



Technical Assistance Consultant's Report

Project Number: 39405-01

Bangladesh: Dhaka Water Supply (Financed by the TA Special Fund and Cooperation Fund for the Water Sector)

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Asian Development Bank

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I. THE PROPOSAL

1. I submit for your approval the following report and recommendations on a proposed multi-tranche loan to the People's Republic of Bangladesh (the Government) for the Dhaka Water Supply Project (DWSP) with Dhaka Water Supply and Sewerage Authority (DWASA) as Executing Agency. The design and monitoring framework is in **Appendix 1**.

II. RATIONALE: DWASA PERFORMANCE, PROBLEMS, AND OPPORTUNITIES

1. Introduction

2. Dhaka Water Supply and Sewerage Authority (DWASA) is responsible for the provision, operation and maintenance of water supply, sanitation and storm water disposal services to the population of Dhaka City as stipulated in the Water Supply and Sewerage Authority Act, 1996.

3. Dhaka city is the capital of Bangladesh, a country of about 140 million people.¹ Dhaka city is estimated to have a 2005 population of about 11 million people within the Dhaka Metropolitan Area (DMA) and 8.6 million within the DWASA service area. DWASA is responsible for operating and maintaining the: (i) water supply services; (ii) sewerage services and (iii) storm water drainage service of the city of Dhaka. It is estimated that DWASA presently serves a total of 7.7 million people with water supply, nearly 90% of the people living in the DWASA service area. The remaining estimated 10% (860,000 people) are mostly served by private wells abstracting water from the same aquifer under the city.

4. The population of Dhaka City is growing at a frightening pace and based on detailed analysis of available census data and present land use pattern the population of the present DWASA service area is projected to increase to 17.2 million by year 2025 while another 4.4 million will be staying within Dhaka Metropolitan Area but in areas presently not served by DWASA.

5. A sizeable number of population (estimates vary from 10 to 60%) living in the DWASA service area are living in slum areas. A survey carried out under this study revealed that the majority of the people living in the slums are served by DWASA water. However, a significant number of vulnerable slum dwellers still do not benefit from DWASA services. Recently a Guideline for Dhaka Water Supply has been approved by the Government stating that DWASA is allowed to extend basic water supply and sanitation services to slums within its service area providing legal connection and introducing formal billing and collections.

2. Physical constraints

6. Generally the analysis of the water supply system in Dhaka suffers from a number of uncertainties: (i) Population figures may be underestimated in particular due to a huge floating population. (ii) Slum figures vary grossly from one report to another (10% to 60%), possibly due to differences in the definition of a slum. (iii) No proper records exist of service connections and it is evident from the pilot project under the PPTA (Manikdi project) that many connections are un-official and that a huge number of households have more than one connection with only one being official. (iv) 40% of the registered service connections are not metered and the quality of the meters used in the remaining 60% are of questionable quality. (v) 60% of the project area in Manikdi more than 20% of the meters were over reading more than 20%. (vi) Official figures for the design

¹ Sector Development Programme, Water and Sanitation Sector in Bangladesh, September 2005, Unit for Policy Implementation, Local Government Division

(UFW), 40%, are based on billed amount rather than actual reliable meter readings. In Manikdi actual readings gave 60% UFW. Present average demand, assuming 40% UFW, is around 110 Lcd. DWASA use 160 Lcd as planning parameter, but in Manikdi, a low income area, demand increased from 95 to 200 Lcd when 24 hours pressurized supply was established as part of the pilot project. Presently, with no strong incentives to save water, demand appears to be equal to the supply, or in other words, the more we produce, the more is consumed.

7. Nevertheless, the analysis of the physical water supply system highlight that DWASA is facing serious challenges in maintaining an adequate level of supply to the people in Dhaka city as a consequence of: (i) the high (40%+) unaccounted for water (UFW) as a result of leaky pipes and house connection joints and lack of metering, under billing and free riders; (ii) uncontrolled demand, making 24 hours pressurized supply impossible; (iii) heavy reliance on groundwater (82% of total supply) while the groundwater table is falling 2 to 3 meter per year and causing mining of the resource; (iv) a network of small diameter pipes partly adequate for present supply situation which is based on spatially diffuse injections of water from 430 production wells, but totally incapable of meeting the future supply situation where large quantities of surface water must be transported into the city; (v) a projected 223 production wells, of the 430 wells in operation, will have gone out of operation by 2013; (vi) the procedures where individual consumers are allowed to make their own connection direct to the main pipes. This has been ongoing for decades with the result that the whole network in reality has been seriously damaged.

8. DWASA also face the challenge of maintaining the quality of the water supplied to the customers. The quality of the ground water being pumped into the network from the PTWs and SWTPs is believed to be good although no proper baseline or monitoring data exist on the present and possibly changes in the groundwater quality. However, ensuring that high quality water is pumped into the distribution network does not guarantee that the quality of the water reaching the consumers still is acceptable. In Dhaka where (i) the network pipes and connections are often leaking; (ii) the pressure in the pipes is low and sometime negative due to the prevalent use of suction pumps by the consumers; (iii) service connections are often installed at the bottom of underground tanks allowing water to run back to the network when pressure is negative; and (iv) the general sanitary environment where domestic and industrial wastewater are discharged directly into open drains along the roads in which water pipes are also frequent observed, it is certain that the contamination of the water during the transport from the wells to the consumers is significant.

3. Governance constraints

9. DWASA operates within the provisions of the Water Supply and Sewerage Authority Act – 1996. According to the Act, DWASA should be able to manage its facilities and to operate with a high degree of autonomy referring to its board constituted by various key professionals from the civil society headed by a chairman appointed by the Government. However, an essential provision of the Act is that where the Government finance or act as a surety for finance, all information relating to a scheme will have to be submitted to the Government for approval. The performance of DWASA is thus constrained through its financial dependency of the Government and consequently limited adherence to / value of the WASA Act (1996) whereby decisions on crucial operational and organizational aspects like human resource development and employment, setting of tariffs and salaries cannot be taken and where decisions on day to day operational aspects are either delayed or not given.

10. Management of DWASA is also constrained by an unusual role of various labor unions and employers cooperative societies. Billing and revenue collection in 3 out of the total 7 water supply zones of Dhaka, comprising approximately half the population and service connections of DWASA service area, has been outsourced to DWASA Employees Consumer Supplies Co-operative Society

by a PPI (Program for Performance Improvement) agreement. The PPI agreements are performance based and the employers working under the PPI agreements also benefit from some performance based bonus arrangements. The billing efficiency of the PPI zones are generally higher than the DWASA zones, however, the splitting of responsibilities between DWASA staff and PPI staff is unclear and unpractical in some areas, e.g. controlling of UFW is under DWASA while identification of and disconnection of illegal connections are under the PPI; meter maintenance is under DWASA while meter reading is under PPI. Moreover, three unions are active in DWASA representing the employees. The word employee means all staff other than officers who are barred by law from joining trade unions. But these officers have their own associations and often behave like trade unions. Two of the unions are affiliated to the two major political parties while the third is independent. The Unions appears to be strongly linked with political forces making them a strong actor in most new employment of DWASA and other management issues like promotion, transfer and contract awards. This undue interference jeopardizes the management's ability to recruit, promote and post the right persons at the right place. This problem is difficult to address because the role of the unions in management decisions is not institutionalized and thus not visible. However, if not addressed, staff quality and disciplinary problems will continue to worsen.

