	130.84%	130.06%	132.50%	135.43%
9	Gollaprolu	481.93%	99.07%	98.08%	99.15%	100.95%	103.13%	103.23%	102.92%	100.70%	98.62%	99.15%	98.90%	97.37%	95.95%	95.16%
10	Gooty	340.41%	92.15%	93.30%	100.63%	103.55%	109.84%	118.13%	120.96%	125.92%	125.62%	127.13%	127.96%	130.48%	133.03%	132.48%
11	Gudur - Knl	677.51%	94.97%	93.50%	93.07%	91.26%	90.94%	90.14%	90.51%	89.50%	88.23%	86.12%	85.41%	83.67%	82.85%	82.57%
12	Guntur Merged villages	179.88%	91.15%	94.10%	99.38%	102.09%	104.23%	107.13%	108.06%	108.51%	109.25%	107.81%	107.67%	106.35%	105.95%	110.66%
13	Ichapuram	519.46%	100.38%	102.64%	103.27%	102.80%	101.70%	100.51%	100.25%	98.32%	98.08%	96.94%	95.67%	93.16%	92.20%	89.56%
14	Jaggiahpet	12181.95%	325.17%	323.57%	292.17%	299.05%	275.40%	255.98%	283.91%	262.30%	245.66%	255.84%	239.53%	227.97%	234.12%	224.07%
15	Jangareddygudem	382.48%	119.43%	127.29%	129.17%	139.73%	145.25%	153.81%	156.91%	178.18%	182.09%	192.01%	194.98%	209.21%	209.12%	207.59%
16	Kalyanadurgam	282.17%	92.97%	97.72%	103.00%	107.11%	113.47%	118.86%	121.19%	122.53%	123.52%	124.63%	133.04%	141.14%	146.83%	154.24%
17	Kanigiri	487.69%	92.95%	94.68%	97.96%	99.79%	102.35%	104.24%	105.05%	104.85%	104.48%	104.57%	106.42%	106.50%	106.68%	107.32%
18	Kovvuru	690.86%	114.29%	120.08%	124.62%	127.71%	131.59%	132.96%	133.59%	132.51%	131.26%	130.05%	130.57%	129.29%	129.73%	128.65%
19	Macherla	922.87%	113.56%	116.22%	115.38%	121.61%	119.96%	116.66%	121.26%	118.88%	115.63%	117.47%	113.46%	111.77%	114.20%	111.11%
20	Madakisara	942.49%	95.89%	96.77%	97.95%	96.14%	96.20%	96.88%	98.49%	98.91%	97.64%	96.07%	96.65%	94.27%	95.06%	95.59%
21	Mangalagiri	1434.09%	116.89%	119.73%	120.54%	122.98%	121.06%	116.34%	121.02%	118.71%	113.99%	114.39%	109.78%	108.13%	108.29%	104.76%
22	Mummadivaram	533.59%	94.84%	95.20%	92.90%	96.85%	95.28%	96.66%	99.87%	96.62%	96.31%	94.26%	91.57%	91.41%	91.36%	88.04%
23	Maydukur	618.40%	94.38%	95.45%	97.77%	99.46%	101.67%	103.12%	103.89%	103.32%	102.60%	102.70%	104.06%	104.78%	104.50%	104.70%
24	Naidupet	574.53%	94.99%	93.09%	93.88%	94.74%	95.36%	95.22%	94.51%	93.23%	91.77%	91.63%	90.34%	88.71%	88.31%	87.92%
25	Nandigama	523.87%	109.80%	117.34%	118.19%	120.85%	119.04%	114.99%	118.49%	116.32%	112.22%	111.87%	107.85%	106.22%	106.21%	103.00%
26	Nandikotkur	479.27%	91.18%	91.27%	92.64%	93.23%	94.09%	94.43%	94.39%	93.39%	92.30%	91.83%	92.45%	92.60%	92.09%	91.87%
27	Narsipatnam	377.36%	91.80%	93.08%	92.30%	93.44%	92.87%	91.68%	92.01%	91.98%	89.01%	88.21%	87.87%	85.14%	85.29%	83.99%
28	Nellimarla	1582.72%	124.28%	123.20%	116.54%	123.21%	117.02%	111.61%	117.47%	112.03%	107.86%	111.22%	104.91%	102.66%	104.93%	100.77%
29	Nellore	434.23%	96.07%	93.95%	92.79%	94.83%	93.99%	92.86%	94.27%	94.04%	92.48%	92.74%	90.23%	87.63%	85.95%	84.23%
30	Nidadavolu	778.41%	112.06%	115.20%	115.96%	120.92%	123.23%	125.89%	126.90%	126.11%	124.26%	125.59%	125.87%	126.37%	126.51%	125.60%
31	Palakollu	349.45%	107.35%	113.66%	120.92%	127.95%	130.69%	129.41%	131.22%	132.66%	129.92%	129.84%	128.50%	127.75%	126.08%	138.71%
