Project Number: TA 7954
August 2012

India: Karnataka Integrated and Sustainable Water Resources Management Investment Program

This consultant’s report does not necessarily reflect the views of ADB or the Government concerned, and ADB and the Government cannot be held liable for its contents. (For project preparatory technical assistance: All the views expressed herein may not be incorporated into the proposed project’s design.)
Foreword

This Draft Final Report has been prepared as a deliverable of the PPTA-7954 IND: “Karnataka Integrated and Sustainable Water Resources Management Investment Programme – Urban Water and Sanitation Component”.

The comments made in this Report are not made to criticise, but as a means of achieving the required long-term institutional and financial improvements that the stakeholders, including ULB staff desire. Considering the scarcity of staff, the lack of any structured approach to UWSS management is inevitable. The service is maintained through the dedication of the ULB and the operational staff, and their desire to provide the best service within their capability to provide.

During the preparation this Report, I have unashamedly plagiarised from the work of others, in particularly for the institutional “as is” position. The reason is simple. The issues facing the sector are well known, and well documented. Previous Reports and Studies have both adequately described these issues, and the comments made have been accepted by Stakeholders. Consequently, I saw little point in re-visiting the issues, but instead concentrated on the changes to be implemented for the future – the “Criteria for Success”, as we have called them. Although it is not possible to reference each incidence of usage from the Report of CDTA7418, the CLIPS, DPRs and ADB Aide Memoires, even our own ToR, the use of these documents is acknowledged now. I would add that the work by my colleagues in assessing the technical and financial issues from their site visits and meetings is unique, as is the work of the safeguard experts.

During the course of the preparation of the Report, considerable advice, guidance and assistance has been provided by the Steering Committee and the staff of the KUIDFC, the local ULBs, KUWS&DB and by the engineering staff responsible for the existing on-going UWSS projects within the subject towns. This kind assistance, without which this Report could not have been produced, is herewith duly acknowledged and credited.

In particular, the assistance and advice offered by the Managing Director of the KUIDFC and our Core Nodal Officer has been essential. Many of the recommendations made in this Report are theirs. I have merely taken their suggestions, polished them and fitted them into the overall context of the Programme.

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<th>Abbreviation</th>
<th>Full term</th>
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<tbody>
<tr>
<td>ADB</td>
<td>Asian Development Bank</td>
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<tr>
<td>CC</td>
<td>City Corporation</td>
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<tr>
<td>CDTA</td>
<td>Capacity Development Technical Assistance</td>
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<tr>
<td>CLIP</td>
<td>City Level Investment Plan</td>
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<tr>
<td>CMC</td>
<td>City Municipal Councils</td>
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<tr>
<td>DPR</td>
<td>Detailed Project Report</td>
</tr>
<tr>
<td>DWSM</td>
<td>Drinking Water Supply Mission (proposed)</td>
</tr>
<tr>
<td>EA</td>
<td>Executing Agency</td>
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<tr>
<td>EARF</td>
<td>Environmental Assessment &amp; Review Procedure Framework</td>
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<tr>
<td>EARP</td>
<td>Environmental Assessment &amp; Review Procedure</td>
</tr>
<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
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<tr>
<td>ELSR</td>
<td>Elevated Storage Reservoir</td>
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<tr>
<td>EMP</td>
<td>Environmental Management Plan</td>
</tr>
<tr>
<td>FR</td>
<td>Final Report</td>
</tr>
<tr>
<td>FYP</td>
<td>(GoI) Five Year Plan</td>
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<tr>
<td>GO</td>
<td>Government (of Karnataka) Order</td>
</tr>
<tr>
<td>GoI</td>
<td>Government of India</td>
</tr>
<tr>
<td>GoK</td>
<td>Government of Karnataka</td>
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<tr>
<td>IEE</td>
<td>Initial Environmental Examination</td>
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<tr>
<td>ID&amp;IP</td>
<td>Infrastructure Development &amp; Investment Plan</td>
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<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>IPPF</td>
<td>Indigenous Peoples Development Plan</td>
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<tr>
<td>IND</td>
<td>India</td>
</tr>
<tr>
<td>IEE</td>
<td>Initial Environmental Examination</td>
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<tr>
<td>IWRM</td>
<td>Integrated Water Resource Management</td>
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<tr>
<td>KISWRMIP</td>
<td>Karnataka Integrated and Sustainable Water Resources Management Investment Programme</td>
</tr>
<tr>
<td>KUIDFC</td>
<td>Karnataka Urban Infrastructure Development &amp; Finance Corporation</td>
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<tr>
<td>KUWSDB</td>
<td>Karnataka Urban Water Supply &amp; Drainage Board</td>
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<tr>
<td>MFF</td>
<td>Multi-Tranche financing facility</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-Government Organisation</td>
</tr>
<tr>
<td>NKUSIP</td>
<td>North Karnataka Urban Sector Investment Program</td>
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<tr>
<td>NRW</td>
<td>Non-Revenue Water</td>
</tr>
<tr>
<td>O&amp;M</td>
<td>Operations &amp; Maintenance</td>
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<tr>
<td>PSA</td>
<td>Performance Service Agreement</td>
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<td>PCU</td>
<td>Project Co-ordination Unit</td>
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<td>PPP</td>
<td>Private Public Participation</td>
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<tr>
<td>(PP)TA</td>
<td>(Project Preparation) Technical Assistance</td>
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<td>(P)SC</td>
<td>(Programme) Steering Committee</td>
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<tr>
<td>REA</td>
<td>Rapid Environmental Assessment</td>
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<td>RF</td>
<td>Resettlement Framework</td>
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<td>RP</td>
<td>Resettlement Plan</td>
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<td>SPV</td>
<td>Special Purpose Vehicle</td>
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<td>Acronym</td>
<td>Full Form</td>
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<tr>
<td>SWP</td>
<td>State Water Policy</td>
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<tr>
<td>TMC</td>
<td>Town Municipal Council</td>
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<tr>
<td>TP</td>
<td>Town Panchayath</td>
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<tr>
<td>(D)TL</td>
<td>(Deputy) Team Leader</td>
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<tr>
<td>UDD</td>
<td>Urban Development Department</td>
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<tr>
<td>ULB</td>
<td>Urban Local Body</td>
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<tr>
<td>UDWSP</td>
<td>Urban Drinking Water &amp; Sanitation Policy</td>
</tr>
<tr>
<td>WB</td>
<td>World Bank</td>
</tr>
<tr>
<td>WRD</td>
<td>Water Resource Department</td>
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<tr>
<td>(U)WSS</td>
<td>(Urban)Water Supply &amp; Sanitation</td>
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<tr>
<td>WTP (W)</td>
<td>Water Treatment Plant (Works)</td>
</tr>
<tr>
<td>WWTP (W)</td>
<td>Wastewater Treatment Plant (Works)</td>
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Technical Abbreviations

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<thead>
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<th>Abbreviation</th>
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<tbody>
<tr>
<td>Kl</td>
<td>Kilolitre</td>
</tr>
<tr>
<td>km</td>
<td>Kilometre</td>
</tr>
<tr>
<td>l/hd/dy</td>
<td>Litres per head per day</td>
</tr>
<tr>
<td>ips</td>
<td>Litres per second</td>
</tr>
<tr>
<td>M</td>
<td>Million</td>
</tr>
<tr>
<td>Mld</td>
<td>Mega litre per day</td>
</tr>
<tr>
<td>m</td>
<td>Metre</td>
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<tr>
<td>mm</td>
<td>Millimetre</td>
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1. KNOWLEDGE SUMMARY

1. The reasons for poor Urban Water Supply and Sanitation (UWSS) sector performance are well known and do not need to be detailed in this Knowledge Summary:
   - Poor condition of UWSS assets, often beyond their reliable working life;
   - Lack of overall sector coordination and control, and
   - Insufficient capacity, particularly at Urban Local Body (ULB) level where there are neither sufficient operational staff members, or staff of the necessary calibre.

2. In many respects these have been due to:
   - Lack of priority afforded to urban water supply and sanitation;
   - Lack of investment, and
   - Politically driven tariffs that are insufficient to fund the Operation & Maintenance (O&M) of the assets, and their timely replacement.

3. The issues have manifested themselves in poor levels of service achieved:
   - Intermittent and insufficient water supplies;
   - Supplies subject to interruption due to asset failures and power cut-outs;
   - High levels of leakage that aggravate water availability to customers;
   - Poor levels of wastewater collection, and
   - Untreated sewage being discharged to water courses and being used directly for irrigation.

4. In the context of a rapidly developing area with increasing customer expectations and yet a scarcity of good quality water, the "Karnataka Integrated and Sustainable Water Resources Management Investment Programme (KISWRMIP) is being developed with the assistance of the Asian Development Bank (ADB) in order to ensure the adequacy and sustainability of water and wastewater service provision in the state of Karnataka.

5. The Programme is specifically required to take into account two cornerstones of the Government of India and the Government of Karnataka sector strategies – those of Integrated Water Resource Management (IWRM) and for the maximum use of Public Private Partnerships (PPP), and focuses on immediate investments to extend UWSS.

6. The Multi-Tranche Financing Facility’s (MFF) first tranche, Tranche-1, covers operationalisation of IWRM functions and investments for four ULBs in the upper Tunga Bhadra River basin. Other ULBs in the basin and water scarce sub-basins of Karnataka are to be covered during the subsequent tranche(s).

7. In our Report, the underlying issues have been assessed and recommendations for the consideration of stakeholders made in each of the strategic themes of Institutional, Technical, Customer Service and Financial.

8. Institutional issues at state level have been addressed in the Draft Cabinet Paper. The Paper proposes the establishment of a Drinking Water Supply Mission (DWSM) in a central coordinating role, and a Water Council as an embryonic Regulator; envisages the Karnataka Urban Water Supply and Drainage Board (KUWS&DB) as a bulk water supply entity and confirms the ULBs as the responsible water and wastewater utilities. We understand that the Paper has been fully discussed and has general acceptance. We have not concerned ourselves with institutional state issues, instead concentrating at the local ULB level.

9. At the local level, there is a recognised under capacity and capability. Addressing the lack of capacity is a main output of this Project Preparation Technical Assistance (PPTA).

10. In our discussions with the KUIDFC, and in line with Union and State policy, the use of a private operator is seen to be beneficial and desirable. The use of a private operator would both bring experience to the service provision which, if managed correctly could enable technology transfer to the ULBs, and would provide the additional resources.
11. Before the operation and maintenance of the facilities can be successfully introduced, four elements must be in place:
   - A sufficient number of experienced and competent operators to ensure a viable tendering process;
   - A customer service base of sufficient size to attract competent operators;
   - A competency in the client ULBs to be able to manage the contracts, and
   - Adequate data available to the bidding operators to enable them to assess the risk and make a viable bid without passing undue risk cost through to the client ULB.

12. We would respectfully suggest that perhaps only the first of these is currently present in Karnataka. In our opinion, with some limitation as discussed later, full scale operation of the water and wastewater systems by a contractor is a medium-term objective, and not for immediate introduction.

13. An objective of the project will be to put in place the measures to bring the ULBs to a position to be able to issue a tender for a PPP operator should they wish i.e. to ensure that there will be available to bidders the data that they will require to be able to make a competitive bid such as NRW performance and asset data/histories. The competency building will include for PPP operator project management.

14. Whilst some of the larger ULBs do have a customer base of adequate size to interest an operator; most do not. We are suggesting that ULBs associate themselves on a district basis in order to form a Special Purposes Vehicle (SPV) company to be the service provider for their administrative areas. Such an SPV would have the requisite customer service base. A draft Performance Service Agreement (PSA) is provided as an Appendix in which the service conditions to be met are set out in a series of Performance Indicators, based upon Customer Service Levels and Operational Standards.

15. As a means to bring financial incentive/penalty to the PSA, we agree with and have included the KUIDFC proposal that an SPV or ULB that is judged to be an unsatisfactory performer against the Indicators progressively has the MFF grant converted to a loan, with required interest payments as a “penalty”.

16. To assist with the establishments of the SPVs, and in consultation with the KUIDFC, we recommend that an IWRM Project Management Unit be formed in the KUIDFC. The unit, which would continue through subsequent MFF Tranche investments, would comprise KUIDFC employees with appropriate skills, supplemented as required by short-term consultants, national and international. In addition to assisting the establishment of the SPVs, the Unit would also directly assist the newly formed SVPs, and water departments of larger ULBs, to prepare corporate documentation such as a Business Plan and a Human Resource and Training Plan, as well as provide “centre of excellence” guidance for technical aspects e.g. non-revenue water reduction programmes, emergency response planning and asset inventories. In this way, the Unit will not only be introducing competency into the service provision but it would be ensuring the required data is available on, for example, asset histories, for subsequent private operator bidding.

17. In addition to IWRM and PPP, our recommendations are based around the concepts that the UWSS agencies need to consider how the local community can be more directly involved in the UWSS planning, and how the welfare of the disadvantaged can be safeguarded. The latter becoming increasingly important should the sector move towards a more commercial position.

18. We recommend inclusion of a small team within the IWRM Project Management Unit to focus on gender and social issues applicable to UWSS service provision. The team will develop poverty reduction strategies to target meeting the Millennium Development Goals and for mitigating any disincentives to serve disadvantaged customer groups, as well as strategies to assist low-income families with the cost household water/sewer connections, e.g. through pre-financing or subsidies, as well as on such issues as improving fee collection efficiency and debt management within such groups.

19. A scope for the Unit is provided as an Appendix to the Report.
20. The IWRM project Management Unit could evolve into the Drinking Water Supply Mission, should that become Government policy.

21. Where we do consider that there is an immediate opportunity for active private sector participation is in the design, construction and operation of the water and wastewater treatment plants proposed under the Tranche-1 investment. Design and Build contracts are in common practice in Karnataka and an accepted form of PPP. We are suggesting that the contracts include for a 5year extended O&M phase as a first step to bring private sector participation into the operation of the water sector facilities. Further, we propose that the Tranche-1 procurement modality is for the treatment plant contract to include for the rehabilitation and construction of the strategic transmission network, and of the strategic water storage facilities. There are three reasons for the proposal:

- As mentioned, it will introduce the private sector into the operation and maintenance of the strategic elements of the system where risk should be minimised for security of supply;
- Physical losses in the strategic network should be maintained at an acceptable level of around 2% and in so doing the required 24x7 quantity of water will be delivered to the strategic reservoirs which are the key points for distribution of water to customers, and
- It will enable the requirement of the KUIDFC to be met whereby the investment in the distribution network to ensure a continuous supply will be made only after the ULB has itself shown a commitment to improved service by meeting performance standards.

22. We are recommending three works contracts are let, together with a Design and Supervision contract for all four Tranche-1 investment capital works:

- A water and wastewater plant, strategic network and reservoir design, construct and operate contract;
- A wastewater collection construction contract, and
- A water distribution construction contract.

23. We appreciate that the contractor both designing and constructing the strategic network is unusual, if not unique in Karnataka, and that stakeholders might wish for the design to be by the Design and Supervision Consultant. The reasons for the proposal are:

- It is common international practice and would be an innovative “first” for Karnataka;
- It would enable an earlier on-site commencement date to the contract as the strategic mains could be designed as the treatment plants are constructed without having to wait for the designs to be completed, and
- A contractor has more experience and skills base at the rehabilitation of strategic mains than a consultant which he would bring this experience to the design process to ensure a best value-for-money design.

24. For the O&M of existing plants, we suggest that the following options be considered:

- For ULBs such as Ranebennur where a major extension of an existing plant is proposed and where some rehabilitation of the existing plant is required, the Tranche-1 contract includes for the O&M of the existing plant;
- For ULBs such as Byadgi, where a contract is currently under way, negotiations commence with the works constructor for the inclusion of a 5yr operations period, or the plant is considered as an “existing” plant at the end of the contract maintenance period, and
- For existing plants, an O&M contract is prepared for the plants in an SVP service area.

25. For all three options, the O&M of the strategic network will be by the Tranche-1 treatment plant constructor/operator as all towns will require rehabilitation of their strategic network. Ideally, the Tranche-1 plant contractor would be the operator of all the water treatment plants. If there is more than one operator, the interface will need to be clearly defined, logically the outlet meter from the treatment plant. A similar interface definition will be required for branches off the strategic network, although by definition of a strategic main these should all be metered branches, and at the outlets from reservoirs.
26. For the water distribution contract, as the start date within a ULB will be determined by the performance of the ULB in meeting the indicators and because the length of mains to be rehabilitated will not be known until mains condition data is collected, a conventional water distribution works contract will be difficult to manage.

27. We have made a proposal for a second innovative approach to be adopted in Karnataka, but an approach widely adopted elsewhere. Conventionally, a main laying contract is for the construction of fixed, pre-determined elements, e.g. a certain length of pipes of a known diameter to be laid in a specified time. As an alternative, we are suggesting that a “Schedule of Rates” contract be adopted. In such a contract, bidders enter their required prices in a matrix of pipe sizes for different locations e.g. major road, secondary or un-surfaced ground. As a ULB meets the performance criteria or a section of main is assessed to need replacement, the contractor will commence the work, and be paid according to his schedule of rates. The schedule of rates principle can also be adopted for mains repairs, meter installation etc. The procedure might be innovative and an opportunity for Karnataka to lead, but a Schedule of Rates approach is common throughout the UK, for example.

28. Perhaps a step-too-far at the moment, the design of the mains could be by the contractor or, by a consultant as a sub-contractor to the contractor, rather than by the Design and Supervision Consultant – again, common practice in the UK. In this case, the price entered in the Schedule would be inclusive of design.

29. Whilst we are considering innovations for Karnataka, we suggest that the state with its IT competency is in a good position to establish a water and wastewater technology competency to be exported throughout India, if not internationally.

30. Non-revenue water reduction will be critical to the ability to provide a continuous water supply. In addition to bringing the maintenance of the strategic network and reservoirs within the scope of the plant works contractor who will have a responsibility to manage leakage, we propose that the NRW reduction work is programmed to enable a Performance Baseline to be established for the issue of a NRW reduction contract/concession contract i.e. in the first stage bulk flow meters will be installed, a household survey completed and a water audit prepared. For the next, second, stage, the service providers could develop an in-house NRW reduction capacity, or outsource to a PPP specialist contractor through a performance contract.

31. We have adopted the criteria proposed by the KUIDFC for the selection of the Tranche 2 and subsequent investments. Prior to being considered as a subject MFF Tranche town, the ULB will need to demonstrate that it has taken steps to improve the UWSS service in the town by simple messages such as installing bulk metering, conducting a household survey to validate the customer database. The Report provides a proposed methodology and has recommended an allocation of $20m in the Tranche-1 budget to provide the initial support to prospective ULBs.

32. In general, the UWSS sector is heavily subsidized, though the degree of subsidization varies between ULBs. Almost all the ULBs are not charging water tariffs to recover at least the entire O&M cost of water supply schemes, let alone to cover debt servicing. There are also many unauthorized consumers or households using public taps who are not required to pay any charges for their water use.

33. Tariffs should be structured in a manner such as to act as a disincentive for ‘excessive’ consumption and wastage of water, whilst ensuring at least a minimum ‘lifeline’ supply to the poor. An appropriate cost recovery mechanism based on adequate tariffs will help ensure that revenues cover O&M costs, debt service plus a reasonable return on capital.

34. We propose that:
   - Tariffs are to be set independent of political influence and to be adequate for a financially sustainable service provision;
   - Charges are volumetric based, as measured by individual customer revenue meters;

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1 The lengths of distribution mains to be laid provided in the Feasibility Studies are provisional, pending the collection of mains history data, which was not available at the time of the drafting of the Studies, and mains condition surveys and sampling and testing.
Tariffs to be “affordable” up to an agreed consumption. Thereafter, to become increasingly punitive to encourage reduced water demand and conservation of water by such as rainwater harvesting. We suggest that the limit is the Indian design standard for domestic demand of 135 litres/head/day;

Volumetric charges are introduced for wastewater collection with additional charges for industrial customers based upon the quality of the effluent discharged to the sewer;

An active policy is adopted to ensure the accuracy of the customer database used for charging and that unknown connections are proactively located, and

The adequacy of existing Debt Management procedures to be reviewed or new introduced.
2 INTRODUCTION TO THE PROJECT

2.1 Background to the project

35. The Government of Karnataka (GoK) has declared the period from 2011 to 2020 as the “Irrigation Decade” for achieving water and food security. The Government envisages the introduction of an “Integrated Water Resources Management (IWRM) approach in the water resources sector to achieve the objectives which includes the integration of issues related to irrigation, agriculture, industrial, energy, drinking water and other allied demands for water.

36. In this context, the “Karnataka Integrated and Sustainable Water Resources Management Investment Programme (KISWRMIP) is being developed with the assistance of the Asian Development Bank (ADB).

37. Specifically, on 9 December 2011, ADB approved the provision of $1,200,000 for technical assistance to prepare the Programme. On 19 January 2012, the Government of India (GoI) signed the associated Technical Assistance (TA) Letter of Agreement. The TA is based on outcomes of a preceding ADB financed capacity development TA which undertook institutional analyses and consultations, and provided an IWRM roadmap covering policy, institutional, and planning framework, specific water management functions and tools to be introduced, and directions to manage challenging water sector agendas towards the future.

38. Consulting services for the Programme are provided by three separate teams of consultants; (i) Integrated Water Resources Management; (ii) Irrigation and (iii) Urban Water Supply and Sanitation (UWSS). The Irrigation consultants are responsible for overall synthesis of all outputs and preparation of a single project design. Subsequent to the interim review mission, the Government of Karnataka (GoK) and ADB approved the segregation of urban water supply and irrigation into two separate but coordinated Multi-Tranche Financing Facilities (MFF) which would be simultaneously prepared under a common IWRM umbrella.

39. The Water Resources Department (WRD) is the Executing Agency (EA) for the preparation of Integrated Water Resources Management and Irrigation components and overall coordination of the KISWRMIP. The Karnataka Urban Infrastructure Development & Finance Corporation (KUIDFC) is the Executing Agency for the UWSS component of the Programme.

2.2 Project Deliverables

2.2.1 MFF Sector Road Map

40. As the PPTA UWSS consultancy team we are tasked to prepare an Investment Programme that can lead to the intended sector impacts and outcome, comprising:

- Sector Road Map to provide an effective basis for MFF investments. The institutional development roadmap for UWSS, in the context of IWRM, is to contain specific reform recommendations and associated actions to provide an enabling environment and progressive steps for incremental improvements. Key agendas include (i) institutional setup, skill mix, and capacities of sector agencies including opportunities for Public/Private Participation (PPP); (ii) enabling environment such as legal, regulatory and operational; (iii) asset operation & maintenance (O&M) sustainability with expenditure review of the concerned agencies; and (iv) climate change adaptation/disaster prevention planning for institutional reforms and resilience in infrastructure and O&M designs;

- Strategic sector investment plans to attain the set sector objectives over the medium term. The investment plan has been prepared by compiling the relevant programs financed by the Government of India, the State, and any other external financiers for IWRM and by updating the existing investment plan for UWSS. Within this framework, appropriate selection criteria of individual subprojects have been prepared, with prioritization of specific investment recommendations.
2.2.2 Feasibility Studies

41. Feasibility Studies have been prepared for the subject Tarnche-1 towns to cover expansion/rehabilitation of UWSS systems and will include, amongst other aspects, (i) baseline surveys of the social, economic, poverty and other indicators; (ii) subproject designs for engineering structures and other programs, cost estimates, and implementation arrangements; (iii) economic and financial assessments; and (iv) social and environmental safeguards including impacts, risks and their mitigation measures.

2.2.3 Program Implementation Plan and Materials

42. The TA has been required to prepare a detailed program implementation plan with the assessment of (i) detailed component design and cost estimates; (ii) procurement plans and implementation scheduling with projection of physical, financial, and other progresses; (iii) institutional arrangements for IWRM and sector specific implementation involving the concerned State and local government agencies, consultants, NGOs, and other agents, along with associated capacity development programs; (iv) implementation arrangements such as financial management and planning for consultant engagements; (v) safeguards management, (vi) monitoring and evaluation arrangements and (vii) executing and implementing agencies’ procurement capacity assessment.

2.3 Scope of the Draft Final Report

43. The Draft Final Report comprises:

Volume 1 – Road Map;

Volume 2 – Investment Plan;

Annex 1, 2, 3 & 4 – Feasibility Studies for UWSS investments in the four subject MFF Tranche-1 towns, and

Annex 5 – Safeguard Reports.

2.4 ADB Policy and Experience in India

44. The past urban operations of ADB confirm that implementation of urban projects is complex and requires close coordination between multiple agencies. In several cases, staffing and capacity of executing and implementing agencies were inadequate, and effective project leadership was lacking. Land acquisition and other clearances take very long and implementation of safeguards is weak and cumbersome. The special evaluation study of ADB noted that where capacities are weak, this should be seen as a risk, and mitigation measures should be incorporated into the design of projects.

45. The Country Assistance Program Evaluation (CAPE) of India (2007) raises concern about sustainability due to slow implementation of financial measures for cost recovery, user charges and taxes, and weak capacity of urban service providers to operate and maintain the assets.

46. The recommendations of CAPE to enhance sustainability include (i) innovative lending and PPPs and municipal bond market development; (ii) transfer of best practices and long-term capacity building for reforms, asset management, and project design and management, and greater consultation with stakeholders for buy-in; (iii) alignment of ADB reform agenda with JNNURM; (iv) prioritizing local governments with commitment to reforms; and (v) considering use of policy-based loans and continuation of MFF as an appropriate lending instrument. All these recommendations forms important elements of ADB’s on-going operations and continue to be pursued during Country Partnership Strategy (CPS) 2009-2012.

47. ADB’s urban operations have been expanded to cover economically weaker states. Assessment of the effectiveness of past urban operations reaffirms the relevance and visible impact of ADB

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projects in Indian cities. In the past, ADB provided loans for integrated urban projects, including investments in water, sanitation, drainage, urban roads and transport to Jammu and Kashmir, Kerala, Kolkata, Madhya Pradesh, Karnataka, and Rajasthan. These were accompanied by urban reforms and capacity building directed at improving the institutional, financial, and management capacity of ULBs and other service providers. Schemes for targeted poverty reduction and “slum up-gradation” were regular component of these projects. While the projects have responded well to the Government’s multi-pronged urban agenda and created positive synergies among sub-sectors, their design and implementation have proven to be complex.

48. ADB continues to support the Government’s urban development agenda with dual objectives of (i) improving the quality of life of urban residents and (ii) enhancing the competitiveness of Indian cities to attract investment in a globalizing world. The key outcome of ADB’s sector assistance is contributing to the 11th Plan’s targets for (i) increasing access of urban population to water supply and sanitation, which is one of the MDGs, (ii) enhancing urban accessibility and mobility, and (iii) improving environment and public health of urban population. These key outcomes will be achieved through investments in water supply, sewerage, drainage, and urban roads and transport. Where feasible, investments include urban renewal and other infrastructure such as tourism to enhance the economic potential of the cities. To ensure sustainability and quality service delivery, ADB continues to pursue urban reforms.
3 PROJECT RATIONALE

3.1 Pilot Sub-Basin

49. The “Upper Tunga Bhadra Sub-Basin”, a part of the Krishna River Basin, has been selected as the pilot sub-basin for KISWRMIP. Three main rivers are located in the sub-basin – the Rivers Bhadra, Tunga and the Varada. The total water availability is about 6,600 cubic metres per year. There are thirty-four Urban Local Bodies (ULBs) located in the sub-basin which is considered to be water-stressed. The total population in the sub-basin is 70 lakhs, of which 22.4 lakhs are urban.

50. The location of the sub-basin is shown in Figure 1, reproduced from the Report: FINAL REPORT INTEGRATED WATER RESOURCES MANAGEMENT AND SUSTAINABLE SERVICES DELIVERY IN KARNATAKA (ADB TA No. 7418-IND) COMPONENT 3: Urban Water Supply and Sanitation.

3.2 Definition of Sub-sector

51. The sub-sectors to be included in are (i) potable water supply (ii) and wastewater collection and safe disposal, within urban areas. Land drainage and solid waste management are excluded from the project.

52. Rural areas are included only as much as to the extent that water can be made available to rural communities from transmission mains passing close to communities. Any supplies made available are of untreated water. Peri-urban areas are included where they included within local ULB development plans.

53. “Potable water supply” from groundwater or surface water is defined as the abstraction, conveyance, pumping, treatment, storage, distribution and delivery to domestic and non-domestic customers via piped connections or public stand posts of water needed for daily living and for fire fighting and operational purposes.

54. “Wastewater” refers to the infrastructure that conveys sewage and covers the system of sewer pipes, septic tanks, pump stations, sewage treatment plants and outfall arrangements necessary to safely remove water contaminated by faecal, household or industrial wastes and thereby preserving public health.
3.3 PPTA Project

3.3.1 Project Impact & Outcome

The expected Impact of the Project is (i) enhanced water security for the urban population in the pilot sub-basin, which will be measured through improved access to safe supplies of water,
improved ULB service charge income and financial management, and (ii) improved water quality in rivers due to improved wastewater collection and treatment.

56. The Project outcome will be improved UWSS service delivery that will result in an improved quality of life for people in the sub-basin.

57. KISWRMIP is proposed to support the State towards achieving the goal of sustainable water resources and related environmental management with applying IWRM principles. The Programme encompasses (i) establishment of relevant institutions and capacities for IWRM, and (ii) specific investments to expand UWSS access and improve efficiency/ productivity through development of an effective basin water balance.

58. The UWSS element for Tranche-1 of the Programme focuses on immediate investments to extend and rehabilitate UWSS assets and facilities in four subject ULBs, while promoting integrated state and basin water planning.

59. The investment proposed are in accord with (i) the GoK sector policy and the sub-basin water management plan being developed by the IWRM PPTA; (ii) demand allocation and water pricing strategies; (iii) proposed standards for customer service and operational performance, and (iv) service monitoring and evaluation through Performance Indicators, including water auditing.

60. The MFF’s first tranche, Tranche-1, covers operationalisation of IWRM functions and investments in upper Tunga Bhadra River basin, while other water-scarce sub-basins of the Krishna River basin will be covered during the subsequent tranche(s).

3.3.2 Project Methodology

3.3.2.1 MFF Sector Road Map

61. The PPTA is targeting one of the areas in the State of Karnataka with the most acute shortage of drinking water and sanitation services and facilities. In the PPTA we have focused upon the local service provider level. Strategies are being put into place at the state/regional level. Unless adequate capacity and capability is addressed locally, the impact of regional change will have little impact upon Customer Service Levels, and thus the objects of Union and State policies.

62. Physical and non-physical investments are proposed to achieve the objectives of improving service delivery across Karnataka. Physical works over the life of the program include (i) new creation and expansion of more efficient drinking water schemes, and for the rehabilitation of existing assets; (ii) new creation and expansion of wastewater schemes, with a particular view to (a) maximizing water reuse opportunities, particularly for industrial, irrigation and groundwater recharge purposes; and (b) reducing downstream pollution; and (iii) water tank rehabilitation and bankside storage, but not considered under tranche 1. Appropriate technology has been considered based on various parameters, including the size of the town i.e. affordability.

63. Non-physical investments focus on (i) the development of benchmarking, water auditing and water accounting systems, (ii) the establishment and operationalisation of the Drinking Water Supply Mission; (iii) maximising the role of the private sector through performance based management contracts and other PPP arrangements; (iv) increasing capacity for urban water planning and monitoring of quantity and quality at sub-basin level, and (v) project implementation assistance.

64. We have made proposals to put in place measures to address O&M shortcomings post-project completion and to tackle current unacceptable high levels of non-revenue water.

65. Our proposed Road Map contains specific reform recommendations and associated actions to provide an enabling environment and progressive steps for incremental improvements. The task has been approached using a conventional GAP analysis approach, with horizontal and vertical components:

Horizontally, the Road Map spans across the strategic theme areas of:

- Institutional;
- Technology;
- Customer Service, and
Financial Management.

And

Vertically, the approach embracing each of the strategic theme areas will be:

- Analysis of the current situation - the “As is”, or “Impediments to Success”;
- Proposing where the Karnataka sector would like to position itself or “Criteria for Success” within each of the theme areas, and
- Recommendations for Change from the “Impediments to Success” to the “Criteria for Success” condition through the development of an Implementation Plan.

3.3.2.2 Feasibility Studies

3.3.2.2.1 Selection of Subject Tranche-1 Towns

66. The first stage in the preparation of the Feasibility Studies was the selection of the Subject Tranche-1 towns from the thirty four ULBs located within the sub-basin.

67. Our intention behind the selection has been to ensure that the sub-projects cover as diverse a representation of ULBs as possible. In this way, all possible options for service provision; asset creation/rehabilitation and institutional frameworks have been explored. A wide diversity will ensure that the recommendations for the sector are piloted over most water resource and WSS planning circumstances to be found within the state.

68. The overriding factor within the selection process has been that clear benefits and outputs will be derived from the pilot studies which can be applied across Karnataka. Critically, the selection has been based upon the ability to test the principles of IWRM and the opportunities for PPP, as much as the priority need for investment.

69. As the selection must be capable of replication within the state for subsequent MFF tranches, a preliminary “desktop” assessment was made using a “scoring system” to prioritise towns based upon a demonstrable need for investment to meet improved customer service levels; the potential for water re-use; the ability to consider the opportunities for PPP and the opportunity to test the proposed bulk water supply arrangement.

70. Towns identified as the most suitable subject ULBs from the preliminary “filtering” for water investment were: Davangere, Ranebennur and Harihar. For wastewater, the only significant conclusion that could be drawn from the filtering process was that Davangere should be considered as a subject town because of its reported potential for industrial re-use of wastewater – a component of IWRM.

71. Considering that the opportunity to pilot the re-use of water for industrial purposes is a main objective of the PPTA, Davangere was recommended as a “wastewater” Tranche-1 town.

72. If a ULB is selected as water and a wastewater sub-project town, there will be an opportunity to look at water re-use as a negative component of demand, and so better demonstrate the CAPEX and OPEX advantages to be gained from water re-use. As Davangere also featured in the water prioritisation process, Davangere was proposed as both a water and wastewater Tranche-1 subject town.