11. The organizational performance of the administrative and financial departments, including recording of consumption and billing is weak and lack computerized systems to increase the transparency and accuracy of data processing. Moreover, the current operation and maintenance practices, particularly in allowing unskilled persons access to the network, cause serious damage to the system and increased system losses.

12. Manpower management within DWASA suffers from: (i) the lack of an effective performance based human resource development plan whereby active steps are taken to enhance the overall performance of the Authority; (ii) discontinuities in management positions whereby MD and DMDs are frequently changed and presently lacking; (iii) a lack of incentive schemes to attract better qualified staff to key positions; (iv) recruitment not based on functional requirements; (v) political and bureaucratic interference in the recruitment process, (vi) vacant key positions; (vii) top down management structure, stifling initiative and personal development.

13. The DWASA organization was modified during the WB supported 4th Water Project where a board was constituted with members from the civil society and the top management comprising a Managing Director (MD) and three Deputy Managing Directors (DMDs). The organization is, however, still highly top-heavy pyramid like where little is done without approval all the way up to the top management, the MD, and recently even to the Board and the Ministry. There are no incentives for the staff to take full responsibility for his or her working areas. The organization is enormous having around 3.500 staff and serving approximately 8 million people with water. Apart from the head office where the whole management, the Chief Engineer and all Superintending Engineers are located, 6 zonal offices have been established for the operational purpose. These MODS Zone offices are each jointly headed by an Executive Engineer on the technical side and a Revenue Officer on the financial side. The joint management and the fact that the Executive Engineer has 3 management levels between him and the MD and thus a long and cumbersome way for decisions, makes the MODS Zone offices very weak and inefficient.

14. As mentioned earlier the PPI operated zones are significantly more efficient in billing and revenue collection than the DWASA operated zones. However in all zones the billing lacks transparency. Frequent lack of a functioning meter at the service connection and the inadequate records and mapping leaving the revenue inspectors as the only people who can identify the right APB 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. bill to the right connection, leaves a situation where the billing is up to the mercy of the revenue inspector or what agreements the revenue inspector makes with the beneficiaries. Further, there are no efficient mechanisms in use to make defaulters pay their bills. Presently 60% of the produces

water is billed, but only 62% of the bills are paid so overall only 37% of the water produces are paid for.

4. Role of civil society

15. The project has been developed with significant donor and stakeholder consultation, which includes stakeholder interviews and a number of stakeholder workshops. Key areas of concern have been identified as physical problems such as losses and intermittent supply, but in particular institutional problems related to DWASA's performance. Consensus were reached on salient points including: Restructuring of DWASA into a truly autonomous body with minimum interference from the Government and with an efficient board; Government to approve DWASA's proposed structure; phasing in of commercial/financial viability based on cost recovery through tariffs, to be monitored by independent regulatory body; some privatisation of selected, smaller operations; combat of corruption problems through strong monitoring of operation and maintenance, in particular the proposed investment project; partial involvement of the civil society to overview policies, but not direct involvement in daily management issues. These issues will now be further discussed and actions developed through a number of consultations with stakeholders and decision makers. A summary of the salient points is in [Appendix 2](#).

16. This document is based on consultants' feasibility reports prepared during an ADB financed technical assistance project², understandings reached during multiple Missions, and extensive discussions with both central and local governments, other donors, NGOs, and community groups.

A. Performance Indicators and Analysis

17. The performance indicators for DWASA as published in 1997³ list data on: (i) Production / Distribution; (ii) Service connections; (iii) Service indicators; and (iv) Efficiency indicators. The data on (i) and (ii) is incorporated in the Monthly Management Information reports. Only limited data on (iii) and (iv) is available to management. The project will reactivate these indicators to enhance management efficiency.

18. According to MIS records, the network now comprises 2,425 km of pipelines in various sizes serving a total of 231,392 connections, 60% metered and 40% unmetered. 430 production wells are in operation, producing 82% of the total water volume. Billing efficiency stands at 60% while collection efficiency overall is 81%, while only 62% for water alone and current arrears represent 14.7 months of billing.

1. Lessons Learnt

19. For an equitable and safe water supply, it is essential that water is distributed under pressure in the network, 24 hours per day. To demonstrate the practicality of this proposition, the TA project included a provision for carrying out a pilot program in an area within the DWASA network to demonstrate the feasibility of and quantify the effort required for bringing the area under 24 hour pressure. The area of Manikdi with approximately 2,500 water connections, 45,000 inhabitants and 2 production wells, was selected, as it could be easily isolated and was of appropriate size. The experience, observations and findings have been included in [Supplementary Appendix A](#). The lessons learnt are summarized in [para 20 and 21](#).

² ADB TA 4651-BAN - Dhaka Water Supply Project

³ ADB, Second Water Utilities Data Book, October 1997.

20. The PPTA consultant worked closely together with DWASA to achieve the goals of a) bringing the area or a sub-area under 24 hours pressurized supply; b) reduce the UFW to 25% and c) bring awareness to the users about water quality and water conservation (demand control). Both DWASA and the consultant learned a lot during the pilot project, which can be summarized as follows: (i) DWASA management is very interested and cooperative but fighting against internal procedures and traditions; (ii) construction management capacity of existing DWASA Contractors is poor; they have a severe shortage of skilled plumbers (Mistries) and working tools; (iii) workmanship of the existing system leaves a lot to be desired. Solvent cement joints are leaking and pipes are not laid to the specified depth, nor are quality materials used; (iv) the house-connections are arranged by the householder after getting a permit from DWASA. They are made without supervision and low cost poor quality materials are used. The connections onto the network pipes are made with poor quality connection clamps and inappropriate seals that all end up leaking; (v) Most of the Contractors don't have experience in ensuring quality pipe laying works. Some even tried to skimp on the quality of materials for the pipeline and house connection during the rehabilitation work in Manikdi; (vi) Contractors lack the required equipment, tools, foremen for proper management of works and also they do not have sufficient pressure testing equipment; (vii) Continuous, strong and highly professional supervision is required in every step of pipe laying works; (viii) It takes time to repair the numerous leaks in the main pipelines.

21. The network condition and coverage is not keeping pace with the requirements of the community in terms of pipeline installation; and (i) Low strength PVC pipes from unrecognized manufacturers (Class B) have been used in network extensions, which creates problems during pressurizing and will influence the decisions for rehabilitation in the overall network; (ii) valves need extensive rehabilitation; (iii) additional bulk water meters should be installed for system management; (iv) each production well needs to have a stand-by generator to ensure an uninterrupted water supply to the system; (v) house connections need to be equipped with a stop cock, water meter and float valve in the storage tank to reduce wastage and provide proper recording / billing of water consumed; (vi) connections to on-site storage tanks need to be adjusted from the base to the top of the tank and multiple connections removed; (vii) some meters are placed after underground reservoirs and even after roof tanks; (viii) Most of the meters have restricted access which creates problem in taking readings; (ix) With the involvement of social workers and community interaction the situation has been improved, but still field workers need to knock several times to gain access in few houses; (x) Most of the connections in Dhaka are equipped with suction type pumps that suck water from the main line.