32	Palakonda	567.19%	100.15%	101.04%	100.45%	102.66%	101.99%	100.06%	101.78%	100.64%	98.43%	98.42%	96.03%	94.98%	107.08%	104.25%
33	Palasa-Kasibugga	416.29%	99.37%	100.05%	99.83%	99.09%	97.52%	95.91%	95.43%	93.25%	92.49%	91.26%	89.50%	86.93%	85.61%	82.98%
34	Paamidi	677.51%	94.97%	93.50%	93.07%	91.26%	90.94%	90.14%	90.51%	89.50%	88.23%	86.12%	85.41%	83.67%	82.85%	82.57%
35	Parvathipuram	518.85%	104.54%	105.77%	105.55%	105.11%	103.46%	101.76%	101.84%	99.47%	98.75%	97.72%	96.15%	93.32%	92.48%	89.59%
36	Pedana	521.53%	97.55%	96.74%	97.92%	99.74%	101.67%	101.55%	101.20%	98.76%	96.44%	96.99%	96.48%	94.66%	93.28%	92.32%
37	Piduguralla	1697.31%	120.69%	123.06%	123.66%	125.97%	123.68%	118.69%	123.89%	121.24%	116.27%	116.90%	112.05%	110.25%	110.52%	106.73%
38	Puttaparthi	405.44%	95.79%	97.78%	98.40%	100.02%	102.55%	100.00%	98.85%	96.23%	94.52%	92.56%	90.35%	89.34%	87.53%	85.58%
39	Puttur	820.92%	95.15%	93.20%	92.27%	92.77%	93.49%	93.44%	92.74%	91.13%	89.39%	88.93%	87.72%	86.23%	85.28%	84.36%
40	Salur	577.89%	101.49%	104.78%	105.26%	104.90%	103.00%	101.72%	103.56%	102.13%	100.22%	99.46%	100.68%	98.14%	99.16%	96.41%
41	Sullurpet	2175.40%	113.91%	111.99%	114.20%	114.03%	113.71%	112.23%	111.85%	109.47%	108.39%	107.08%	107.82%	105.02%	105.29%	104.45%
42	Tadepalli	510.34%	102.57%	105.90%	108.33%	109.58%	107.98%	107.58%	107.41%	104.77%	103.23%	103.05%	102.62%	99.71%	98.72%	95.97%
43	Tanuku	2419.21%	145.02%	151.56%	160.29%	172.44%	175.57%	172.85%	175.24%	173.62%	171.76%	172.15%	171.10%	167.52%	167.00%	164.32%
44	Tiruvuru	283.30%	106.01%	113.50%	114.49%	115.68%	115.97%	112.87%	113.78%	110.47%	108.85%	106.12%	107.34%	105.15%	103.55%	101.44%
45	Vinukonda	510.49%	106.51%	114.12%	115.69%	118.47%	117.09%	113.28%	116.24%	114.45%	110.57%	110.02%	106.22%	104.64%	104.48%	101.55%
46	Vuyyuru	1073.73%	121.76%	124.17%	122.44%	124.22%	124.08%	119.66%	122.67%	117.66%	117.71%	115.19%	114.53%	109.49%	108.24%	107.08%
47	Yelamanchili	514.10%	94.82%	95.12%	95.05%	94.24%	93.38%	92.39%	90.93%	88.72%	87.17%	86.62%	85.00%	83.16%	82.58%	80.55%
48	Yeleswaram	796.04%	100.65%	101.75%	104.64%	104.75%	105.70%	107.43%	108.41%	106.42%	104.53%	103.76%	104.62%	103.45%	102.72%	102.54%
49	Yemmiganur	667.08%	96.03%	95.69%	94.89%	95.79%	94.03%	91.97%	92.00%	89.53%	88.79%	88.82%	87.36%	84.73%	83.55%	81.52%
50	Yerraguntla	371.25%	94.39%	96.55%	97.26%	101.64%	101.56%	101.48%	101.79%	101.01%	100.11%	98.61%	97.83%	97.64%	97.99%	96.58%
Min		179.88%	89.33%	86.76%	84.26%	83.03%	80.85%	78.44%	77.60%	75.07%	72.65%	71.17%	68.62%	66.14%	64.40%	62.33%
Max		12181.95%	325.17%	323.57%	292.17%	299.05%	275.40%	255.98%	283.91%	262.30%	245.66%	255.84%	239.53%	227.97%	234.12%	224.07%
Average		912.36%	106.64%	108.21%	108.98%	111.27%	111.35%	110.70%	112.48%	111.38%	109.73%	109.86%	108.77%	107.60%	107.99%	107.01%
Median		550.39%	98.72%	97.93%	100.54%	102.73%	103.06%	103.18%	103.73%	102.72%	102.05%	102.20%	101.92%	100.07%	101.82%	101.15%