73. We wished to select towns that would best enable the concept of a “cluster” to be piloted. In this way, (i) there will be a sufficient customer service base to attract the private sector. (ii) bulk water supply arrangements can be piloted and (iii) the towns will be sufficiently close together to permit any common central administrative functions as a means to reduce costs, if agreed by stakeholders.

74. Having selected Davangere, it was logical, if the “cluster” concept is accepted, to include Ranebennur and Harihar as water and wastewater subject towns because both featured in the water and wastewater “filtered” lists of prioritised ULBs. For completeness of the “cluster”, and to demonstrate the benefit within a smaller ULB, Byadgi was also included.
75. A presentation was made to the project Steering Committee on 30th May and the towns of Davangere, Ranebennur, Byadgi and Harihar were approved by the Committee as the Tranche-1 towns for which both water and wastewater Feasibility Studies were to be prepared.

76. The Committee requested that consideration be given to a second set of sixteen towns for which a Detailed Project Report (DPR) had been prepared under the Ganga II project, and which was to be sued as the basis for the PPTA Feasibility Study. After consideration of this list, and discussion with stakeholders during the ADB Mission in June, the two towns of Birur and Kadur were selected as most suitable.

3.3.2.3 Applicability of the Subject Tranche-1 Towns to the Road Map

77. As discussed above, a requirement for the selection of the Tranche-1 towns was that the lessons learnt and recommendations made for the Tranche-1 towns are replicable across the State.

78. Accordingly, the Road Map document is applicable across the State but reference is made to the Tranche-1 towns, as examples. Similarly, where reference is required to a wider area, that reference is to the Tunga Bhadra sub-basin, as the project pilot sub-basin.

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4 Feasibility Studies were not prepared. The KUWS&DB, as “owners” of the DPRs did not release them to the KUIDFC for use of the PPTA team.
4 GOVERNMENT SECTOR POLICY & INITIATIVES

4.1 Legal Framework

79. The major enactment concerning water supply and wastewater is the 74th Constitutional Amendment Act 1973 which, in its 12th Schedule devolves governmental functions to the ULBs, two of which are for:
   - Water supply for domestic, industrial and commercial purposes; and
   - Public health, sanitation conservancy and solid waste management.

80. Various other Laws specify other associated activities e.g. the Karnataka Municipal Corporations Act (1976) governs the management of municipal corporations and the Karnataka Municipalities Act (1964) governs the management of city municipal and town municipal councils. Other legislations is
   - Government of Karnataka (GoK) Policy on Urban Drinking Water and Sanitation, 2002;
   - GoK Water Policy (2002), and

81. A critical framework governing project implementation is the 1996 Government Order (GO) regarding project financing patterns and contributions by ULBs to the project cost. GOs issued from time to time deal with project specific interventions; project financing measures, service delivery standards, etc.

82. Planning and implementation of infrastructure is governed by the respective GO.

83. Government Orders also define the tariff structures for water supply cost recovery. For example, the funding pattern for water supply projects is governed by GO No. UDD 204 UMS 95 dated November 15, 1996, which details out loan: grant: own share mix in case of water supply projects based on a town’s 1991 population.

4.2 National Policy

84. The Government of India (GoI) has a number of policy initiatives pertaining to the water resources sector. Of most current relevance is the 12th Five Year Plan (2012-17) which is still under preparation. However, the National Planning Commission has issued the document “Faster, Sustainable and More Inclusive Growth: An Approach to the 12th Five Year Plan” in August 2011 that sets the objectives and priorities for the 12th Five Year Plan. The document makes a detailed assessment of water sector issues and priorities for the 12th Five Year Plan include (i) Water Resources Management; (ii) Ground Water Management; (iii) Major and Medium Irrigation; (iv) Irrigation Management; (v) Water Information Management; (vi) Water Pricing; (vii) Water Requirements of Industry and Urban Centres, and (viii) River Pollution.

85. To address the critical issues identified above, the National Planning Commission has proposed an integrated strategy to be put in place under the 12th Five Year Plan. Some of the elements of the strategy are as follows:
   - Re-estimate India’s water balance basin-wise with all aquifers being mapped over the next five years and aquifer management plans put in place;
   - Incentivising irrigation reform and efficiency of water use;
   - Wider profile of irrigation department staff who can bridge the gap with the users;
   - The Centre formulate and facilitate adoption of a model Water Resources Regulatory Authority Bill by States; and
   - A National Water Commission is put in place to monitor compliance with conditionality imposed in clearance of important water resources projects.

86. GOK is taking a lead role in recognizing the impending demands for water resources as the State undergoes rapid urbanization which will result in future, competing needs for water by various
users including, drinking water, irrigated agriculture, industry and environment. Significant
initiatives have already been introduced by the WRD in this regard, specifically the establishment
of the Advanced Centre for IWRM (AC-IWRM), intended to be a centre of excellence for IWRM
and will provide required expertise and advice to improve water resources management. It is
envisioned that ADB will continue to provide support for AC-IWRM under the proposed MFF
through capacity building and partnering with knowledge hubs.

87. Recognizing IWRM as an “adaptive process” of strengthening WRM systems step by step on the
basis of priorities and needs, as opposed to pursuing a number of reforms in one go, the AC-
IWRM is to lead the process of the requisite institutional changes and capacity and knowledge
development under the guidance of the governing and executive bodies chaired by Chief Minister
and Chief Secretary, respectively, and supported by its interdepartmental working group
represented by the concerned GoK departments.

88. Union water and wastewater policies are contained within the following, Table 1 and Table 2,
respectively.
### Table 1: Union Government Water Policies

<table>
<thead>
<tr>
<th>Government Body</th>
<th>Plan</th>
<th>Policy Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millennium Declaration of the United Nations, to which Govt. of India is a signatory</td>
<td>Millennium Development Plan</td>
<td>94% urban households access drinking water by 2015</td>
</tr>
<tr>
<td>Planning Commission, GoI</td>
<td>11th 5 Year Plan 07-12</td>
<td>100% urban water supply by 2012; JNNURM and UIDSSMT Programmes - top priority water supply needs towns and towns, especially those contaminated source, drought prone, water shortage, water quality problem; metering to be mandatory; use MIS data bases; penalties for leakage and wastage; use of low volume flush toilets, waste not taps; rain water harvesting; artificial recharge of ground water; water quality testing laboratories</td>
</tr>
<tr>
<td>Ministry of Urban Development (MoUD), GoI</td>
<td>Urban Water Supply &amp; Sanitation Programme</td>
<td>Sector policy prerogative State governments; Ministry Rural Development - rural water supply; Ministry Housing - urban water supply. Central Ministries have advisory capacity only;</td>
</tr>
<tr>
<td>MoUD, GoI</td>
<td>Handbook Service Level Benchmarking, June 2010.</td>
<td>WS coverage 100%; Per Capita Supply 135 lpcd; NRW water 15%; metering – 10%; continuity of supply 24 hr; Efficiency redress customer complaints 80%; quality of water supplied 100%; cost recovery – 100%; revenue collection efficiency 90%</td>
</tr>
<tr>
<td>MoUD, Central Public Health &amp; Environmental Engineering Organisation, GoI</td>
<td>Manual on Water Supply &amp; Treatment, May 1999</td>
<td>Sets parameters for water supply design, treatment, storage and distribution</td>
</tr>
</tbody>
</table>

---

29
Table 2: Union Government Wastewater Policies

<table>
<thead>
<tr>
<th>Government Body</th>
<th>Plan</th>
<th>Policy Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millennium Declaration of the United Nations, to which Govt. of India is a signatory</td>
<td>Millennium Development Plan</td>
<td>Sanitation Coverage: Have, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation; % households without sanitation by 2015 94%; urban households access drinking water by 2015-12.14% for urban area.</td>
</tr>
<tr>
<td>Planning Commission, GoI</td>
<td>Eleventh Five Year Plan (2007-2012)³</td>
<td>Coverage of urban sanitation by end of plan period (2012) Coverage of Population 100%; sewerage facility 70%; low cost sanitation 30%</td>
</tr>
<tr>
<td>MoUD, GoI</td>
<td>National Urban Sanitation Policy, 2008</td>
<td>Allow open defecation 0%; proportion of total human excreta generation that is safely collected 100%; proportion of total black waste water generation that is treated and safely disposed off 100%; proportion of total grey waste water generation that is treated and safely disposed off 100%; proportion of total storm-water and drainage that is efficiently and safely managed 100%; preparation of State Urban Sanitation Strategy by the respective states within two years from 2008</td>
</tr>
<tr>
<td>MoUD, GoI</td>
<td>Handbook Of Service Level Benchmarking</td>
<td>Targets: Coverage of toilets 100%; coverage of waste water network services 100%; collection efficiency of waste water network 100%; adequacy of waste water treatment capacity 20%; quality of waste water treatment 100%; extent of reuse and recycling of waste water 80%; extent of cost recovery in waste water management 90%; efficiency in redressing customer complaints 100%; efficiency in collection of sewerage related charges 90%</td>
</tr>
<tr>
<td>MoUD Manual on Sewerage and Sewage Treatment</td>
<td>Technical Guideline by Ministry of Urban Development Department</td>
<td>Wastewater collection efficiency 80% of the supplied water in general</td>
</tr>
</tbody>
</table>

³ Ref: MILLENNIUM DEVELOPMENT GOKLS, INDIA COUNTRY REPORT 2009, Mid-Term Statistical Appraisal Central Statistical Organization, Ministry of Statistics and Programme Implementation, Government of India. The % with sanitation facility is linearly interpolated from this figure for 2010-11

4.3 State Policies for the Sector

89. The GoK “Vision 2020” envisages eliminating poverty in all areas and the achievement of the Millennium Development Goals by 2015. Achieving these goals will require enhancing human competencies and equitable growth for all people and regions throughout the state; institutionalizing good governance through increased transparency, accountability and participation in water resource management and utilization.

90. There are two pertinent State policies. Both were promulgated in 2002, both are current and between them they provide the enabling framework for the development and delivery of UWSS service deliver. They are:

- The State Water Policy (SWP), and
- Karnataka Urban Drinking Water and Sanitation Policy (KUDWSP).

91. The State Water Policy sets out the sector objectives and strategies for managing the water resources within the State. The Karnataka Urban Drinking Water and Sanitation Policy was formulated with the primary purpose of continuing and strengthening efforts to provide all residents of urban areas with piped water supply and sanitation services at or near their dwellings, to be provided by their ULB.

92. The State Policy adopts the principles of IWRM and sustainable service delivery. The Policy sets out the strategic goal of ensuring water resources planning, development and management is done for each hydrological unit, entire river basins or sub basin, integrating multi-sectoral objectives, addressing conjunctive management of surface and ground water resources, and incorporating quantity, quality and environmental considerations.

93. Development projects and investment proposals are to be formulated and considered within the framework of river or sub-basin plans so that the best possible combination of options can be obtained for poverty alleviation, increasing incomes and productivity, equity, reduced vulnerability to natural and economic risks and costs. Solutions to water allocation and planning issues will be found adopting a demand management approach.

94. The Water Policy identifies that there is a lack of appropriate institutional arrangements at the State level which can consider sector water demands, plans and manage water between them. Water issues are fragmented between different departments without formal mechanism to ensure co-ordination. The fragmentation of water management decision making was recognised as resulting in sub-optimal management of Karnataka’s limited surface and ground water resources that need to be systematically developed and properly utilized to enable the overall development of the State.

95. The Project and associated investments in UWSS improvements will contribute to the achievement of the GoK Vision 2020 and implementation of IWRM and holistic water management by 2030.

4.3.1 Draft Cabinet Paper

96. The state’s current UWSS strategy to meet the sector Policies is contained in the 2012 draft Cabinet Paper. The Paper endorses the establishment of regional coordination entities in the state, and the separation of bulk water supply from distribution of water. The following institutional proposals are made:

- Setting up of a “Drinking Water Supply Mission”
- Constituting a “Water Council”
- Restructuring the Karnataka Urban Water Supply and Drainage Board (KUWS&DB) as a bulk supply entity, and
- Adopting a “New Contracting Model”

97. Water distribution to customers and wastewater collection will continue to be a ULB responsibility. The segregated responsibility is intended to address present varying technical and managerial capabilities at that level, and also varying levels of political preparedness to accept water supply
as a paid public service. ULBs will have the option of tackling this (i) either by itself or (ii) through KUWS&DB or (iii) with private sector participation.

98. We understand that the Paper, although not as yet approved, is accepted by stakeholders. The Paper is taken to be the state’s institutional strategy and we make no proposals or suggestions that diverge from the Paper.

4.4 Public/Private Partnerships

99. Both the GoI and the GoK encourage private sector participation in UWSS through their policy of Public/Private Partnerships (PPP). To quote the GoI 12th Plan, as just one example:

*The Twelfth Plan must continue the thrust on accelerating the pace of investment in infrastructure, as this is critical for sustaining and accelerating growth. Public investment in infrastructure will have to bear a large part of the infrastructure needs in backward and remote areas to improve connectivity and expand the much needed public services. Since resource constraints will continue to limit public investment in infrastructure in other areas, PPP-based development needs to be encouraged wherever feasible. It is necessary to review the factors which may be constraining private investment, and take steps to rectify them.*

100. There is a clear incentive to consider all options for PPP.

101. One of the major issues related to lack of the implementation of the PPP model in the WSS sector, is that this sector is still regarded as a State subject. Issues to be overcome before there is a wide acceptance and suitability for the PPP model are:

- Non sustainable levels of water and wastewater charges;
- Feasibility and risk of a venture;
- Political interference;
- Lack of accountability on the part of the ULBs;
- Perceived threat of the urban local bodies with respect to their roles and authorities;
- Lack of private sectors operators with proven experience in Indian conditions, and

102. A major issue is the absence of well-designed contract and contracting procedures with:

- Clearly defined responsibilities of the Government and private sector partners; and
- A performance linked system of payments and penalties.

103. The Infrastructure Development Department (IDD) of the Government of Karnataka has taken an initiative to explore the possibility of the PPP model for WSS and Storm Water Drainage for six towns - Raichur, Hospet, Davangere, Gadag, and Ilkal. The pre-feasibility Report suggested specific measures that need to be taken for each of the towns while opting for the PPP model. The model would provide opportunity for:

- Increased efficiency of service through structured O&M of the assets;
- Application of the latest technology;
- OPEX reduction, including NRW reduction;
- Improvement in water quality;
- Timely and effective grievance redress, and
- Increased consumer satisfaction.

104. In this Road Map, we have looked at opportunities for PPP, such as:

- Works construction projects – as proposed for all construction works;
- O&M of the assets – new and existing – through opportunities for outsourcing non-core business activities and in an extended O&M period for works construction contracts;
- Specialist network management skills - such as NRW reduction, and
ULB capacity building and improved UWSS service delivery through PPP management and/or concession type contracts, as shown in the following figure.
## Technical Assistance

**Obligations of Contractor**
- To provide defined number of qualified staff for specific management “desk-top” deliverables.
- Can be limited to producing a Strategy that proposes a way forward.

**Duration**
- Time is related to that required to produce the deliverables. Usually around 1 year.

**Risks for utility**
- Consultant’s performance

**Contractor’s risks**
- Minimal

**Advantages to utility**
- Simple and quick to contract
- Least cost of options
- Stepping stone to other approaches

**Disadvantages to utility**
- Limited knowledge transfer

## Management Contract

**Provision of a Strategy that proposes a way forward.**
- Provision of team of adequate size to manage the utility within all or defined activities
- Normally up to 5 yrs, but can have a further period to ensure improved performance is sustained
- Accountability for performance remains partly with the utility
- Poor contract / utility staff relations in management
- Poor contract clauses limit effectiveness or require performance payments without real performance achieved
- Service delivery (within limits)
- Finance performance (within limits)

**Advantages to utility**
- Considerable responsibility for achieving performance passed to Contractor within performance payments.
- Opportunity for knowledge transfer to be passed to the utility.

**Disadvantages to utility**
- Might promote parallel Contractor / utility organisations
- Contracts can be complex with regard to performance payments
- May require an accurate baseline determination before performance improvement can commence

## Concession/Full Service Provision

**Full responsibility for service provision passed to contractor.**
- Statutory accountability remains with the service provider
- Long-term contract if found not to be satisfactory
- Contractor is taking the risk of delivering to an emerging performance standard

**Advantages to utility**
- All responsibility for day-to-day management passed to contractor
- Investment funding provided by the contractor

**Disadvantages to utility**
- Relatively complex to establish and change
- Needs good information
- Administrative burden to effect staff transfers
- Sensitivity of transferring local person

---

Figure 2: Option for PPP in Service Provider Management
5 STATE OF KARNATAKA PROFILE

5.1 Economic Development

5.1.1 National

105. India has developed a selective open-market economy. Economic liberalisation, including industrial deregulation, privatisation of state-owned enterprises, and reduced controls on foreign trade and investment that began in the early 1990s have served to accelerate the country's growth, which has averaged more than 7% per year since 1997.

106. India's diverse economy encompasses traditional village farming, modern agriculture, handicrafts, a wide range of modern industries, and a multitude of services. Slightly more than half of the workforce is in agriculture, but services are the major source of economic growth, accounting for more than half of India's output, with only one-third of its labour force.

107. India's medium-term growth outlook is positive due to a young population and corresponding low dependency ratio, healthy savings and investment rates, and increasing integration into the global economy. Long-term challenges include widespread poverty, inadequate physical and social infrastructure, limited non-agricultural employment opportunities, scarce access to quality basic and higher education, and rural-to-urban migration.

108. The domestic per capita income for 2011 was estimated at US$3,700, an increase from the 2010 figure of $3,500. Unemployment is 9.8% with 25% of the population considered to be below the poverty line in 2007. Inflation has fallen from 12% in 2010 to 6.8% in 2011.

5.1.2 State Overview

109. Karnataka is located in the south of India, in the western half of the Deccan plateau surrounded by Andhra Pradesh in the east, Maharashtra in the north and Tamil Nadu and Kerala to the south.

110. The Government of Karnataka is a democratically elected body, with the Governor as the constitutional head. The Governor appoints the Chief Minister and his council of ministers who are responsible for the day to day running of the government. The seat of the government, Bangalore, is the sixth largest urban agglomeration in India.

111. Urban local government is categorised by population, economic activity and by the revenue generated, into:

- City Corporations (CCs) – 7 No;
- City Municipal Councils (CMCs) – 44 No;
- Town Municipal Councils (TMCs) – 92 No, and
- Town Panchayats (TPs) – 70 No.

112. With approximately 34% of the state’s 52.737 million population living in urban areas, as against 27.78% for the country as a whole, Karnataka is one the most urbanized states in India. The rapid rate of urbanization has resulted in pressure on local bodies to provide basic services, including water supply and sanitation. It has also resulted in an increasing dissatisfaction between the levels of service achieved and growing expectations of an affluent society for water services.

113. For many, agriculture is the major occupation. A total of 123,100 km² of land is cultivated in Karnataka constituting 64.6% of the total geographical area of the state. According to the 2001 census, farmers and agricultural labourers formed 56% of the workforce of Karnataka. The main crops grown here are rice, ragi, jowar, maize, and pulses besides oilseeds and a number of cash crops. Cashews, coconut, arecanut, cardamom, chillies, cotton, sugarcane and tobacco are among the other crops produced in the state.

7 Taken from the 2001 census, pending publication of the results of the 2011 census
114. Karnataka is the largest producer of coarse cereals, coffee and raw silk among the states in India. The income generated from horticulture constitutes over 40% of income generated from agriculture and it is about 17% of the state's GDP. In floriculture, Karnataka occupies second position in India in terms of production. 700 tons of flowers, worth $10 million, were produced in 2004-05.

115. A majority of the Indian silk industry is located in Karnataka State, particularly in the North Bangalore regions.

116. The state, which has rich mineral resources distributed more or less evenly in the whole territory, is the major producer of gold in India with the two major mines located in the districts of Kolar and Raichur. Other resources are deposits of asbestos, bauxite, chromite, dolomite, iron ore, kaolin, limestone, magnetite, manganese, ochre, quartz and silica sand. It is also the sole producer of felsite, moulding sand and fuchsite quartzite, as well as ornamental granites.

117. Karnataka accounts for nearly 6% of the country's surface water resources, about 40% of which is available in the east flowing rivers, and the remaining from the west flowing rivers. There are seven river basins in Karnataka, formed by the Krishna, Cauvery, Godavari, West flowing rivers, North Pennar, South Pennar & Palar, as shown in Figure 3.

5.1.3 State Economic Assessment

118. As a result of measures taken up by GoK, in 2011-12 the total GSDP in Karnataka at constant prices (2004-05) was estimated to be in excess of Rs.2,979.64 billion, yielding a per capita

---

Figure 3: River Basins of Karnataka

*Taken from the Water Resources Department web site*
income of Rs.69,493 (US$1,264). For total GSDP, at constant 2004-05 prices, this implied a growth in excess of 6% over the year 2011-12, as shown in the following table.

Table 3 Recent GSDP Growth Rates

<table>
<thead>
<tr>
<th>Year</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004-05</td>
<td></td>
</tr>
<tr>
<td>2005-06</td>
<td>10.5</td>
</tr>
<tr>
<td>2006-07</td>
<td>10.0</td>
</tr>
<tr>
<td>2007-08</td>
<td>12.6</td>
</tr>
<tr>
<td>2008-09</td>
<td>7.1</td>
</tr>
<tr>
<td>2009-10</td>
<td>5.2</td>
</tr>
<tr>
<td>2010-11</td>
<td>8.9</td>
</tr>
<tr>
<td>2011-12</td>
<td>6.4</td>
</tr>
</tbody>
</table>

(Karnataka Economic Survey 2011-12).

119. Karnataka has a per capita income of $1,264 a year, over 14% more than India’s average of $1,109 and 19% of the population live below the poverty line against India’s average of 22.15%.

120. The sector composition of State Income, at current prices, in 2010-11\(^9\) indicates that the share of primary sector, secondary sector and service sector were 16.9%, 28.6% and 54.5%, respectively.

121. The sector contribution of the State Income has undergone considerable changes during 1960-61 to 2010-11. Over the period, the share of primary sector has declined steadily from 60% to 16.9%; the share of secondary sector has increased from 15.2% to 28.6%, while service sector has increased from 24.8% to 54.5%, during the same period.

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\(^9\) Economic Survey 2011-12, India
\(^10\) Economic Survey 2011-12, Karnataka
5.1.5 Major Economic Activities of Karnataka

Economic activity data is available on a district-wide basis; not by town specific. The table below presents relevant data for the 30 districts which includes the seven districts in the pilot sub-basin. In 2009-10 the seven districts accounted for over 14.5% of NSDP\(^{11}\), at constant price.

Table 4: Pilot Sub-Basin District NSDP

<table>
<thead>
<tr>
<th>District</th>
<th>2009-10 NSDP at 2004-2005 constant prices - Rs. Millions</th>
<th>% to Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bagalkote</td>
<td>14,160</td>
<td>2.0</td>
</tr>
<tr>
<td>Belgaum</td>
<td>34,810</td>
<td>5.6</td>
</tr>
<tr>
<td>Bellary</td>
<td>23,110</td>
<td>3.4</td>
</tr>
<tr>
<td>Bidar</td>
<td>7,030</td>
<td>1.3</td>
</tr>
<tr>
<td>Bijapur</td>
<td>13,440</td>
<td>1.9</td>
</tr>
<tr>
<td>Chamrajnagar</td>
<td>10,670</td>
<td>1.0</td>
</tr>
<tr>
<td>Chickballapur</td>
<td>8,830</td>
<td>1.2</td>
</tr>
<tr>
<td>Chickmagalur</td>
<td>14,270</td>
<td>1.7</td>
</tr>
<tr>
<td>Chitradurga</td>
<td>12,000</td>
<td>1.8</td>
</tr>
<tr>
<td>Dakshina Kannada</td>
<td>11,950</td>
<td>5.5</td>
</tr>
<tr>
<td>Davangere</td>
<td>15,760</td>
<td>2.4</td>
</tr>
<tr>
<td>Dharwad</td>
<td>7,720</td>
<td>3.5</td>
</tr>
<tr>
<td>Gadag</td>
<td>5,070</td>
<td>1.1</td>
</tr>
<tr>
<td>Gulbarga</td>
<td>9,640</td>
<td>2.1</td>
</tr>
<tr>
<td>Hassan</td>
<td>17,680</td>
<td>2.4</td>
</tr>
<tr>
<td>Haveri</td>
<td>10,900</td>
<td>1.5</td>
</tr>
<tr>
<td>Kodagu</td>
<td>11,370</td>
<td>1.3</td>
</tr>
<tr>
<td>Kolar</td>
<td>16,320</td>
<td>2.2</td>
</tr>
<tr>
<td>Koppal</td>
<td>10,370</td>
<td>1.3</td>
</tr>
<tr>
<td>Mandya</td>
<td>14,610</td>
<td>1.8</td>
</tr>
<tr>
<td>Mysore</td>
<td>17,830</td>
<td>4.5</td>
</tr>
<tr>
<td>Raichur</td>
<td>10,940</td>
<td>1.6</td>
</tr>
<tr>
<td>Ramnagara</td>
<td>9,410</td>
<td>1.7</td>
</tr>
<tr>
<td>Shimoga</td>
<td>14,740</td>
<td>2.6</td>
</tr>
<tr>
<td>Tumkur</td>
<td>23,200</td>
<td>3.3</td>
</tr>
<tr>
<td>Udupi</td>
<td>9,480</td>
<td>2.4</td>
</tr>
<tr>
<td>Uttara Kannada</td>
<td>7,510</td>
<td>1.9</td>
</tr>
<tr>
<td>Yadagiri</td>
<td>4,870</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>KARNATAKA</strong></td>
<td><strong>382,730</strong></td>
<td><strong>2.262,780</strong></td>
</tr>
</tbody>
</table>

5.1.6 Future Growth

The State’s fiscal consolidation efforts have continued to be effective with all the fiscal indicators having been contained within the stipulated limits of the Karnataka Fiscal Responsibility Act, 2002.

\(^{11}\) Economic Survey 2011-12, Karnataka
124. State has managed its expenditure well while also enhancing its revenues. The State’s fiscal deficit has declined to 2.8712% of GSDP in 2011-12 while the capital outlay has grown to 121% of Gross Fiscal Deficit. The State’s revenue receipts have increased to 15.27% of GSDP.

125. Revenue receipts have grown primarily due to growth of tax revenue with the State having an overall revenue surplus. The State’s expenditure on social services as a share of GSDP has grown while the non-tax revenues continue to remain at low levels.

126. Education and Water resources development are significant components of the State’s development expenditure. A gradual increase is seen in the plan expenditure of the State with district plan size at about 15% of the State’s plan size.

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12 Karnataka Economic Survey Report 2011-12
Table 5: Karnataka Receipts and Expenditure

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue receipts</td>
<td>265,697</td>
<td>303,521</td>
<td>375,869</td>
<td>411,511</td>
<td>432,907</td>
<td>491,557</td>
<td>577,846</td>
<td>663,133</td>
</tr>
<tr>
<td>Revenue expenditure</td>
<td>249,319</td>
<td>280,409</td>
<td>334,354</td>
<td>373,748</td>
<td>416,593</td>
<td>475,369</td>
<td>561,892</td>
<td>650,343</td>
</tr>
<tr>
<td>Capital receipts</td>
<td>75,038</td>
<td>44,015</td>
<td>64,448</td>
<td>60,297</td>
<td>92,852</td>
<td>129,427</td>
<td>135,468</td>
<td>146,500</td>
</tr>
<tr>
<td>Capital disbursements</td>
<td>91,320</td>
<td>66,831</td>
<td>104,166</td>
<td>99,480</td>
<td>113,649</td>
<td>143,107</td>
<td>149,460</td>
<td>156,342</td>
</tr>
<tr>
<td>Capital Outlay (net)</td>
<td>46,737</td>
<td>58,219</td>
<td>85,426</td>
<td>84,032</td>
<td>96,893</td>
<td>120,669</td>
<td>118,174</td>
<td>117,544</td>
</tr>
<tr>
<td>Revenue receipts</td>
<td>15.97</td>
<td>15.53</td>
<td>16.55</td>
<td>15.23</td>
<td>14.07</td>
<td>14.28</td>
<td>14.49</td>
<td>15.27</td>
</tr>
<tr>
<td>Capital Receipts</td>
<td>4.51</td>
<td>2.25</td>
<td>2.84</td>
<td>2.23</td>
<td>3.02</td>
<td>3.76</td>
<td>3.40</td>
<td>3.37</td>
</tr>
<tr>
<td>Capital Outlay (net)</td>
<td>2.81</td>
<td>2.98</td>
<td>3.76</td>
<td>3.11</td>
<td>3.15</td>
<td>3.50</td>
<td>2.96</td>
<td>2.71</td>
</tr>
<tr>
<td>Capital Disbursements</td>
<td>5.49</td>
<td>3.42</td>
<td>4.59</td>
<td>3.68</td>
<td>3.69</td>
<td>4.15</td>
<td>3.75</td>
<td>3.60</td>
</tr>
</tbody>
</table>

Source: Government of Karnataka, Accounts Reckoner, 2002-12
6 STATEMENT OF NEED: “IMPEDIMENTS TO SUCCESS”

6.1 Introduction & Overview

127. The issues associated with current service provision are well known to stakeholders. In summary these are:

- Poor condition of UWSS assets, often beyond their reliable working life;
- Lack of overall sector coordination and control, and
- Insufficient capacity, particularly at ULB level where there are neither sufficient operational staff members, or staff of the necessary calibre.

128. In many respects these have been due to:

- Lack of priority afforded to urban water supply and sanitation;
- Lack of investment, and
- Politically driven tariffs that are insufficient to fund the O&M of the assets, and their timely replacement.

129. The issues have manifested themselves in poor levels of service achieved:

- Intermittent and insufficient water supplies;
- Supplies subject to interruption due to asset failures and power cut-outs;
- High levels of leakage that aggravate water availability to customers;
- Poor levels of wastewater collection, and
- Untreated sewage being discharged to water courses and being used directly for irrigation.

130. In this Section we have set out the “Impediments to Success” that we have identified in each of the strategic theme areas of Institutional, Technical, Customer Service and Financial Management.

6.2 Institutional – State Level

6.2.1 Stakeholders and their Role in Project

131. Karnataka’s UWSS sector is managed by multiple agencies - the Urban Development Department (UDD), the ULBs, the Karnataka Urban Water Supply and Drainage Board (KUWS&DB), the Karnataka Urban Infrastructure Development and Finance Corporation (KUIDFC). Specifically:

- The Urban Development Department of the State Government is the managing Government Department for the KUIDFC, the KUWS&DB, and for the ULBs;
- The KUIDFC represents the UDD as the project funding; formulation; management, and executing agency. The UDD acts (i) as the State Government’s interface for externally aided projects, and (ii) as nodal agency to implement Government schemes in all sector components, which among others also includes improvement and strengthening of urban components in the field of UWSS facilities.
- The KUWS&DB is primarily responsible for planning, designing, and implementation of water and waste water facilities funded by the Government of Karnataka in the urban areas of Karnataka, excluding Bengaluru city. The KUWS&DB designs and implements water supply and underground drainage schemes in urban areas of the state and transfers them to respective ULBs. The KUWS&DB has two administrative regions – the North Karnataka Zone and South Karnataka.
- As per the 74th constitutional amendment, the responsibility of providing municipal services including water and sanitation services vests with ULBs. In Karnataka, there are a total of 218 elected ULBs responsible for public administration divided, according to size, into City
Corporations, City Municipal Councils, Town Municipal Councils, Town Panchayaths and Notified Area Committees.

- The ULBs are mandated to provide basic services to the urban residents including operation and maintenance (O&M) of water and waste water facilities on a day to day basis. Once a UWSS scheme is completed, it is handed over to the concerned ULBs for O&M. The ULBs have the responsibility of fixing tariffs and collecting revenue for the services rendered.

132. Other involved agencies are:

- The Water Resource Department (WRD) is mandated to harness surface water for major and medium irrigation, for industry and for drinking water. The WRD comprises three major groups of Agencies: Krishna Bhagya Jal Nigam Limited, Karnataka Nagar Nigam Limited, and Cauvery Neeravari Nigam Ltd. The Agencies are the three corporations for new irrigation projects. Component entities within the WRD are:
  - The Water Resources Development Organization is primarily responsible for providing technical services for developing and managing irrigation projects. The Command Area Development Authority and Water and Land Management Institute are primarily concerned with operation and maintenance of existing irrigation projects;
  - The IWRM Advanced Centre set up within the Water Resources Department is mandated to serve as an Overall Programme coordination unit to implement the IWRM component of the programme.

- The Karnataka Rural Water Supply and Sanitation Agency is the equivalent body to the KUWS&DB for rural areas.

Table 6: Karnataka Water Sector Stakeholders

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government of India</td>
<td>National policy and law enactment</td>
</tr>
<tr>
<td>Government of Karnataka</td>
<td>Ultimate responsible entity within the state for water sector policy, strategy and implementation</td>
</tr>
<tr>
<td>Water Resources Department</td>
<td>Management of water resources, surface and groundwater, within the state for public water supply, industrial water and irrigation</td>
</tr>
<tr>
<td>Urban Development Department</td>
<td>Oversees policy related to urban water supply and sanitation as well as urban planning and development, in which role the UDD supervises the function of both the Karnataka Urban Water Supply and Drainage Board and of the Karnataka Urban Infrastructure Investment Development &amp; Finance Corporation.</td>
</tr>
<tr>
<td>Karnataka Urban Infrastructure Investment Development and Finance Corporation</td>
<td>The KUIDFC represents the UDD for infrastructure project formulation; management, and execution, and for the disbursement of investment funding for infrastructure projects and related capacity building.</td>
</tr>
<tr>
<td>Karnataka Urban Water Supply and Drainage Board</td>
<td>Primarily responsible for planning, designing, and implementation of water and waste water facilities funded by the Government of Karnataka in the urban areas of Karnataka, excluding Bangalore. The Board is, at the request of a ULB, can be responsible for the O&amp;M of some ULB water systems</td>
</tr>
<tr>
<td>Urban Local Bodies</td>
<td>Responsible for local administration, mandated to provide basic services to residents including operation and maintenance (O&amp;M) of water and waste water facilities on a day to day basis.</td>
</tr>
</tbody>
</table>

6.2.2 Regulation

133. There is no water services regulator in Karnataka. Customers have no recourse for complaints other than to the ULB service provider.
134. Tariffs are set by the ULBs without out reference to customer service levels provided. The tariffs are related to political influence; not to the service provided.