22. Dhaka WASA is new to the investment program of the ADB, although other donors, particularly WB and JICA have invested considerable sums in the WS system of DWASA, details in [Appendix 3](#). The current situation is that the network requires a major overhaul to reduce system losses and that a new surface water source need to be developed to guarantee adequate water quantities to serve the demand of present and future population of Dhaka. The 'business as usual' option will lead to serious water shortages and public unrest. The scope of investments has been carefully studied and incorporated into the Project, including (i) enforceable milestones into the project in the form of a phased performance-based funding approach; (ii) placing high priority to financial performance and autonomy of DWASA, mandating tariff reforms, adoption of commercial accounting systems, separation of water supply accounts, training staff, and embracing the move towards a more autonomous operating model; (iii) drastically reducing the number of contracts and procurements to minimize processing, implementation delays and maximize uniformity in quality; and (iv) actively engaging Ward commissioners and communities through extensive consultations. ADB and the Government cannot be held liable for its contents. For project preparatory technical assistance, and the establishment of civil society coordination committees to ensure stronger design, smoother implementation. All the views expressed herein may not be incorporated into the proposed project's design. More information on lessons learnt and how they have been incorporated into the Project is in [Appendix 4](#) and in the special features section of this document.

B. Analysis of Key Problems and Opportunities

23. **Institutional problems:** Provision, operation and maintenance of water supply by DWASA is governed by the provisions of the 'Water Supply and Sewerage Authority Act', 1996. An essential provision of the Act is that where the Government will have to finance or be a surety for finance, all information relating to a scheme will have to be submitted to the Government for approval. As long as DWASA is financially dependent on the Government, the Government will remain the controlling Authority in the operation of DWASA. DWASA does not have the autonomy to set its own water tariffs, create positions and appoint personnel (unless the first organogram is approved). Operation of the water utility is based on outdated procedures e.g., the use of single-entry accounting system, manual billing and collection, manual customer data-bases, etc.

24. In order to be an autonomous and commercial organization, DWASA must have full control and not be compelled to seek government approval over: (i) its production and delivery systems, i.e. it must know how much water it produces and how much it sells to the consumers, based on reliable figures; (ii) the distribution network up to and including the meter supplying the consumer, no unsupervised access by third parties should be tolerated; (iii) its computerized commercial accounting systems that reliably processes the production and consumer data, issues the bills and records the revenues as well as all the other financial transactions made by DWASA; (iv) the tariffs and budgeting required, based on projected operation and maintenance and debt servicing charges; (v) its decentralized operations and maintenance systems on a pro-active basis; (vi) its interactions with the consumers being able to make commitments regarding service levels without being hampered by time consuming bureaucratic approval procedures; (vii) its external funding requirements; and (viii) its dedicated staff that provides optimal performance against appropriate remuneration. Only when such conditions exist, will DWASA be able to fulfill its mandate of providing a quality service to its consumers.

25. **Technical Problems:** The key problem for DWASA is how to maintain a satisfactory level of service to 7.7 million consumers with a dwindling supply source, a network with high system losses, a lengthy procedural and construction period for providing treated surface water and a network that is not really suited to large volumes point source injections. To meet this challenge, it needs donor support to address its short-comings at least for the next 10 years.

26. **Opportunities:** The socio-economic situation of Dhaka is improving and the big majority of the population can easily afford paying for the water (Appendix 20). Dhaka is a flat city with a huge population in a relatively small geographical area and the population is expected to double within the next 20 years. Still in the future about half the water needed can be abstracted at a cheap price from the underground aquifers while adequate quantities of surface water is available within a reasonable distance from the city. Considering this overall scenario, supplying water to Dhaka City should, with a strong, autonomous and professional management, be if not a highly profitable business then at least sustainable.

27. In the water sector DWASA will be receiving assistance from DANIDA in the construction of the second phase of the Saidabad treatment plant, while the World Bank is providing support to DWASA in the sewerage and drainage sectors.

28. **ADB's Country Strategy** for Bangladesh⁴ is to continue to assist government expand the access to improved water supply and sanitation, and build the capacity of key agencies and local government institutions. The interventions proposed for Dhaka WASA aim at: (i) strengthen the capacity of DWASA to provide quality water supply services to an increasing population in Dhaka

⁴ Bangladesh Country Strategy and Program (2006-2010)

and (ii) provide sound management to guarantee the continued operation of the assets during its economic life.

29. The Strategy envisions that ADB will play a major role in supporting policy and institutional reforms to improve governance and efficiency in the urban water supply and sanitation sector. Assistance in the urban development and water sectors are to be focused on strengthening management and local resource mobilization, fostering clean urban environments, and improving basic living conditions in cities. ADB aims to contribute to improved management efficiency and institutional strengthening so that water authorities can become economically viable and attract the investment required to service the poor and meet growing urban demand. This Project is designed with several special features to closely follow and reinforce the overall ADB strategy for Bangladesh.

30. **Multitranches Financing Facility.** In order to support the Government's strong priority in the water and sanitation sector, a master plan for the needed investment in Dhaka water supply over the next 10 years, has been outlined as part of this PPTA. ADB financing has been structured for financing using ADB's Multitranches Financing Facility. The Project has been divided into six components as follows:

- **Component-A:** rehabilitation of the existing network, including secondary and tertiary network (where necessary), service connections and existing overhead balancing tanks; procurement of digital water meters; installation of chlorination equipment at all DTWs; consultancy packages.
- **Component-B:** rehabilitation of infrastructure including zonal offices, head office, training institute and laboratory; expansion of network to areas within the DWASA service areas presently only partly served by the use of coil pipes; feasibility study for 500 MLD SWTP
- **Component-C:** primary transmission lines to distribute water from the SWTP constructed under Component-D.
- **Component-D:** 500 MLD SWTP at Khilket including intake structure at Lakhya river and raw water transmission main.
- **Component-E:** additional generators for power backup to existing functioning PTWs and additional DTWs abstracting water from the deeper aquifer.
- **Component-F:** Saidabad phase 2, 225 MLD SWTP at Saidabad including pre-treatment for both existing Saidabad 1 and the new SWTP.

The proposed 6 Components shall be considered as one integral programme to prepare the water supply system to the future and the division into Components is because different parts of the project will be financed by different mechanisms and to reduce the cost for GOB. Component A, B, and C will be financed under the ADB multitranches Financing Facility; Component-D will, if possible, be financed by a private investor under a BOT or BOOT arrangement; Component-E will be financed by GOB and Component-F will be financed by Danida Mixed Credit facility. This solution is in line with the Government's sector policies and strategies, particularly the recently approved SDP-WSSB.

31. The SDP-WSSB and related Government policies set forth clear and well formulated development objectives, investment plans, institutional arrangements, and transition plans for the water supply and sanitation sector. DWASA, the proposed executing agency (EA) for the Project has experience managing externally funded projects but it will need to be supported in developing capacity required to become a commercially self-sufficient enterprise.

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III. THE PROPOSED PROJECT

A. Impact and Outcome

32. The primary impact of the project is to secure the water supply to the inhabitants of Dhaka within the DWASA jurisdiction area in a sustainable manner and negating the effects of the declining groundwater table under Dhaka city. More specific outcomes will include: (i) increased quantity and quality of water supply; (ii) improved capacity of DWASA to monitor, operate, manage and maintain the water supply system including new investments; (iii) adoption of improved management practices consistent with SDP-WSSB requirement for greater efficiency and sustainability of the water utility; (iv) increased awareness among the beneficiaries towards water handling and conservation. The development of the action plan for project implementation is detailed in [Appendix 5](#), and the analysis carried out to quantify the size of the project through network modeling is included in [Supplementary Appendix B](#).

B. Outputs

33. The Project will use a zonal and performance driven approach to upgrade and expand the water supply system benefiting approximately 12.3 million people in Dhaka in 2015. The project consists of four components: Part A: System rehabilitation, strengthening and expansion; Part B: Supply augmentation; Part C: Institutional development and capacity building; and Part D: Demand control and Public Awareness.