## Annex 5: Sovereign Credit Fact Sheet

### A. Recent Economic Development

India is a lower-middle-income country, with a population of 1.31 billion. Indian real GDP expanded at an average annual rate of 7.3 percent between FY2003 and FY2012, however, growth had slowed to 5.6 percent and 6.4 percent in FY2012/13 and FY2013/14 because of growing imbalances, binding supply constraints, and subdued sentiment. Since 2014, the Indian economy has been on a gradual cyclical recovery, helped by lower commodity prices bringing about an improvement in the current account.

The Indian economy is also supported by structural reforms, such as a new bankruptcy code and the implementation of the pan-India GST. A range of supply-side measures (including release of surplus grain buffer stocks), an appropriate monetary stance and lower oil price have also contributed to the decline in inflation, from an average of about 9.8 percent during 2011-2013 to 4.9 percent in FY2015/2016. Nevertheless, the demonetization initiative resulted in a slower growth in FY2016/2017. The Rupee has weakened with global capital outflow from emerging market assets.

### B. Economic Indicators

#### Selected Macroeconomic Economic indicators (2013/2014-2017/2018)

Economic Indicators	2013/14	2014/15	2015/16	2016/17*	2017/18*
National income and prices (change %)					
Real GDP Growth	6.4	7.5	8.0	7.1	6.7
Inflation (change %, average)	9.4	5.8	4.9	4.5	3.8
Central government operations (% of GDP)					
General government overall balance	-7.6	-7.3	-7.0	-6.8	-6.6
External debt (% of GDP, EOP)	23.9	23.3	23.4	22.9	22.7
Nominal gross public debt (% of GDP)		68.3	69.8	69.6	68.8
Money and credit					
Broad money (% annual change, EOP)	13.4	10.9	10.5	12.0	13.4
Direct investment in India (net, % of GDP)	-1.2	-1.5	-1.7	-1.7	-1.7
Gross reserves (months imports)	6.7	8.5	8.6	8.1	7.9
Current account balance (% of GDP)	-1.7	-1.3	-1.1	-0.7	-1.4
Exchange rate (Rupee/\$, end period)	61.0	62.6	66.6	68.4	

Note: \* denotes projected figures. IMF Country Report No. 17/54, February 2017, WEO April, July, October, 2017.