6.2.3 Identified Issues

135. Some of the causes of the poor service delivery originate in institutional and management failures and include:

- Responsibility for UWSS is spread across the three tiers of government – union, state and local, within entities and agencies whose roles and functions can be overlapping and uncoordinated;
- UWSS services are initiated in a top-down approach with limited local participation;
- There is no single policy and regulatory body which is empowered to coordinate enforce and lend focus to the various efforts and inputs, or to act as a “centre of excellence” for the sector;
- The peripheral areas adjoining towns have been largely ignored and water supply services in those areas have been left to informal arrangements – tankers and privately owned wells;
- Uncoordinated, conflicting projects have been developed resulting in CAPEX inefficiencies, and
- Lack of sector Master Plans and methodology for prioritising schemes.

6.3 Institutional – Local Service Provider Level

136. The ULBs are the mandated water and wastewater service providers, but they do not have adequate technical and operational skills and financial resources to deliver water and sanitation services efficiently. Even KUWS&DB, who is mandated to provide the service on behalf of the ULBs, is not fully equipped to provide effective O&M services.

137. Where the ULB does not have sufficient number of capable staff, the ULB uses local contractors for both the O&M of the facilities and for repairs.

138. There is no organisation structure, infrastructure or established practice for operations and maintenance of water supply and sanitation services as priorities for the ULB’s are centred on the construction of new assets rather than the efficient management, operation and maintenance of those already in service.

139. Institutionally, the current situation is characterised by insufficient and poorly trained management and staff. Some of the technical staff in charge of the O&M of UWSS facilities come from the Public Works Department who, normally working on roads, buildings, irrigation, etc.; have little or no experience of the water sector or understand public health impacts of improperly treated water supply.

140. All managers responsible for water supply and sanitation services also have other duties which distract them from their UWSS responsibilities. In the subject Tranche-1 towns, this dilution of authority over management of water services is underlined by the table below that clearly shows there are no engineering / managerial posts designated entirely to this function.

141. In two of the subject ULB’s, the supervisor of networks, which is a low grade task, is the first employee dedicated to management of water services whereas in the largest, Davangere, all posts below that of Area Engineer are filled by contractor staff. In many cases the positions for UWSS services exist within the ULB's organisation structure, but are currently vacant.

142. The number of staff allocated to the provision of UWSS services, both in the organisation structures and in terms of posts actually filled, is insufficient to provide the level of service desired, Table 7, below.

Table 7: Water Sector ULB Staffing Levels

<table>
<thead>
<tr>
<th>Position</th>
<th>Davangere</th>
<th>Ranebennur</th>
<th>Harihar</th>
<th>Byadgi</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of staff</td>
<td>% of time</td>
<td>No. of staff</td>
<td>% of time</td>
</tr>
<tr>
<td>Area Executive Engineer</td>
<td>1</td>
<td>20</td>
<td>1</td>
<td>50</td>
</tr>
</tbody>
</table>
143. With regards to wastewater, no staff members who are directly employed in the function. In the event of a network problem a local contractor is deployed on an 'ad hoc' basis.

144. No formal training had been provided to any of the staff interviewed from the Tranche-1 towns, resulting in the majority of staff operating UWSS systems not being qualified for the jobs they perform. Some knowledge has been gained by experience and through information passed on by other members of staff. Skills have been developed during hands on working and learning by ‘getting it wrong’.

145. In addition to staffing levels, ULBs in the Tranche-1 towns lacked business support systems, procedures, and maintenance equipment considered essential for the efficient and professional O&M of the infrastructure.

### 6.4 Technical

#### 6.4.1 General

146. As a consequence of the lack of staff and capacity, many of the technical activities that are normally associated with water and wastewater service provision are missing. For example, accepted “good practice” through asset management, work planning and asset history recording are absent in many, if not all, ULBs.

147. We saw little evidence of formalised data collection on asset performance that can be used subsequently in the decision making process, and essential for PPP operator tendering.

148. With the lack of bulk metering at critical points in the water networks, including “water into supply” from the source treatment plants, network management cannot be adopted or the preparation of water audits. Similarly for annual energy audits or the holding of emergency response exercises.

#### 6.4.2 Raw Water Availability

149. In the sub-basin, water is drawn from the Tunga Bhadra, or its tributaries, and from groundwater sources, with varying degrees of treatment. The groundwater sources are overexploited with levels of fluoride, nitrates and chlorides above permitted levels. There are borewells with hand pumps in many towns.

150. The State Water Policy has given first priority for drinking water use. As the responsible entity, the Water Resources Department permits the ULBs and KUWS&DB to take water from various identified sources such as dams, rivers, canals, lakes and others. Although water abstractions are permitted, the Department does not necessarily ensure that the water is available by preventing the construction of temporary, unauthorised bunds across the river to store water.

#### 6.4.3 Asset Conditions

151. The following observations were made following site visits to the Tarnche-1 towns. They do not constitute an asset survey and are mentioned here to provide background to the problems facing the sector. We have no reason to consider that they are no better or worse than other ULBs in the state.
6.4.3.1 Treatment Plants & Pumping Stations

6.4.3.1.1 Potable Water Treatment

152. “Normal” treatment of surface waters comprises conventional water treatment with flash mixer, flocculator, clarifier, rapid sand filters, treated water reservoir and pumping into supply.

153. In addition to water availability and to any process issues particular to a plant, our main concern is with the O&M of the treatment plants and pumping station facilities. There is a lack of planned maintenance or of an asset inventory with asset histories, upon which replacement decisions can be made. Generally, for all facilities there is a lack of data collection and of the recording and monitoring of the data that is available.

154. The majority of plant is old, past its reliable life and in need of replacement. There are no standby generators to mitigate the effect of the irregular power supplies.

155. Site staff seemed uninformed about the processes and operation of the plant for which they are responsible. Safety and site security are other causes for concern that need urgent attention.

Figure 5: Contrasting Pictures of Pumping Stations Visited

156. Excess of water loss in the treatment process is another concern, as shown in the photograph below.

Figure 6: Example of Excessive Loss during Treatment Process

157. At the plants visited, and we understand generally, there is a lack of flow metering on “water into supply”, and within the plants. Lack of reliable flow data prevents proficient network management and the optimisation of the treatment processes and chemical usage. From the lack of measuring facilities, we assume that energy audits are not common practice.
6.4.3.1.2 Wastewater Treatment

158. Wastewater treatment plants are commonly oxidation ponds or facultative treatment ponds, constructed under the National River Conservation Plan (NRCP). Few towns have treatment plants and, where wastewater treatment plants exist, they are not always fully operational due to lack of maintenance.

![Figure 7: Stabilisation Pond Out of Service](image)

159. Treatment plants often do not have sufficient influent due to a lack of property connections, and as existing gutters carrying sullage, have not been diverted into the sewerage system. The existing treatment plants are also not properly maintained by the ULBs and the final effluent not always analysed for conformity with quality standards. The inevitable effect of this is pollution of the water bodies to which the final effluent is discharged, potentially affecting downstream water supplies and others who draw from the water courses.

6.4.3.2 Water Network

160. The primary concerns with the water network are:
- The quality of workmanship employed for the construction and maintenance of assets;
- The lack of plans showing the location of networks, and a GIS. The lack makes the planning of extensions difficult, results in duplication of pipelines and does not support the maintenance of existing assets, and
- The absence of a recording system for work performed on the network, and an asset history upon which a mains replacement programme can be formulated.

161. No inspection regime is in place to monitor the integrity of the underground assets or to identify maintenance needs.

162. The majority of the distribution network is uPVC, with pipes being jointed using solvent cement techniques. This material is relatively inexpensive, light to handle and straightforward to install. If it is not handled carefully during installation, damage can be caused that is initially not apparent but which manifests itself in a catastrophic failure at a later date following pressure fluctuations, heavy traffic loading etc.

163. The use of solvent cement jointing techniques in an open trench environment is notoriously difficult because of the need for absolute cleanliness to prevent contamination of the jointing surfaces. This may well be the cause of the high number of failures of uPVC pipes, particularly at joints and points where house connections have been made. The lack of record keeping procedures for maintenance activities means that there is no documentary evidence to support this but the anecdotal evidence from all ULB's is consistent.

164. Once again the potential for failure may not be apparent when the joint is made but the poor quality control of jointing techniques is probably the major cause of failure at these points leading to subsequent failures.

165. House connections are made using a mixture of pipe materials including a uPVC saddle, galvanised iron riser pipe, valve and elbow and threaded uPVC pipe. Mixing pipe materials is not
considered best practice because of the differing rates of expansion and contraction that can result in future leakages. The use of galvanised iron for underground pipes is poor practice because it is highly prone to corrosion and the use of rigid uPVC threaded into the connection point to the main provides no flexibility in case of ground movement caused by traffic loading.

6.4.3.3 Water Storage Facilities

166. In the subject towns, the majority of the water storage was in elevated tanks. The Indian norm is for storage equal to 35% of demand to be available. From our observations, this target is achieved.

167. The condition of the facilities varied with the problems being leakage and poor structural condition.

168. Concerns that we have with many of the facilities were with safety, especially access ladders, and with ensuring that the water held is not contaminated through poor access covers, ventilators etc. As with many sites visited, site security is poor making the sites vulnerable to vandalism or more serious activity.

6.4.3.4 Sewer Network

169. The above comments on the water network can apply to sewer networks. If anything with the lack of staff and equipment for sewer maintenance and cleaning, as noted in the subject towns, the situation could be worse. We noted in several locations, that untreated sewage is taken from the sewers and used for irrigation.

170. Whilst we did not witness any sewer laying the assumption is that similar poor on-site techniques are also prevalent.

171. ULBs lack the required plant for sewer and manhole cleaning, clearing of blockages and for CCTV inspections.

6.4.4 Capital Works

6.4.4.1 Scheme Initiation

172. Water resource planning for UWSS is focused on local needs without any wider considerations. Demands are determined from standards rather than as applicable to the area to be supplied, and the required infrastructure designed and constructed. As mentioned elsewhere, the lack of flow measurements makes designing for “real” needs rather than against “norms” impossible.

173. There seems to be no concept of water resource in a catchment or basin. Water permits are applied for without due consideration to the water balance for the resources in the basin.

174. To initiate the process, a ULB sends a written Council resolution to the KUWS&DB, requesting scheme implementation. When a new urban WSS project is being planned, clearance from the Water Resource Department is secured to ensure that sufficient water is available. This clearance takes the form of a permission which falls short in both legal power and in scope of its regulatory impact when compared to a water license.

175. For wastewater discharge, permits are issued by the State Pollution Control Board.

176. As far as we have been able to ascertain, there is no formal project appraisal process in which projects are appraised, at key times in their creation, against the original business needs and estimates to ensure that the project remains “on track” to deliver the objectives sought. The only formal review of a project is at the Detailed Project Report stage.

177. As such there is no on-going learning process so that design engineers can learn from the mistakes of projects, as well as the good points.

6.4.4.2 Main laying Performance

178. Of concern, from our site visits we have strong reservations about the quality of materials being used for new projects, and the quality of workmanship. Complete replacement of water networks is openly discussed due to the poor quality of the mains. At most, 20 to 25yrs old,
systems are requiring replacement that should be lasting 40 to 50yrs, if not longer. With the major investments now taking place and contemplated, it is essential that the full working life of the assets procured is obtained without the need for premature replacement.

179. As shown in the pictures below, that were taken during a site inspection, the installation techniques are not up to modern standards. The photographs show a pipeline being installed by a local contractor. The trench environment is congested making it impossible to properly store the pipes, and to lay them in a straight line. The resulting bends, albeit slight, place stress on the pipe wall and make it more prone to failure. No bedding material is used to mitigate against this by keeping hard/abrasive materials away from the pipe wall.

180. Incorrect storage can cause damage to the pipes and contamination.

Figure 8: Distribution Network Installation

181. Concerns highlighted by the photographs include the:
   - Unsatisfactory pipe storage on the roadside with risk of damage and contamination;
   - Complete lack of bedding material to surround the pipe;
   - Proximity of an open sewer presenting the risk of contamination of the pipe;
   - Depth at which the pipe was being installed;
   - No safety barriers or other warnings to the public, and
   - Congestion of the trench with other pipes making future maintenance and repair more difficult.

182. The difficulties encountered with finding a good route and maintaining joint cleanliness are clearly evident from these photographs.

183. The pipe shown is 160mm diameter and is manufactured to IS 4985. This allows for a variation in pipe diameter of 0.8mm. Using solvent cement joints under these circumstances increases the risk of failure because the technique requires the spigot to be a close fit in the socket.

184. The pressure rating of the pipe shown is 6bar. With the current operating pressures well below this level, primarily because of the intermittent supply regime, this should be sufficient. However, it was repeatedly stated that fluctuations in pressure as a result of valve operations caused pipe failures. As a continuous supply is made available and pressures increase, low
pressure rated pipes will be at increased risk of failure with the consequential adverse effect on both the service to customers, and for non-revenue water levels\textsuperscript{13}.

\textbf{6.4.4.3 Plant Performance Guarantees}

185. We were unable to review the performance guarantees for the treatment process and for the operational costs of the plants, in the current works contracts. From discussions with the site staff, guarantees are either not requested in the contract documents or are weak.

\textbf{6.4.5 Non-Revenue Water}

\textbf{6.4.5.1 Definition of NRW}

186. Losses from water transportation, treatment and distribution systems that have not been quantified are commonly known as ‘Non-Revenue Water’ (NRW) and/or ‘Unaccounted for Water’ (UFW). There is often considerable confusion regarding the difference between these two terms. In fact both are constituent parts of the other and to a large degree the preference for a particular terminology depends upon the reasons for the reduction of ‘losses’. For example if the reason is to increase the income gained from the provision of water services then NRW is often adopted but if the reason is to reduce leakage then UFW is often used. For clarification:

- NRW is the difference between the volume of water input to a system and the volume for which revenue is received,
- UFW is the difference between the volume of water input to a system and the volume of water consumed, minus the unbilled volumes that can be accurately quantified.

187. For the purposes of this Report, it is considered that both have the same overall objective; consequently although the term NRW is used this also includes UFW.

188. Non-Revenue Water (NRW) requires to be maintained at acceptable levels for three principle reasons:

- To maximise the quantity of water available for supply to consumers;
- To increase the revenue received from the sale of water by making more water available for “sales” and by identifying previously unknown connections, and
- To reduce the risk of contamination caused by the ingress of contaminated water into pipelines through points of leakage.

189. In a majority of cases the first two reasons are the main driving factors behind reduction of NRW. The quality of the water provided will be improved as a result of actions taken to achieve the first two criteria.

190. Depending upon the ability of the service provider to meet customer demand, a reduction in leakage can be used to:

- Extend current coverage without the need for additional treatment capacity;
- Permit increased consumption by existing customers, or
- Where demand is being met, reduce the quantity of “water into supply”, and thus OPEX.

191. In Karnataka, reduced NRW will lead to increased coverage and customer consumption i.e. improved Levels of Customer Service.

\textbf{6.4.5.2 Current NRW Practice Within ULB’s}

192. There is no organised structure or practice for the reduction of NRW in any of the Tranche 1 towns. Priorities for the ULB’s are centred on the construction of new assets rather than the efficient management, operation and maintenance of those assets in service.

\textsuperscript{13} A pipe rated at 6bar should, if laid correctly, be capable of withstanding pressures of up to 9bar — the site test pressure, possibly higher. If the introduction of a continuous supply is managed to maintain pressures at the minimum necessary to supply building, the effect might be mitigated. To further reduce the risk, wherever possible, distribution mains should be gravity, rather than pumped.
193. The basic infrastructure required for the establishment of a NRW reduction methodology are not present in any of the ULB’s. Due to the complete absence of meters there is no accurate monitoring of flows and pressures, and water audits are performed rarely. Where flow data is provided it is based commonly on volumes pumped as determined from the pump performance curves, with no allowance for wear of the pumps and efficiency losses.

194. The current practice for the identification and rectification of losses is entirely reactive which means that only those losses that become visible are attended. Repairs are prioritised based on the level of public nuisance they cause rather than the impact they may be having on service delivery standards, costs and system performance.

195. No attempt is made to locate hidden losses and unauthorised usage, or to practice demand management.

196. This operating philosophy has been adopted as the result of a wide a range of circumstances including:

- ULB managers are few and they do not view NRW reduction as a priority - they are too busy fire fighting or have other non-water related duties;
- Limited staff members do not have time to allocate to active leak detection;
- A lack of training in the principles of NRW management means that the degree of understanding of the issues involved is limited in the extreme;
- Lack of leak detection equipment and computer network management programmes;
- Networks are not designed with the objective of monitoring and managing NRW;
- Consumer metering policies and tariffs are not conducive to managing demand for water, and
- Lack of funds for the improvement of operational assets.

6.4.5.3 Indicative Water Balance

197. Accurate determination of Non-Revenue Water (NRW) is impossible without the means to measure "water into supply", or the volumes supplied to customers. In the lack of adequate data, the following assessment has been made of the NRW levels within the four subject towns. The figures must be taken as indicative, only.

Table 8: Indicative NRW Levels in Subject Towns

<table>
<thead>
<tr>
<th></th>
<th>Byadgi</th>
<th>Ranebennur</th>
<th>Harivar</th>
<th>Davangere</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011 population</td>
<td>28,000</td>
<td>114,580</td>
<td>101,711</td>
<td>488,410</td>
</tr>
<tr>
<td>Number of domestic connections</td>
<td>2,876</td>
<td>13,000</td>
<td>6,500</td>
<td>41,000</td>
</tr>
<tr>
<td>Occupancy rate/property</td>
<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>No of Domestic customers</td>
<td>14,380</td>
<td>65,000</td>
<td>32,500</td>
<td>205,000</td>
</tr>
<tr>
<td>Coverage by population</td>
<td>51%</td>
<td>57%</td>
<td>32%</td>
<td>42%</td>
</tr>
<tr>
<td>Coverage as reported</td>
<td>36%</td>
<td>59%</td>
<td></td>
<td>30%</td>
</tr>
<tr>
<td>Domestic per capita, as stated</td>
<td>56/81</td>
<td>79/94</td>
<td>84/36</td>
<td>86/17</td>
</tr>
<tr>
<td>Domestic demand</td>
<td>0.81</td>
<td>5.14</td>
<td>2.73</td>
<td>17.63</td>
</tr>
<tr>
<td>No of stand pipes</td>
<td>50</td>
<td>261</td>
<td>260</td>
<td>3516</td>
</tr>
<tr>
<td>No of people/standpipe</td>
<td>272</td>
<td>190</td>
<td>266</td>
<td>81</td>
</tr>
<tr>
<td>Standpipe customer's per capita</td>
<td>25/34</td>
<td>25/1.24</td>
<td>25/1.73</td>
<td>25/7.09</td>
</tr>
<tr>
<td>Standpipe demand</td>
<td>0.34</td>
<td>1.03</td>
<td>0.55</td>
<td>3.53</td>
</tr>
<tr>
<td>Commercial demand</td>
<td>0.16</td>
<td>0.3</td>
<td></td>
<td>1.00</td>
</tr>
<tr>
<td>Industrial demand</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installed treatment capacity</td>
<td>Mid</td>
<td>11.35</td>
<td>9.0</td>
<td>80.0</td>
</tr>
<tr>
<td>Probable &quot;water into supply&quot;</td>
<td>Mid</td>
<td>11.35</td>
<td>8.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Total customer demand</td>
<td>Mid</td>
<td>8.71</td>
<td>5.01</td>
<td>29.24</td>
</tr>
<tr>
<td>NRW: flow</td>
<td>Mid</td>
<td>2.64</td>
<td>2.99</td>
<td>20.76</td>
</tr>
<tr>
<td>NRW: as percentage of &quot;water into supply&quot;</td>
<td>Mid</td>
<td>23%</td>
<td>37%</td>
<td>42%</td>
</tr>
</tbody>
</table>
198. An assessed NRW level of around 40% is realistic and probably representative of most ULBs in Karnataka. We would suggest that the 23% non-revenue water is low considering the reactive nature adopted by ULBs for the O&M of the network, and under-estimates the criticality of the problem. For all ULBs, when the supply become continuous, the percentage would be higher, possibly 50% to 60%. Without urgent attention, a large percentage of water that will become available with the commissioning of the treatment plants currently under construction, will be lost.

199. The non-revenue water is divided between physical losses and commercial losses. No division between the two is possible due to the lack of reliable data upon which an assessment can be made.

6.5 Customer Service

6.5.1 Introduction
200. We have considered customer service performance in technical terms and for the response to customer contacts.

6.5.2 Service levels – Water Supply
201. It is in the service provided to customers that shortcomings in the institutional organisation, asset conditions and technical problems become apparent.

202. As a direct result of the increase in population, demand for water has grown at a similar rate, albeit with customer demand limited by the ability to meet that demand. As a result, there is a significant unmet customer demand within the state. Water supplies are often infrequent with supplies provided for only a few hours on alternate days, or worse, as shown in the following table taken from the Draft Cabinet Paper: “Water Supply and Sanitation - Re-organization of Institutional Arrangements”

Table 9: Current Levels of Service in Karnataka

<table>
<thead>
<tr>
<th>Total No. of ULBs</th>
<th>219</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Frequency of supply</strong></td>
<td></td>
</tr>
<tr>
<td>No. of ULBs with a daily water supply</td>
<td>-</td>
</tr>
<tr>
<td>No. of ULBs with a water supply on alternate days</td>
<td>-</td>
</tr>
<tr>
<td>No. of ULB with a water supply once every 3 or more days</td>
<td>-</td>
</tr>
<tr>
<td><strong>B. Hours of supply</strong></td>
<td>2 to 3 hours, on average</td>
</tr>
<tr>
<td><strong>C. Service Level</strong></td>
<td></td>
</tr>
<tr>
<td>No. of ULBs with service level &gt;70 l/hd/dy</td>
<td>-</td>
</tr>
<tr>
<td>No. of ULBs with service level 40-70 l/hd/dy</td>
<td>-</td>
</tr>
<tr>
<td>No. of ULBs with service level &lt;40 l/hd/dy</td>
<td>-</td>
</tr>
</tbody>
</table>

203. Service levels provided in the sub-basin are shown in the following table.

Table 10: Customer Service Levels for Water Supply in Sub-Basin

<table>
<thead>
<tr>
<th>Town</th>
<th>Coverage</th>
<th>Consumption (l/hd/dy)</th>
<th>Continuity of Water Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harapanahalli</td>
<td>78%</td>
<td>71</td>
<td>One hour Every alternate Day</td>
</tr>
<tr>
<td>Davangere</td>
<td>26%</td>
<td>86</td>
<td>Supply is once every alternate day, for duration of about 1 to 2 hours. In this summer, the supply was curtailed to once in four days</td>
</tr>
<tr>
<td>Harihara</td>
<td>65%</td>
<td>84</td>
<td>1-1.5 Hours every three days</td>
</tr>
<tr>
<td>Honnali</td>
<td>73%</td>
<td>62</td>
<td>Once in Three Days</td>
</tr>
<tr>
<td>Channagiri</td>
<td>91%</td>
<td>91</td>
<td>Once in alternate days</td>
</tr>
<tr>
<td>Jaglaur</td>
<td>90%</td>
<td>30</td>
<td>Once in five Days</td>
</tr>
<tr>
<td>Shiggaon</td>
<td>23%</td>
<td>35</td>
<td>Once in four days for one hour</td>
</tr>
<tr>
<td>Bankapur</td>
<td>18%</td>
<td>40</td>
<td></td>
</tr>
</tbody>
</table>
The rate of water supply is the average rate of supply during the year. The availability of water can be higher during monsoon; lower during the summer.

The reasons for the poor supply range from inadequate raw water or treatment capacity to a lack of capacity in the transmission systems and in the distribution network.

Standby generators are not available and supplies are affected by power failures.

With intermittent supplies, householders use storage tanks and other means to store water during periods when it is not available. This in turn aggravates the situation as the control valves to domestic tanks frequently let by causing tanks to overflow to waste. Prior to the supply being provided, customers empty their storage tanks to waste.

Pressures within the system are low.

We do question how the values of Table 10 are derived without comprehensive metering of water into supply or of the supply to individual customers. Also, the duration of the supply will depend upon where a customer is located i.e. on high or low ground or at the extremity of the network. Nevertheless, all are below the lower Indian design standard of 100l/hd/day, let alone the target of 135l/hd/day for larger towns and those with a sewerage network.

### 6.5.3 Service levels – Waste Water

The situation for wastewater is worse than that for potable water supplies. Of the thirty-four ULBs located in the Upper Tunga Bhadra basin, only five have a piped wastewater collection network – Davangere, Shimoga, Chitradurga, Harihar and Ranebennur.

Septic tanks are the predominant sewage treatment system in Karnataka towns, 50-80% coverage. Septic tank effluent is discharged to open drains adjacent to household dwellings. Nearly all sewerage in Karnataka is therefore an ‘open sewerage’ system.

Property holders are often reluctant to connect their properties to sewer lines since it involves substantial expenditure compared to using their old septic tank systems. The lack of willingness to pay for a connection is an issue to be addressed if the investment in wastewater collection systems and treatment are to be viable; the ULBs are to achieve the expected income to pay for...
the OPEX of the facilities and the desired public health and environmental objectives are to be met. A small team is included in the IWRM Project Management Unit, Section 7.6.4.1, to tackle this issue for the disadvantaged groups.

### 6.5.4 Service Levels – Customer Response

213. ULBs visited have no formal system or procedures to record customer contacts, and to track how the ULB responds to that contact. It is not possible, therefore, to assess the performance of ULBs to customer contacts.

214. There is no customer regulator or “ombudsman” role to whom customers can take complaints or who oversees ULB service performance.

215. Considering the few staff available and the common poor supply service levels, our assumption would have to be that (i) customers rarely contact the ULBs and that (ii) response times would not be that prompt. Probably, but not verified, the main incentive for a ULB to respond is political pressure.

### 6.6 Financial

#### 6.6.1 Overview

216. The following is based upon the assessment of the four Tranche-1 towns, but is considered as typical across the State. The salient points from the assessment are:

- The ULB revenue income hardly pays the revenue expenditure. The ULBs heavily depend on grants from the state government for day-to-day operations;
- Collection efficiency for property tax in three of the four Tranche-1 ULBs needs improvement as it ranges from 62% in Harihar to 86% in Davangere, for the financial year 2011-12. In Byadgi, the collection efficiency is very good at 99%;
- Collection efficiency for water is low and ranges from 50.4% in Harihar to 81.9% in Davangere, and needs to be improved, and
- Revenue expenditure has grown in the range of 12% in Harihar to 39.1% in Ranebennur.

#### 6.6.2 Operational Costs in the Subject Towns

217. Operational costs are shown below:

<table>
<thead>
<tr>
<th>Subjective Costs (INRm)</th>
<th>Byadgi</th>
<th>Ranebennur</th>
<th>Davangere</th>
<th>Harihar</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Staff costs</strong></td>
<td>1.65</td>
<td>4.67</td>
<td>11.15</td>
<td>4.13</td>
<td>21.6</td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td>4.9</td>
<td>12.52</td>
<td>62.89</td>
<td>8.64</td>
<td>88.95</td>
</tr>
<tr>
<td><strong>Consumables</strong></td>
<td>0.97</td>
<td>1.63</td>
<td>14.7</td>
<td>0.17</td>
<td>17.47</td>
</tr>
<tr>
<td><strong>Repairs &amp; Maintenance</strong></td>
<td>1.11</td>
<td>0.47</td>
<td>3.68</td>
<td>1.8</td>
<td>7.06</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>6.51</td>
<td>1.98</td>
<td>6.51</td>
<td>1.98</td>
<td>8.49</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>8.63</td>
<td>19.29</td>
<td>98.93</td>
<td>16.72</td>
<td>143.57</td>
</tr>
<tr>
<td><strong>No of customers</strong></td>
<td>14,380</td>
<td>65,000</td>
<td>205,000</td>
<td>32,500</td>
<td>316,880</td>
</tr>
<tr>
<td><strong>INR/customer</strong></td>
<td>600</td>
<td>297</td>
<td>483</td>
<td>514</td>
<td>453</td>
</tr>
<tr>
<td><strong>Water into supply</strong></td>
<td>11.35</td>
<td>50</td>
<td>8</td>
<td></td>
<td>69.35</td>
</tr>
<tr>
<td><strong>INR/cubic metre</strong></td>
<td>2,460</td>
<td>1,979</td>
<td>2,090</td>
<td></td>
<td>2,070</td>
</tr>
</tbody>
</table>

218. Taking into consideration the lack of flow data for “water into supply”, the unit costs across the four ULBs are not dissimilar. The cost per customer in Byadgi is higher and this could be due to the bulk purchase of water from the Ranebennur plant. Combined, the unit cost is 352INR/customer.

219. The largest cost, by far, is power.
6.6.3 Service Charges

220. For urban areas of Karnataka, service charges are set by the relevant ULB; not at the State level. In general, the sector is heavily subsidized, though the degree of subsidization varies between ULBs.

221. Tariffs are based upon political expediency and are not related to the level of service provided.

222. Almost all the ULBs are not charging water tariffs to recover at least the entire cost of operation and maintenance (O&M) of water supply schemes, let alone to cover debt servicing. The present rates charged by many ULBs in the State range from Rs. 50-65 per connection per month for domestic use and Rs. 100-130 per connection for non-domestic use. These rates fail to even cover O&M costs.

223. Where it provides a service on behalf of the ULB, the KUWS&DB collects revenue from customers at rates decided by the ULB, with the difference between income and expenditure met by the Government. In turn, the Government recovers the deficit from grants forthcoming to the ULB. Indirectly the ULB has to bear the loss in revenue.

224. As mentioned above, the tariff is inadequate to meet the current operational costs. If the service is to be improved there will be a need for a significant increase in the tariff, or increased subsidy. There is a real risk that the increased OPEX associated with the works currently under construction will not be fully covered by the increased income that should be derived from the higher “sales” due to significant losses due to leakage.

225. The charge for water supply is a monthly charge; that for wastewater is included within the property tax. As sewerage schemes only cover partial sections of the population, ULBs often find difficulty levying sewerage service charges in the very small areas covered.

226. The state government has issued an order in July 2011, requiring the ULBs to introduce full charging by volume, i.e. meters, and other measures to improve collection efficiency and the financial sustainability of the service provision.

6.6.4 Financial Management

227. The major findings common to four ULBs are presented in following table.
Table 12: Summary of Financial Performance in Subject ULBs

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Findings</th>
<th>Solution / Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting System</td>
<td>Accrual based accounting system; All four ULBs have implemented the new accounting system developed under KMRP. Harihara has prepared the Annual Performance Report for FY 2011-12, Byadgi – FY 2009-10 (FY 2010-11 final corrections); Ranebennur FY2010-11 and Davengere FY 2009-10.</td>
<td>Byadgi will be creating a new PIU cell for IWRM project In other ULBs where either NKUSIP or KMRP cell is in operation as PIU, one additional First Divisional Assistant (FDA) with 10 years experience need to be posted.</td>
</tr>
<tr>
<td>Staffing</td>
<td>Inadequate Staff(^{14}); Lacks training</td>
<td>ULBs have created PIUs for NKUSIP and KMRP project implementation</td>
</tr>
<tr>
<td>Weak Financial Situation</td>
<td>Percentage of own source income to total revenue income: Davanagere – 24% Ranebennur – 29% Harihara – 22% and Byadgi – 31%</td>
<td>Upon full implementation of the new water and sewerage tariff as per the GoK GO dated 20(^{th}) July 2011 and improving the collection efficiency the ULBs aim to improve their financial situation.</td>
</tr>
<tr>
<td>Safeguards over Assets</td>
<td>Insufficient safeguards No insurance of assets; No physical verification</td>
<td>Asset module has been developed under KMRP. Once implemented, fixed assets records will be kept up to date; physical verification and reconciliation of assets done.</td>
</tr>
</tbody>
</table>

\(^{14}\) Number of staff in accounts department to be strengthened for accrual based accounting system
6.6.5 Financing of UWSS schemes

228. Almost all ULBs neither have the technical nor financial capability to independently pursue the development of water supply and/or sewerage schemes either from their own resources or by raising funds without the support of GoK.

229. The financial assistance from GOK varies according to population size of the ULB. The Town Panchayaths, Town Municipal Councils and City Municipal Councils, with populations of up to 75,000, receive the maximum ceiling for grants from the government.

230. The Town Panchayaths do not need to borrow from financial institutions or raise their own funds for water supply schemes or, if the need arises, to take out a loan for sewerage schemes as the share for a Town Panchayath is only 20%. For Town Municipal Councils and City Municipal Councils with population of up to 75,000, grants for water supply scheme are 50% and the remaining 50% is raised from borrowings from financial institutions, avoiding the need for raising their own share.

231. In the case of sewerage schemes though, all City Municipal Councils are required to raise their own share of 25% of the cost. The share of Town Municipal Councils is less than that required to be raised by City Corporations.

232. Grants for water supply schemes for the City Corporations are less in percentage compared to the City Municipal Councils / Town Municipal Councils / Town Panchayath, hence they need to raise finance from financial institutes and to contribute from their own sources of income.

233. ULBs normally raise finance for WSS projects from the Life Insurance Corporation of India, the Housing and the Urban Development Corporation of India (HUDCO) and nationalised banks.

6.7 Summary of Issues identified

234. The following is a summary of issues identified for attention. The issues have been identified from the review of practices and circumstances in the four subject ULBs but can be taken as indicative for most, if not all ULBs in Karnataka.