1. Part A: System rehabilitation, strengthening and expansion

34. The DWSP aims to address the issue of water losses through: (i) relining the existing pipe network using trenchless technology to the extent possible; (ii) replacing house connections containing unspecified materials with quality fittings that ensure water tight joints; (iii) installation of quality water meters that will allow automated / digital recording of consumption.

35. The network improvement component will include rehabilitation, strengthening or lining of all substandard or leaking pipelines under control of DWASA (Component-A)) and some expansions in fringe areas and un-served pockets (part of Component-B)). Two technical options will be used to ensure that all segments of the urban population will benefit from the Project: (i) piped supply with house connections; and (ii) shared water points for slum / poor households. Details of the different requirements for the improvements are included in [Appendix 6 Project Quantification](#).

a. Network rehabilitation

36. The network rehabilitation will start with a CCTV inspection of the interior condition of the pipe network. A record will be produced that identifies the location of the individual house connections and the internal condition of the pipes with respect to build-up of deposits, obstructions and position of laterals and appurtenances. Depending on the outcome, the pipelines may have to be cleaned by using either high pressure and foam plugs or augers that will move the deposits to selected withdrawal points.

37. Additional investigations will need to be carried out to determine the quality / strength of the pipe as the pilot project has revealed that the quality of many pipes are below standard, not being able to withstand the pressure that is expected to prevail after completion of the project. This condition cannot be ascertained from a CCTV inspection. The investigations will need to be carried out in conjunction with the reinstatement of the house connections as at that stage small pipe sections will be exposed. Pipe material quality and thickness will be measured and recorded.

b. Network expansion

38. Several areas of Dhaka, particularly areas which have recently been developed on ad-hoc basis, can only be considered partly served by water, because the secondary or tertiary water lines does not reach to the proximity of all houses. In these areas water supply is often supplied through long coil pipes laid by the owner of the house on the side of the road. This supply pattern implies a lot of leakages and makes it impossible to pressurize the system. Network expansion under this project aim at bringing proper distribution pipes to the close vicinity of all houses presently served by DWASA. The network expansion into different residential/ industrial areas will be through trenchless or conventional trenching techniques whereby the pipelines will be laid with a minimum cover depth of 1.0 meter. Only pipes and fittings using rubber seal joints will be used. Pipes will be bedded on sand, pressure tested, house connections installed and backfilled in layers with sand compacted to the required standard, most times 95% modified AASHO in the top 300 mm. The pavement restoration, where required, will be carried out by Dhaka City Cooperation (DCC) when all backfill has been settled after 6 weeks.

c. Replacement of existing lines

39. The design and network modeling will define those pipes that will be constraints in the operation of the network when large surface water supply injections are introduced in the future as explained in the water demand considerations detailed in [Appendix 7](#). These constraints have to be removed as part of the project.

40. The investigations detailed in para 34 will provide further information where the quality of the pipelines is below the standard required for maintaining the pressure conditions in the network. These pipes will also need to be replaced based on the experience from the Manikdi pilot project. Trenchless technologies like the pipe bursting techniques can be applied in such situations. See [Supplementary Appendix C](#).

d. Trenchless technology for pipeline repair

41. Great advances have been made in the use of Trenchless technology whereby a new lining is provided inside the existing pipes to counteract the leakage from the pipes through poorly constructed joints and house connections. Details of the various trenchless technologies are outlined in [Supplementary Appendix C](#). The important advantage is, particularly in the crowded streets in inner Dhaka, that it considerably reduces the requirement to open up the road pavement over the entire length of the line and thus reduce obstructions to traffic and minimizes the resettlement impact of the project. Still extensive surveys will be necessary to locate the exact location of the pipe, its service connection joints and to identify the installations of other utilities.

42. With the introduction of a lining inside the pipe, all house connections will be closed off and need to be reinstated. The work effort will rely to a large extent on interaction with the householders as the house connection lines and meter will need to be replaced. It will be a simple way for regularizing any unregistered connections as supply will automatically be discontinued, if the householder does not make it known that he has a connection.

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e. Rehabilitation of service connections

43. It is the experience in Manikdi that most house connections are substandard and leaking. The prime cause is the lack of quality control during implementation as DWASA has made the householder solely responsible for installing the connection. It is logical that the householder will reduce his cost as much as possible and (i) having no understanding of the technical requirements, (ii) the plumbers (mistris) being poorly qualified / equipped; and (iii) the operating pressure being low, the end result is one or more leaking connections to the household. This practice must be discontinued.

44. The connection materials must include a proper watertight clamp (saddle) in PVC or cast iron to the main pipeline and rigid heavy duty uPVC or HDPE pipes and fittings, dimensioned to suit consumption requirements. The project must insist that proper control on the quality of installation is maintained as already in Manikdi it has experienced the recurrence of improper work standards, threatening to jeopardize the benefits of bringing the network under full pressure operational conditions and negating the project purpose. For that reason DWASA must accept the responsibility and ownership for the house connection from the main to the meter placed just inside the property boundary. Any wastage beyond the meter will be a cost to the householder, but DWASA must ensure that there is no leakage before the meter.

45. Currently DWASA indicates (April 2006) that there are 135,500 metered and 95,900 unmetered connections. All of these will need to be replaced with proper fittings and connection lines to the property boundary and an AMR meter installed. Assuming that the number of connections is reliable, it means that about 34 persons are served by one connection. In the future, all individual households may need to be metered in order to have an equitable billing system based on household consumption, and 1.8 million meters would be required.

46. To facilitate the computerization of the meter reading operations and reduce the chance of error in data transfer, it is proposed that the new domestic meters have a provision for Automated Meter Reading (AMR) whereby the data on consumption is transferred directly to an electronic memory for later transmission to the account recording computer. The computer must then issue the bills and flag those households with: (i) irregular consumption patterns; and (ii) arrears in bill payments for follow-up action by the inspectors.

f. Installation of valves and bulk meters

47. DWASA operates its water supply system through 7 zones. During the implementation of the project additional valves and bulk meters will be installed to effectively control and provide management information on the operation of each zone. The bulk meters will record the volumes that are received from or supplied to adjacent zones such that an overall water balance is recorded on the production / consumption within each zone or even the sub-zones within each MODS zone. This allows the performance indicator on non-revenue water to be more precisely determined.

g. Rehabilitation of overhead reservoirs

48. At present there are 32 overhead reservoirs with a combined capacity of 20,000 m³ attached to the network. Twenty of these reservoirs are not in use, however they will have to be brought into use when the system becomes fully pressurized. The project includes the provision for repair of all tanks and connecting pipes and fittings to ensure full operational conditions.

h. Provision of new overhead reservoirs

49. In addition to the existing tanks, a further 18 tanks with combined capacity of 12,000 m³ will be required to act as dynamic buffers during short term peak daily demands. The tanks will be constructed as part of Component d) be of standard construction in concrete and have an individual storage capacity of 650 m³. The static water level is projected to be at 26 m above ground level.

i. Reestablish disinfection of water

50. DWASA is supposed to add free chlorine as disinfectant at all its water sources (PTWs and SWTPs) to ensure that a residual level of chlorine is maintained throughout the distribution network. This practice has, however, only been done to a limited extent at the PTW for the last decades and presently only 127 out of the 430+ DTWs have a functioning chlorination unit, while the remaining pumps pump water untreated into the network, with the result that the quality of the water reaching the consumers is unprotected against pollution with pathogenic organisms during the distribution. The project will reactivate the disinfection and monitoring activities by ensuring that all PTWs are equipped with an appropriate dosing system for free chlorine. Presently, DWASA use chlorine gas as disinfectant in some DTWs and bleach (chlorinated lime) in other DTWs. A risk assessment must be carried out by the project consultant to assess whether the use of chlorine gas should be continued or changed to the use of chlorine in liquid form (hypochlorite)

51. Further, a 2 tier water quality monitoring system will be initiated where 1st tier of the monitoring will be conducted by the pump operators, while the 2nd tier of the monitoring system will be carried out by the DWASA water quality laboratory. See **Supplementary Appendix D** for details of the monitoring program and laboratory upgrading.

j. Ring main distribution network expansion

52. As part of the development of the additional surface water treatment facility the necessary transmission mains will need to be laid to bring the treated water to the various zonal areas and sub-areas. See **Supplementary Appendix E** for details of the proposed primary transmission mains. The transmission mains are in Component-C and will be financed by ADB OCR loans. The supervision consultancy under Component-A will be responsible for detailed design of the mains and for tendering using FIDIC red book conditions.