## C. Economic Outlook and Risks

Looking ahead, India's growth is projected to slow to 7.1 percent in FY2016/17 before rebounding to 7.4 percent in FY2018/19. This is due to the temporary disruptions, particularly in private consumption, caused by cash shortages accompanying the demonetization. The current account deficit is expected to widen to about two percent of GDP over the medium term on the back of stronger domestic demand and possible increase in commodity prices.

External risks include financial market volatility and slower growth in China, EU and US. Internally, India faces some risk arising from potential deterioration of corporate and public bank balance sheets, and setbacks in the reform process including implementation of GST on the domestic side. India's public debt remains sustainable given manageable interest rate costs and robust growth outlook. Assuming gradual fiscal consolidation and implementation of GST, the public debt-to-GDP ratio is forecast to decline gradually to around 61 percent of GDP in the medium term from the current level of almost 70 percent. Negative growth shocks represent one of the major risks to the debt outlook. India's external debt, currently at 23.5 percent of GDP, remains sustainable.<sup>46</sup>

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<sup>46</sup> International Monetary Fund (IMF), 2017. Country Report No. 17/54—2017 Article IV Consultation—Press Release; Staff Report; and Statement by the Executive Director for India, February, 2017.



## Annex 6: Procurement Principles Checklist and Procurement Plan

### Core Procurement Principles and Procurement Standards—Checklist

CRITERIA	REVIEW
1. <b>Economy</b> —Procurement process demonstrates that the total price outcome of the of contracts for goods works and services, including economic life and cycle costs, does not have a negative impact on the Project	<p>This is an established principle in PHMED’s practices. The procurement approach has been well thought through; aiming to strike a balance to attract wide competition of competent contractors capable to carry out the works and the maintenance obligations.</p> <p><b>Criterion met</b></p>
2. <b>Efficiency</b> —Procurement implementation arrangements are proportional to the required outcome with regard to implementation capacity and time constraints and are effective.	<p>The agreed implementation arrangements have been discussed at length. PHMED and AIIB agreed the amalgamation of contracts/works per packages, based on the geographical distribution per circle, the scope of works, the estimate cost, the procurement approach and method (ICT and NCT) are deemed appropriate to ensure an efficient contracting and (more importantly) implementation. PHMED also had to comply with achieving at least 30 percent of contract to be ready to be awarded prior signing of the Loan. On this basis the agreed implementation arrangements are considered efficient.</p> <p><b>Criterion met</b></p>
3. <b>Effectiveness</b> —The procurement process facilitates the achievement of the ultimate objectives of the Project taking into account the recipient’s socio-economic and other development objectives	<p>The PDS and its implementation steps and processes to be carried out serve well the Project’s aim and objective and have been crafted with the purpose of facilitating achievement of the ambitious Project’s goals. Contracts are organized in two groups to separate the two technically different tasks of providing water and distributing water, respectively, which will help to ensure effective implementation.</p> <p><b>Criterion met</b></p>
4. <b>Fairness; good governance</b> —The procurement process is open, fair, nondiscriminatory and provides equitable opportunity and treatment for tenderers and consultants in their submission of tenders and proposals. It also provides for clear rights and obligations as between Recipients on the one hand and suppliers, contractors,	<p>PHMED jurisdiction by law and internal decision-making process is well defined and the level of responsibilities clearly identified, mostly determined by the estimated cost of the contract and the applicable government order (GO) provisions to day-to-day embrace the principles of fairness and good governance. PHMED has a good track record and successfully manages high number of contracts with a quick turnover.</p> <p><b>Criterion met</b></p>