235. Our main conclusion is that at the root of the problem: centrally, there is minimal coordination and planning and locally, ULBs operate with limited accountability in terms of (i) water use; (ii) in maintaining efficient, coordinated and commercially viable systems and (iii) in complying with quality and performance standards.

236. At the heart of the matter are issues of inadequate tariff structures to support the O&M function and so undermine the sustainability viability of UWSS investments, and the ineffective management of non-revenue water.

<table>
<thead>
<tr>
<th>Strategic Theme</th>
<th>Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutional-State</td>
<td>1. Lack of co-ordination among the state agencies.</td>
</tr>
<tr>
<td></td>
<td>2. No over-riding responsible &amp; proficient entity for UWSS.</td>
</tr>
<tr>
<td></td>
<td>3. No “Centre of Excellence” for knowledge dissemination.</td>
</tr>
<tr>
<td></td>
<td>4. No Water Sector Master Plan with prioritised investment programme.</td>
</tr>
<tr>
<td></td>
<td>5. Lack of previous investment.</td>
</tr>
<tr>
<td></td>
<td>6. Emphasis is on creation of new assets and not operability.</td>
</tr>
<tr>
<td>Institutional–Local</td>
<td>7. Managers not dedicated to UWSS.</td>
</tr>
<tr>
<td></td>
<td>8. Insufficient staff, poorly trained and lacking business support systems and equipment.</td>
</tr>
<tr>
<td></td>
<td>9. Insufficient staff with establishment posts not always filled.</td>
</tr>
<tr>
<td></td>
<td>10. No formal training programmes resulting in untrained staff at all levels.</td>
</tr>
<tr>
<td></td>
<td>11. Lack of business support systems.</td>
</tr>
<tr>
<td>Technical</td>
<td>12. Inadequate O&amp;M of assets resulting in their premature failure and inefficient operations.</td>
</tr>
<tr>
<td></td>
<td>13. No data collection for decision making.</td>
</tr>
</tbody>
</table>

Table 13: Summary of “Impediments to Success” Identified
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>15.</td>
<td>Supplies adversely affected by power failures.</td>
</tr>
<tr>
<td>16.</td>
<td>High levels of NRW without the ability/resources to reduce to acceptable levels.</td>
</tr>
<tr>
<td>17.</td>
<td>Poor workmanship and incorrect materials used for new schemes.</td>
</tr>
<tr>
<td>18.</td>
<td>Inadequate site supervision.</td>
</tr>
<tr>
<td>20.</td>
<td>Poor service with infrequent supplies of limited quantities.</td>
</tr>
<tr>
<td>22.</td>
<td>No formal service agreement between “asset owner” and “asset operator”.</td>
</tr>
<tr>
<td>23.</td>
<td>No effective monitoring of service levels.</td>
</tr>
<tr>
<td>24.</td>
<td>No independent recourse for customer complaints.</td>
</tr>
<tr>
<td>25.</td>
<td>Inadequate service charges that were insufficient to fund sustainable O&amp;M budget and required staff establishment.</td>
</tr>
<tr>
<td>26.</td>
<td>Tariffs influenced by political pressures.</td>
</tr>
<tr>
<td>27.</td>
<td>Absence of revenue meters preventing accurate income determination and customer demand management.</td>
</tr>
<tr>
<td>28.</td>
<td>Some poor collection efficiency</td>
</tr>
</tbody>
</table>
7 RECOMMENDATIONS FOR BEST PRACTICE - “CRITERIA FOR SUCCESS”

7.1 Introduction

237. In the previous section, we set out the issues that we have identified with the current service provision. In this section, we propose solutions to those issues based upon best international experience.

238. The section is sub-titled “Criteria for Success” as the introduction of the recommendations can be monitored and used as indicators for the Karnataka water sector as it follows this Road Map to success in providing a professional and sustainable water and wastewater service in the state.

239. We, and the reader, must appreciate that the move from the current situation to that recommended in this Section is a major change and requires considerable planning and augmentation of existing resources and, not least, the necessary financial budget. The change cannot be achieved overnight and the full implementation must be measured in years; not months.

240. In making these proposals, we wish to record our appreciation of the assistance and guidance provided by the Managing Director of the KUIDFC and his staff from whom many of the proposals have originated.

7.2 Key Concepts

241. We have taken into consideration a number of key concepts when making our proposals.

7.2.1 Integrated Water Resource Management

242. The project is specifically required to take into account the opportunities for IWRM, which embraces strategies for:

- River water quality improvement through, for example, eliminating untreated sewage discharge and water quality protection measures;
- Increase water efficiency gains through NRW reduction, efficient water treatment processes, wastewater treatment effluent reuse and sludge management;
- Increasing water security with provision of bankside storage, and
- Promotion of associated water measures, typical of which are rainwater harvesting and aquifer recharge.

243. Accordingly, the project particularly addresses these opportunities. The project scope limits us to consider only UWSS aspects of IWRM that can be funded within the KISWRMIP Tranche-1 MFF funding parameters, as agreed with the Government in the Financing Memorandum.

244. There are other initiatives, outside of KISWRMIP, which can assist equally to deliver IWRM objectives. Typical of the initiatives would be:

- Slum clearance and the creation "buffer zones" alongside the rivers, around lakes and other significant water spaces to prevent wastewater and other pollutants from being discharged, intentionally or otherwise, into the water space. The zone can be created by enforced town planning laws to prevent unauthorised building and by slum clearance programmes, and
- Effective solid waste management to ensure that pollutants do not leach into the ground waters.

245. An option for consideration by stakeholders would be for slum clearance and other IWRM measures that cannot be funded by the ADB within the KISWRMIP funding vehicle to be funded by the Government of Karnataka within their component of the KISWRMIP investment.
7.2.1.1 Re-Use of Municipal Wastewater

246. A cornerstone of IWRM is to seek opportunities for the re-use of wastewater effluent in order to reduce the demand on scarce water resources. Opportunities for re-use exist in:

- Irrigation and agriculture;
- Industry, and
- Landscaping and development of “green” areas in towns.

247. Currently, in the sub-basin area wastewater is effectively re-used, with or without treatment, by farmers for irrigation. As untreated, the wastewater acts as a good fertiliser especially as in most cases there is an absence of heavy metals.

7.2.1.1.1 Issues Associated with Wastewater Re-use for Industry

248. In many locations, the diversion of wastewater effluent to industry would merely take from one application, to give to another. Without a significant increase in irrigation efficiency, the loss of wastewater for irrigation would mean that farmers would have to rely more upon depleted groundwater sources or take surface waters the water previously taken by industry.

249. Where the water is re-used for industrial water:

- There needs to be a market for the re-used water;
- The supply of re-used water must be reliable and compliant with the required standard;
- There must be adequate wastewater available/collection for treatment; and
- The sale price to industry must be competitive with the industry’s cost for raw water procurement.

250. Given the costs of (i) wastewater treatment to a standard for re-use and (ii) distributing the treated wastewater, if the sale of municipal wastewater to industry is to be financially viable, the charge levied to industry for a “normal” potable water industrial supply must be at a cost to encourage industry to re-use water.

251. Using treated wastewater for irrigation purposes would both be a re-use of wastewater and would be safer than the current practice of using untreated sewage. However:

- There would be a cost of the additional treatment to be met, and it is unlikely that the farmers would be prepared to pay the charge even if some form of charging could be determined;
- The treated wastewater would need to be distributed back to suitable irrigation nodal points, and
- There would be a need of policing to ensure that the untreated wastewater was not stolen and that, sewers were not vandalised to obtain the wastewater without charge.

7.2.1.1.2 Hospet Opportunity

252. Nevertheless, there are opportunities for re-use. Hospet provides an excellent opportunity for industrial re-use of wastewater within the local steel mills. Our investigative work has only progressed to a preliminary stage, but we see long-term potential for industrial re-use. The steel mills have indicated a willingness to invest in the required municipal wastewater treatment and distribution facilities. We see this as an excellent opportunity for close ULB/private sector partnership.

253. A model for possible PPP within locations such as Hospet has been provided in Appendix 3.
7.2.2 Public Private Participation

7.2.2.1 System Operator

254. The water sector proposals are focused upon providing a continuous water supply to the urban communities of Karnataka, in a systematic, sustainable and affordable way.

255. In our discussions with the KUIDFC, and in line with Union and State policy, the use of a private operator is seen to be instrumental to achieve this objective. The use of a private operator should both bring “best practice” experience to the service provision which, if managed correctly would enable technology transfer to the ULBs. A private sector operator and would provide also the additional resources.

256. Before private sector O&M of the facilities can be successfully introduced, four elements must be in place:

- A sufficient number of experienced and competent operators to be available to ensure a viable tendering process, willing to participate;
- A customer service base of sufficient size to attract competent operators and to pay for the operator costs and profit without undue load on the tariff;
- A competency in the client ULBs to be able to prepare, evaluate and manage the contracts, and
- Adequate data available to the bidding operators to enable them to assess the risk and make a bid.

257. We respectfully suggest that only the first of these is currently present in Karnataka, and that is doubtful. In our opinion, with some limitation as discussed later, full scale operation of the water and wastewater systems by a private sector contractor is a medium-term objective; not for immediate introduction.

258. Our proposals are framed around the need to put in place measures to ensure that the last three requirements are met in order to permit later greater private sector participation, should that remain as policy.

7.2.2.2 Other Opportunities for PPP

259. The reasons for PPP out-sourcing are that: (i) the work out-sourced can be obtained at a cheaper cost, (ii) for a highly technical service, the work can be more competently performed than by in-house staff; (iii) because benefit will be gained from expensive, specialist equipment that the ULB could not afford or justify, and (iv) the service provider can concentrate on service provision.

260. In addition, there needs to be a clear cost advantage, taking into consideration the ULB bidding and monitoring costs.

261. The reduced costs are brought out by lower overheads; fuller utilisation of time and the payment of lower wage rates than ULBs are obliged to pay. The following ULB activities be considered for outsourcing:

- Grounds and buildings maintenance;
- Clearing sewer blockages on public sewers and on private sewers for a charge;
- Customer meter replacement, water and sewer service pipe repairs and new service connections;
- Leak detection and repair – service providers would benefit from the experience and specialist equipment of an international contractor. Payment could be based upon results;
- IT – often outsourcing to a specialist company is the best way to ensure that the company’s IT equipment is up to date, is regularly and correctly maintained and that access is available to the most skilled, current technical knowledge, and
- Vehicle maintenance.
Future opportunities include, in particular, mains and sewer repairs which avoid the need for expensive plant and vehicles, and meter reading and billing which are often out-sourced in conjunction with other utilities that have to read meters at customer’s premises.

### 7.2.3 Disadvantaged Groups

Presently service charge payers, have minimal involvement in the initiation, planning and management of UWSS schemes. We suggest that participation of communities at all stages in the creation of UWSS investments, including women as a main beneficiary of improved UWSS service, will promote schemes that meet customer needs and instil ownership.

The traditional focus of UWSS of merely providing water and sanitation services needs to shift towards focusing on securing and safeguarding the sources of water supplies and upon the sustainability of the service. The public need to become aware of the importance of a good quality water supply and of safe wastewater disposal so that communities are prepared to pay the necessary service charges and become involved in protecting important water sources.

UWSS agencies thus need to consider how the local community can be more directly involved in the UWSS planning, and how the welfare of disadvantaged can be safeguarded. The latter becoming increasingly important should the sector move towards a more commercial position.

We suggest that a small team is established in the proposed IWRM Project Management Unit – see Section 7.6.4.1 - to focus on gender and social issues applicable to UWSS service provision. The team will develop poverty reduction strategies (i) to target meeting the Millennium Development Goals, (ii) to mitigate disincentives against equal service to disadvantaged customer groups, and (iii) to assist low-income families with the expense of household connections and payment of service charges through special fee collection arrangement for within groups.

The Report of our Social Safeguard Specialist (Annex 5) has considered how the project generally will benefit women.

### 7.3 Definitions

In the following text, we have used specific terms that require definitions.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>(UWSS) Service</td>
<td>The supply of potable water to customers and the collection of wastewater from customers, including all ancillary O&amp;M, and management activities.</td>
</tr>
<tr>
<td>Asset owner</td>
<td>The owner of the fixed assets and the legal entity, within a ULB’s boundary.</td>
</tr>
<tr>
<td>Service provider</td>
<td>The entity responsible to the ULB for the service. The service provider may be the ULB or a second party contracted to the ULB to provide all or part of the service. In turn, the service provider may contract another entity to be the asset operator.</td>
</tr>
<tr>
<td>Bulk supplier</td>
<td>The entity with the mandated responsibility to procure, treat and provide water in bulk for distribution to customers by the service provider. Currently this is the ULB; under the Draft Cabinet Paper, the responsibility will pass to the KUWS&amp;DB.</td>
</tr>
<tr>
<td>Asset operator</td>
<td>The service provider or another entity contracted to the service provider to operate and maintain all / or part of the assets and / or deliver all or part of the services</td>
</tr>
<tr>
<td>Contractor</td>
<td>A commercial organisation contracted to the Service Provider or the ULB’s to provide a specific resource / service or range of resources / services</td>
</tr>
</tbody>
</table>

A ULB, as the asset owner, might form a separate entity to be the service provider and that service provider entity might contract an experienced contractor to be the asset operator and to provide the service. The water supplied to customers could be purchased in bulk from a works contractor who has contracted to design, build and operate a treatment plant over an extended period.
7.4 Current Investment Initiatives

There is currently a considerable investment\textsuperscript{15} for both water and wastewater within the sub-basin as set out in the following tables. The investment comprises:

- ADB funding through NKUSIP;
- By the GoK through the KUWS&DB, and
- By the World Bank.

\textsuperscript{15} The investments are not coordinated or prioritised, and there is no central entity which provides a schedule of work in-hand. As a consequence, the two tables are our “understanding” of the investments and may not be complete, or correct.
Table 15: Current Water Investments

<table>
<thead>
<tr>
<th>Funder</th>
<th>Name of the Town</th>
<th>Value (Lakhs)</th>
<th>Scheme Outline</th>
<th>Current Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADB via NUKSIP</td>
<td>Gadag-Betageri</td>
<td>9,087</td>
<td>New WTP (27.0 Mld), WS Mains (56 Kms), Distribution Network (16 Kms):</td>
<td>Work in progress</td>
</tr>
<tr>
<td></td>
<td>Davangere</td>
<td></td>
<td>Providing and Laying of Raw Water Pumping main from Rajanahalli Head works to</td>
<td>Work in progress</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Kundawada Lake: 20.28 km, Construction of 15LL Clear Water Storage Reservoir, 20 MLD</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Filter House and Supplying and installation of Bulk Flow meters.</td>
<td></td>
</tr>
<tr>
<td>Government of Karnataka through KUWS&amp;DB</td>
<td>Davangere</td>
<td></td>
<td>Providing and Laying of Raw Water Pumping main from Rajanahalli Head works to</td>
<td>Under tender</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Kundawada Lake: 20.28 km, Construction of 15LL Clear Water Storage Reservoir, 20 MLD</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Filter House and Supplying and installation of Bulk Flow meters.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bhadravathi</td>
<td>4,460</td>
<td>Bulk Water Supply (0.2 Kms) and Distribution Network (55.0 Kms) with 8,200 connections.</td>
<td>DPR approved</td>
</tr>
<tr>
<td></td>
<td>Byadgi</td>
<td>2,892</td>
<td>Bulk Water Supply (36.0 Kms) and treatment works.</td>
<td>DPR approved</td>
</tr>
<tr>
<td></td>
<td>Sagar</td>
<td>5,486</td>
<td>Bulk Water Supply (32 Kms) from Saravathi river and Distribution Network (51.7 Kms)</td>
<td>Under tender</td>
</tr>
<tr>
<td></td>
<td>Hanagal</td>
<td>7,600</td>
<td>Bulk Water Supply (80.0 Kms) from Tunga-Bhadra and Distribution Network (14 Kms)</td>
<td>DPR submitted</td>
</tr>
<tr>
<td></td>
<td>Hadagali</td>
<td>1,994</td>
<td>Bulk Water Supply (13.5 Kms) and Distribution Network (29.0 Kms)</td>
<td>Tenders invited</td>
</tr>
<tr>
<td></td>
<td>Thirthahalli</td>
<td>683</td>
<td>Bulk Water Supply (0.1 Kms) and Distribution Network (9.5 Kms)</td>
<td>DPR submitted</td>
</tr>
<tr>
<td></td>
<td>Shikaripura</td>
<td>1,880</td>
<td>Bulk Water Supply and Distribution Network</td>
<td>Planned</td>
</tr>
<tr>
<td></td>
<td>Mulgund</td>
<td>2,596</td>
<td>Bulk Water Supply for Shirahatti (5.5 Kms) and Distribution for Mulagand (9.4 Kms) and Shirahatti (7.7 Kms)</td>
<td>Work in progress</td>
</tr>
<tr>
<td></td>
<td>Sirahatti</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Shiggaon</td>
<td>4,600</td>
<td>For Shiggaon (Bulk - 21 Kms, Distribution-22 Kms), Bankapur (Bulk-8.0 Kms and 35.0 Kms) and Savanur (Bulk-12 Kms, Distribution – 36.5 Kms)</td>
<td>Work in progress</td>
</tr>
<tr>
<td></td>
<td>Savanur</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bankapur</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hirekerur</td>
<td>1,617</td>
<td>Bulk Water Supply (31.0 Kms) from Tunga-Bhadra and Distribution Network (25 Kms)</td>
<td>Work in progress</td>
</tr>
<tr>
<td>Funder</td>
<td>Name of the Town</td>
<td>Value (Lakhs)</td>
<td>Scheme Outline</td>
<td>Current Status</td>
</tr>
<tr>
<td>---------</td>
<td>------------------</td>
<td>---------------</td>
<td>---------------</td>
<td>---------------</td>
</tr>
<tr>
<td></td>
<td>Channagiri</td>
<td>5,796</td>
<td>Bulk supply and Distribution</td>
<td>Work in progress</td>
</tr>
<tr>
<td></td>
<td>Honnali</td>
<td>72</td>
<td>Distribution network .</td>
<td>Work in progress</td>
</tr>
<tr>
<td></td>
<td>Kadur</td>
<td>3,680</td>
<td>Bulk Water Supply and Distribution Network to be considered as a PPP model.</td>
<td>Work in progress</td>
</tr>
<tr>
<td></td>
<td>Birur</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Shimoga</td>
<td>6,065</td>
<td>Bulk Water Supply (12 Kms) and Distribution Network (405.0 Kms) with 21650 connections.</td>
<td>DPR approved</td>
</tr>
</tbody>
</table>

Table 16: Current Wastewater Investments

<table>
<thead>
<tr>
<th>Funder</th>
<th>Name of the Town</th>
<th>Value (Lakhs)</th>
<th>Scheme Outline</th>
<th>Current Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>World Bank under NKUSIP</td>
<td>Ranibennur</td>
<td>Treatment plant and sewer network</td>
<td>Work in Progress</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Harihara</td>
<td>2,350</td>
<td>First-time sewer network</td>
<td>Tenders to be Invited.</td>
</tr>
<tr>
<td></td>
<td>Haveri</td>
<td></td>
<td>Treatment plant expansion and collectors</td>
<td>Work in progress</td>
</tr>
<tr>
<td>World Bank under KMRP</td>
<td>Chitradurga</td>
<td>9,610</td>
<td>First-time sewer network with treatment plant</td>
<td>Planned.</td>
</tr>
<tr>
<td></td>
<td>Bhadravathi</td>
<td>2,000</td>
<td>First-time sewer network</td>
<td>Work in progress.</td>
</tr>
<tr>
<td>ADB under NKUSIP</td>
<td>Davangere</td>
<td>Treatment plant and rehabilitation of sewers</td>
<td>To be tendered</td>
<td></td>
</tr>
<tr>
<td>Government of Karnataka through KUWS&amp;DB</td>
<td>Harapanahalli</td>
<td>2,950</td>
<td>First-time sewer network with treatment plant</td>
<td>DPR approved</td>
</tr>
<tr>
<td></td>
<td>Honnali</td>
<td>3,000</td>
<td>First-time sewer network with treatment plant</td>
<td>DPR approved</td>
</tr>
<tr>
<td></td>
<td>Hirekerur</td>
<td>1,000</td>
<td>First-time sewer network</td>
<td>Under implementation.</td>
</tr>
<tr>
<td></td>
<td>Laxmeshwara</td>
<td>2,200</td>
<td>First-time sewer network</td>
<td>Under implementation.</td>
</tr>
<tr>
<td>Funder</td>
<td>Name of the Town</td>
<td>Value (Lakhs)</td>
<td>Scheme Outline</td>
<td>Current Status</td>
</tr>
<tr>
<td>------------</td>
<td>------------------</td>
<td>---------------</td>
<td>-----------------------------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Gada-Betgri</td>
<td>1,115</td>
<td>First-time sewer network with treatment plant</td>
<td>Work in progress.</td>
<td></td>
</tr>
<tr>
<td>Hoovinahadagali</td>
<td>1,120</td>
<td>First-time sewer network</td>
<td>Work in progress.</td>
<td></td>
</tr>
<tr>
<td>Koppa</td>
<td>1,052</td>
<td>First-time sewer network</td>
<td>DPR approved</td>
<td></td>
</tr>
<tr>
<td>Sagaara</td>
<td>7,100</td>
<td>First-time sewer network</td>
<td>Work in progress</td>
<td></td>
</tr>
<tr>
<td>Shimoga</td>
<td>6,180</td>
<td>First-time sewer network</td>
<td>Work in progress.</td>
<td></td>
</tr>
</tbody>
</table>
7.5 Institutional – State Level

271. Addressing the issue of lack of coordination and planning across the state, a draft Cabinet Paper has been published that sets out the institutional arrangements for water supply and sanitation in the State.

272. The Paper proposes:

- The establishment of a Drinking Water Supply Mission (DWSM) and a Water Council;
- Defines the KUWS&DB as the entity responsible for bulk water supply and for wastewater treatment, and
- Assigns the ULBs as the entities responsible for service delivery

273. The relationship proposed between the entities and their roles are shown in the following diagram. The lines are “functional”; not managerial.

![Diagram showing institutional roles and responsibilities]

274. The roles and responsibilities at state level, as we understand the recommendations, are shown in the following table.

<table>
<thead>
<tr>
<th>Level</th>
<th>Function</th>
<th>Entities/Institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>National</td>
<td>• National strategies &amp; policies</td>
<td>• Ministry of Water</td>
</tr>
<tr>
<td></td>
<td>• National funding initiatives</td>
<td>• Department of Economic Affairs, Min of Finance</td>
</tr>
<tr>
<td></td>
<td>• National law enactments</td>
<td>• Planning Commission</td>
</tr>
<tr>
<td></td>
<td>• Design and other Standards</td>
<td></td>
</tr>
<tr>
<td>State</td>
<td>• Overall river basin planning/interstate coordination – prepare and maintain Master Plan</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Promotion of inter-state and regional schemes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Allocation of water resources between public water supply, irrigation and industry, ensuring adequacy of water to meet allocations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ensuring the integrity of groundwater resources</td>
<td></td>
</tr>
</tbody>
</table>

Table 17: Stakeholder UWSS Roles and Responsibilities
<table>
<thead>
<tr>
<th>Level</th>
<th>Function</th>
<th>Entities/Institutions</th>
</tr>
</thead>
</table>
|       | • Monitoring abstraction  
|       | • Raising abstraction charges  
|       | • Regionally promote alternative water resources  
|       | • Application of sector national laws  
|       | • State strategies to meet national obligations  
|       | • Co-ordinate sector activities within the state  
|       | • Ensuring consistency in performance and standards of service across the state  
|       | • Catalyst for collaboration at state and local level  
|       | • Correlating, analysis and reporting of performance data  
|       | • Monitoring and regulation  
|       | • Centre of expertise and “spreader” of success (and failure) stories across state  
|       | • Ensure availability of education places for ample skilled workforce  
|       | • Public awareness of health and hygiene issues  
|       | • Emergency planning at state level  
|       | • Initiative for new ventures, funding mechanisms and technology etc  
|       | • Maintain long-term water sector investment programme  
|       | • Prioritisation of investment needs  
|       | • Guidelines for tariffs, other charges and general WSS service conditions  
|       | • Tariff approval  
|       | • State subsidy policy and application  
|       | • Asset manage State water sector assets  
|       | • Obtaining of investment funding, coordination and disbursement  
|       | • Standardisation of designs, contract documents  
|       | • Works and service contract tendering  
|       | • Ensure CAPEX efficiency through appraisals and KPIs  
|       | • Major CAPEX supervision  
|       | • Obtaining of investment funding, coordination and disbursement  
|       | • Acting as “Transmission Entity”, O&M of transmission system  
|       | • If requested by ULB, O&M of assets  
|       | • Issue discharge consents  
|       | • Ensuring quality of river water and control of discharges to rivers  
|       | • Asset owner  
|       | • Service provision and O&M of assets  
|       | • Tariff setting  
|       | • Monitoring wastewater discharges to sewer  
|       | • Service income & billing  
|       | • Customer service  
|       | • Local emergency planning  
|       | • Minor CAPEX & capital maintenance  
|       | • Performance data collection and local analysis  

Karnataka Urban Infrastructure & Development Finance Corporation.  

Karnataka Water Supply & Drainage Board  

Karnataka State Pollution Control Board  

ULBs

275. The proposed roles and inter-relationships between the Government, the Water Council, the Drinking Water Supply Mission, the ULBs and the KUWS&DB, are well defined and, we understand, provisionally agreed by the stakeholders. We have confined our attention to the following, which we see as critical to the long-term sustainability of water and wastewater service provision across the state:

- The O&M of the bulk water supply assets;
- The O&M of water distribution and wastewater assets, and
- Capacity building within the ULBs.
276. Our recommendations are intended for application across the state, albeit that some aspects are proposed to be piloted within the subject Tranche-1 towns.

### 7.6 Institutional: Local Service Provision

#### 7.6.1 Options for improvement O & M management

277. It is assumed that maintaining the status quo is not an acceptable option as:

- The current service is under resourced and under financed. As a direct consequence of this the standard of service is universally poor in terms of the quantity of water available, quality of water provided to consumers, staff performance and asset performance.

- None of the ULB's have an organisation for the management of wastewater services. This has resulted in raw effluent being used to irrigate crops and to overflow from collection systems in the street. Wastewater treatment plants, where these exist, do not function as designed.

278. The substantial level of investment in water and wastewater assets will provide an ideal opportunity to upgrade the management and organisation of service provision in these areas. We recommend that this opportunity be grasped and an operating structure put in place that allows staff to familiarise themselves with the new assets whilst they are being constructed and then to take that knowledge forward into operations and maintenance activities.

#### 7.6.2 Management of Service Providers

279. In many countries, developed and developing, there has been a move towards regionalisation of the water sector. The advantages are several and, in particular, the larger service provider entities with their larger customer base are more able to finance the required O&M of the water and wastewater service facilities. Other advantages are that schemes can be planned on a regional basis leading to CAPEX efficiencies and that the larger organisations are able to attract, and pay, for the more highly qualified and experienced specialist staff required for a modern and proficient utility.

280. In the majority of the Karnataka ULBs, a major impediment to success has been the size of the ULBs. We suggest that regionalisation will overcome the problems that result from the lack of a significant customer service base. We, therefore, recommend that the Karnataka sector considers a move towards regionalisation.

281. We appreciate that such a move does not come easy and there will be resistance based upon local pride and independence. Nevertheless, we suggest that regionalisation is the best, if not only, way forward if the sector wishes to develop and meet customer expectations.

282. Commonly, regionalisation is based upon hydrological river basins. For example, the Tundra Bhadra sub-basin could be divided into three regional service providers – Upper, Middle and Lower Reaches with service providers centred on a prominent town within their respective service area.

283. At the moment, and as a first stage, we recommend that the regional service providers are district based, centred on the district administrative town.

284. Accordingly, we suggest two options for the management of the local service provision:

- A ULB continues as the service provider within its designated area, or

- A Special Purposes Vehicle (SPV) entity is established as the service provider within a district.

285. We suggest that the option be provided to all ULBs to remain as the service provider, i.e. there would be no obligation to form an SVP, albeit that this would be the Government’s preferred modality.
7.6.2.1 ULB Continues as the Service provider

286. A ULB is the entity legally responsible for the water and wastewater service provision in its administrative area. The issue with the ULB continuing to be responsible is that the ULB needs to have a sufficiently large customer service base to derive an adequate income for the water service charges to be able to fund the service. For the larger ULBs in Karnataka this is quite feasible and, with the necessary assistance for the development of the UWSS service, would be an acceptable option.

287. Where the ULB elects to continue as the service provider, we recommend that a distinct and recognisable “ring-fenced” Division be established for UWSS.

7.6.2.2 Special Purposes Vehicle

288. We have suggested that an SPV be district based, formed initially around the district administrative town and to progressively extend across the district, as the appointed service provider. The Service Area will include the peri-urban areas. Not initially included within the service area, the district rural area may be supplied from transmission mains running suitably close to settlements. In the longer term, we suggest that an SPV also takes responsibility for the water and wastewater service to all peoples in its geographically defined area.

289. Whilst the following would apply equally to a larger ULB, for the smaller ULBs the advantages of the SPV model are:

- Should the SVP wish to outsource the O&M of the assets, collectively, the customer service base becomes of sufficient size to “interest” an experienced O&M contractor, from the private sector;
- The UWSS finances can be “ring-fenced” to ensure that water service charge derived income is applied only to water sector service provision;
- Decision making would be outside of local government restrictions;
- Qualified, experienced staff would be attracted to the larger entities, and
- Service provision would benefit from economies of scale.

290. We suggest that the ULBs remain as the asset owners and as the legal entity responsible for the service provision. The SPV would be a “beneficial user” of the assets. The arrangement would also avoid the need for any enabling laws.

291. We consider that the SPV model will provide the most efficient method to introduce significant improvements into the provision of water services within a short timescale. It has the benefits of:

- Generating economies of scale when procuring goods or services;
- Creating a centre of excellence to manage and improve service standards;
- Providing an opportunity for staff to develop their knowledge and skills across a range of disciplines;
- Reducing duplication of resources to a minimum;
- Opening up the opportunity to combine the use of assets to minimise the impact on the environment caused by multiple abstraction points from rivers and duplication of pipes in roads to serve different locations;
- Taking advantage of the skills and knowledge that can be provided by an experienced contractor;
- Simplifying responsibilities and reporting lines;
- Normalising standards of service and costs across a wide area, and
- Providing a body to manage the introduction of new assets effectively and efficiently.

292. Adopting the model provides the resources and infrastructure to develop a highly performing UWSS service provider that is best equipped to:

- Manage both existing and proposed levels on infrastructure;
Focus on improvement in UWSS services;
Recruit and develop staff with the necessary qualifications and skills, and
Deliver the further improvement in functionality and administration.

7.6.3 Performance Service Agreement

293. For both options, we recommend that a Performance Service Agreement (PSA) be entered into between either:
- If the ULB continues to be the service provider, the “service provider” Division and the ULB Council, or
- If an SVP is established as the service provider, the SVP and the ULB Council(s).

294. The PSA would set out the obligations and responsibilities of the two parties, and would include a series of Performance Indicators that were based upon Customer Levels of Service and Standards of Operational Performance to be achieved, as well as establishing financial competency rules. A draft PSA is included as Appendix 1.

295. We suggest that the Drinking Water Supply Mission (DWSM) has a role to act as an Auditor on the performance of the service provider against the obligations of the PSA. The DWSM may delegate the auditor role to the KUWS&DB, or a third party.

296. In order to introduce a financial element into the PSA in order to make it effective, The KUIDFC, as disburser of investment funds, proposes that satisfactory performance against the PSA would need to be demonstrated as a pre-condition for investment funding or, where investment has been provided, poor performance would be “penalised” by the gradual conversion of a grant to a loan with the ULBs required to pay loan charges as a “penalty charge” for poor performance.

297. If the service provider was to use a contractor as the “asset operator”, we suggest that the responsibility for complying with the PSA should remain with the service provider, who would need to have a “back-to-back” contract with the operating contractor.

7.6.3.1 Organisational Structure of the Service Provider

298. The following suggested organisational structure and establishment numbers apply either to a UWSS department within a ULB or to a SPV service provider.

299. For a service provider’s operational function to be successful, some key criteria need be met:
- A clear organisational structure is required for the operations function with adequate trained and experienced managers for the operation and maintenance of the assets;
- The organisational structure should have lines of responsibility and accountability that are clearly defined;
- The operations team will require a Management Information System that is sufficient to report all operational and associated UWSS activities and to hold current data so enabling the operations team to monitor their performance against service objectives, and to make decisions based upon current, auditable data;
- The size of the operational units must be such that they are cost efficient yet of sufficient size to justify computer and other technical and business support systems;
- Maximum use is made of the investment in SCADA, network modelling and other business systems;
- Levels of Customer Service are adopted that meet PSA requirements, yet ensure customer “value for money” commensurate with the charges made, and
- Customers should be able and encouraged to participate in the discussions regarding levels of customer service and operational performance.

300. We recommend for consideration a structure built around the four principle functions of UWSS service provision:
Customer Services – to be responsible for all customer services;
Corporate Services – to include such as finance, administration and human resources;
Operational Services Directorate – all operational activities, and
Asset Services Directorate – responsible for planning, capital works etc.

301. The organisational structure that is proposed is shown in the following Figure.

![Organisational Structure Diagram]

Figure 10: Suggested Service Provider Organisational Structure

302. The structure shown is the ideal for a totally independent SPV. For a ULB department, or in a smaller SPV, some of the above functions may remain in the ULB, or may be considered as unnecessary especially during the early, establishment period.

303. The key points of the recommended structure are:
- The establishment of a Customer Services department that is responsible for all customer contacts, including billing;
- Within Operational Services, there is a separation between “operations” and “maintenance” with:
  - All treatment works and pumping station maintenance to be centralised under a Maintenance Manager;
  - Branch Managers for the O&M of the networks;
- All non-operational activities to be centralised at the Head Office, and
- The laboratories and the revenue meter checking departments to remain independent and not included into operations and customer services, respectively.