2. Part B: Supply augmentation

53. The water supply to Dhaka city is in a critical situation. The upper aquifer underlying Dhaka is already being mined, while the deeper aquifer has only limited capacity for supplying additional water. Surface water sources will have to be used to satisfy the current demand deficiency from the community and any future demands that will arise from an expanding city. The limit of cheap groundwater exploitation has been reached.

54. The magnitude of supply will stand in direct proportion to the efficiency of DWASA in convincing the community to curb their wastage of water, which frequently exceeds 500 l/c/d. At the same time system losses will have to be curtailed and the project will greatly assist in this. With the high cost of surface water treatment, both in capital and operation and maintenance, DWASA cannot maintain the business as usual approach. The project maintains a two-pronged approach of (i) upgrading the quality and quantity of surface water supplies and (ii) introduce a tariff system that will encourage water conservation. (For project preparatory technical assistance: All the views expressed herein may not be incorporated into the proposed project's design.

a. Lower Dupitila aquifer production wells (GOB financing)

55. Extensive investigations have been carried on the yields of the Dupitila aquifers underlying Dhaka city. It has been determined that the upper aquifer is being mined as evidenced by the continuously declining water table and it is estimated that by the year 2013 some 223 of the 431 wells currently operating will go out of order. In the water demand projections in **Appendix 7** it is assumed that the abstraction from the upper aquifer will be reduced from 1,175 MLD to 975 MLD by 2013. The lower aquifer offers some additional capacity, however it is estimated to be to a maximum of 200 MLD, or 50 tubewells installed at 300 meter depth. Special provisions will be required during installation to prevent a short-circuiting from taking place between the two aquifer zones.

56. The project will need to foster an understanding within DWASA on the need to monitor the performance of the wells in relation to the effects of a falling groundwater table in order for it to be pro-active with respect to determining the likely time when a replacement well will need to have been installed and the conditionalities, especially with respect to possible land acquisition and resettlement have been satisfied.

b. Stand-by generators (GOB financing)

57. Bangladesh as a whole and Dhaka in particular experiences shortages in the provision of electric power, leading to power outages in all areas for a varying number of hours per day. Those wells that currently don't have a stand-by generator need to be equipped with the same. To determine however how many generators will be required, and currently 100 have been budgeted for, DWASA will have to determine: (i) the actual condition of each well; (ii) its yield; (iii) the probability that it will become obsolete in the next few years and when; and (iv) its program to limit its extraction from the upper aquifer to 1180 Mld, or preferably to 925 Mld or 230 tubewells operating at capacity of 4 Mld and avoid the mining situation. The spatial distribution and the stand-by generating requirement of these wells will need to be determined. In future natural gas/diesel fuel operated generators should be procured instead of diesel generators that are in use now.

c. Saidabad 2 water treatment plant and pre-treatment (Danida financing)

58. A duplication of the existing surface water treatment plant, constructed under the 4th Dhaka Water Supply Project with a capacity of 225 Mld will be constructed with Danida Mixed Credit financing. Both the Bangladeshi and the Danish Governments have approved the project, however it has been determined that the raw water quality at the river intake during the dry season suffers from domestic wastewater pollution and high levels of ammonia, which impacts on the performance of the treatment plant and subsequent quality of the purified water.

59. To address this problem, a feasibility study is presently being carried out to determine the most appropriate pre-treatment facility to be constructed at the current treatment plant site. The feasibility study is expected to be completed by February 2007 and the procurement and contracting of a contractor to build both the 225 MLD Saidabad phase 2 SWTP and the pre-treatment for both Saidabad phase 1 and phase 2 SWTPs is expected by November 2007. The new treatment plant and the pre-treatment facility is expected to be completed by 2010. During the coming dry season from January – April 2007, a monitoring program is implemented that will provide the river water quality data and the flow / tidal characteristics in the river Lakhya. The contract documentation for a design and build project can then be compiled by the project consultants.

60. The water quality in the Lakhya River is of concern. The tributaries to the river drain major channels emanating from within Dhaka city and these carry large volumes of untreated sewage. The World Bank has now committed US\$ 200 million for DWASA to address its wastewater and

drainage problems. Consultants are now being appointed to prepare the necessary studies relating to: (i) DS-1: Wastewater management to improve / rehabilitate the sewer connections, conveyance and treatment systems; (ii) DS-2: Wastewater studies for the preparation of a master plan for sewage collection, disposal and the control of industrial pollution and drainage of Dhaka City; (iii) DS-5: Environmental Management Framework for the development of an environmental management framework for environmental screening of projects and the formulation of environmental management plans.

61. The World Bank is also initiating the Dhaka Integrated Environment and Water Resources Management Project to mitigate the pollution problems and improve the surface water quality. For more details about planned pollution control projects see [Appendix 3](#).

d. Surface water treatment plant in Khilkhet (BOT financing)

62. The project has determined that there will be a demand for additional surface water by the year 2013. Initial computations assess the requirement at 500 Mld, to serve the combined population of 11.5 million people (see [Appendix 7 Water Demand Projections and Supplementary Appendix F Demographic Development](#)). The projected timetable for the implementation of such facility places the commissioning in the year 2014, assuming that a study will start on appointment of the project consultants in January 2008 as detailed in [Appendix 8 Implementation Schedule](#).

63. It is anticipated that the new plant will be located near Khilkhet with the intake near the Kanchon Bridge on the Lakhya River, however a feasibility study must be conducted to assess this option and compare with other options like bringing raw water from Meghna River or other less polluted rivers and compare these with the extra cost implied when treating the polluted water from Lakhia River. The feasibility study must also consider the potential development of the Singair well field or a well field another place as an option of producing 500 MLD water.

64. For the funding of this development, given the overall capital investments required for the whole project, alternatives will have to be considered through the involvement of the private sector through the use of BOOT (Build Own Operate and Transfer) whereby the private party will construct and operate the established plant for an agreed number of years with the surety of the sale of a given quantity of water annually. The surety will need to be underwritten by the Government of Bangladesh or failing this by the ADB.