CRITERIA	REVIEW
and consultants on the other. The procurement process is aligned with principles of good governance.	
<p><b>5. Value for Money (VfM)—</b></p> <p>The procurement process enables the Recipient to obtain optimal benefits with the resources utilized. This may include not only the initial costs but also costs over the economic life of the procure items, the quality of the output, fitness-for-purpose, timeliness, and the achievement of other socioeconomic and environmental development objectives of the recipient, Price alone may not necessarily represent VfM.</p>	<p>PHMED is used to operate under the applicable GO that embraces in full the principle of value for money. To achieve this a very well-oiled mechanism is in place to streamline the technical requirements, continuous review and update of the applicable common Schedule of Rates (SORs) published by the GoAP have created an efficient and competitive market place. To guarantee sustainability, the contract will include a period of maintenance beyond the defects notification period (established practice in AP) by the Contractor so that they will have to ensure that quality and not only low prices are duly considered during tender preparation, evaluation and contract implementation. ULBs will be trained in O&amp;M during implementation and will take over O&amp;M after completion.</p> <p><b>Criterion met</b></p>
<p><b>6. Fit-for-Purpose (FfP)—</b>To realize VfM, the procurement process ensures that the procurement methods and procedures applied by the Recipient for the Project, and the nature and extent of bank oversight are FfP. The procurement modalities appropriately reflect the strategic needs and circumstances of the situation. Standardized approaches maybe used for low value low-risk or low complexity procurement. Where procurement complexity, risk and impact are high, a customized approach with transaction-specific documentation and method may be the most efficient and effective approach.</p>	<p>Albeit not explicitly spelled out GO provisions applicable to PHMED procurement aim at achieving FfP by a strong upstream technical preparation based on widely publicly available standards and the use of e-procurement platform at GoI level. During the preparation of the PDS a well-crafted procurement approach has been agreed considered: the relatively low technical complexity; the degree of geographical distribution (13 districts across the AP); the average estimated cost; and the need to ensure reliable and competent contact are attracted given the required engagement for maintenance period. On this basis the proposed procurement approach is ICT for bulk-water contracts and NCT for distribution systems contracts using Standard Bid Documents (SBDs) coupled with GoI e-procurement platform and adequate project implementation supervision by PHMED and PMC is considered to be FfP.</p> <p><b>Criterion met</b></p>
<p><b>7. Transparency—</b>AIIB is committed to achieving a high level of transparency under each project. Transparency during the procurement process is a key element in establishing a</p>	<p>All procurement opportunities will receive adequate level of publicity and access to information. A General Procurement Notice (GPN) has been published on UNDB and on AIIB's website as well as on PHMED's. The use of the GoI e-procurement platform for all the specific notices is coupled with publication on newspaper. On this</p>

CRITERIA	REVIEW
good procurement outcome. To this end, sufficient and relevant information is required to be made available in an open manner to interested parties and for appropriate scrutiny.	basis it is deemed that the information on project's procurement opportunities will be adequately publicized. The Selection for the PMC has attracted 20 Consulting firms, including foreign participants.  <b>Criterion met</b>
PROCUREMENT STANDARDS	REVIEW
<b>(a) Planning</b> —Strategic Procurement Planning	PHMED is required to plan one year ahead for their budget purposes, and the due diligence has demonstrated that from the preparation of technical documentation through to tendering process and implementation a good degree of discipline in planning ahead is achieved.
<b>(b) Transparency</b> —Transparent and unless other approaches are adequately justified, international competitive processes	<b>See above</b>
<b>(c) Optimized balance</b> between price and quality to generate desired development results on a sustainable basis	PHMED has a strong technical competence in-house and widely available standards to determine rates. The good quality of technical documentation along with clear, transparent and unambiguous pricing mechanism have nurtured a marketplace that delivers quality contracts, on time and on budget in most cases.
<b>(d) Credible recourse</b> and impartial and equitable dispute resolution: integrity throughout the procurement process including during contract management and closure	The form of Contract used for the project is the Standard for WB and it does include provisions to ensure an equitable resolution of any disputes and the Bank's Policy on Prohibited Practices apply in full to the Project.
<b>(e) Quality assurance</b> , compliance checks, audits inspections and as appropriate third-party verification	PHMED will apply the well-known "three tiers" quality control (applicable to most Indian public-sector projects) coupled by PMC support during implementation; moreover, it has been agreed to include a third-party technical audit on a portion of the executed contracts.
<b>(f) Credible mechanism</b> to address complaints of bidders and providers of goods works and consulting services	Procurement Complaints are rare in Andhra Pradesh. However, the SBDs provide for a clear mechanism to lodge a complaint throughout the procurement process and a mechanism to handle that. Moreover, AIIB will monitor such events should occur as provided for by the bank's Procurement Policy.