304. More specific detailing of responsibility is shown in the table below:

<table>
<thead>
<tr>
<th>Department</th>
<th>Responsible for:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate Services</td>
<td>1. Financial Management;</td>
</tr>
<tr>
<td></td>
<td>2. Internal audit;</td>
</tr>
<tr>
<td></td>
<td>3. Human Resources;</td>
</tr>
<tr>
<td></td>
<td>4. Legal;</td>
</tr>
<tr>
<td>Department</td>
<td>Responsible for:</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>5. Procurement and stores management.</td>
</tr>
<tr>
<td>Customer Services</td>
<td>6. All initial customer contacts;</td>
</tr>
<tr>
<td></td>
<td>7. Income and Billing;</td>
</tr>
<tr>
<td></td>
<td>8. Debt management;</td>
</tr>
<tr>
<td></td>
<td>9. IT Platform.</td>
</tr>
<tr>
<td>Asset Services</td>
<td>10. Engineering support;</td>
</tr>
<tr>
<td></td>
<td>11. Quality assurance;</td>
</tr>
<tr>
<td></td>
<td>12. Monitoring environmental management systems;</td>
</tr>
<tr>
<td></td>
<td>13. New service connections;</td>
</tr>
<tr>
<td></td>
<td>14. Monitoring water quality;</td>
</tr>
<tr>
<td></td>
<td>15. Capital programming;</td>
</tr>
<tr>
<td></td>
<td>16. Implementation of construction projects;</td>
</tr>
<tr>
<td></td>
<td>17. NRW management;</td>
</tr>
<tr>
<td></td>
<td>18. Asset data base;</td>
</tr>
<tr>
<td></td>
<td>19. Reporting of asset performance;</td>
</tr>
<tr>
<td>Operational Services</td>
<td>21. O&amp;M of the treatment works and networks;</td>
</tr>
<tr>
<td></td>
<td>22. Work planning;</td>
</tr>
<tr>
<td></td>
<td>23. Emergency planning.</td>
</tr>
</tbody>
</table>

305. Because they are critical corporate rather than department functions, the activities we suggest to be responsible directly to the General Manager:

- Public Relations, including media and national/local government relations;
- Health and safety;
- “Upward”/“Regulation” reporting such as to Drinking Water Supply Mission, and
- Laboratorieds.

306. Public Relations is a separate activity from customer services requiring different skills. The two departments would work together such as the customer services would distribute literature produced by the Public Relations department

307. Other points are:

- Emergency Planning is an operational activity and shown within Operations;
- Stores management is suggested as a function of Corporate Services due to the financial management required;
- Customer meter repairs have been moved to Operational Services (Maintenance Manager): (i) to provide the financial independence from the meter reading function of customer service and (ii) to allow the new Customer Services to concentrate upon customer service rather than workshop operational technologies;
- An Asset Performance Department that will be responsible for the maintenance of the asset database; for the collection and reporting of data on asset performance and for an asset replacement programme.

7.6.3.2 Establishment Size

308. Recommendations for the establishment size are very hard to make for a variety of reasons: level of service provided; extent of outsourcing; affordability, and condition of the assets are but few. Indicative figures within the World Bank: “IBNET Water Supply and Sanitation Performance Blue Book” suggest an establishment of around 1 staff member per 1,000 customers. Practice also suggests an operational to administrative staff ratio of 5:1.
309. Based on these indicators the following graph has been prepared.

![Graph showing Staff Numbers vs Population]

**Figure 11: Staff Establishment**

310. It must be stressed that the graph is indicative only.

311. To put the required establishments in context, the establishment for Harihar would increase from the current 41 to around 100; Byadgi from 23 to 28 and for Ranebennur from 46 to around 100. The largest increase would be in Davangere where an establishment of almost 500 is required.

312. In reality, the numbers would not increase linearly, but would increase more rapidly for smaller utilities and flatten as the population served increased due, for example, to a larger treatment plant not needing a significant increase in manpower resources over a medium sized plant, or an increase in the customer base not necessarily requiring an increase in administrative staff. Within the four subject towns, the establishment for Byadgi would need to be slightly higher and that for Davangere, lower. A suggested division between functions could be:

<table>
<thead>
<tr>
<th>Function</th>
<th>Davangere</th>
<th>Ranebennur</th>
<th>Byadgi</th>
<th>Harihar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate Services</td>
<td>75</td>
<td>17</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>Asset Services</td>
<td>15</td>
<td>8</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Customer Services</td>
<td>40</td>
<td>20</td>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>Operations – Water treatment</td>
<td>50</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Operations – Water network</td>
<td>50 +</td>
<td>10 +</td>
<td>5 +</td>
<td>10 +</td>
</tr>
<tr>
<td>Operations – Wastewater treatment</td>
<td>50</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Operations – Wastewater collection</td>
<td>25 +</td>
<td>5 +</td>
<td>3 +</td>
<td>5 +</td>
</tr>
<tr>
<td>Operations – Support staff</td>
<td>20</td>
<td>10</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>275</strong></td>
<td><strong>100</strong></td>
<td><strong>65</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

313. Staff will be a mix of (i) permanent staff, some of whom in an SVP will be transferred from the existing ULB water and wastewater teams; and (ii) contract or agency staff. We would recommend that all key post holders to be permanent staff.

314. The above numbers could be further reduced by the use of contractors for the operation of the treatment plants, outsourcing revenue meter reading and billing and by the use of ULB staff
for some of the Corporate Services, such as legal and some financial and human resource services.

315. The total establishment of 540 across the four towns could be further reduced by two or more of the towns having a single SPV service provider.

316. The requirement for each location can be determined only by a Human Resource Plan that takes into consideration the specific circumstances of each town.

### 7.6.4 Capacity Building in Service Providers

#### 7.6.4.1 IWRM Project Management Unit

317. Irrespective of the option chosen for a service provider – the SPV model or a separate Division of a ULB – there is a demonstrable need for capacity building within the service providers.

318. Further, the KUIDFC will require assistance to introduce the SPV model.

319. To assist with the establishments of the SPVs, and in consultation with the KUIDFC, we recommend that an IWRM Project Management Unit be formed in the KUIDFC. The unit, which would continue through subsequent MFF Tranche investments, would comprise KUIDFC employees with appropriate skills, supplemented as required by short-term consultants, national and international. In addition to assisting the establishment of the SPVs, the Unit would also directly assist the newly formed SVPs, or water Divisions of larger ULBs, to prepare corporate documentation, as well as provide “centre of excellence” guidance for technical aspects. In this way, the Unit will not only be introducing competency into the service provision but it would be ensuring the required data is available on, for example, asset histories, for subsequent private operator bidding. The scope of the Unit will be to:

- Assist the KUIDFC in the establishment of the SVP service provider organisation;
- Review existing tender documentation, Specifications and materials selection;
- Provide assistance to the SVP service providers upon competent service provision;
- Prepare a generic Human Resource and Training Plan to provide capacity building in the SVPs;
- Review current GIS and network modelling facilities in an SVP and advise upon improvements and application, as required;
- Advise on a state-wide Management Information System for processing of state water sector data;
- Advising on the determination of the Base Line Performance of an SVP and upon how improved performance could be achieved;
- Preparing a state-wide NRW Reduction Strategy and Programme potentially using one or more specialist NRW reduction contractors;
- Assisting the SVPs to prepare specific Plans such as Business, Master, O&M, and Emergency Response.

320. We suggest that the IWRM Unit contains a small team specifically tasked to focus on gender and social issues applicable to UWSS service provision.

321. A work scope for the Unit is provided as Appendix 2.

#### 7.6.4.2 Long-Term PPP Assistance

322. If the district-based SPV model is generally accepted, the advantages of a long-term concession as a means of ensuring the required on-going capital investment become increasingly advantageous.

323. As an initial step towards a long-term concession, the SPVs might wish to consider the advantages of a formal 5yr co-management contract in which an experienced operator will work with the SVP staff to co-manage all activities of the SVP.
324. Such models have been successfully implemented, especially in the Middle East.

7.6.4.2.1 Development of a National PPP Competency

325. Currently, there are few if any Indian suitably experienced private sector water operators. As the sector develops, there will be an increasing need for such a competency.

326. We would suggest that in the placing of operational contracts, whilst the requirement is for an experienced operator, an emphasis is placed in the contract upon the participation a local partner in order to develop a national competency.

7.6.4.3 Training

327. Training is a key requirement for the long-term success of a service provider. The training programme to be introduced through the IWRM Unit should assist both office based staff and the site based O&M staff, at all levels, to acquire relevant working knowledge so that they are competent to undertake the tasks assigned to them.

328. The training needs of individuals differ as a result of their level of education, experience gained during their working life and their motivation to improve both their level of performance and personal knowledge.

329. We recommend that all procurement contracts – works and business systems – include for staff training in the procured services. Ideally, for new works the staff to be employed on the works should be appointed and in place during the commissioning periods; if not having an earlier involvement.

330. At all times, training provided should be targeted towards the business objectives.

331. We suggest that all employees embark upon the training programme prepared, irrespective of their current ability and whether office or on-site based. In this way, all employees will be at the same base level of expertise within their particular activities. Subsequent advanced training can then be provided to specific employees, building upon this common base level of knowledge.

7.6.5 Management Information and Other Systems

332. In order for the service providers to be proficient and to be able to store data for subsequent reports preparation, performance monitoring and management decision making, it will be necessary for the service providers to have access to a Management Information System (MIS), within which the data relating to the business will be held.

333. The MIS may be an integrated system or a collection of separate systems, and may be discreet to the UWSS service provider, or shared with the "parent" ULB(s).

334. Ideally, all service providers in the State use an MIS that is compatible to each other and to a central MIS, so that data can be readily accessed, stored and analysed for the State.

335. Table 20 shows the various the MIS functions.

Table 20: Typical MIS Functions

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Inputs</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Finance</strong></td>
<td>1. Materials and services purchases;</td>
<td>1. Financial management reports;</td>
</tr>
<tr>
<td></td>
<td>2. Operator payments;</td>
<td>2. Budget performance;</td>
</tr>
<tr>
<td></td>
<td>3. Operator staff payroll.</td>
<td>3. Reports of purchases and supplier accounts and performance;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Financial statements;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Data for tariff determination.</td>
</tr>
<tr>
<td><strong>Human Resources</strong></td>
<td>1. Staff personal information;</td>
<td>1. Reports for staff management e.g. staff numbers, absenteeism.</td>
</tr>
<tr>
<td></td>
<td>2. Attendance records;</td>
<td>2. Reports on training provided;</td>
</tr>
<tr>
<td></td>
<td>3. Training records;</td>
<td>3. Payroll reports;</td>
</tr>
<tr>
<td></td>
<td>4. Salary scales.</td>
<td></td>
</tr>
<tr>
<td>Functionality</td>
<td>Inputs</td>
<td>Outputs</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Operations.</strong></td>
<td>1. Operational performance records e.g. pumping records;</td>
<td>1. Asset Performance Recording;</td>
</tr>
<tr>
<td></td>
<td>2. “Water into supply” and other bulk meter readings;</td>
<td>2. Data for computation of Performance Standards;</td>
</tr>
<tr>
<td></td>
<td>3. NRW data.</td>
<td>3. Input reports for pump replacement due to fall-off in performance.</td>
</tr>
<tr>
<td><strong>Asset Management:</strong></td>
<td>1. Asset survey data on:</td>
<td>1. Asset record history;</td>
</tr>
<tr>
<td></td>
<td>i. Asset location, type, age, material etc.;</td>
<td>2. Asset data for emergency planning;</td>
</tr>
<tr>
<td></td>
<td>ii. Asset condition and capability report;</td>
<td>3. Input to computer network model of asset parameters for design;</td>
</tr>
<tr>
<td></td>
<td>iii. Details of manufacturer;</td>
<td>4. Preventative maintenance work planning requirements;</td>
</tr>
<tr>
<td></td>
<td>iv. Risk profile;</td>
<td>5. Data for asset replacement programme;</td>
</tr>
<tr>
<td></td>
<td>2. Details of new assets installed or constructed;</td>
<td>6. Asset Inventory.</td>
</tr>
<tr>
<td></td>
<td>3. Details of replacement assets;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Asset maintenance records.</td>
<td></td>
</tr>
<tr>
<td><strong>Income and Billing:</strong></td>
<td>1. Pertinent customer details;</td>
<td>1. Information for raising service charges;</td>
</tr>
<tr>
<td><strong>Income and Billing:</strong></td>
<td>3. Water meter details or details of alternative method of payment of</td>
<td></td>
</tr>
<tr>
<td><em>Billing records</em></td>
<td>wastewater charge</td>
<td></td>
</tr>
<tr>
<td><strong>Customer Service</strong></td>
<td>1. Customer records of bills raised and paid;</td>
<td>1. Service charges;</td>
</tr>
<tr>
<td></td>
<td>2. Records of customer contacts concerning charges.</td>
<td>2. Data for computation of KPIs for response to customer billing enquires.</td>
</tr>
<tr>
<td><strong>Industrial Effluent</strong></td>
<td>1. Details of all customer contacts with log of events and responses;</td>
<td>1. Progress reports on customer service responses;</td>
</tr>
<tr>
<td><em>Register</em> (held within the</td>
<td>2. New connections progress.</td>
<td>2. Analysis of complaints for asset replacement or improvement;</td>
</tr>
<tr>
<td>Customer Services functionality)</td>
<td></td>
<td>3. Data for computation of customer service KPIs.</td>
</tr>
<tr>
<td></td>
<td>1. Details of industrial customers;</td>
<td>1. Industrial effluent charges;</td>
</tr>
<tr>
<td></td>
<td>2. Permitted quality of industrial effluent to be discharged to sewer;</td>
<td>2. Industrial effluent sampling programme;</td>
</tr>
<tr>
<td></td>
<td>3. Industrial effluent sample results.</td>
<td>3. Industrial effluent non-compliances.</td>
</tr>
</tbody>
</table>

336. In addition to the Head Office, work stations will be required at branch/depot offices and at treatment plants for data entry and for abstracting work orders, customer enquiry requests and billing data.

**7.6.6 Maintenance Management System**

337. A computerised maintenance management business system is recommended in order to ensure that the methods and procedures adopted for maintenance can be planned and an historic record of activities held so that the full operational life of assets procured under the various investment programmes, is achieved.
7.6.7 GIS and Network Modelling

338. A key ancillary component of asset management is a digitised GIS record of the water and wastewater networks. Such a record is not only an essential data base for operational activities but is the basis for computer modelling of the water and wastewater networks.

339. Computer models will assist in several O&M tasks:

- Determination of “critical” mains and sewers;
- By identifying the sewers with low velocities, a sewer model will enable an effective sewer flushing programme to be prepared;
- By identifying pipes with higher or lower than expected losses, the model will assist with the identification of:
  - Leakage from mains and sewers;
  - Ingress into of ground or surface water into sewers;
  - Valves in the closed or partially closed position;
  - Blocked or partially blocked sewers and mains;
  - Unknown connections;
  - Pipes of smaller diameter than shown on records
- Pump performance optimisation, and
- Emergency Planning.

340. Computer models will also assist in the design of extensions to the water mains and sewer systems. Modelling of future flows will ensure that the water and sewer networks will be able to cope with customer requests to take a supply from water mains and for the return to sewer flows.

341. We would recommend, and have included in the Tranche-1 investment, for a GIS programme, and for computer water and wastewater network models to be constructed.

7.7 Technical Proposals

7.7.1 Condition of Assets

342. In Section 6.4.3, the condition of the UWSS assets was highlighted as an issue. For the existing assets, the issue can only be resolved by a long-term asset replacement programme. The provision of a Sinking Fund to finance the programme is discussed in Section X.

343. What is important is that, once procured, assets are operated and maintained as to ensure that their full asset life is obtained and that the assets do not suffer from premature failure. For this purpose, the asset operators must perform regular maintenance of the assets.

7.7.2 Plant Maintenance

344. One of the most serious current failings is the poor maintenance of assets. We have drawn specific attention to the need for improved work planning and maintenance of the assets to ensure efficiently their continued availability for service delivery and to ensure that the assets do not suffer premature failure.

345. We recommend that “good practice” maintenance procedures are introduced and that preventive maintenance and warranty maintenance programmes be adhered to strictly in order to reduce as much as possible the necessity for corrective maintenance.

346. It is important that plant maintenance regimes should include for the following programmes:

- Corrective maintenance programmes;
- Preventive maintenance programmes;
- Warranty maintenance programmes;
Vehicle and equipment maintenance programmes, and
Systems for planning, scheduling and recording all activities.

7.7.2.1 Maintenance Regimes

7.7.2.1.1 Corrective Maintenance

347. Corrective maintenance is probably the most commonly used approach, but it is easy to see its limitations. When equipment fails, it often leads to downtime in production. In most cases this is costly and disruptive to both the business and customers. Also, if the equipment needs to be replaced before the end of its planned operational life this can be time consuming and expensive. It is also important to consider the impact on health, safety and environmental issues related to malfunctioning equipment.

7.7.2.1.2 Preventive Maintenance

348. To avoid the problems of correcting failed assets many try to maintain equipment before it fails. By doing this, the goal is to avoid failure, unnecessary cost, disruption, and health and safety violations.

349. Within a planned preventative maintenance policy, assets are maintained:

- So as to ensure no failure is allowed to cause deterioration in performance or customer service standards or unnecessary detriment to the environment;
- Safely in accordance with all relevant Health and Safety Regulations, and
- At minimal cost consistent with the adequacy of the maintenance work.

7.7.2.1.3 Condition Based Maintenance (CBM)

350. With planned preventative maintenance, plant is maintained to a schedule; not necessarily when required. To try to maintain equipment at the right time, condition based maintenance is introduced. CBM is based on using real time data to prioritise and optimise maintenance resources.

351. In a CBM regime, plant is maintained only if necessary, following an inspection. Better tools for analysing the condition of plant means maintenance personnel are able to decide the right time to perform maintenance on equipment. Ideally condition based maintenance will allow maintenance personnel to limit their interventions to only the required tasks at the right time thus minimising spare parts costs, system downtime and time spent on maintenance.

7.7.2.1.4 Recommended Maintenance Regime

352. Whilst CBM is a methodology to be preferred for complex machinery, because of its cost to implement, it is recommended that initially planned preventative maintenance is adopted and later, if it chooses, an operator can move fully or partially to CBM.

353. Planned preventative maintenance can apply to the treatment works, pumping stations, water storage facilities and to the water and wastewater networks.

7.7.2.2 Work Planning

354. Work planning, an essential component of planned preventative maintenance, will be essential to ensure the sustainability of the current investment in new water and wastewater treatment works. The adoption of a comprehensive work planning strategy will demonstrate to future funding agencies the ability of the SPVs to sustain the assets previously funded and thus its suitability for further funding.

355. Work planning will achieve:

- The continued availability of the assets through effective monitoring of performance and maintenance;
High standards of repair through the use of the correct materials and spare parts, supervision and a trained workforce;
Avoidance of adverse effect on the environment or annoyance to the local community through noise, dust or smell;
An optimised balance between planned and unplanned maintenance;
Regular maintenance reporting and monitoring, and
The availability of spare parts.

356. Work Planning comprises:
- Preparation and issue of maintenance schedules to the maintenance teams;
- Monitoring and recording the maintenance work within the Management Information System;
- Use of the maintenance schedules for computing maintenance costs;
- Linking the work planning activity to the stores issue and stock procurement systems in order to ensure the availability of spare parts, and
- Reviewing the maintenance frequencies and maintenance tasks specified by the manufacturer to ensure their continued suitability.

357. Work planning will involve:
- Planning the work of the workforce against performance obligations;
- Ensuring the best use is made of the workforce available, and the mobile plant and equipment;
- Providing data on spares usage to ensure that the stores levels are set at an economic level consistent with the availability of spares, and
- Use of the work planning records to:
  - Resolve customer and regulator queries about events;
  - Monitor performance against the PSA;
  - Plan for rehabilitation and replacement of assets.

358. The recommended method of working would be for the planners to;
- Plan the work of the treatment works and pumping station maintenance staff according to the work requirements of the plant manufacturer’s maintenance schedules;
- Ensure that adequate stores and any equipment is available for the work;
- Allocate work orders to the plant maintenance staff, according to the prepared work planning schedules;
- Monitor that the work is completed according to the planning schedules, and
- Update the asset inventory within the asset management section of the Management Information System with the record of the work.

7.7.3 O&M of the Treatment Plants

7.7.3.1 Plants to be Procured Under Tranche-1 Investment

359. We suggest that the treatment plant construction contract for works to be procured in the Tranche-1 and later investments, has an extended 5yr period within which the works contractor will remain responsible for the O&M of the works that he has constructed. Such the facility has the advantages that:
- Failure to meet the contract process and performance guarantees directly impose on the costs incurred by the contractor in performing the O&M tasks;
- Time is provided for the ULB/SVP staff to become familiar with the O&M of the works, and
7.7.3.2 Existing Treatment Plants

360. For the O&M of existing plants, we suggest that the following options be considered:

- For ULBs such as Ranebennur where a major extension of an existing plant is proposed and where some rehabilitation of the existing plant is required, the Tranche-1 contract includes for the O&M of the existing plant;
- For ULBs such as Byadgi, where a contract is currently under way, negotiations commence with the contractor for the inclusion of a 5yr operations period, or the plant is considered as an "existing" plant at the end of the contract maintenance period, and
- For existing plants, an O&M contract is prepared for the plants in a service area.

7.7.4 Strategic Network

361. We propose that the Tranche-1 procurement modality is for the treatment plant contract to include for the rehabilitation of existing and the construction of new elements of the strategic transmission network and of the strategic water storage facilities. There are three reasons for the proposal:

- As mentioned, it will introduce the private sector into the operation and maintenance of the strategic elements of the system where risk should be minimised for security of supply;
- Physical losses in the strategic network should be maintained at an acceptable level of around 2% and in so doing the required 24x7 quantity of water will be delivered to the strategic reservoirs which are the key points for distribution of water to customers, and
- It will enable the requirement of the KUIDFC to be met whereby the investment in the distribution network to ensure a continuous supply will be made only after the ULB has itself shown a commitment to improved service by meeting performance standards.

362. For towns where there is no proposed investment in a treatment plant, the O&M of the strategic network will be by the Tranche-1 treatment plant constructor/operator as all towns will require some rehabilitation of their strategic network. Ideally, the Tranche-1 plant contractor would be the operator of all the water treatment plants. If there is more than one operator, the interface will need to be clearly defined, logically the outlet meter from the treatment plant. A similar interface definition will be required at the outlets from reservoirs and for branches off the strategic network, although by definition of a strategic main these should all be metered branches.

363. The contractor will be required to record the asset performance data that will be essential for any subsequent operator tendering of the whole water and wastewater service function.

7.7.5 Draft Cabinet Paper Proposals

364. Within the draft Cabinet Paper, the KUWS&DB is the entity designated for the O&M of the bulk water supply assets, which includes for the water treatment plants. The KUWS&DB is also designated as the entity for the O&M of the wastewater treatment plants.

365. The only issues that we identify associated with the designation are:

- The expansion of the KUWS&DB to take on the role;
- The difficulties of resourcing and managing the workforce across a large area, especially for emergency events when a quick response is required to any system failure, if customer supplies are not to be affected.

366. The options open to the KUWS&DB are:

- For the work to be by KUWS&DB, in which case the above issues are applicable;
- Appoint a number of regional O&M contractors, or
- Enter into an agreement with the SVPs for their staff, or those of their contractor, to perform the work on behalf of the KUWS&DB.
Our recommendation would be for the third option. In this way, the “blame” for any service failure is at the “door” of only one contractor.

### 7.7.6 Hierarchy of O&M Documentation

#### 7.7.6.1 Framework

To successfully transmit its policies and procedures and thus to ensure a correct and consistent approach, the service providers will need to have in place a hierarchy of O&M documentation, generated in order to ensure compliance with the obligations of the ULB and to meet the service provider objectives:

**A Suite of Business Documents**

*↑↑↑↑

**Policies and Strategies**

**Operational Objectives of the Service Provider**

![Figure 12: Hierarchy of O&M Documentation](image)

The following sections present the framework for the preparation of the documentation that we suggest that the service providers will need to have in place.

#### 7.7.6.2 Operational Objectives

The Operational Objectives will be the obligations as set out in the proposed Performance Service Agreement and any commercial objectives that the service provider may instigate.

#### 7.7.6.3 Policies and Strategies

To be effective, the Operational Objectives will need to be underpinned by operational policies, implemented through a series of strategies.

#### 7.7.6.4 Business Documentation

Business documentation comprises a series of functional Business Plans and Manuals. The functional Plans supplement the Business Plan and set out the high-level strategies and policies for each service provider directorate. The Manuals form the day-to-day work instructions.

Suggested functional Business Plans comprise those shown in the following table.

<table>
<thead>
<tr>
<th>Plan</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Plan.</td>
<td>The Business Plan sets out the long-term strategy for water and wastewater service provision. All investment and other company activities and policy making should be focused upon the achieving the aims of the Business Plan.</td>
</tr>
<tr>
<td>Operational Management Programme.</td>
<td>The Operational Management Programme will ensure that “best international practice” is adopted within the operation and maintenance of the assets.</td>
</tr>
<tr>
<td>Water &amp; Wastewater Master Plan.</td>
<td>A Water and Wastewater Master Plan addresses the technical issues that will ensure a sustainable water and wastewater service.</td>
</tr>
<tr>
<td>Financial Management Plan</td>
<td>The Financial Management Plan sets out the financial management and funding policies.</td>
</tr>
<tr>
<td>Asset</td>
<td>The Asset Management Plan sets out the overall policy for the creation,</td>
</tr>
</tbody>
</table>
### Plan and Purpose

<table>
<thead>
<tr>
<th>Plan</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management Plan</td>
<td>maintenance and renewal of the assets.</td>
</tr>
<tr>
<td>Human Resource Plan</td>
<td>The implementation of the Human Resource Plan will ensure the adequacy, capacity and skills base of its workforce.</td>
</tr>
</tbody>
</table>

374. The suite of Manuals that we recommend to be in place, comprise:
- Operations and Maintenance Manual;
- Customer Services Manual;
- Energy and Environmental Manual;
- Project Management Manual;
- Accounting Systems Manual;
- Billing and Debt Management Manual;
- Procurement Manual;
- Human Resource, Health and Safety and Training Manual, and

375. The Manuals comprise a series of Procedures that cover the various aspects of the business. Thus, for the Customer Services Manual there would be procedures for, amongst other topics:
- New water and sewer connections;
- Responding to customer enquiries;
- Responding to water quality complaints;
- Responding to flooding incidents.

### 7.7.7 Other Areas Of Required Improvement

376. In addition to the above, there is a wide range of improvement across the spectrum of activities if the water and wastewater services are to be improved to the level desired, including:
- Asset Management      A full inventory of assets, including their specification, operating efficiency and condition, needs to be developed to provide a register that can be used to manage the replacement and rehabilitation of those assets in the worst condition. This will determine if the correct asset specification has been used for the relevant output required;
- Asset Availability     With particular reference to pumping stations and treatment plants stand by generation facilities are needed to keep them operating in the event of a power failure, and
- Water Quality          Facilities must be provided to monitor the quality of water produced and delivered to consumers throughout the processes of treatment and distribution. Similarly the quality of effluent collected must be monitored together with that discharged back into the natural environment. To achieve this requires laboratory facilities, monitoring and laboratory procedures and staff training.

### 7.7.8 Capital Works

#### 7.7.8.1 Project Management

#### 7.7.8.1.1 Scheme Objectives

377. If CAPEX efficiency is to be assured it is essential that all capital investment schemes are evaluated against a service provider business objective, which can be:
- Legal requirement;
- Improved Customer Service or Operational performance standard or PSA indicator;
- Improved OPEX efficiency;
- Environmental safeguard, and
- Health and safety and/or staff welfare.

378. As it is easy for projects to “creep” away from a business objective to satisfy some other perceived need. In order to ensure that projects are delivered on time and to budget, “best practice” requires that project appraisals are held are critical stages in the creation of a project. The most common times are:

- When a business objective “need” is first realised in order to ensure that the “need” is matched against a business objective and to establish the project in the capital investment programme;
- After a feasibility study or conceptual design has been prepared to ensure that the original objectives are being met by the proposed solution and that the project remains cost beneficial;
- Upon completion of the DPR to again verify the validity of the project and to update the CAPEX estimate;
- At tender evaluation time as part of the evaluation process;
- Post commissioning of the project to verify that the project has delivered the expected outputs and met the original “need”

7.7.8.1.1.1 KISWRMIP Objectives

379. KISWRMIP objectives for the succeeding MFF investments are focused upon the UWSS issues facing the sector, that is to:

- Provide for full and continuous water supply within the urban areas;
- Provide for wastewater collection, where the number of people willing to connect to a sewer make the sewer economically viable;
- Treat wastewater collected to Indian standards for discharge to a water course, and
- Reduce NRW to economic levels, and
- To promote the commercial re-use of wastewater.

380. In order to meet the KISWRMIP objectives, the investments are to provide for:

- Augmentation of existing potable water treatment capacity to provide adequate capacity for the foreseeable future;
- Rehabilitation of existing water treatment facilities to improve the efficiency and reliability of the existing plants;
- Construction of a strategic transmission networks and water storage facilities to be able to transfer the water from the treatment works, and to store adequate quantities to (i) meet customer peak demands and (ii) safeguard against supply failure;
- Expansion of the distribution network to cater for increased development of the towns and for increased customer per capita demand, which is assumed as 135 litres per head per day in accordance with Indian standards;
- Rehabilitation of the existing water distribution network to ensure its continued availability for service provision;
- Formalising any unregulated connections and making new within the developing areas;
- Installing customer revenue meters to enable service charges to be volume based;
- Laying of new sewers to connect properties where financially viable;
- Construction of new wastewater treatment plants and/or rehabilitation of the existing to match volumes of “water into supply” with wastewater treatment capacity, and
- Miscellaneous associated works such as provision of SCADA, stand-by generators and laboratory facilities.

7.7.8.2 Treatment processes

7.7.8.2.1 Water Treatment

381. Surface water available in the State has no particular problems for treatment that would make it unsuitable for potable water supply.

382. The classification nomenclature used by the Water Department to describe river water quality is confusing. We would suggest that alternative descriptions by used. Classification “C” – “Drinking water source after conventional treatment and disinfection”, infers that river water of quality “D” or less is unsuitable. Whereas, the water is suitable provided that the correct treatment is used. Quality “D” water is drawn for use at most treatment plants for at least part of the year.

383. One aspect of water treatment that is of concern is the possible presence of pesticides in the raw water. We have been unable to obtain any records of water analysis for pesticides. We would expect that pesticides are present at certain times of the year depending upon rainfall and the agricultural calendar. For the Feasibility Studies for the subject Tranche-1 towns, we had the raw water analysed and no pesticides were found. Nevertheless, we recommend that a full-year sampling programme be instigated to verify that pesticides are not present. If they are found, two options are open to the State Government:
  - Provide additional treatment process, ozone, at the sites found to be affected, or
  - Issue a derogation against the Indian water Quality Standard.

7.7.8.2.2 Wastewater Treatment

384. Stabilisation ponds have been the dominant treatment process used for wastewater treatment in the state for medium to small towns. The process is simple, has a low construction and operating costs. The disadvantage is the large amount of land that is required. With the increasing cost of land and, critically, the increasing difficulty to obtain the required acreage, the process is becoming less attractive.

385. The alternative processes of aeration and sequential batch reactors use less land but are more expensive to construct, require a higher level of operator capability and are more expensive to operate, especially for power.

7.7.8.3 Development of a Karnataka Treatment Specialisation

386. In India and across the world there is a movement away from the more simple treatment processes towards more sophisticated plants with their reliance upon electronic process monitoring, flow measurements and process/power efficiency. We would suggest that Karnataka, with its reputation as a high-tech state, could benefit from this movement by developing a competency in the new generation of treatment processes.

7.7.8.4 Construction Issues

387. We suggest that the issues related to materials selection and contractor performance be addressed by the IWRM Project Management Unit through:
  - Standardisation of designs and Specifications with the introduction of a Design & Construction Manual;
  - A review of all contract documentation to ensure its sufficiency and currency with latest construction techniques;
  - Training of supervisory staff;
  - Maintenance of an “Approved Contractor” list;
➤ Project Appraisal at appropriate times during the creation of an asset to ensure both CAPEX efficiency and that the project continues to meet a business objective. We recommend a post-construction appraisal after the asset/facility has been in service to ensure that it meets the original objectives of the project and to “learn lessons”, good and bad, from the project, and
➤ Adequate performance guarantees in contracts that are rigidly enforced with effective penalties for non-compliance.

7.7.8.4.1 Selection of Pipe Materials

388. We agree with the use of HDPE and ductile iron pipes as preferred water pipe materials, and for clay, concrete and ductile iron for sewers. We understand that DN200 is the size at which ductile iron becomes the preferred material to HDPE. Provided that the HDPE pipes are available and that there are the required skills for pipe jointing, we suggest that the change could be moved to DN300.

7.7.9 Non-Revenue Water Reduction

389. We have identified high levels of NRW to exist in all subject Trabche-1 towns and probably across the state. With the significant investment that is taking place on new source works and treatment capacity, it is essential that NRW levels are reduced if the full benefit is to be obtained from the investments. Considering the importance of NRW reduction for a sustained and efficient service provision in the state, we have included in this section for a full description of our recommend actions to be adopted.

390. We recommend that service providers adopt the internationally accepted International Water Association (IWA) methodology that provides guidance regarding the actions to be taken to reduce NRW. This guidance is in the form of standard terminology and methods of calculating actual levels of NRW present in a system. By the use of the IWA methodology, performance can be bench-marked across the state and internationally.

391. The IWA methodology is made up of a series of guiding principles that are generic in nature and designed to be applicable to water systems of all sizes. This process makes it possible to compare the performance of NRW activities across systems of hugely different scales. For example the same process can be applied to the whole of Karnataka as readily as it can to individual parts of Byadgi and makes the areas requiring urgent attention readily recognisable.