65. BOT or BOOT contracts are still relatively new concepts in Bangladesh but are used more and more throughout the world. Whether the money to construct a SWTP comes from a private investor or from a bank loan to the Government, the money has to be financed using commercial conditions and the debt servicing cost is likely to be the same. There are, however, a number of advantages with the BOT or BOOT contracts. These can be summarized as follows: a) A STWP is a relatively safe investment where private investment is possible. So as long as there are huge investment needs in the country in sectors like education and health, it will be better not to use ADB OCR loans in areas where private investment is possible; b) the management capacity of DWASA is poor and a public private partnership (PPP) as would be the case for a BOT or BOOT financed SWTP will clearly be an advantage for DWASA and be the way forward towards improved water supply service in Dhaka; c) with a private company both owning the plant and operating the plant it is likely that the operation and maintenance of the plant will be better than if DWASA was the owner and operator; d) bringing this amount of private investment into Bangladesh under a BOT or BOOT arrangement will be a clear signal about improved investment climate in Bangladesh and will likely be a catalyst for more private investment in Bangladesh. (For project preparatory technical assistance: All the views expressed herein may not be incorporated into the proposed project's design.

66. It will be necessary to carefully facilitate the process leading towards signing of a BOT or BOOT contract for the Khilkhet SWTP either as part of this project or direct by ADB. During this

process both DWASA and GOB will have to be informed adequately about all aspects of such contracts including technical, financial and legal aspects, so they will be in a situation where they can take an informed decision whether they are interested in this arrangement or still prefer to borrow the money and build the plant themselves. The process was started with the Private Sector Participation workshop held by ADB in Radison Hotel in Dhaka on the 15th October 2006, and the process will continue with more workshops and consultants input giving specific advice to DWASA and GOB on the issue.

3. Part C: Institutional Development and Capacity Building

a. Dhaka Water Supply and Sewerage Authority

67. The present performance of DWASA must be rated as inadequate with respect to: (i) the supply of water, both quality and quantity, to its consumers; (ii) the operation of the system with respect to non-revenue water and quality of maintenance; (iii) the management of the system allowing: (a) unskilled mistries to make substandard house connections and other plumbing works; and (b) the incorporation of low quality pipeline materials into the network; (iv) the operation of its financial and administrative systems; (v) the lack of ability (willingness) to fill in vacant key positions and (vi) its interaction with the Ministry of Local Government, Rural Development and Cooperatives.

68. The functioning of DWASA is laid down in the Water Supply and Sewerage Act, 1996 which contains an important provision that gives the Ministry of LGRDC full control over DWASA as long as it funds or is the guarantor for the funds that DWASA requires for its operation and capital investments. This control has expressed itself in delayed decisions, most times with a negative outcome or no response as is the case with rules and regulations that are lying with the Ministry of Law. This approval dependency severely restricts DWASA management in creating an autonomous commercial organization that is competent to operate in a financially self-sufficient manner. Further details are included in **Appendix 9: DWASA Institutional Assessment; Supplementary Appendix G: Financial Management Assessment and Supplementary Appendix H: Institutional Development.**

69. Various institutional and capacity problems have been identified during the project. The institutional are mainly related to the functionality and degree of implementation of the WASA Act and the role of the various main stakeholders: the Ministry, the board, the management and the unions, while the capacity problems are basically throughout the organization.

b. Institutional Strengthening

70. The Institutional strengthening of DWASA will aim at the following: (i) the modification of the legal frame work for ensuring an autonomous operational environment including restructuring of the Board and management; (ii) the development of computerized accounting systems based on commercial accounting principles; (iii) the institutionalizing of efficient billing, revenue collection and customer record systems; (iv) extensive training of all levels of staff to optimize operational performance; (v) the development of a performance based remuneration system and promotional opportunities; (vi) the upgrading of the training and laboratory facilities; and (vii) the establishment of succinct management systems to support in its management decisions.

71. The main constraints on the institutional setting of DWASA are political in nature; any reform path to overcome these limitations has to be build on a participatory approach to promote ownership of reform and to generate the necessary support from the part of the Government. An immediate amendment of the WASA Act is not considered essential but the implementation of the Act must be reformed to strengthen the operation of the institution.

72. DWASA need to be given higher autonomy and be less depending on the Government. The MD and the DMDs should be appointed from the private sector, (which was agreed in principle prior

to securing World Bank loan for the 4th Dhaka Water Supply Project), since political nominations makes them vulnerable to political influence thus slowing and often negating reform efforts. To become a commercial sustainable entity, DWASA must be given the authority to determine and set tariff based on cost recovery principles; have the ability to recruit staff from the open market; and introduce a merit-based remuneration and promotion system.

73. Approval of the DWASA revised organogram will be a pre-condition for loan commencement, see section VI. Assurances. The institutional capacity building consultant will assist DWASA in updating or developing Operational Manuals and Business Plans for DWASA. This will be done in a highly participatory manner to ensure ownership of the manuals and plans

74. DWASA has already initiated the process of reforming the tariff structure. The capacity building consultant will work closely with DWASA to assist DWASA designing the most appropriate and financial sustainable tariff structure and get it implemented during the project period.

75. The evaluation of the current situation with respect to the use of Information Technology and Management Information Systems, contained in **Supplementary Appendix I** IT/MIS Assessment, it is found that DWASA has taken a piecemeal approach to bringing its systems up to date by improving the data processing on the billing and revenue collection. Contracts have been entered into for selected companies to prepare the required software, operate and prove the system for a period of three years before transferring the same to DWASA. The authority is in need however of a fully integrated commercial accounting system and this requires an integrated approach to IT development. It would be preferable to utilize existing commercially developed packages.

76. The present organogram of DWASA, adopted in the mid eighties by the then martial Law government, is a typical top-heavy government organization not suitable for commercial operations. From early nineties DWASA has tried to modify the organogram to conform to those of a commercial water utility, however, no major changes have been approved by the government. It is clear that the institutional structure of DWASA need to be reformed in many areas and when preparing a new organogram special emphasis should be given to reorganize the zones into self supporting "Mini WASA's".

77. Presently DWASA provides 3 basic services, namely, water supply, sanitation and storm water disposal. Water supply and sanitation services are provided from the zonal office where as storm water disposal services are provided from a separate office called Drainage circle. Operation of the DTWs is the responsibility of the zones but repair and replacement of the pumps are the responsibility of another division named "Field Maintenance Division". Meter installation, repair and replacement are the responsibility of the Meter Division. Such fragmentation of the service delivery is problematic for the consumers having to go to different DWASA offices for different services and the division of authority and responsibility between the different actors are often not clear leading to lack of actions or delays. The zonal offices, each serving around 1½ million people, must all be strengthened to be able to provide all services to the customers as a One-Stop-Service rather than sending the customer from one office to another. Presently a zone is headed by an Executive Engineer on the technical side and Revenue Officer on the marketing side. In the proposed "Mini-WASA" the management should be brought under one umbrella and the zonal head should have position equivalent to the DMD of DWASA. The present position of Revenue Officer should be upgraded to the rank of the Deputy Chief Revenue Officer. The capacity building consultant will assist by developing the necessary capacity at zonal level to facilitate that the zonal offices can take more responsibilities and be more autonomous.

78. A more rigorous and aggressive decentralization policy has become essential to enable DWASA to function as a truly commercial water utility. Decentralization will be effective only when it is backed by adequate delegation of power and authority (both administrative and financial) and with proper accountability. DWASA management should immediately initiate a dialogue with the

Board to decide on the extent of both decentralization and delegation of power. The project consultants will also be part of that dialogue.

79. Several Water and Wastewater Utilities from the region has shown a very positive development over the last decade and are now fully financial sustainable without support from their governments or donors. Twinning arrangement will be established with a regional water utility (PUB, Singapore; Phnom Penh Water Supply Authority etc) to help DWASA develop its managerial, technical and financial capabilities required for efficient management of commercial oriented water utility. This will be financed through technical assistance for a period of four years. This will subject renewal every year subject to satisfactory performance of both the provider of the service and the recipient. Already discussions have been initiated with Singapore Water Utility.

c. Capacity Development

80. The capacity of DWASA is weak both in regards to human resources, management, and institution. A broad spectrum of activities will be required during the project period to lift DWASA to a commercial viable organization capable of fulfilling its obligations to supply water of adequate quantity and quality to the population of Dhaka.