## Procurement Plan

Description		Estimated contract value USD .000	Contract type	Procurement method	Bank's Prior Review	Tender Invitation	Contract Award	Construction contract completion	O&M contract completion
PHASE I - Circle	PHASE I Districts/ULBs								
Package 1 - Anantapur	Kadapa (2 ULBs) Kurnool (5ULBs) Anantapur (5 ULBs)	90,000	Works	IOCT	Y	Sep-18	Nov-18	Nov-20	Nov-27
Package 2 - Nellore	Chittoor (2 ULBs) Nellore (3 ULBs) Prakasam (4 ULBs)	80,000	Works	IOCT	Y	Sep-18	Nov-18	Nov-20	Nov-27
Package 3 - Anantapur	Anantapur (5ULBs)	30,000	Works	NCT	N	Sep-18	Nov-18	Nov-20	Nov-27
Package 4 - Kadapa	Kadapa (2 ULBs)	10,000	Works	NCT	N	Sep-18	Nov-18	Nov-20	Nov-27
Package 5 - Kurnool	Kurnool (5 ULBs)	30,000	Works	NCT	N	Sep-18	Nov-18	Nov-20	Nov-27
Package 6 - Nellore	Nellore (6ULBs)	20,000	Works	NCT	N	Sep-18	Nov-18	Nov-20	Nov-27
Package 7 - Chittoor District	Chittoor (2 ULBs)	10,000	Works	NCT	N	Sep-18	Nov-18	Nov-20	Nov-27
Package 8 - Prakasam District	Prakasam (4ULBs)	20,000	Works	NCT	N	Sep-18	Nov-18	Nov-20	Nov-27
Package 9 Sanitation (Pilot)	5 ULBs	6,000	Works	NCT	N	Sep-18	Nov-18	Nov-20	Nov-27
Package 10 - Drainage WW Treatment (Pilot)	5 ULBs	7,500	Works	NCT	N	Sep-18	Nov-18	Nov-20	Nov-27
Phase II - Circle	Phase II - Districts/ULBs								
Package 11 - Rajamundry	Guntur - Krishna Districts	45,000	Works	IOCT	TBC	Jan-19	Apr-19	Apr-21	Apr-28
Package 12 - Guntur	West & East Godavari Districts	40,000	Works	IOCT	TBC	Jan-19	Apr-19	Apr-21	Apr-28
Package 13 - Visakhapatnam	Visakhapatnam + Vizianagaram & Srikakulam Districts	50,000	Works	IOCT	TBC	Jan-19	Apr-19	Apr-21	Apr-28
Package 14 - Guntur	6 ULBs	24,000	Works	NCT	TBC	Jan-19	Apr-19	Apr-21	Apr-28
Package 15 - Krishna	Tiruvuru & Vuyyuru	20,000	Works	NCT	TBC	Jan-19	Apr-19	Apr-21	Apr-28
Package 16 - West Godavari	5 ULBs	20,000	Works	NCT	TBC	Jan-19	Apr-19	Apr-21	Apr-28
Package 17 - East Godavari	3 ULBs	12,000	Works	NCT	TBC	Jan-19	Apr-19	Apr-21	Apr-28
Package 18 - Visakhapatnam	2 ULBs	8,000	Works	NCT	TBC	Jan-19	Apr-19	Apr-21	Apr-28
Package 19 - Vizianagaram	4 ULBs	16,000	Works	NCT	TBC	Jan-19	Apr-19	Apr-21	Apr-28
Package 20 - Srikakulam	4 ULBs	16,000	Works	NCT	TBC	Jan-19	Apr-19	Apr-21	Apr-28
Project Management Consultant		4,200.0	Consultancy	IOCT	Y	Jul-18	Nov-18		
Institutional Component		11,300.00	Consultancy	IOCT/Competitive	TBC	Oct-18	Dec-18		
<b>Total:</b>		<b>570,000.00</b>							

## Annex 7: Organization of the Institutional Component

**OVERALL OBJECTIVE:**  
To improve water supply and sanitation for ½ million HHs in AP, and...