392. Some of the procedures recommended by IWA were formulated several years ago, for example during the ‘Managing Leakage’ discussions and documentation in the UK during the early 1990’s. The procedures have repeatedly shown themselves to still be valid today and to provide the best option for both establishing the performance of a system and for making comparisons with other systems.

393. The common basis for any NRW reduction programme is the need for comprehensive and accurate metering of water supply networks. Without the introduction of meters, it is impossible to accurately determine the volumes of water entering and leaving a water network and subsequently determine the levels of NRW within each part of the system.

7.7.9.1 System Monitoring

394. As stated above, the IWA methodology is based on the installation of meters to monitor flows into and out of systems, and from this data to calculate the level of NRW. Every water system has its own individual monitoring requirements but there are many locations that are common to every network. For example:
➤ Sources The monitoring of all water removed from the natural environment forms the starting point for all NRW calculations.
➤ Transmission Mains Installing meters at both ends and at intervals along major pipelines allows for the identification of sections with high levels of losses.
➤ Water Treatment Plant Inlets & Outlets Water treatment plants are a major part of water operations and in many cases constitute the second highest operating cost after power
consumption. From an overall system NRW viewpoint it is important to know how much water is used as part of the treatment process.

- **Reservoir Inlets & Outlets**  
  At this stage the water enters the system that eventually delivers it to consumers. Reservoirs themselves can leak and pipe networks are in many cases old and poorly maintained potentially making them subject to high levels of losses. Accurate knowledge of the exact amount of water entering these systems permits the amount being lost through various means to be calculated and allows the identification of priority areas for action to reduce such losses.

- **Water Consumers**  
  Large consumers of water (individually) and domestic consumers (collectively) must be metered because they form a large part of the water balance calculation (see below). Failure to meter consumers can lead to a failure to misinterpretation of the results of water balance calculations and to basic misunderstandings regarding the levels of losses from systems.

- **Supply Zones**  
  Some treatment plants and reservoirs will supply water to widespread areas. To enable the effective identification of areas with higher than expected use the volumes being distributed to each zone have to be measured.

- **Local Metered Areas**  
  Where appropriate each supply zone is divided into smaller areas to allow for the further refinement of flows and volumes within the system and permit the accurate targeting of efforts to locate and eliminate losses.

- **We have made provision in the subject Tranche-1 towns’ investment programme for comprehensive metering of flows at critical locations for both NRW monitoring and network management.**

### 7.7.9.2 Water Balance Calculation

395. The IWA methodology places great emphasis on the calculation of a water balance for the overall system and its constituent parts. The calculations are designed to identify, through a process of elimination, the amounts of water entering a system that cannot be accounted for through the sum of the volumes being used / withdrawn for different purposes. It is a method of ‘balancing’ the ‘inputs to’ and ‘outputs from’ a system. At the end of the calculation the volume that cannot be accounted for is the amount that requires further work to identify and either allocate to a part of the equation or take action to identify and/or rectify the cause. The calculation can be carried out for a localised area, a combination of localised areas (Supply Zone) or for the complete system.

396. The calculation of a ‘Water Balance’ forms the basis for all future activities related to the improvement of network management and the reduction of losses. From the results of the calculation a decision can be made, based on sound information, about the need for further action, the urgency that any action should be accorded and the areas in which the action should be taken.
397. The IWA Task Force on Performance Indicators recommends that if the term ‘Unaccounted For Water’ (UFW) is used it should be defined and calculated in the same way as ‘Non Revenue Water’ (NRW) in the above table.

398. Definitions of the principal components of the IWA water balance methodology are as follows:

- **System Input Volume**  The annual volume input to that part of the water supply system
- **Authorised Consumption**  The annual volume of metered and/or non-metered water taken by registered consumer, the water supplier and others who are implicitly or explicitly authorised to do so. This includes losses after the point of customer metering.
- **Unauthorised Consumption**  All consumption of water not authorised by the water supplier and for which revenue is received.
- **Non-Revenue Water (NRW)**  The difference between System Input Volume and Billed Authorised Consumption. NRW consists of:
  - Unbilled Authorised Consumption (usually a minor component)
  - Water Losses
- **Water Losses**  The difference between System Input Volume and Authorised Consumption, consisting of Apparent Losses and Real Losses
- **Apparent Losses**  Unauthorised Consumption and all types of metering inaccuracies
- **Real Losses**  The annual volumes lost through leaks, bursts and overflows on mains, reservoirs and service connections, up to the point of customer metering.
7.7.9.3 Location of Losses

399. The calculation of a water balance for city wide distribution systems, supply zones within cities and ultimately for local metered areas, identifies those parts of the transmission and distribution networks with the highest level of losses. Following this the effort to locate those losses and take corrective action commences.

7.7.9.3.1 Location of Real Losses

400. There is a wide range of methods available for this stage of the process with the most appropriate being selected based on the material of the pipe network, system pressures and the level of skilled manpower available. To further reduce the time required to locate leakages, we recommend a process of progressively isolating sections of the network, and recording changes of flow rate with a meter, in order to locate the lengths of pipe with the highest losses. Subsequently those lengths are surveyed to pinpoint the position of leaks.

401. The majority of leak detection methods rely on the attenuation of noise created by the leak and then detection of this using manual or electronic listening equipment. Networks with a high proportion of metal pipes are best suited to these techniques.

402. Plastic pipes do not attenuate noise to the same degree as metal pipes. Consequently listening leak location techniques are much less successful. In the ULB’s identified there is a high proportion of plastic pipe. Additionally no leak monitoring or identification has been carried out so the number of leaks is likely to be very high. The noise created by large numbers of leaks can also be detrimental to the performance of acoustic detection methods and equipment.

403. Acoustic techniques are most effective in continuous supply situations where the level of noise from customers drawing water is lower and the system pressures are more stable.

404. To counter the problem, as found in Karnataka, where supplies are intermittent, innovative leak location techniques such as the insertion of an inert gas with the water can be employed. The gas escapes through the leaks and, as it is lighter than air, rises to the surface where it can be detected. This process can be used to survey relatively large areas at a time depending on the equipment and skilled operators available.

405. The system also has the advantage that it can be used on an intermittent supply system, albeit less efficiently than in a continuous supply system, by introducing the gas during a water supply period, and then searching for concentrations at the surface over the following days. This is possible because the gas rises through the ground slowly over an extended period.

406. We propose the adoption of the technique as it is practical to start locating and repairing leaks almost immediately whilst network flow monitoring systems are being installed.

7.7.9.3.2 Location of Apparent Losses

407. The most common sources of apparent losses are:

- Meters under recording the flow being drawn by customers, and
- Consumption of water through unauthorised connection.

408. As commonly there is not universal customer metering, meter under-registration is less of a factor. However, making an accurate allowance to legitimate consumption forms a vital part of the water balance calculation. We suggest that to achieve an accurate determination of volumes consumed by unmetered customers, a representative customer sample should be metered to establish consumption patterns and, using the data from the household survey, the total volume to be included in the water balance can be calculated.

409. Consumption through unauthorised connections will be the largest element of apparent losses. Once the physical losses have been eliminated any continuing excess consumption must be through unauthorised connections. To identify these:

- Locate all known connections;
- Survey for other connections not previously registered, and
Take corrective action to register the 'new' connections.

### 7.7.9.4 NRW Calculation & Reporting

410. Achieving an accurate calculation of the level of losses is fraught with difficulty unless there is a substantial set of stable and consistent data on which it can be based. This volume of data can only be collected over a period of several years and must be based on actual measured information, not on estimates.

411. The result of the calculation of losses, regardless of the method used, can vary widely from period to period, as information is improved. For example, changes to the data can cause the calculated level of losses to increase or decrease regardless of the efforts made to identify and repair leaks. This can seriously undermine the efforts of staff if the benefit of the leaks they locate and repair is outweighed by changes to the asset information. Conversely, reported levels of losses can apparently improve without any effort to locate and rectify these.

412. Traditional measures for reporting water losses from networks include:

- As a percentage of the volume “water into the system”;
- As a volume of water per length of main, measured as m³/km/day, applicable to rural pipelines, and
- As a volume of water per connection to the network, measured as m³/connection/day and applicable to urban pipelines.

413. All of these methods are flawed in that they fail to account for one circumstance or another for the following reasons:

- Percentage is the most commonly used measure for making global comparisons of performance across water supply organisations. The benefit of it is that it is readily understandable by those not involved in the industry, such as the media. Although convenient, using percentages is always misleading because it takes no account of the actual volume involved. For instance, if 10m³ is lost from a system that has 100m³ put into it every day, the NRW is 10%. If the “water into supply” increases to 120m³ due to increased demand, and the losses remain at 10m³, NRW, as a percentage, apparently falls to 8% without any NRW reduction effort.

- Using the volume of water per length of main or the volume per connection both have their benefits if used in the correct circumstances. They should only be used to compare systems with similar characteristics in terms of their length and the number of connections involved. Any attempt to compare systems with different characteristics will only result in misleading results.

- None of the reporting methods mentioned above takes due account that higher pressures result in higher loss volumes or that the same network will lose more water during a 24 hour supply that it will under an intermittent supply simply because the water will leak longer.

414. In order to overcome the above factors, we recommend that the IWA formulated *Infrastructure Leakage Index*[^16] be adopted. The Index is a method of reporting the level of water lost from a network in such a way that the relative levels of losses can be compared from system to system and is specifically designed to be used on networks with intermittent water supplies. An ILI calculation is a ratio between those losses that are assumed to be unavoidable and those that are measured. The ILI ratio specifically allows for pressure and continuity of supply variations by expressing both parts of the ratio in terms of losses per metre head of system pressure per hour of supply.

415. NRW performance data and the results from loss reduction exercises should be coordinated centrally. This will ensure that areas are prioritised for loss reduction activity on the basis of:

[^16]: Reference should be made to the IWA Blue Pages entitled “A Review of Performance Indicators for Real Losses from Water Systems”, October 2000 which explains the issues associated with leakage reporting in detail.
The greatest benefit to the water service provider and customers, and targeting of resources in the most efficient manner.

Centralising the coordination of data also makes the preparation of operational and management reporting easier and more consistent.

### 7.7.9.5 NRW Staffing

For optimum efficiency, we strongly recommend that NRW management is placed in the hands of the organisation responsible for the delivery of water services – the service provider. This course of action encourages the:

- Efficient transfer of information between operations staff and NRW teams;
- Coordination of operational activities to minimise the impact on transmission and distribution networks and customers;
- Clear delegation of responsibility for meeting improvement targets, and
- Maintenance of accurate records to identify performance of staff and assets.

In our suggested organisational structure, Figure 10, we have proposed a specialist NRW management team. If established, a key objective must be the retention of knowledge gained by the team to make it available in the future. A suggested team structure is shown below:

![Figure 14: NRW Management Organisation Structure](image)

### 7.7.9.6 Options for Improvement of NRW management

The options whereby improved NRW performance can be delivered are shown below.

<table>
<thead>
<tr>
<th>Option</th>
<th>Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1 - Continue with the current passive process of responding to leaks as they become visible.</td>
<td>This is the lowest cost option but contributes nothing to reducing the level of water lost or improving customer service and maintenance of water quality.</td>
</tr>
<tr>
<td>Option 2 - Implement a system of active leakage control by recruiting additional staff and systematically inspecting pipelines for leakage.</td>
<td>As with option 1 this is a low cost option but does nothing to identify either hidden leaks that may be discharging high volumes of water continuously for extensive periods of time or consumers who are supplied with water but are not registered.</td>
</tr>
</tbody>
</table>
Option 3 - Recruit a contractor to inspect the network and identify water losses.

This option has the advantage of rapidly placing staff 'on the ground' to identify losses but it will not achieve the desired results unless they have the ability to prioritise their activities towards areas that are known to have the highest levels of losses.

Option 4 - Implement a management structure dedicated to the reduction of NRW using the IWA methodology and an operational system designed to determine flows within water systems to prioritise those sections requiring attention.

Initial capacity building by experienced NRW reduction contractor

7.7.9.7 NRW Management Process

420. The figure below illustrates the process that we recommend is followed to successfully implement a NRW reduction programme. The process is iterative whereby when actions have been taken the success or otherwise of these must be measured and further activities identified as appropriate.

421. Continuous monitoring of flows is essential to identify both improvements in performance and changes in operational circumstances that require action.

![Figure 15: NRW Reduction Process](image)

7.7.10 NRW Management Reduction

7.7.10.1 NRW Policy & Targets

422. The setting of clear targets for the identification and reduction of NRW is essential to provide guidance regarding the level of investment required in infrastructure and the resources needed in terms of staff and equipment.

423. The establishment of the Baseline Performance is a key element of the NRW reduction process. Between the two elements the actual amount of NRW that are present in any system, or part of a system, and allows for the identification of:

- Priorities for action - the most benefit can be gained from reducing the largest levels of NRW first;
- The likely cost of reducing the level of NRW to the target (the lower the level of NRW to be found the unit cost of reduction is higher as is the degree of effort required), and
- The potential benefit of reducing NRW in terms of the additional revenue to be gained and / or the additional number of consumers that can be supplied or the additional hours of supply that can be provided.
424. Without the baseline figure the measurement of progress towards achievement cannot be established.

425. The following is an indicative three-phased NRW Reduction programme.

Table 23: NRW Reduction Schedule

<table>
<thead>
<tr>
<th>Year</th>
<th>Activity / Target</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stage 1</strong></td>
<td>Recruit staff and, if used, NRW contractor; Procure equipment for the measurement of flows within networks; Design flow monitoring regimes i.e. Supply Zones, DMA’s etc., and implement; Commence household survey to validate Customer Data base; Install necessary revenue meters; Establish and gain approval for a consumer metering policy, and Determine Base line performance and set targets.</td>
</tr>
<tr>
<td><strong>Stage 2</strong></td>
<td>Complete household survey and continue to install revenue meters; Monitor flow measurement equipment; Document data collected; Analyse data, and Identify priority areas for action.</td>
</tr>
<tr>
<td><strong>Stage 3</strong></td>
<td>Commence NRW identification and reduction</td>
</tr>
<tr>
<td><strong>Year 4 and subsequent years</strong></td>
<td>Continuous flow /pressure monitoring, and Continuous NRW identification and reduction towards set target</td>
</tr>
</tbody>
</table>

426. The resources and technology employed to reduce NRW has a direct impact on the level of success.

427. NRW identified and eliminated will be a mixture of physical losses from networks - real losses, and unauthorised connections/meter under registration - apparent losses - which lead to increased revenue. NRW reduction cannot be divorced from action to measure the volume of water legitimately taken by registered consumers. Metering is the best method of achieving this but it does incur costs in the form of the:

- Procurement and installation of meters;
- Ongoing maintenance to maintain meter accuracy, and
- Billing and collection of charges raised.

428. Where a revenue metering programme is completed, a representative sample of consumers must be selected for:

- Assessment of water consumption;
- Identification of peak demands, and
- Monitoring of meter performance.

429. All consumers similar to those in the sample would then be charged, or the water consumed determined, on the basis of the volumes consumed by the respective part of the sample.

430. For NRW calculations the number of consumers represented by each part of the sample must be identified and the total volume consumed by each allocated to the water balance calculation.

431. The process must be continuous to identify changes in consumption patterns over time and variations in consumption patterns during different part of the year.
7.8 Customer Service levels

7.8.1 Water Supply

Meeting Customer Service Levels for water flow and pressure, requires two conditions to be met:

- Adequate raw water and treatment capacity, and
- Capacity within the supply and distribution systems to deliver the water to customers.

7.8.1.1 Adequacy of Raw Water and Treatment Capacity

In line with the Government policy, we have assumed that public water supplies will be taken from surface waters; not groundwater sources.

Water is in demand in the state for public water supply, irrigation, industry and power. At times, especially during periods of drought, there are significant shortages. Nevertheless, and in line with the Government’s policy of giving priority to public water supplies, there should be adequate water availability to meet customer demand, as shown in the following table from the above mentioned Draft Cabinet Paper.

Table 24: Water Availability in the State

<table>
<thead>
<tr>
<th>No. of River Basins</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average yield in the Basins</td>
<td>3438 TMC</td>
</tr>
<tr>
<td>Economically utilizable water potential</td>
<td>1695 TMC</td>
</tr>
<tr>
<td>Availability of water based on allocation under KWDT/CWDT</td>
<td>1054 TMC</td>
</tr>
<tr>
<td>Current consumption for drinking purpose</td>
<td>70.59 TMC</td>
</tr>
<tr>
<td>Projected demand by 2050 for drinking purpose</td>
<td>207.33 TMC</td>
</tr>
<tr>
<td>Consumptive use</td>
<td>41.46 TMC (4% of allocated water)</td>
</tr>
</tbody>
</table>

The “consumptive use” refers to the water that is lost from the river systems, and thus as a state water resource. The 41.46 m\(^3\)/day assumes that 80% of the water drawn for public water supply is “returned to sewer”, and flows back into the river systems. Such an assumption can be erroneous in that water abstracted can be “lost” into the ground. In reality, the lost volume could be as high as 30% of the water abstracted, yet remains insignificant when compared with the total water available.

Whilst adequate water made be available, in theory, it does not necessarily mean that the water will actually be available at the point of abstraction. For example, Davangere and Harihar operational staff say that during the summer when the flows in the River Tunga Bhadra River are very low flow, temporary bunds are constructed across the river to store water upstream of their treatment works intakes.

Overall water resource balance in Tunga Bhadra River Basin and measures for assurance of water availability within the Tunga Bhadra River for public water supply and other uses will be proposed within KISWRMP: Water Resource PPTA. Government of India policy is for priority to be given to public water supply and we have assumed that adequate water resources will be available, without affecting current downstream uses.

Of concern to us, is the determination of the quantity of water to be made available/abstracted for public water supply. Indian design standards, assume losses of 15% as NRW in the distribution network, plus losses in the treatment process and in the transmission systems. We respectfully suggest that this is a very low figure and one that will be achieved only with considerable effort and investment both to reduce the NRW and to maintain the level at 15%. We suggest that this level will not be achieved for a considerable time, if at all. A more conservative level of around 25% would be more realistic and safer upon which to base future raw water requirements and treatment capacity. The consequences of different NRW levels are shown in the following table.
Table 25: Variation in Raw Water Requirement with Increased NRW Levels

<table>
<thead>
<tr>
<th>Distribution Non-Revenue Water levels</th>
<th>15%</th>
<th>20%</th>
<th>25%</th>
<th>30%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub Basin Population (2031)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assumed per capita consumption I/hd/dy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domestic demand Mld</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial/Industrial Demand Mld</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Customer demand Mld</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-revenue water Mld</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total required treatment capacity Mld</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Required abstraction quantity MLD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variation against NRW of 15% Per cent</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 3.883,000                             | 135 | 524 | 105 | 629 |
| 111                                   | 157 | 210 | 270 |
| 770                                   | 818 | 872 | 935 |
| 785                                   | 834 | 890 | 953 |
| 49                                    | 105 | 168 |
| 106%                                  | 113%| 121%|

439. Within the overall water resource balance, the additional water abstracted would not be a concern. Where it could be an issue is where water is drawn from tributaries to the main rivers where the flow will be less and for the adequacy of the treatment capacity so that available “water into supply” meets both customer demand and a the “demand” of a higher-than-designed NRW.

7.8.1.2 Bankside Storage

440. Most water treatment plants in the sub-basin draw directly from the River Tundra Bhadra, or its tributaries, as their source of raw water. In this respect, they are vulnerable to:

- Pollution in the water course from which the water is abstracted for treatment;
- Low flows in the water course, and
- Problems in water treatment and potential damage to pumping plant etc, during the periods of high flows in the river when the water is turbid and debris is carried by the river.

441. The remedial measure commonly adopted is for bankside storage to be provided. The concept is not necessarily the “bankside” location, but the provision of a facility whereby water is first stored prior to treatment.

442. During “normal” river flow conditions, water is first passed into the bankside storage facility and the treatment works draws from the storage; not the river. In the event of pollution in the river or high, turbid flows, the intake to the storage is shut down and the treatment works continues in operation using water stored in the bankside reservoir. During periods of low river flow, water from the bankside storage would supplement the water that was available in the river.

443. Indicatively, seven days storage is provided with the required storage capacity dependent upon the river hydrology. The problem is, of course, the availability and cost of the land.

444. Alternatively, and as a long-term solution, transmissions could be laid from the existing or additional, raw water reservoirs in the sub-basin such as the Tunga Bhadra Reservoir. Such solutions are CAPEX and OPEX expensive but, as in fully developed countries, might become a customer-driven requirement. Such investments do become more viable when the facilities are also used for other purposes such as river flow management and recreation. For the immediate future, they, and bankside storage, remain long-term options.

7.8.1.2.1 Stand-By Power Generation

445. We recommend that stand-by power generation be provided at all treatment plants and at critical pumping stations. The required generator power will need to be ascertained at each site and will be dependent upon the available storage held in the strategic reservoirs, and the expected duration of power failures.
The generator sets will need to be provided with fuel storage contained within a bunded area at least equal to the volume of fuel stored.

A procedure will be required to ensure that the fuel is “turned over” and that the starter batteries remain charged.

7.8.1.3 Network Capacity

The water distribution and supply network comprises three sections:

- Transmission mains from the treatment plant that comprise the strategic network;
- Strategic storage, and
- Distribution network that also contains distribution storage.

Each element has a role to play to ensure the adequacy of supplies to customers and must be of sufficient capacity for that role.

7.8.1.3.1 Strategic Network

The strategic network transports the treated water from the treatment plant to the strategic reservoirs. The capacity must be such as to meet the seasonal peak demands and be able to transport additional flows should another element of the strategic network fail. The operation of the strategic network can be complex, especially during an emergency event, and can only be safely designed with a computer network model.

7.8.1.3.2 Strategic Water Storage

Strategic storage is provided to ensure that water supplies can be maintained in the event of a source or strategic network failure. The volume to be provided should be determined in a risk assessment that takes into consideration the demand on the reservoir, the probability of a failure and the time to correct that failure. The volume needs to take into consideration the amount of draw-down that might have occurred when the emergency event happens. Indicative storage is normally around 24 hours demand but can in some circumstances be higher. The danger with too much storage is that there will be a low turn-over during periods of low demand with consequential risk of stagnation of the water stored.

7.8.1.3.3 Distribution Network

The distribution network is arguably the most important part of the supply system as it is the distribution network that delivers the water to customers. A failure of the network has an immediate effect on the supply to customers. Yet, often it is the part that receives the least attention.

The distribution network has to be dimensioned to deliver the peak hour flows to customers. For this purpose and for fire fighting, we would suggest that consideration be given to laying DN100 pipe as the smallest pipe size that is laid.

Storage is provided in the distribution system to smooth out the peak demands, and to provide some security against mains failure. The Indian standard of 35% of demand would seem adequate for this purpose.

7.8.1.4 Wastewater Collection

Inadequacies in the wastewater collection system have less effect on customers than inadequacies in the potable water network. Nevertheless, the wastewater system needs to be adequate for the purpose intended. In particular, sewers need to be designed adequate to prevent flooding from manholes but maintaining a self-cleansing velocity.

7.8.2 Customer Service Levels – Response to Customer Contacts

We suggest that a series of Customer Service Levels are introduced not only for water supply and wastewater collection performance, but also for response to customer contacts.
Suggested Service levels are provided in the draft PSA attached as an Appendix, and cover such as response time to customer enquiries and response to emergencies to minimise the effect upon customers.

In Section 7.6.5, we have proposed a Management Information System that would include for “tracking” customer enquiries to ensure that they are “closed down” to the satisfaction of the customer, and to be able to monitor and report performance against the PSA Performance Indicators.

7.8.3 Risk Mitigation

There will always be a risk in the provision of a water supply and wastewater collection service. It is the responsibility of the service provider to ensure that the risk is mitigated wherever possible to within acceptable levels. Risks are assessed for the likelihood of an event and the consequences.

Some risks can be designed out of the system by, for example, dual treatment streams, duplication of critical mains and by providing adequate storage.

Where they cannot be designed out, the risks can be mitigated by the availability of an Emergency Response Plan that sets out the framework for responding to an emergency event.

An Emergency Response Manual is one of the documents which we recommend that the service providers have in place – Section 7.7.6.4.

7.8.4 Other IWRM Initiatives

The following, whilst not suitable for KISWRMIP funding are IWRM initiatives that could be adopted or current use, extended, to play an important role in reducing water demand and in the conservation of water resources.

7.8.4.1 Rain Water Harvesting

Rainwater harvesting is a recognised and accepted practice in Karnataka that is actively promoted by the state. The KUIDFC has issued a User’s Manual and a Handbook, both of which are available on the internet, and provide information on the design of rainwater harvesting schemes.

Domestically, the water collected can be used for non-potable uses such as garden irrigation, toilet flushing and washing. Ideally, the water harvested should first be filtered to remove solids, grit etc. before passing into a storage tank. The system is applicable in both urban and rural locations but is particularly relevant where a centralised ULB supply is either non-existent or is unreliable. In its very simplistic, basic form, rain water harvesting can simply consist of a large water barrel collecting water from a roof downpipe.

Rain water harvested is different from “grey water” which is water re-used in a property from washing.

Within an IWRM context, water harvesting can be considered applicable for:

- Small, household schemes where the rain water that falls within a property boundary is collected and used as “harvested water”. Such schemes require an investment to be made by the householder on the basis that the water harvested and used is a saving against the cost of potable water drawn or provided by tanker. The problem with rain water harvesting at this level is that, unless there is a critical water shortage, the cost of water saved at the current low tariff rates is rarely sufficient to justify the initial outlay for the cost of the installation and internal plumbing.

- The second level is for rain water harvesting in larger buildings and sites where the volume of water collected is much greater and, with adequate storage, will be able to continue to provide the required volumes during dry spells. If the secondary plumbing is installed at the time of construction, the proposition becomes increasingly viable. Again, the cost benefits and thus take-up would be greater with a higher water tariff. Rainwater can be collected not only from the roof of building but also from paved areas. In this case, the water collected needs to be filtered with particular care taken to ensure that the water collected is not polluted with oil or
In addition to retaining on-site some water for immediate needs such as gardening, within a larger area, such as municipal parks, industrial parks, housing complexes and larger industrial/commercial premises, rain water can be collected and channelled to percolation tanks or re-charge wells to be used for aquifer recharge. Such schemes need to be carefully designed with adequate filtration to ensure that the aquifer does not become polluted.

- **Rain water harvesting is a proven technique to reduce demand on the centralised system, provide water for some purposes where the centralised system is inadequate and to recharge the water bearing aquifers.** Whilst some far-sighted people and industrialists will install water harvesting systems, for most people an incentive is required. For some this might simply be the need for water but within an urban context this is less likely and a financial or other incentive is required. A suggested incentive could be a reduced property tax where rain harvesting is installed or even a token payment for the value of water used to recharge an aquifer.

### 7.8.4.2 Rehabilitation of Historic Water Tanks

468. Historically large open water reservoirs or tanks have been used in India for many purposes, other than just for irrigation. As a result of large-scale canal irrigation they have fallen out of use and, in some locations are no longer used.

469. The decline in the use of tanks may be traced to a chain of events started by the takeover of community and private tanks by the state. This led to an institutional breakdown and erosion of traditional arrangements in most tanks, consequent breakdown of collection of water charges, lack of maintenance and increasing encroachments on tank beds and feeder channels. The decline also led to a decrease in recharge of groundwater, an increase in flash floods and overspills and reduced capacities. At the same time, there was an increasing population that demanded services from the tanks and their expectations were also changing rapidly away from the thinking that framed traditional agriculture and tank use.

470. Tanks were also made redundant because of environmental degradation in upstream catchments such as deforestation, overgrazing, soil erosion and siltation. In addition, changes in land use patterns, particularly in the catchment zones of reservoirs, aggravated soil erosion and subsequent siltation in tank beds.

471. A study\(^\text{17}\) of tanks in the upper catchment of the Tungabhadra sub-basin, found that tanks still play an important role in the area. Proper integration of the tank and canal systems can provide important synergies for irrigation. They can also provide a useful function as water storage facilities for other uses, including water supply and sanitation.

472. In rural areas, their use could be applied to many applications - irrigation, drinking water, water for domestic use and sanitation, water for bathing, drinking water for cattle, water for washing and bathing cattle, washing clothes, fishing, recreation, worship, silt and seasonal tank bed cultivation.

473. In an urban environment, their use would be more limited but could still play an important role as:

- Emergency storage against low flows and pollution in rivers from which water is abstracted for treatment, or failure of treatment works and/or transmission mains;
- A receptacle for treated wastewater before being distributed for re-use;
- The receiving storage facility for rainwater harvested from major initiatives such as large scale drainage systems;
- “Holding ponds” from which water percolates into the ground for aquifer re-charge.

474. The tanks could be filled by:

- Water naturally flowing under gravity from adjacent water courses;

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\(^{17}\) **TANKS IN THE TUNGABHADRA SUB-BASIN AND AN IWRM STRATEGY FOR TANKS: The long and the short view by Suhas Paranjape and K. J. Joy. Society for Promoting Participative Ecosystem Management, 16 Kale Park, Someshwarwadi Road, Pashan, Pune 411008, Tel: 91-20-2588 0786/6542 Email: soppecom@gmail.com**
- Branch lines from raw water transmission mains;
- Pumping plant and pipelines specifically installed for the purpose, and
- Rainwater harvested.
- In order that the tanks could be brought back into use there would need to be:
- Rehabilitation of the tanks, and
- Institutional frameworks need to be in place with policies for tank water usage, charging and maintenance, amongst other requirements.

### 7.9 Financial Management within ULBs

#### 7.9.1 Tariffs

475. Adequate water service charging is central to a sustained service. The importance of demand management, water pricing and pro-poor targeting of water service is recognized under IWRM. Establishing transparent procedures for setting and applying tariffs, and defining ‘affordability’ in different contexts remains a key challenge.

476. In general, the UWSS sector is heavily subsidized, though the degree of subsidization varies between ULBs. Almost all the ULBs are not charging water tariffs to recover at least the entire O&M cost of water supply schemes, let alone to cover debt servicing. There are also many unauthorized consumers or households using public taps who are not required to pay any charges for their water use.

477. Tariffs should be structured in a manner such as to act as a disincentive for ‘excessive’ consumption and wastage of water, whilst ensuring at least a minimum ‘lifeline’ supply to the poor. An appropriate cost recovery mechanism based on adequate tariffs will help ensure that revenues cover O&M costs, debt service plus a reasonable return on capital.

478. We propose that:
- Tariffs are to be set independent of political influence and to be adequate for a financially sustainable service provision;
- Charges are volumetric based, as measured by individual customer revenue meters;
- Tariffs to be “affordable” up to an agreed consumption. Thereafter, to become increasingly punitive to encourage reduced water demand and conservation of water by such as rainwater harvesting. We suggest that the limit is the Indian design standard for domestic demand of 135 litres/head/day;
- Volumetric charges are introduced for wastewater collection with additional charges for industrial customers based upon the quality of the effluent discharged to the sewer, and
- An active policy is adopted to ensure the accuracy of the customer database used for charging and that unknown connections are proactively located, and
- The adequacy of existing Debt Management procedures to be reviewed, or new introduced.

479. The above proposals are all accepted “good practice” and are being introduced across Karnataka.

#### 7.9.2 Financial Management

480. One set of performance Indicators by which the performance of the service providers will be appraised will be financial management. Immediate requirements will be for:
- If the ULB elects to remain as the service provider, ring-fencing of the UWSS income and budgets;
- A financial coding system be used that allocates costs against a job or activity so that unit costs can be determined for the purpose of benchmarking;
- Accounts are to be prepared with the E Governance software developed under Karnataka Municipal Reforms Project (KMRP) that incorporates fund based accounting with Certified Audit Register, and
- A Sinking Fund, financed from the ULB Property Tax income, to be established, as permitted by the Municipal Business Rules in order to fund asset rehabilitation.

7.9.3 Sinking Fund

481. Improved UWSS service would lead to a better quality of life, and an increase in capital value and rental value of properties. This would lead to an increase in the Property Tax base value of the ULBs. It is suggested that a minimum of 20% of the Property Tax goes into a Sinking Fund, which will be managed as an Escrow Fund. Income from the Property Tax would first go to the Sinking Fund and only when the 20% is reached would the monies start to flow to the other Municipal funds.

482. Each service provider should prepare an asset rehabilitation programme from which an annual budget for asset rehabilitation/replacement can be determined, to be financed from the Sinking Fund.