81. An internal DWASA training centre was established under the WB financed 2nd DWASA Credit. The center is located at Lalmatia and housed fully in the 3rd floor and partly in the 2nd floor of the Zone No 3 office where it has two class rooms, one computer class room, one conference room and seven office rooms for the officers and staff. The center should, according to the approved DWASA organogram, be staffed with 10 training officers: 1 Chief Training Officer of the rank of S.E., 2 Joint Chief Training Officers (one for Engineering and one for Finance & Administration) at the rank of E.E. and 7 Deputy Chief Training Officers (4 for Engineering and 3 for Finance and Administration) supported by 9 office staff. However, presently only 2 training officers (Chief Training Officer and one Deputy Chief Training Officer) are working there supported by 6 office staff. The physical facilities of the training center will be rehabilitated during the project and DWASA must ensure qualified people are employed to fill all vacant positions. Training Calendar, training programs, curricula, outlines for handouts and hands on exercise details shall be developed and upgraded. The training consultants under the Institutional Capacity Building Consultancy under Package-A will work closely with the training center.

82. A balance between internal and external training will be worked out. DWASA gets many opportunities of foreign training for its technical officers mainly. Most training programs are in the field of water supply and sewerage system. Close monitoring and evaluation of these external training programs will be made and their suitability and applicability for DWASA will be assessed. Officers receiving external training programs will be required to exchange ideas and views with the Training Officers as well as DWASA officers. Some training will be outsourced to technical institutes and schools in Dhaka like BUET. Internal training programs will be organized and rigorously implemented at the DWASA Training Center to disseminate state of the art technical know-how to DWASA officers and staff.

83. Plumbers of DWASA as well as the Pipe Laying Contractors are not adequately skilled. As a result most of the pipe laying work develops problems within a very short time. Plumbers training curricula will be developed to make a balance between theoretical and practical knowledge. Plumbers will be given hands-on-exercises and their learning skill will be assessed thoroughly. During actual work of pipe laying and joining, trainers will assess the plumber's skill. Similar training will be imparted to the production well operators and technicians operating and maintaining the SWTPs.

84. Accounts and Finance Department is one of the weakest departments in DWASA. Most of the officers and staff do not have requisite academic qualification and skill to run a modern computer based accounting system. It is therefore, essential that, at the earlier part of the implementation phase, training in finance and accounts be initiated on a priority basis. This will be done through international and national financial specialists, IT and MIS specialists who will be part of the capacity building consultancy team. At the same time necessary number of trained accountants should be recruited to work with DWASA accounts section.

d. Project Management and Implementation Support

85. Consulting services funded from the loan for this project requires a number of distinct inputs whereby the main consultancy will be engaged to help manage the Project at the PMU and Project Implementation Unit (PIU) levels, to implement and supervise the various interventions. Consulting support will include (i) project management and monitoring, (ii) planning and design of network rehabilitation, (iii) contract structuring, tendering, execution, and management, (iv) construction supervision, (v) preparation of the tariff awareness program; (vi) resource conservation awareness creation.

86. Additional consulting services will be required as separate packages for: (i) Institutional capacity building of DWASA, funded from the loan and including planning and implementation of capacity building programs and community / stake-holder involvement programs; (ii) a separate TA, funded by the ADB as a grant, for overseeing and guiding: (a) the procurement process; (b) the institutional strengthening process; (c) development of the quality control systems; and (d) the development of the financial, administrative and computer management systems; and (iii) the feasibility study for the optimal location of the 500 Mld surface water treatment plant. Given the urgency by which the latter is required, it is recommended that this work is retro-actively financed from the loan in the form of a TA.

87. Given the paramount importance that must be attached to the success of the transformation of DWASA into an autonomous, efficient and dedicated organization, there will have to be a number of focal persons who are thoroughly familiar with the workings of the Government and DWASA and have a complete understanding of the development process that DWASA will have to go through in order to achieve its stated goals. In addition there is a need for: (i) quality assurance, particularly with respect to the procurement of construction services and materials; and (ii) the development of the financial systems and computerization. Because of its importance, it is recommended that these services are provided under direct contract from the ADB (bullet (ii) in last paragraph).

c. Project Performance Monitoring and Evaluation

88. A Project Performance Monitoring and Evaluation (PPME) program will be carried out by the PMU. Consulting support will be provided to the PMU to define the PPME program and identify indicators and methodologies for monitoring benefits such as increased coverage, appropriate service and consumption levels, and efficiency in operations and financial management and finally consumer satisfaction.

4. Part D: Demand Control and Public Awareness

89. The present water supply situation in Dhaka is inadequate and unacceptable from a physical supply point of view because many of the pipes are old and leaky. The water they provide is of an acceptable quality and there is a need to invest in additional water facilities like underground storage tanks and suction pumps to get water from the system. Huge quantities of water are presently produced and the main focus in DWASA and the relevant Ministry is on producing more water to

meet a run away water demand. The exact quantity of water being abstracted from the ground water resources and produced from SWTPs is not known because the private abstraction is basically unknown, however, it has been estimated to 700 million m³ per year or close to 2,000 MLD. This amount of water is pumped into an area with about 8 million people which is 250 Lcd. It should be kept in mind that a significant number of people live in slum or low income areas where they will use only a fraction of that quantity.

90. At the start of the PPTA the average metered consumption in the Manikdi pilot area was 95 Lcd. At that time the supply was intermittent and under minimum pressure. Now when most leaks have been repaired and 24 hours pressurized supply been established, the metered demand has increased to 200 Lcd. In other words, water demand seems to be closely related to delivery.

91. If the project is to achieve objectives and goals typical for water supply projects: health and economic benefits for the beneficiaries, then 24 hours pressurized supply to all areas is a unavoidable requirement, and 24 hours pressurized supply is only achievable if the demand is controlled, both the official demand and the unofficial demand through unofficial connections. In the demand assessment it is assumed that the per capita demand are gradually reduced from 150 Lcd in 2006 to 130 Lcd in 2015 and to 110 Lcd in 2025, and in parallel that the UFW is reduced from 40% in 2006 to 25% in 2013. Both assumptions are considered realistic if necessary measures are introduced and implemented. If the project fails to meet these assumptions, 24 hours pressurized supply can only be achieved by constructing 5 additional 500 MLD SWTPs over the next 20 years instead of 2 as proposed by this PPTA.

92. To reduce the per capita demand to 110 Lcd by 2025 will require a huge and continuous awareness campaign and forceful tools like a block tariff structure allowing lifeline quantities of water to be very cheap while excess demand become very expensive, see the tariff section of this report.

93. The awareness campaign must be designed to cope with the situation where the (i) population of Dhaka has very limited understanding of the water supply mechanism; (ii) most consumers don't have contact with or know how to read a water meter; (iii) often water is paid as part of peoples house rent; and (iv) often people share one connection with other people whereby there are little incentive for reducing the water consumption. Generally only few people in Dhaka have an understanding of the supply mechanisms of water, and more seriously, most people do not have an understanding that the cost of water depend on how much they use, they pay a lump sum to the house or land owner and will not benefit financially if they start to reduce their consumption. That bring in additional obstacles like the use of low quality fittings, leaking underground storage tanks, leaking fittings and domestic piping because why pay extra if you get nothing in return. The problem with low quality piping and fitting has historically not been so important due to the low pressure supply situation, however it will be a very serious problem when the pressure in the supply network are increased. Moreover DWASA has a bad public image and are often criticized in the media both for water quantity and water quality issues but also for being a disturbance when digging up the roads to repair pipes or laying new pipes.