7.10 Summary of Proposals

483. In the previous Section: 6.7, we identified a number of “Impediments to Success”. In this Section, we have made proposals to overcome those impediments. These are summarised in the table below.
### Table 26: Proposals to Overcome Impediments to Success

<table>
<thead>
<tr>
<th>Strategic Theme</th>
<th>“Impediments to Success”</th>
<th>Proposals as “Criteria for Success”</th>
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</thead>
</table>
| **Institutional-State** | 1. Lack of co-ordination among the state agencies.  
2. No over-riding responsible & proficient entity for UWSS.  
3. No “Centre of Excellence” for knowledge dissemination.  
4. No Water Sector Master Plan with prioritised investment programme.  
5. Lack of previous investment.  
6. Emphasis is on creation of new assets and not operability. | 1. Generally, provided for in the Draft Cabinet Paper  
2. Prepare a sector Master Plan with prioritised Capital Investment Programme |

| **Institutional–Local** | 7. Managers not dedicated to UWSS.  
8. Insufficient staff, poorly trained and lacking business support systems and equipment.  
9. Insufficient staff with establishment posts not always filled.  
10. No formal training programmes resulting in untrained staff at all levels.  
11. Lack of business support systems. | 3. Move towards a policy of regional service providers.  
4. Establishment of a separate ULB UWSS department or of a SPV service provider  
5. Capacity building programme through an IWRM Project Management Unit  
6. Further investment in business support systems such as MIS, GIS and network computer models |

| Technical | 12. Inadequate O&M of assets resulting in their premature failure and inefficient operations.  
13. No data collection for decision making.  
15. Supplies adversely affected by power failures.  
16. High levels of NRW without the ability/resources to reduce to acceptable levels.  
17. Poor workmanship and incorrect materials used for new schemes.  
18. Inadequate site supervision.  
19. Lack of performance guarantees in tender documents. | As for Institutional – Local, plus  
7. Introduce Performance Service Agreement  
8. Develop service providers to a position suitable for PPP operator tendering, if State/ULB policy  
9. Installation of flow metering  
10. Installation of stand-by generators at critical sites  
11. Determine Baseline NRW performance and move to a pro-active NRW reduction programme using specialist contractor.  
12. Review of all contract documentation and Specifications. |

| **Customer Service** | 20. Poor service with infrequent supplies of limited quantities.  
22. No formal service agreement between “asset owner” and “asset operator”.  
23. No effective monitoring of service levels.  
24. No independent recourse for customer complaints. | 13. Provide for a Customer Services department in service provider organisation structure  
14. Prepare Customer Service Levels and with Operational performance Standards incorporate into a Public Services Agreement.  
15. PSA to be subject to technical audit |
| Financial                                                                 | 16. Segregate UWSS finances from other ULB activities.  
| 25. Inadequate service charges that were insufficient to fund sustainable O&M budget and required staff establishment.  
| 26. Tariffs influenced by political pressures.  
| 27. Absence of revenue meters preventing accurate income determination and customer demand management.  
| 28. Some poor collection efficiency | 17. Remove tariff setting from politics  
| 18. Ensure adequacy of tariffs with a tariff setting mechanism that includes a “demand management” element | 19. Install revenue meters on supplies  
| 20. Training in billing & income skills with modern billing systems | 21. Introduce volumetric charge for wastewater service  
| 24. Improve collection efficiency within capacity building programme |
8 SELECTION OF TRANCHE-2 INVESTMENTS

484. In proposing selection criteria for Tranch-2 and subsequent investments, criteria such as those based upon current service levels; the benefits to be derived and the cost/beneficiary can be proposed. Such criteria can be hard to evaluate without adequate data and are always open to debate and influence.

485. The investments chosen this way are also top down; not necessarily customer or ULB driven which is a requirement of IWRM.

486. The KUIDFC is of the opinion that the MFF investments should be dependent upon positive actions by the ULBs to improve service provision themselves, as far as they are possible within their financial and institutional constraints. We support this opinion and propose that it becomes the basis for future investments.

487. As discussed previously, lack of funding has been a major deterrent in the allowing the ULBs to deliver the improvements in service that they wish to deliver. In recognition of this lack of finance, we suggest that limited monies, $20m suggested, are made available from the Tranche-1 funding to assist ULBs to “take the first steps” to initiate the process within their towns.

488. A prime function of the proposed IWRM Project Management Unit will be to assist the KUIDFC select the Tranche-2 and subsequent towns.

489. The following model is put forward for the consideration as to how “willingness” can be demonstrated:
Stage 1 – Preliminary Works

a. ULBs will be invited to make an application for funding for Preliminary Works, prior to a major UWSS performance based investment, up to a maximum of INR X.

b. The application is to show:
   i. How the ULB is prepared to be proactive in bringing about improvement;
   ii. The works for which the preliminary investment is required;
   iii. Benefits to be derived from the investment with indicators to measure (i) ULB performance in disbursement of the investment and (ii) achievements, and
   iv. Required investment with the contribution that the ULB is prepared to make – minimum of Y%.

c. Applications would be evaluated by the IWRM Project Management Unit within KUIDFC with representatives from other stakeholders e.g. KUWS&DB, Water Department.

d. If suitable, funding will made available from the Preliminary Works Fund, and Preliminary Works implemented.

e. Performance is monitored against proposed Performance Indicators.

Typical works that would be considered as suitable are:

a. Installation of bulk meters on all treatment works outlets and a preliminary water audit;

b. Metering of transmission mains and leak detection and repair to bring physical losses to the Indian design criteria of 2%;

c. Repairs and improvements in treatment works to reduce water used in the treatment process to the Indian design criteria of 4%;

d. Bring water service charge collection efficiency to 90%;

e. Complete a customer household survey to find illegal connections;

f. Completing a 100% GIS record;

f. Install measuring devices and conduct an energy audit at all treatment works and pumping stations;

h. Fit meters and automatic shut-off valves to all standpipes;

i. Remedial works at all storage facilities to ensure site security and water quality;

j. Set out and publish customer service levels.

Stage 2 – Selection of Tranche-2 ULBs

a. Based upon their success with Preliminary Works, ULBs will be invited to prepare a preliminary Master Plan to show where UWSS investment is required including for growth, expanded service area and asset rehabilitation;

b. Master Plans are evaluated and where there is considered to be demonstrable need, a full DPR is commissioned from the IWRM project funds, and schemes are prioritised against available funding using predetermined criteria;

c. Subject to a DPR that shows benefits in the investment, the ULB is afforded Level 2: Priority 1 in the prioritisation process.
9 IMPLEMENTATION PLAN

490. Work subsequent to the submission of the Final Report comprises:

<table>
<thead>
<tr>
<th>Group</th>
<th>Activity</th>
<th>By Whom</th>
<th>Duration</th>
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</thead>
<tbody>
<tr>
<td>Draft Final Report</td>
<td>Review and comment</td>
<td>GoK, KUIDFC and other stakeholders ADB</td>
<td>1 month</td>
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<tr>
<td></td>
<td>Incorporate into Final Report</td>
<td>PPTA Phase I</td>
<td>1 month</td>
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<tr>
<td>Loan</td>
<td>ADB Fact Finding Mission</td>
<td>ADB with local stakeholders</td>
<td>2 months</td>
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<td></td>
<td>Agree and finalise loan terms</td>
<td>GoI, GoK and ADB</td>
<td>3 months</td>
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<tr>
<td>IWRM Project Management Unit</td>
<td>Established and staff appointed</td>
<td>KUIDFC</td>
<td>6 months</td>
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<tr>
<td>PMU &amp; PIUs</td>
<td>Establish or develop existing</td>
<td>KUIDFC</td>
<td>1 month</td>
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<tr>
<td>Works &amp; Supervision contracts</td>
<td>Draft contract for Design &amp; Supervisory consultants, including for DPR preparation</td>
<td>KUIDFC with ADB support through PPTA Phase II</td>
<td>1 month</td>
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<td>Appoint consultants</td>
<td>KUIDFC</td>
<td>4 months</td>
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<tr>
<td></td>
<td>Prepare DPRs and Works Contracts</td>
<td>Consultants to KUIDFC</td>
<td>6 months</td>
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<td></td>
<td>Appoint Works contractors</td>
<td>Consortium of Tranche-1 ULBs advised by KUIDFC/PPTA Phase II</td>
<td>4 months</td>
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<tr>
<td>Sector Reorganisation</td>
<td>Establish Drinking Water Supply Mission and Water Council</td>
<td>Sector stakeholders led by Department for Urban Development/KUIDFC</td>
<td>On going</td>
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<td></td>
<td>Establish SPVs and separate UWSS departments in ULBs</td>
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9.1 Implementation

9.1.1 Steering Committee

491. The established IWRMP Steering Committee whose members include Additional Chief Secretary (Committee Chair), MD of KUIDFC (Committee Secretary), Principal Secretary of the Urban Development Department, Principal Secretary of Planning Department, Secretary for municipalities and urban development authorities of Urban Development Department, secretary for expenditure of the finance department and director of Directorate of Municipal Administration, will continue.
9.1.2 Executing Agency

492. The KUIDFC will continue as the nodal executing agency (EA) responsible for implementing NKUSIP. Investment Programme implementation activities will be monitored by KUIDFC through a separate Programme Management Unit (PMU), which will be set-up within KUIDFC. The Managing Director of the KUIDFC will head the PMU and will be assisted by an Executive Director at the Regional office of KUIDFC at Dharwad to oversee the Investment Program progress.

493. A team of senior technical, administrative and financial officials will assist the Executive Director in controlling and monitoring Investment Program implementation activities.

494. We suggest that the Executive Director be supported by a new Divisional Office established at Davangere. The consultant team will be under the Divisional Programme Director and will be involved in project planning, preparation of subproject and cost estimates, co-ordination, technical guidance and supervision, financial control, training and overall subproject management.

495. All Investment Program decisions will be made by the Executive Director who shall operate from the PMU, Dharwad; only interactions with GoK, GoI and ADB shall be conducted through the KUIDFC office at Bangalore.

496. As previously discussed, an IWRM Project Management Unit is proposed to assist in the execution of the Programme, including for the selection of Tranche-2 and subsequent towns.

9.1.3 Implementing Agency

497. Implementation Agencies (IA) in each of the Tranche-1 ULBs will oversee sub-project component implementation at the sub-project towns, where the Investment Program ULB will implement sub-project components.

498. A Programme Implementation Unit (PIU) is to be established in each ULB unless one or more of the ULBs decide to form a single PIU.

499. Other than the above institutional setup, District Level Programme Steering Committee will be set up in each district to monitor implementation of subprojects and institutional reforms. The District Level Programme Steering Committee shall consist of Deputy Commissioner of District, Divisional Program Director from concerned divisional office, Municipal Commissioners’ / Chief Officers of Investment programme ULB and President / Chair of investment programme ULB. The District Level Programme Steering Committee will report to the PMU Executive Director: Dharwad.

9.2 Works and Supervision Contracts

9.2.1 Design and Works Supervision Contract

500. We propose that a single contract be awarded by the KUIDFC for:

> Preparation of the DPRs;
> Preparation of the Works Construction Contracts;
> Review of Treatment Plant and strategic network proposal detailed designs prepared by the Plant Works Contractor, and
> All normal site supervisory and associated activities.

501. The contract will be prepared by the KUIDFC with the assistance of this PPTA Phase II, and be entered into by the KUIDFC and the appointed contractor.

9.2.2 Water and Wastewater Treatment Plant Construction & Strategic Network

502. We propose that the procurement of all Tranche-1 water and wastewater treatment plants be in a single two-year design and construct contract with an extended five-year operational period. The contract is to include for all raw water transmission pipelines and pumping stations.
503. The purpose of the operational period will be to enable local operators to become fully familiar with the works prior to their transfer to the service provider at the end of the 5yr operational period. The extended period will also permit a full verification of the contract performance guarantees for process and for OPEX performance.

504. We propose for the reasons outlined in Section 7.7.4, that the contract includes for the strategic network. Our suggestion would be for the contractor to also design the strategic network elements. We agree that this may not be acceptable to stakeholders.

505. As a single contract is proposed for all four Tranche-1 ULBs, the contract will require to be entered into between a delegated representative of the four ULBs and the works contractor.

9.2.3 Wastewater Network Construction

506. In order to meet the requirement of the KUIDFC that only the IWRM components of the investment be disbursed initially, we propose a 2yr network contract for the construction of the all proposed wastewater network enhancements and rehabilitation.

507. The detailed design will be prepared by the Design and Works Supervision Contractor.

508. As a single contract is proposed for all four Tranche-1 ULBs, the contract will require to be entered into between a delegated representative of the four ULBs and the works contractor.

9.2.4 Water Network Construction

509. We propose a single works contract for the construction of the water distribution network enhancements and rehabilitation to provide for a continuous water supply.

510. The single contract will comprise a separate component for each of the four Tranche-1 towns. Each component will commence only when a ULB meets the required performance criteria. Alternatively, four smaller contracts can be prepared.

511. The detailed design will be prepared by the Design and Works Supervision Contractor.

512. If a single contract is provided for all four Tranche-1 ULBs, the contract will require to be entered into between a delegated representative of the four ULBs and the works contractor. If separate contracts are preferred, the contract will be between the appropriate ULB and the contractor appointed for that ULB.

513. Conventionally, a contract is for the construction of fixed elements, e.g. a certain length of pipes of a known diameter to be laid in a specified time. As an alternative, we are suggesting that a “Schedule of Rates” contract be adopted. In such a contract, bidders enter their required prices in a matrix of pipe sizes for different locations e.g. major road, secondary or un-surfaced ground.

514. As a ULB meets the performance criteria or a section of main is assessed to need replacement, the contractor will commence the work, and be paid according to his schedule of rates. The schedule of rates principle can also be adopted for mains repairs, meter installation etc. The procedure might be innovative and an opportunity for Karnataka to lead, but a Schedule of Rates approach is common throughout the UK, for example. Typical matrix are included in Appendix 4, with some back-ground to the proposal.

9.3 Performance Contracts

515. We recommend at that all contracts are performance based, with performance to be measured by:

- Physical indicators e.g. length of mains laid and treatment process units constructed;
- Process and OPEX guarantees for the treatment works;
- Hydraulic and purity for water mains and water retaining structures;
- CCTV inspections of sewers for line, freedom from blockages etc.

9.4 Implementation Programme

516. A suggested Implementation Programme is provided below:
### Table 27: Implementation Programme

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<td>ADB Fact Finding Mission and Approve loan etc</td>
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<td>Draft contract for Design and Supervision Contract</td>
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- **Preliminary Activities**
  - Submit Final Report
  - ADB Fact Finding Mission and Approve loan etc
  - Establish PMU and PIUs
  - Establish IWRM Project Management Unit
  - Draft contract for Design and Supervision Contract
  - Appoint D&S consultant when loan approved

- **Implementation Phase**
  - Prepare DPRs and works contracts
  - Appoint contractors
  - Treatment Plant & Strategic network construction
  - O&M Phase
  - Wastewater networks
  - Period in which ULBs meet performance criteria
  - Potable water network enhancements and rehab.
  - Start date dependent upon ULB meeting performance criteria
Appendix 1 - DRAFT PERFORMANCE SERVICE AGREEMENT

Introduction

The following Agreement has been written as between a SPV service provider company, “the Company” and a number of ULBs, the “ULB Collective” whose administrative areas collectively comprise the service area of the SVP. The Agreement assumes that there is a supporting agreement in place between the ULBs to the establishment of the SVP and to the manner in which the management of the SVP will be authorised.

If the service provider is a department of a single ULB, the wording of the Agreement will need to be amended to reflect that the Agreement is between the ULB Council and the “asset operator” element of the ULB.

Preamble

Background to the Agreement

1. Within India, Urban Local Bodies (ULBs) are responsible for the provision of water and sewerage services
2. SVP Company [...] , herein referred to as the “Company”, was founded in [...] by the [...] ULBs, herein referred to as the “ULB Collective”, as a specialist company for providing water and sewerage services. The Company is fully owned by the constituent ULBs as fully described in the Articles of the Company.
3. In the accord with the desire of both the Company and the ULB Collective to provide an efficient and professional water and wastewater service to the peoples in the ULB Collective administrative area, the Company and the ULB Collective wish to enter into a Service Agreement for the water and wastewater services provided by the Company in the ULB Collective of Chisinau.
4. This Agreement is intended to foster improvement and further development of the water and wastewater service, within the ULB Collective.
5. The contracting Parties intend that this Agreement shall contribute to the water and wastewater service in the ULB Collective administrative area by ensuring a “best-of-class” service delivery. In so doing, improve the overall quality of life of the people of the area, whilst promoting environmental protection, energy savings and the economic development and well-being of the area. Further, the Agreement is designed to enhance service delivery and financial performance, and ensure value for money for the customers of the Company.
6. Specifically, the purpose of this Agreement is to formalise a delegation agreement from the ULB Collective, and to specify:
   a) The respective responsibilities for the provision of water and wastewater services in the ULB Collective administrative area;
   b) The rights and obligations of the ULB Collective and the Company;
   c) The method for establishing the tariff of the services, and
The customer rights and duties.

7. By this Agreement, the ULB Collective delegates to the Board of the Company, the authority to appoint the General Director and Directors of the Company.

8. The representative of the ULB Collective and the General Director of the Company sign this Agreement as the persons with the authority so delegated to them by the constituent ULB Councils and by the Board of the Company.

Parties to the Agreement

9. The ULB Collective, represented by [...............], acting based on the decision of the Councils of the ULB Collective.

and

The Company, represented by its General Director, [.....]

The ULB Collective and the Company may sometimes be referred to individually as “the Party” and as “the Parties” in the present Agreement.

The Parties have entered on this day of [xx/xx2012], into the following:

General Provisions

Article 1: Scope

10. This Agreement shall, as of the date of effectiveness, become the only legally valid instrument governing the provision of public water and wastewater services in ULB Collective administrative area entered into by the ULB Collective and Company.

11. This Agreement is established within the framework of the laws and Government resolutions of the Republic of India, other applicable legal acts and of the decisions of the Councils of the ULB Collective.

12. The water sector objectives of the ULB Collective are (i) to improve the quality of life of its citizens; (ii) to reduce the health risks that are inherent with inadequate water and wastewater service provision, (iii) to ensure the environmental health of their administrative area, and (iv) to prevent excessive exploitation of natural resources.

13. The ULB Collective has concluded this Agreement on the provision of the Services as the entity responsible for water and wastewater services as referred to in the Law of India and of the State of Karnataka and, having such responsibility, in order to meet its above stated objectives.

14. The objectives of the Company are to provide a best-of-class water and wastewater service to its customers at a level of service commensurate with the water charges tariff that customers are willing to pay.
15. The Company has concluded this Agreement in order to be able to demonstrate to its customers the Company’s performance in meeting its objectives through the indicators stated or implied in this Agreement.

16. The water and wastewater treatment plants, pumping stations, water storage tanks and the water and wastewater network as set out in the Facilities Schedule, as well as any other Public Interest assets used by the Company for the benefit of providing the Service and any new assets procured during the life of this Agreement (the “Assets”), are provided to the Company by the ULB Collective for the purpose of providing the Services.

17. The “Services” shall comprise the proper and efficient operation and management of the Assets in order to ensure the continued and sustained delivery of a water and wastewater service to the people in the ULB Collective, together with associated financial, administrative, legal and managerial functions.

18. Any non-fixed plant, tools, equipment and vehicles necessary for the delivery of the Services are to be procured by the Company and shall be the property of the Company to be used, maintained, disposed of and replaced as the Company desires.

19. As much as it is able under Indian and Karnataka Law, the ULB Collective grants to the Company the right to be the sole public water and wastewater service provider within the administrative area of the ULB Collective.

Article 2: Activities of the Company

20. The Company shall provide the Services in its own name and in the accordance with the provisions of this Agreement and applicable legislation.

21. The Company shall:
   a) Perform the Services;
   b) Perform the Services in the accordance with the Performance Standards set out in the Performance Standards Appendix, and
   c) Perform the Services within the Service Area, as defined within the Service Area Appendix and as they relate to the Facilities set out in the Facilities Schedule.

22. The Company shall not sub-contract any part of the Company’s core activities without the formal approval of the ULB Collective. Core activities are considered to be the direct activities for the provision of the Services; that is the operation of the Assets. The maintenance of the Assets is not considered as a core activity. In the event of any dispute over the definition of a core activity, the opinion of the ULB Collective shall take precedence.

23. The Company shall perform the Services, in accordance with this Agreement and all applicable Laws. The Company shall ensure that its employees and any contractors whom it employs shall be made fully aware of the requirements of this Agreement and shall abide by the requirements of the Agreement.

24. The Company shall prepare and submit to the ULB Collective for approval annually a Business Plan incorporating (i) financial, administrative and management reports for the preceding year, (ii)
an operating plan and an annual operating budget for the coming year and (iii) a water and wastewater services tariff determination for the coming year.

25. The first Business Plan submitted after the signing of this Agreement shall contain a 25yr Water Sector Master Plan and Capital Investment Plan. Every fifth year thereafter, i.e. the next being the sixth year, the Business Plan shall include for a revision of the Water Sector Master Plan and the Capital Investment Plan, with the addition of a further 5 years i.e. the Plans at the time of revision shall be for the next 25yrs. The Business Plan in the intermediate years shall report on progress with the approved Capital Investment Plan and on any significant changes from the Master Plan and Capital Investment Plan that are such as to require the approval of the ULB Collective.

26. The Company, his employees and sub-contractors, shall not disclose any proprietary or confidential information relating to the Services, this Agreement or the business of the ULB Collective before, during or after the period of the Agreement, without the prior written consent of the ULB Collective.

27. The Company shall ensure free and unrestricted access to the Facilities at all times to any employee or other person on the business of the ULB Collective, with prior notification by the ULB Collective.

28. Subject to written notification to the ULB Collective by the Company, the ULB Collective shall make no unreasonable objection to the Company:
   a) Providing a water and wastewater service to customers outside of the ULB Collective administrative area, and
   b) Performing any other commercial business associated as may be provided by the Company Statutes.

29. The Business Plan shall clearly differentiate between the provision of the Services and other activities conducted by the Company.

Article 3: ULB Collective's Activities

30. The ULB Collective's activities are:
   a) The development of strategic objectives for the water and wastewater service within the ULB Collective;
   b) Providing strategic directions to the Company, and
   c) Coordination with the ULBs in the ULB Collective area in all aspects of the services development strategy, investments and tariffs.

31. The ULB Collective is responsible for the overall planning, development and extension of the water and wastewater service and related infrastructure, but delegates the same to the Company. The Company shall:
   a) Plan and develop the existing water and wastewater treatment works, water and wastewater networks and other facilities to provide for (i) expansion into the development areas of the ULB Collective, (ii) into currently unserviced areas of the ULB Collective and (iii) for any increase in consumption of existing customers;
b) Plan for the rehabilitation and replacement the Assets in order to ensure the continued and sustained availability of the Assets, and

c) Provide the development and rehabilitation plans to the ULB Collective within the Water Sector Master Plan, contained within the Business Plan.

32. The ULB Collective shall guarantee some autonomy to the Company, and shall not interfere with the daily management of the Company.

33. The ULB Collective shall approve promptly the Business Plan prepared by the Company, and any other reports of the Company or promptly and fully provide reasons for not approving.

34. The ULB Collective shall provide the Company with unimpeded the access to all land and premises in the Service Area to which the Company will require the access for the performance of the Services and in respect of which the ULB Collective has a right to grant the access.

Article 4: Financial Responsibilities

35. The Company shall keep and publish accurate and systematic accounts in respect of the Services in accordance with accepted accounting principles.

36. The ULB Collective may, in its sole discretion, audit the Company’s own accounts, financial information, financial statements and technical information at any reasonable time and with 24 hours notice to the Company. The cost of such audit shall be borne by the ULB Collective.

37. The Company shall take appropriate actions to raise charges and collect income due to it from customers for the provision of the water and wastewater service, including for the provision, maintenance, testing and replacement of water meters installed to record, for the purpose of raising charges, the volume of water drawn by customers, or for the estimating of charges where no meter is provided or where a meter is known to be defective in its reading. For this purpose, the Company shall keep and maintain at all times a customer database for each category of customers, including historical information on billing, payments and debts.

38. The ULB Collective shall be responsible for any apportionment of charges and shall promptly pay all water charges raised against properties for which it is responsible to pay the relevant water service charges. Should the ULB Collective be in default of any payment for charges, the Company shall be free to take any action against the ULB Collective, as it would for any other defaulting customer.

39. The ULB Collective shall support the Company to identify and secure the sources of funds required for the development, the rehabilitation and the replacement of the Assets, as provided for in the approved Business Plan.

40. Nevertheless, where the tariff is insufficient to enable the Company to fund any required investments or the Company is itself unable to raise funds from another source, it shall be the ultimate responsibility of the ULB Collective to fund the procurement of new and replacement assets as set out by the Company in the Master Plan, and as agreed by the ULB Collective in the approved Business Plan.
41. The Company shall operate and maintain at its own expense and with due care the Assets, and shall provide all technical, financial, legal, administrative and managerial support required for the performance of the Services, also at its own expense.

42. For which purpose, the ULB Collective shall approve requests of the Company for any modification to the water and wastewater service tariff and as set out in the Business Plan, provided that the Company has prepared the proposals for tariff changes in the accordance with an agreed methodology.

43. The Company shall prepare and submit within the Business Plan, an annual operating budget to a format agreed with the ULB Collective. The budget shall show the forecasted expenditure broken down into functions and heads in sufficient detail for the financial management of the Company and for financial benchmarking of the Company.

Article 5: Customer Consultation

44. The Company shall maintain and adequately staff a customer services department to respond to all customer enquiries and requests for assistance, available 24 hours a day, 7 days a week. Brief details of how to contact the department shall be included in all bills issued and at other appropriate locations.

45. For the purpose of effective provision of Services and to meet customer expectations, the ULB Collective and the Company shall arrange an Annual Customer Meeting at an agreed central location.

46. The Customer Meeting shall be held after the approval by the ULB Collective of the Company’s Business Plan and shall deal with all matters of customer interest such as: a summary of the Business Plan; the quality of the Services provided; service performance indicators; complaints received and the proposals of the Company for improved service delivery as contained within the Business Plan.

47. The Company and the ULB Collective shall ensure jointly that the public is made aware of the time and location of each Customer Meeting and that the Meeting is attended by appropriate representatives and specialists of the Company and ULB Collective, as well as representatives of other interested authorities. The Meeting shall include a “Questions and Answers” session and shall be open to the press. Minutes of the Meeting shall be kept and made public.

48. The Company shall, if requested by the ULB Collective, conduct a Customer Satisfaction Survey. A survey shall not be requested more than once every five years, and shall provide for a minimum sample of 2% of customers spread uniformly across the service area. The questions to be asked and the method of the survey shall be agreed between the ULB Collective and the Company. The survey shall be conducted by a professional survey company who shall also analyse the responses received, and report on the findings of the survey. Within one month of receiving the report, the Company shall provide a response detailing how it intends to resolve significant issues identified by the survey. For the purposes of determining the size of the survey, a customer who receives both a water and a wastewater service shall be considered as one customer.
Rights and obligations of the company

Article 6: Service and the O&M of the Assets

49. From the date of effectiveness of this Agreement, the Company undertakes to provide the Services in accordance with this Agreement.

50. Within the Business Plan, the Company shall submit to the ULB Collective an Operations Plan that sets out the proposals of the Company to provide the Services during the following year. The Plan shall include, amongst other subjects:
   a) An estimate of the water demand during the current year, and a forecast of the demand for the coming four years;
   b) An estimate of the wastewater collected and treated during the current year and a forecast for the coming four years;
   c) An operational overview of how the Services will be delivered;
   d) Current customer service and operational performance together with reasons for failure to meet any Performance Indicators and the measures to be taken to improve performance;
   e) An analysis of customer complaints;
   f) Any planned changes to the current operational regimes;
   g) A report on new assets brought into service and their effect on operational performance, and
   h) Any other matters considered as relevant to the operation of the Services.

51. The Company shall notify the ULB Collective within one hour of the event being known to the Company, of any:
   a) Major works or network failures or other events that seriously affect the service provision;
   b) Major incidence of pollution within the source raw waters;
   c) Gross contamination of the public water supply;
   d) Event that causes untreated wastewater to be discharged to a natural water course;
   e) Any legal action being taken against the Company;
   f) Serious accident or event within which a member of the public is sufficiently injured to require hospital treatment, and
   g) Any other incident that might in any way adversely affect the public image of the ULB Collective or the Company.

52. The Company shall be responsible for design, construction and coordination for obtaining approvals and permits from the authorities for any new water and wastewater service connections and for any modifications, improvements, replacement or refurbishment to the Assets as may have been agreed by the ULB Collective within the approved Business Plan.

53. During the period of the Agreement, the Company shall be fully responsible for the proper and efficient operation and maintenance of the Assets to the satisfaction of the ULB Collective and in accordance with best international practice.

54. The Company shall plan maintenance work in a planned preventative maintenance regime, and in accordance with the manufacturer’s manuals. If Manuals are not available, the Company shall ensure that the maintenance work is correctly and safely performed.
55. **During the course of any maintenance work which will affect the service to customers, the Company shall ensure that alternative arrangements are made so as to maintain the service or take whatever action is required to mitigate the effect upon the service provided.**

56. **The Company shall maintain a computerised maintenance record of the Assets which shall provide an inventory of spare parts, material and consumables used; historical data and asset performance. The maintenance record shall be used as the basis for the Asset replacement programme contained within the Business Plan.**

57. **The Company shall establish and maintain a stores facility with experienced and qualified staff. The Company shall ensure that the stores facility is adequately provided with the required stores and spares taking into consideration the likely usage and the period for replacement as will ensure uninterrupted maintenance works and the ability to meet all emergencies.**

58. **All Facilities shall be kept clean and continuously maintained in a proper and orderly manner. All grounds shall be maintained and kept tidy.**

**Article 7: Staff**

59. **The Company shall ensure that it employs adequate staff for the delivery of the Services and that the staff is suitably experienced, competent and qualified to undertake the duties assigned to them.**

60. **The Company shall provide adequate and suitable accommodation with furniture, telephones, services, lighting and air conditioning, and all necessary business support systems and computers, with necessary software for the effective and efficient technical, financial and managerial functions of the Company.**

61. **The employees of the Company and those of his sub-contractors who come into contact with the general public shall be clearly identifiable to the general public as employees of the Company, or of a contractor working on behalf of the Company. Identification shall be achieved by the wearing of appropriate uniforms and protective clothing, clearly marked, and by the markings on vehicles and other mobile plant. The employees shall carry with them identity cards stating as a minimum their name; position within the organisation of the Company and a telephone number for authentication.**

62. **The Company shall develop and organise a programme of on-going training and staff development. Particular attention shall be paid to Health and Safety training.**

**Article 8: Safety & Security**

63. **The Company shall:**

   a) **Be considered solely responsible for the safety of its employees and the members of the general public who come into proximity of any works, temporary or permanent.**

   b) **Ensure that all its sites are secure against intrusion and that adequate security measures are taken to prevent unauthorised entry.**
c) Acquire and maintain valid the minimum civil liability insurance, as required under Moldovan law.

d) Ensure that it complies at all times with local and national health and safety regulations concerning its employees and it shall ensure that its sub-contractors also comply.

e) Be solely responsible for any damage to public or private utilities or installations that may result from any negligence or default, on his part or the part of his contractors or employees. Any such damages shall be repaired at the Company’s expense.

f) As required by Law and the ULB Collective, indemnify the ULB Collective and its officers against any action, expense, cost, claim, demand, and any other liability arising from third party claims concerning:
   i. Death or personal injury;
   ii. Damage to property;
   iii. Breach of statutory duty in connection with improper provision of Services, provided always that the Company’s liability shall be reduced to the extent that the negligence, breach of duty or breach of statutory duty by officers or the breach of this Agreement by the ULB Collective caused or contributed to the arising of third party claims specified herein.

Article 9: Service Quality

64. The Company shall perform the Services in a diligent, skilful, safe, timely and workmanlike manner, according to this Agreement and good practice and all applicable health, safety and environmental laws and regulations.

65. The Service Indicators to be met by the Company in provision of Services are contained in the Performance Indicators Schedule. Within each Operations Plan, the Company shall set out the Performance Indicators achieved in the previous 12 months and for each of the preceding two years. Within the Operations Plan, the Company shall explain the reasons for any non-compliance with the target Indicators and shall explain the action being taken to ensure compliance and over what time scale.

66. The Company shall register all complaints in a specific Complaints Register.

67. In the event of an emergency affecting the service to customers, the Company shall take immediate action to reduce the nuisance to customers. The Company shall ensure that the public are kept fully informed of the event by appropriate means and provide an expected time by which the service will be resumed. In order to ensure that the Company can professionally and competently deal with emergencies, the Company shall:
   a) Establish and maintain a fully resourced Incident Room;
   b) Within 6 months of signing this Agreement, prepare and implement an Emergency Response Plan;
   c) Hold emergency exercises at least once a year, and
   d) Hold adequate repair and replacement stocks and spare parts.
Article 10: Reporting

68. The Company shall prepare and deliver the following reports to the ULB Collective on agreeable formats, according to the following schedule:
   a) Before January 31: the Annual Report providing all relevant information on the Company’s activities and performance against Indicators and targets as agreed in the Business Plan, as well as the budget execution for the past year;
   b) Before April 30, July 31 and October 31: the quarterly reports providing key information on the Company’s activities and performance against key indicators and targets as agreed in the Business Plan as well as the monitoring of the current budget;
   c) Before June 30: the Company’s audited accounts, and
   d) Before November 30: the budgets for the forthcoming year and the updated 5-year Business Plan.

69. On its own initiative or on ULB Collective’s request, the Company shall prepare and submit specific reports to the ULB Collective.

EXECUTION OF THE AGREEMENT

Article 11: Duration

70. This Agreement shall become effective from [..........].

71. The term of this Agreement is 10 years, or as may be terminated under Article 17: Termination.

Article 12: Management of the Agreement

72. A Management Committee shall be formed comprising a representative from each ULB in the ULB Collective and an equal number from the Company. They all shall have equal voting rights in the management of this Agreement. The Committee shall manage implementation of this Agreement, including: monitoring compliance with the Agreement; the Company performance in delivering the Services; dispute settling and drafting of Agreement amendments for approval by the ULB Collective and the Company.

73. The members of the Management Committee will appoint from within their membership, one person to serve as Chairman and another as Secretary of the Management Committee.

74. Any notice required or authorised by this Agreement to be given by either Party to the other shall be in writing and shall be delivered in the form of registered mail or personally, with confirmation of delivery.

Article 13: Control and Audit

75. The ULB Collective is entitled to specify the quality of Services to be rendered by Company and independently or with others, to monitor the standards being achieved by the Company.
76. Any audit by the ULB Collective of the Services provided by the Company shall be performed by a suitably experienced and qualified person agreed upon by both the ULB Collective and the Company. The audit shall be paid for by the ULB Collective.

Article 14: Agreement Amendments

77. This Agreement constitutes the entire agreement of the ULB Collective and the Company with regard to the provision of the Services and shall supersede any prior expressions of intent or understandings with respect to the Services.

78. In the event that aspects of this Agreement become inconsistent with local, state or national legislation or regulations, the Agreement shall be amended as quickly as possible.

79. Any deficiencies in this Agreement may be rectified by approval of an appropriate Agreement Amendment, signed by authorised persons of both the ULB Collective and the Company.

Article 15: Force Majeure

80. For the purposes of this Contract, “Force Majeure” means an event that is beyond the reasonable control of the ULB Collective or the Company; and which makes the Company’s performance of its obligations under the Agreement impossible or so impractical as reasonably to be considered impossible in the circumstances.

81. Force Majeure includes:
   a) War and riots;
   b) Confiscation or other similar action by government agencies;
   c) An event that is described in a certified statement from any of the Company’s insurance companies stating storm, flood, earthquake or other severely adverse weather conditions that the usual types of insurance cover for businesses of this kind for which the Company previously did receive, are currently not available to entities doing business in Karnataka and to the Company because of conditions in Karnataka.

82. Force Majeure shall not include,
   a) Any event that is caused by the negligence or intentional action of the Company;
   b) An event that a diligent water and wastewater service provider could reasonably have been expected to occur, and
   c) Strikes or similar forms of organized public protests and civil disobedience.

83. In the event of Force Majeure, the ULB Collective and the Company shall take all reasonable measures to minimize the consequences of the event and mutually agree the action to be taken to minimise the consequences to the customers of the Company.

84. In the event of Force Majeure, either the ULB Collective or the Company as may be affected by an event shall forthwith notify the other of the occurrence of such event. The ULB Collective and the Company shall discuss on the methods for curing the Force Majeure event and shall take all reasonable measures to minimize the damage resulting from the Force Majeure event.
85. The failure of the ULB Collective or the Company to fulfill any of its obligations under the Agreement shall not be considered to be a breach of the Agreement to the extent that such failure to fulfill the obligation arises from the Force Majeure event and the timeline to fulfill the obligation shall be extended by such period as is spent for curing the Force Majeure event.

Article 16: Dispute Resolution

86. In the signing of this Agreement, both the ULB Collective and the Company agree to work in a spirit of cooperation to resolve issues that may arise during the operation of the Agreement for the common good of the customers of the Company and of the citizens of the ULB Collective.

87. In the event of any dispute, controversy or claim arising out of or relating to this Agreement, or the breach, termination or invalidity hereof, the ULB Collective or the Company, as may be applicable, may immediately present its position to the other in writing, together with a proposal for its settlement. The Management Committee shall consider each proposal and seek agreement to a mutually acceptable solution. Both the ULB Collective and the Company undertake to apply all reasonable means to settle disputes out of court.

88. If a dispute is not resolved within three months of being formally notified in writing to the Management Committee, the aggrieved may refer the dispute for settlement to the competent Karnataka judicial courts in accordance with the applicable procedural legislation of the Republic of India.

89. This Agreement shall be governed by the Law of the Republic of India and of the State of Karnataka.

Article 17: Termination

90. This Agreement is terminated when:
   a) The duration has expired;
   b) The ULB Collective and the Company agree in writing to the early termination of the Agreement.
   c) In any other cases provided by the Law.

Article 18: Extension of the Agreement

91. Subject to the agreement of the ULB Collective and of the Company, the terms of this Agreement may be extended to include for other areas outside of the ULB Collective administrative area or in such other way as the ULB Collective and the Company may decide. Alternatively, the Company may enter into a separate Agreement for other cities than the ULB Collective within its service area.

92. By agreement with the ULB Collective, the Company may enter into a separate Agreement with the Karnataka Urban Water Supply and Drainage Board for the maintenance of bulk water supply
assets owned by the Board used for the supply of bulk water to customers in the service area of the Company.

For the ULB Collective: For the Company

Date: Date:
Schedule of Facilities

The following comprise the Facilities to be operated and maintained within the Agreement:

A. Raw Water Intakes, Transmission Mains, Boreholes and Water Treatment Works

B. Treated Water Pumping Stations

C. Treated Water Storage

D. Wastewater Pumping Stations

E. Wastewater Treatment Works

Together with all water mains, sewers, property service connections, revenue meters and all other ancillary equipment and devices associated with the water and wastewater networks.
### Schedule of Performance Indicators

**Customer Service Targets to be achieved**

<table>
<thead>
<tr>
<th>Service</th>
<th>Indicator</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response to a property being flooded by wastewater from the sewer network or by failure of a water main</td>
<td>Response to be made within 3 hours of receipt by the Company, irrespective of time of receipt</td>
<td>100% compliance</td>
</tr>
<tr>
<td>Response to a customer contact concerning loss of water supply or the quality of water supplied</td>
<td>Response to be made within 3 hours of receipt by the Company, irrespective of time of receipt</td>
<td>(Actual performance achieved in each category to be reported)</td>
</tr>
<tr>
<td>Response to any other customer contact</td>
<td>Response to be made within 3 working days of receipt by the Company</td>
<td></td>
</tr>
</tbody>
</table>

**Indicators to monitor operational performance**

(Values to be agreed following Base Line Performance survey)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Criteria</th>
<th>Basis of calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuity of water supply to customers</td>
<td>Average % time water is supplied to customers</td>
<td>Calibration of time adequate supply is provided over total time</td>
</tr>
<tr>
<td>Continuity of wastewater collection</td>
<td>Average % time service is available to customers</td>
<td>Calibration of time service is provided over total time</td>
</tr>
<tr>
<td>New water and wastewater service connections</td>
<td>Proportion of committed new connections achieved within agreed time</td>
<td>Calibration of the ratio Achieved: Planned new Connections</td>
</tr>
<tr>
<td>Non-revenue water</td>
<td>Cubic metres/km network/day</td>
<td>Difference between water into supply and water sold. Also to be presented in IWA format</td>
</tr>
<tr>
<td>Final effluent water quality</td>
<td>Compliance level against chemical and microbiological standards</td>
<td>Ratio: Actual compliance level achieved to planned compliance level for relevant period (% compliance against water quality standards)</td>
</tr>
<tr>
<td>Compliance with water quality standards.</td>
<td>Compliance level against chemical and microbiological standards</td>
<td>Ratio: Actual compliance level achieved to planned compliance level for relevant period (% compliance against water quality standards)</td>
</tr>
<tr>
<td>Customer complaints</td>
<td>Percentage of customers who have complained</td>
<td>Total number of water and wastewater complaints per year expressed as a percentage of the total number of water and wastewater connections</td>
</tr>
</tbody>
</table>

**Indicators to measure asset performance**

<table>
<thead>
<tr>
<th>Asset Performance Event</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water main failure</td>
<td>Number/kilometre of network/year</td>
</tr>
<tr>
<td>Property flooding</td>
<td>Schedule to be maintained to show number of people affected by each of the following types of events: Manhole overflow due to inadequate sewer capacity;</td>
</tr>
<tr>
<td>Asset Performance Event</td>
<td>Measure</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Sewer blockage or collapse; Pumping station failure, and Water main failure.</td>
<td></td>
</tr>
<tr>
<td>Sewer failure</td>
<td>By type of failure: blockage or collapse Number/kilometre of network/year</td>
</tr>
<tr>
<td>Pumping Station failure such as to cause: For potable water - Interruption to water supply to customers For wastewater – (i) discharge of untreated wastewater to the natural environment (ii) Property flooding</td>
<td>By potable water and wastewater Number/year Asset inventory history to show location and reason</td>
</tr>
<tr>
<td>Energy efficiency (kwh / m3) Provided for water, wastewater and for the combined total.</td>
<td>Energy consumed / cubic meters produced/collection</td>
</tr>
</tbody>
</table>

Financial & Management Performance Indicators

<table>
<thead>
<tr>
<th>Performance Indicator</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating cost coverage ratio (%)</td>
<td>Total annual operational revenues/total annual operating costs</td>
</tr>
<tr>
<td>Collection ratio (%)</td>
<td>Cash income/billed revenue</td>
</tr>
<tr>
<td>Debt service ratio (%)</td>
<td>Cash income/debt service</td>
</tr>
<tr>
<td>Receivables (months of billing)</td>
<td>total receivables / average monthly billing for the last 12 months</td>
</tr>
<tr>
<td>Payables (months of billing)</td>
<td>total payables / average monthly billing for the last 12 months</td>
</tr>
<tr>
<td>Staff productivity ratio</td>
<td>Total number of staff (excluding staff employed in ACC heating business) expressed as per thousand connections</td>
</tr>
<tr>
<td>Water sold that is metered (%)</td>
<td>Volume of water sold that is metered/ total volume of water sold,</td>
</tr>
</tbody>
</table>
Appendix 2 - SCOPE FOR IWRM PROJECT MANAGEMENT UNIT

Note: The following may be amended when the service provider is known to be more specific.

Background Information

1. To assist with the establishments of the SPVs, and in consultation with the KUIDFC, we recommend that an IWRM Project Management Unit be formed in the KUIDFC. The unit, which would continue through subsequent MFF Tranche investments, would comprise KUIDFC employees with appropriate skills, supplemented as required by short-term consultants, national and international. In addition to assisting the establishment of the SPVs, the Unit would also directly assist the newly formed SVPs, and water departments of larger ULBs, to prepare corporate documentation, as well as provide “centre of excellence” guidance for technical aspects.

2. In this way, the Unit will not only be introducing competency into the service provision but it would be ensuring the required data is available on, for example, asset histories, for subsequent private operator bidding.

Objectives of the Unit

3. To: (i) assist the KUIDFC and the service provider to ensure that the objectives of the Project are met; and (ii) provide support for the KUIDFC and the service provider for the implementation of the management and institutional changes proposed.

4. The following is an indicative summary of the objectives to be met:

   ➢ Provide support to enable the KUIDFC to implement changes for proficient water sector service provision within Karnataka meeting required Levels of Customer Service; Operational Performance Standards; Performance Indicator targets and all regulatory and legal obligations;
   ➢ Participate in the selection of Tranche-2 and subsequent investment towns;
   ➢ Provide support for the service provider in the coordination and management of the implementation process;
   ➢ Provide assistance to the service provider for the O&M of the assets operated and maintained by the service provider, and
   ➢ Prepare various generic associated Plans and Studies associated with the service provision.

Scope of Work

➢ Assist the KUIDFC in the establishment of the SVP service provider organisation;
➢ Using the selection criteria, recommend ULBs for Tranche-2 and subsequent investments;
➢ Review existing tender documentation, Specifications and materials selection;
➢ Provide assistance to the SVP service providers upon competent service provision;
➢ Prepare a generic Training Plan and Training Programme to provide capacity building in the SVPs;
➢ Review current GIS and network modelling facilities in an SVP and advise upon improvements and application, as required;
➢ Advise on a state-wide Management Information System for processing of state water sector data;
➢ Advising on the determination of the Base Line Performance of an SVP and upon how improved performance could be achieved;
Preparing a state-wide NRW Reduction Strategy and Programme potentially using one or more specialist NRW reduction contractors;

Assisting the SVPs to prepare specific Plans such as Business, O&M, HR and Emergency Response.

A. Institutional Re-organisation of the Sector

5. Stakeholders wish that the existing ULB service provider framework be re-organised with the establishment of Special Purpose Vehicle service providers who will be fully owned by a collective of ULBs and who will provide water services in the administrative area of the ULBs.

6. The Unit is to provide on-going assistance, support and advice for the senior management of the KUIDFC to ensure that the non-physical deliverables of the Project are achieved. In this respect, the Unit shall advise the KUIDFC on the establishment of the SVP service providers, and participate in meetings and workshop to present the re-organisation to ULB councillors and officers.

7. The Unit shall review all current Tender Documentation, Specifications and material/service procurement procedures and advise the KUIDFC on improvements to industry "best practice". Particular emphasis shall be placed upon performance Guarantees – process, hydraulic performance and OPEX.

B. Assistance to the service provider for the proficient O&M of the assets.

C. Capacity Building in the Service Providers.

- Assist the staff of the service provider to comply with the requirements of the Performance Service Agreement including for the preparation of a Business Plan and Master Plan;
- Prepare a generic Human Resource Plan for the service providers that will propose optimum staffing levels based upon best international practice. The Plan will include organisation structures for the operational unit and Job Specifications;
- Prepare a generic staff Training Plan, including annual appraisals, for operational, managerial, technical and administrative staff. Skills training is to be provided by others but the Unit will be required to provide overview training to senior managers;
- Prepare a generic Customer Services Manual;
- Review and comment upon the opportunities for outsourcing;
- Prepare specifications for a state Management Information System, business computer systems and non-fixed operational equipment deemed necessary for the service providers;
- Assist service providers to determine their Base Line performance against the Performance Indicators provided in the Performance Service Agreement, and to derive others considered desirable. Advise on: the preparation of records for determining the indicators; the preparation of subsequent annual or intermediate indicators; and the use of the indicators for self-monitoring of performance and for external benchmarking;
- Assist the service providers to introduce and perform an annual water audit. Assist to determine NRW targets based upon economic levels of leakage within a NRW Reduction Plan, and advise the service providers on how to achieve the targets set, including for training of staff on leak detection, flow and demand analysis associated with NRW and network management, and
- Pilot generic Plans and proposals with selected service providers.

D. MFF Tranche-2 Investments

- Advise the ULBs on how they can demonstrate performance and willingness to participate to achieve improved performance;
- Participate in the evaluation of ULB performance as a preliminary to MFF investments;
➢ Arrange for feasibility Studies and other pre-investment requirements, and
➢ Monitor MFF investments for effectiveness;

Training to be Provided

8. In addition to specific skills training, the following is a suggested Training Programme to be delivered, as a minimum:
### Training to be Provided

<table>
<thead>
<tr>
<th>Training Topics</th>
<th>Delivered to:</th>
<th>Delivered by and Format</th>
<th>Number of Participants&lt;sup&gt;18&lt;/sup&gt;</th>
<th>Training Period for (days)</th>
<th>No. of Man Days</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Senior Management Training comprising:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) Developing a Decision-Making Process;</td>
<td>Senior managers</td>
<td>Consultant and specialist staff</td>
<td>10 (may vary with individual elements)</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>(ii) Customer Service;</td>
<td></td>
<td>Lecture format</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(iii) Capital Planning and Programming;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(iv) Contingency and Emergency Planning;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(v) Financial Planning;</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>(vi) Working within a performance related regime;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(vii) NRW reduction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(viii) Preparing Strategies and Plans;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ix) Human Resources Management.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Staff training:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(x) Performance indicator determination and performance reporting;</td>
<td>Operational Managers &amp; other appropriate staff</td>
<td>Consultant and specialist staff</td>
<td>20</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>(xi) Emergency planning – how to plan for emergencies;</td>
<td></td>
<td>Lecture format</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(xii) Asset management;</td>
<td>KUIDFC and appropriate service provider staff</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(xiii) Planning for NRW reduction and asset rehabilitation – principals, selection of options;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(xiv) Project Appraisal – to ensure efficiency in capital spending;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(xv) Customer service.</td>
<td>Customer service staff</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Trainer days</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

<sup>18</sup> The numbers are indicative only. The actual numbers may vary but shall be no more than can be accommodated within one group for each subject of manageable size (max 20)
Composition of the Consultancy Team

9. The composition of the Unit shall comprise a core team of KUIDFC employees to oversee the whole of the Project activities, assisted by short-term local and/or international specialists for specific tasks.

Skills Input

10. A possible breakdown in skills input in the Unit could be:
   - Team leader;
   - Institutional/Human resource expert;
   - Water & wastewater operational experts;
   - Hydraulic and process designers;
   - NRW reduction experts;
   - Social and gender experts, and
   - Economist/financial expert

11. The above is neither prescriptive nor fully inclusive.

Qualifications and Experience of the Unit Team Members

12. The following is indicative of the qualifications and experience of Experts who can be expected to be included into the Unit.

13. The emphasis in selection should be on experience in Operational Consultancy; institutional development and capacity building within utilities of similar size to that of the service provider, and with requirements for environmental and other safeguards.

Team Leader

14. The Team Leader will be a professionally qualified graduate engineer with not less than twenty years’ experience of managing construction and asset O&M in the field of urban and water and wastewater service provision and with institutional development and capacity building. The Team Leader shall have experience of the institutional, environmental, resettlement and sociological aspects of the project, and of water and wastewater facilities. The Team leader should be competent in planning, contract management, resolving problems, quality maintenance, budgeting and financial control, progress monitoring, international procurement procedures, communication skills, and documentation.

15. The specific tasks, as Team Leader, include;
   - Day to day management of Unit staff;
   - Liaison within the KUIDFC and with other stakeholders and with ULBs collectively and individually for the introduction of the proposed institutional changes;
   - Review existing studies / documents and other resources available and formulate the best implementation approach including programmatic project schedule;
   - Facilitate the work of the Unit undertaking specific tasks;
   - Progress reporting; and
   - Appraise Unit’s own training needs and provide Training Plan and Programme, and
   - Provide training as may be proposed for the service providers.

Institutional/Human Resource Expert

16. The Institutional/ Human Resource role can be shared.

17. The Institutional/HR Expert(s) should have more than twenty years relevant service. He/she should have relevant technical and academic qualifications and should have had practical
experience in providing training to public utility staff. They should have relevant vocational qualifications.

18. The Institutional Expert(s) shall have experience in developing institutional capacity; preparation of business procedures and manuals and proven ability to manage within public utilities, in their particular field of expertise. They shall assist in the development of institutional capacity and change management. They should be able to advise on the identification of hardware, software, plant and equipment needs.

19. The Institutional Expert(s) shall provide training as may be proposed for the service providers.

**Other Experts**

20. Other Experts shall be professionally qualified with an appropriate qualification and with not less than ten years’ experience relevant to the role.
Appendix 3: PPP Model for Industrial Re-Use of Treated Wastewater

Introduction

1. An important part of the successful implementation of IWRM in Karnataka state is to include the water used by industry in addition to that used by agriculture and the ULBs. Currently a very large proportion of the water available in the Tungabhadra river catchment is used in agriculture and much of the raw wastewater from the ULBs is also “recycled” to the agriculture.

2. With the substantial investment currently being used to upgrade or construct wastewater treatment facilities in many towns in the Karnataka State the issue of using this treated water has to be decided.

3. As referred to earlier, much of this wastewater is currently being supplied without treatment for use in agriculture, without regard to possible infection of the crop due to the sewage being untreated. In spite of this, many communities regard this as acceptable and a valuable additional source of “water” for growing crops.

4. Without significant improved efficiencies in irrigation to reduce this need, diverting wastewater from the new ULB treatment works away from agriculture to industry, is likely to be regarded as unpopular and therefore difficult to implement.

5. It is in this context that this paper has been developed to look at the scope for reusing the wastewater from the new ULB sewage treatment works in the industries near the ULBs and the opportunities for supplying this water for the financial benefit to the ULB.

6. As part of this study, a case study was carried out (Appendix 1) for Hospet and a preliminary assessment made for setting up a private financed scheme to operate the wastewater infrastructure and supply water to the nearby steel industry.

Industry in Karnataka

7. One of the major consumers of water in Karnataka is industry, which has developed rapidly in the last 20 years. The large industries typically obtain their water from their own private boreholes or extract it from rivers. In some instances they have constructed their own private reservoirs (or lakes) to store the water during the dry part of the year.

8. The Karnataka State has a policy of encouraging the continued expansion of the industrial sector and its "Karnataka Industrial Areas Development Board" (KIADB) has been established to promote the development of this industrial base.

9. The KIADB is involved in obtaining land to cater the specific needs of individual industrial units (Single Unit Complexes) and infrastructure projects for Government, which could include projects of public importance in joint venture with international companies.

10. To date, KIADB has formed 141 industrial areas spread all over the State, and acquired land for nearly 400 Single Unit Complexes. These include major industrial areas in:

- Bangalore (Bommasandra, Electronic City, EPIP-Whitefield, Doddaballapura)
- Mysore
- Mangalore
- Baikampady
- Dharwad
- Belgaum

11. Additionally they have set up special economic zones (SEZ) with reduced taxes and import/export tariffs to encourage international companies to invest in the state. Examples include sector specific SEZ’s in the following places:

- Textile SEZ @ Hassan.
12. Currently Karnataka has a wide variety of industries in many sectors. XXX summaries the locations of some of the most important sectors:

<table>
<thead>
<tr>
<th>Industry</th>
<th>Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel</td>
<td>Bellary, Koppal, Bagalkot, Haveri, Gadag &amp; Raichur</td>
</tr>
<tr>
<td>Cement</td>
<td>Gulbarga, Bagalkot, Chitradurga, Belgaum and others</td>
</tr>
<tr>
<td>Food Processing</td>
<td>Bengaluru Rural, Kolar, Belgaum, Gadag, Koppal, Shimoga, Bagalkot, Bijapur, Davangere, Mandya and Dharwad</td>
</tr>
<tr>
<td>IT / BT</td>
<td>Mysore, Mangalore, Hubli, Dharwad, Belgaum, Shimoga, Gulbarga, Kolar and Mandya</td>
</tr>
<tr>
<td>Automobile</td>
<td>Ramanagara, Shimoga, Dharwad and Kolar</td>
</tr>
<tr>
<td>Readymade Garments</td>
<td>Bengaluru Rural, Tumkur, Kolar, Mandya, Belgaum, Bidar, Dharwad and Others</td>
</tr>
<tr>
<td>Sugar and Co. gen power</td>
<td>Bidar, Belgaum, Bagalkot, Shimoga and Mandya</td>
</tr>
<tr>
<td>Pharmaceutical / Bio Technology</td>
<td>Bengaluru, Mysore and Hassan</td>
</tr>
<tr>
<td>Power Generation</td>
<td>Raichur, Bellary, Bijapur &amp; Chitradurga</td>
</tr>
<tr>
<td>Media &amp; Entertainment</td>
<td>Bengaluru Rural and Ramanagara</td>
</tr>
</tbody>
</table>

**Current & Potential Opportunities for Industrial Water re-use**

13. It is understood that the Mangalore scheme is the largest reuse project in the Karnataka State and is focused within a special enterprise zone (Mangalore Special Enterprise Zone or MEZ) to the north of the city. It consists of industries participating in the use of treated wastewater in their manufacturing processes. To develop the project a "Special Purpose Vehicle" (SPV) was established in February 2006 to bolster the economic growth of the area. and is promoted by the Central & State Governments, industrial groups and financial institutions.

14. The MSEZ project is expected to cover a total area of nearly 4,000 acres of land of Dakshina Kannada District, Karnataka. Currently 1800 acres is already in possession of MSEZ of which 1453 acres has been notified as sector specific SEZ (Petroleum & Petrochemicals)

15. Similar schemes could also be set up in other parts of the state utilising the same principle of treating the municipal wastewater for particular industrial reuse.

**Water Quality**

16. Clearly different industries will have different water quality criteria. In Karnataka there is already a significant steelmaking industry with many companies utilising the ore reserves in the state for primary iron production. In this case the water quality required is low and only biological treatment is required.

17. In the electronics industry a much higher quality is needed involving microfiltration and ion exchange to ensure no contamination of the exotic materials used in the manufacturing process.
18. However in all instances there has to be a water source and treated municipal wastewater has the advantage of been a consistent long term source and generally available where industry is located. It is also much cheaper than desalination as the raw water already has a low salinity.

**Extent to Private Participation**

19. The supply of wastewater to industry will involve a transmission pipeline or a network of pipes to the industries involved. Additionally the treatment works will also have to be operated and maintained to ensure the treated water is kept at the required quality.

20. Industry could be involved in the financing and operation of these functions with the ULB only having a regulatory role. In this way industry (in some cases as a consortium) would be responsible for maintaining the quality and relieve the ULB of that duty.

21. A further enhancement of private participation could include the sewer network as it is clearly essential to maintain supplies of untreated wastewater to the treatment works. This would provide an organisation with an incentive to ensure the good maintenance of the sewer network.

**Operation & Funding**

22. As there are likely to be many industries throughout the state interested in acquiring long term sources of water it is important to identify and engage with these industries as early as possible. In this way the value of this resource can be optimised and the highest revenue stream obtained for the ULBs.

23. In order to quantify the size of the potential demand for this water it is proposed that an organisation already familiar with the water infrastructure within the state be given the responsibility for developing this resource. Typically this could be the KUIDFC who already manages the water investment programme state-wide and has an in depth knowledge of the towns and their industries.

24. Additionally the KUIDFC has experience in contract preparation and tendering which could be further developed into marketing the supply of water to industries. Furthermore should the option of operating the treatment works or taking over the day to day management of sewer networks be an option, they are already familiar with these assets.

25. As there already is insufficient water to satisfy all three major users (agriculture, domestic and industry) conflicts will inevitably exist when apportioning water and since the state government is already aware of these issues, they are likely to be best placed to negotiate a practical way forward.

26. In order to ensure a “transparent” allocation of the water available an open bidding process will probably have to be organised based upon cost/m³ paid to the ULB by the successful bidder. The paid rate could either be on the basis that the investment was by the ULB or, recommended, by the bidder, who would also be responsible for O&M. In either case, the works would need to revert to the ULB at the end of the contract period, suggested as 15yrs.

27. Although industry (possibly as a consortium) maybe willing to fund and operate the supply pipe network, they may also be willing to operate the wastewater treatment works. This has the advantage of removing any responsibility from the ULB for achieving the required water quality. Under this model the ULB would still be responsible for operating the sewerage collection system and ensuring the agreed volume of untreated wastewater is supplied to the plant, although, if possible, this should not be a contract obligation. Another option could be for the “consortium” to operate the whole system from household connection to steelworks. This has the advantage of having a financially motivated organisation being proactive in making the connections with the individual properties and hastening the implementation of all the properties in the ULB being connected to the sewer – with all the benefits to public health. One of the problems with connecting properties is the legal access and the cost of connection, in this case where industry (or the commercial consortium) has the responsibility; it is they could encourage connection by subsidising it or even offering it free – just to get the wastewater into the network.
The way forward

28. Within the next few years the benefits of the substantial investment programme in the state will be realised and considerable quantities of treated wastewater will become available. As these treatment plants are all located in large population areas, they are likely to be near large industries that have an increasing need for water.

29. It is likely that all the major industries in the Karnataka State will have an interest in using this supply of water and resources need to be allocated to identify the major water consumers.

30. As has been discussed earlier a number of approaches could be used to develop this sector such as financing the day to day operation of the ULB owned treatment works or even operating the works and sewer network within the town.

31. It is therefore recommended that a state organisation (such as the KUIDFC) be given the role of promoting the reuse of treated wastewater and develop its application state-wide.

32. In order to develop the potential for the reuse of water in industry the programme could be set out in the following stages:

   **Stage 1:** selection of state organisation and empower them to develop this function

   **Stage 2:** develop deeper understanding of the likely water using industries in the state. This would be generally a research activity based on data held at all the central state organisations in Bangalore and would collate the data, to quantify the likely water requirements and the quality ranking.

   **Stage 3:** Assess the data to decide whether the needs are sufficient to increase resources and develop the application state-wide. This would be complemented by an assessment/understanding to balance the needs of agriculture to those of industry as most of the wastewater current produced (whether treated or not) is used in agriculture. Indeed the Hospet example demonstrates the potential conflict between industry and agriculture.

   **Stage 4:** If sufficient potential is identified in Stage 3, the selected state organisation approaches industry sector by sector, possibly through and with the advice of the KIADB.
Appendix 1

Wastewater Recycling Options for Hospet
Background

33. Hospet, is the second largest urban centre in Bellary District and located 336 Km from State Capital, Bangalore and 65 Km from Bellary. The City Municipal Council’s jurisdiction extends to an area of 51 sq km, with a population of 163,284 as per 2001 census, which is forecast to grow to 294,511 by 2026.

34. Hospet's climate is characterized by dry weather during the major part of the year with very hot temperatures during the period of March to May. The town lies in the dry area of the district and therefore has low annual rainfall with a typical annual average of about 500mm. Approximately 90% of this rainfall is received during May to October.

Current status of Wastewater Collection System & Treatment Plant

35. The first sewerage system of Hospet town was constructed in year 1977 and covers about 50% of the town area but has never functioned. Currently the sewage is bypassed, through the overflow at the old pumping station into the nearby built up drain, which flows to a natural drain.

36. The new sewerage facility is designed to cover a population of 407,340 (for 2041) but only 60% is planned to be completed in this first phase investment, producing 27 MLD of wastewater. The sewage treatment plant is located north of Hospet on a 20 hectare site in Nagenahalli Village. The estimated commissioning date for the treatment works is 2014.

Opportunities for reuse of treated effluent

37. The WWTP is designed to treat 27,000 m3/day of wastewater and produce an effluent of 30 mg/l BOD. Of the water produced, 30% is reserved for use in agriculture and the remainder 19,000 m3/day would available immediately for recycling to industry, once the necessary capital works are completed.

38. There are a number of industries near Hospet which could take this water and the nearby steel mill (BMM) was visited to discuss the options for them to use this water. Currently they are permitted to take water from the nearby Tungabhadra Reservoir up to:
   - 8.6 million gall/day (39,000 m3/day) in June and from September – December
   - 22 million gall/day (100,000 m3/day) from July – August

39. They currently use 2 million gall/day (9,100 m3/day) but have storage lagoons that can hold 8 million m3 to cover the period January to June when they cannot abstract. They are considering increasing this storage to 15 million m3.
Issues

- Water Quality: The steelworks would be using the water for ore washing or similar applications such as beneficiation. The water quality needed would be relatively low and in line with that produced by the wastewater treatment plant (20 BOD/30 SS). However, it is unclear if it needs to be disinfected (chlorine) because of possible contact with the steelworks operators. After visiting the beneficiation process at BMM, it was felt that disinfection would not be needed.

- Other applications: They also use water for "closed circuit" cooling of blast furnaces but this needs a higher water quality and would not be an option for the water from Hospet.

- Supply of water from treatment works: In addition to commissioning the sewerage system and the treatment works, a pipeline will have to be constructed and operated to supply the end users together with a pumping station. In the case of BMM, the pipeline would be approximately 20 km (Figure 17).

- Operation & Funding – As there are several steelworks near Hospet, it is likely that they will also be interested in receiving the water and (like BMM) would probably be willing to fund the required pipeline and pumping station(s). In order to ensure a “transparent” allocation of the water available, an open bidding process will probably have to be organised based upon cost/m3 paid to the ULB by the successful bidder. The paid rate could either be on the basis that the investment was by the ULB or, recommended, by the bidder, who would also be responsible for O&M. In either case, the works would need to revert to the ULB at the end of the contract period, suggested as 15yrs.

- Extent to Private Participation – Although the steelworks (possibly as a consortium) are likely to be willing to fund and operate the pipeline, they may also be willing to operate the wastewater treatment works (BMM have already verbally offered this). This has the advantage of removing any responsibility from the ULB for achieving the required water quality. However, the ULB would still be responsible for operating the sewerage collection system and ensuring the agreed volume of untreated wastewater is supplied to
the plant, although, if possible, this should not be a contract obligation. A further option could be for the "consortium" to operate the whole system from household connection to steelworks.

- Current construction Programme – It is understood that the wastewater treatment works will be commissioned in 2014 with a capacity of 27 MLD, however it is unclear when the collector system will be 100% complete and operational. A delay in completion in the collector system would obviously reduce the volume available for reuse. Considering the difficulties being faced with the treatment works, it might be feasible for the new works to be cancelled and for the sewer collector to be laid to an alternative nodal point where the wastewater can be treated and distributed to industry.
Appendix 4: Schedule of Rates Main Laying Contract

1. Conventionally, main laying contracts are awarded to contractors to lay a pre-determined length of mains of varying diameters in known locations, following a design of the pipeline by the client in-house, or by his consultant.

2. Such contracts have served the sector well and have the advantage that the cost of a scheme is known prior to commencement and are “safe”.

3. They have the disadvantage that the designs have to be completed before the tendering can commence; the design process does not use the skill and experience of the contractor and they have to be of a reasonable value to interest a contractor. Their main disadvantage is that a utility cannot use them to respond quickly to an urgent requirement, locations etc. need to be known and, once let, are inflexible.

4. An alternative is the Schedule of Rates type contract. These are let for a period of time, usually a year, and are non-specific about the location of the work, the total length or diameter. Once let, the contractor is immediately available to lay a pipeline however long or short. Effectively, the contractor becomes a labour resource of the utility.

5. In the process, the utility prepares a “Schedule” of work items that the contracting bidders price. The bids are evaluated against a typical, expected work requirement and the lowest tender accepted.

6. The Schedule contains only expected work items. For other work, a rate can be agreed with the contractor based upon those in the Schedule or, in extreme, a specific contract is prepared. For example, if the Schedule includes for pipes up to and including DN300, rate for DN 350 can be agreed. To agree a rate for DN450 from the Schedule would be a risk and a separate contract let.

7. The following is a typical part “Schedule” to be priced:

<table>
<thead>
<tr>
<th>Cover</th>
<th>Location</th>
<th>DN90 HDPE</th>
<th>DN100 HDPE</th>
<th>DN150 HDPE</th>
<th>DN200 HDPE</th>
<th>DN250 DI</th>
<th>DN300 DI</th>
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</thead>
<tbody>
<tr>
<td>Up to 1m</td>
<td>In surfaced road</td>
<td>Rs</td>
<td>Rs</td>
<td>Rs</td>
<td>Rs</td>
<td>Rs</td>
<td>Rs</td>
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<tr>
<td></td>
<td>In unsurfaced roads</td>
<td>Rs</td>
<td>Rs</td>
<td>Rs</td>
<td>Rs</td>
<td>Rs</td>
<td>Rs</td>
</tr>
<tr>
<td></td>
<td>In field</td>
<td>Rs</td>
<td>Rs</td>
<td>Rs</td>
<td>Rs</td>
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<td>Rs</td>
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<td>In surfaced road</td>
<td>Rs</td>
<td>Rs</td>
<td>Rs</td>
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<td>Rs</td>
<td>Rs</td>
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<tr>
<td>cover</td>
<td>In unsurfaced roads</td>
<td>Rs</td>
<td>Rs</td>
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<td></td>
<td>In field</td>
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<td>Rs</td>
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<td>Rs</td>
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<td>Rs</td>
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<tr>
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<td>In surfaced road</td>
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</tr>
<tr>
<td>cover</td>
<td>In unsurfaced roads</td>
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<td></td>
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<td>Rs</td>
</tr>
</tbody>
</table>

8. A similar Schedule can be included for mains repairs and for service connections.

9. The rate entered includes for all fittings that can be expected to be required. Valves meters would be paid extra.