94. Awareness campaigns must as a minimum deal with the following issues: (i) inform the public about the purpose and outline of the project; (ii) create awareness that water is a scarce and valuable commodity; (iii) inform the relevant people about project imposed disturbances during project implementation; (iv) to improve the public relation and image of DWASA; (v) inform the public / create awareness about a) problems related to the use of suction pumps, b) how to minimize water wastage in households, and c) new tariff structure that will be introduced.

95. A massive campaign at many levels will be needed over the 6 years project period to achieve the project goals. The following tools will be needed: (i) an overall campaign orchestrated by a public relation firm or an advertising firm using mass media like TV, radio, cinema and theater;

(ii) NGOs will be engaged to develop educational materials and to engage and coordinate field workers to conduct community meetings and to work with and educate the individual households; and (iii) the project will distribute information materials before, during and after working in individual geographical areas. Detailed awareness creation activities are included in [Appendix 10](#).

C. Special Features

1. NGO Participation

96. The NGO sector of Bangladesh is very well developed, and the Project aims to take full advantage of their capacity by involving them in the awareness creation of the population of Dhaka. Information and educational campaigns will be carried out on water conservation, new tariff structure, details and consequences of the project etc. They will also be involved in supplying water to the slum areas and the urban poor.

2. Contract Packaging

97. All civil works under the Project will be packaged in a limited number of contracts, which will attract qualified international contractors, minimize administrative burden, implementation delays, and transaction costs. Civil works of the 6 Components are expected to be covered by the following works and procurements contracts. For details see [Appendix 5: Development of the Action Plan and Appendix 6: Project Quantification](#).

- Component-A:
 - Network rehabilitation including service connections and procurement of materials (excluding meters) for Zones 1, 2, 4, and 7
 - Network rehabilitation including service connections and procurement of materials (excluding meters) for Zones 3, 5, and 6
 - Rehabilitation of 32 number of existing overhead reservoirs
 - Procurement of AMR digital water meters for all connections
 - Installation of chlorination equipment at all DTWs
 - Design and Construction Supervision Consultancy
 - Institutional Capacity Building Consultancy
- Component-B:
 - Rehabilitation of zonal offices, head office, training institute and laboratory
 - Construction of one additional zonal office
 - Expansion of network to areas within the DWASA service areas presently only partly served by the use of coil pipes including service connections and procurement of materials
 - Construction of 18 new OHTs
 - Feasibility study for 500 MLD SWTP proposed at Khilkhhet

• Component-C: This Component-C 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.)

- Primary transmission lines to distribute water from the SWTP constructed under Component-D.

- Component-D:

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- 500 MLD SWTP at Khilket including intake structure at Lakhya river and raw water transmission main.
- Component-E:
 - Additional generators for power backup to existing functioning PTWs and additional DTWs abstracting water from the deeper aquifer.
- Component-F:
 - Saidabad phase 2, 225 MLD SWTP at Saidabad including pre-treatment for both existing Saidabad 1 and the new SWTP.

3. Community Management of Common Infrastructure

98. Various means of community involvement and community management of the water supply infrastructure will be applied during the project. The slums will be supplied with DWASA water through water kiosks where the water connection initially will be officially owned by a NGO but later the ownership will be transferred to CBOs. This model has already been demonstrated to work effectively in a large number of slums supported by Water Aid, NGO Forum and other international and local NGOs.

99. During the implementation of the project the concept of making a larger area a bulk consumer of DWASA will be piloted. In this system the society will be billed by DWASA based on a bulk water meter and will have the responsibility to collect money from all the members and pay on behalf of the community.

100. An important aspect of the project is the awareness creation of the water users in Dhaka. In Manikdi extensive training has been given to the users on how to read the water meter, how to understand the readings and how to reduce the consumption. By giving the users an understanding of the importance of conserving the limited water resource and how they can control and minimize their own expenses for water, the users will actually play a role in the management of the system, e.g. if the water bill does not reflect the real situation the consumer will understand and be able to complain to the authorities.

4. Linkage to Other Ongoing Government and ADB Initiatives

101. The World Bank has under the credit agreement No. Q4780 earmarked USD 200 million and promised to assist with further funding to assist DWASA with its handling of wastewater and drainage for Dhaka city. 9 packages have been defined and consultants are now being engaged to conduct the necessary studies. For pollution in general and for the Lakhya River in particular the following packages are crucial:

- DS-1: Wastewater Management: With the objective to improve / rehabilitate sewage connection, conveyance and treatment systems in Dhaka a feasibility study is being carried out to increase the capacity of the Pagla sewage treatment plant; rehabilitation of existing trunk sewers; extension of secondary and tertiary sewers, provision of sewer connections, and construction of sewage pumping stations. After 8 months feasibility and possibly 1 year tender phase implementation of proposed project is expected to run over a 2 years period.
- DS-2: Wastewater Studies: With the objective to initiate the preparation of a Master plan for sewage collection and disposal, control of industrial pollution and drainage of the whole Dhaka City. The studies include: (i) Prepare TOR for the preparation of a Master Plan for handling of domestic and industrial wastewater in Dhaka; (ii) Review the technical

and financial feasibility of common industrial waste water treatment plants; (iii) Review of existing sludge collection system from septic tanks and recommendation for safe disposal arrangements. The studies will deal with the problem of Narai Khal conveying huge pollution loads to Balu River and eventually to the Lakhya River. The study is ongoing and expected to take 5 months after which concrete projects will be formulated tendered and implemented over the next 4 years.

- o DS-5: Environmental Management Frame work: With the objective to develop an environmental management framework including: (i) Guidance of environmental screening for each of the sub-projects i.e. rehabilitation of existing sewers and drains, WSS for low-income communities, constructed wetland, common industrial effluent treatment, etc. (ii) Guidance for the environmental assessments to be done for the sub-projects and for the formulation of environmental management plans. The consultancy work is in progress.

102. The World Bank is also preparing for the Dhaka Integrated Environment and Water Resources Management Project with the aim to mitigate the pollution problems of the Dhaka watershed and to improve the surface water quality. This should be done by various measures to reduce the pollution load, both domestic and industrial, load to the ground and surface water bodies. This project is still in the early preparation stage. However the Japan PHRD Technical Assistance Program has indicated their interest in financing the preparatory TA.

5. Performance indicators for project implementation

103. In order to assess the Project Progress, the following monitoring performance indicators may be considered as useful tools:

- o Time-bound target and achievement (monthly, quarterly & annually) for the individual major item of works e.g. construction and rehabilitation of pipelines, new construction and rehabilitation of OHTs, primary & secondary transmission mains, etc
- o Monitoring ADB's Multitranchise Financing Facility (MFF) both ADF & OCR in different components,
- o Yearly resettlement Issues related to the project activities including pre-construction survey works,
- o Environmental Issues including monitoring activities during & after construction,
- o Water supply services provided to the fringe area & slums (based on yearly target and achievement),
- o Key operational and financial indicators will be agreed with and monitored jointly with the World Bank program for improvement of the wastewater system.

104. Further, the following indicators will be essential for the sustainability of the project:

#	Indicators / Considerations	Risk to sustainability if not effected / achieved
1	Delegation of powers	It is standard government practice to have all decisions taken centrally. This, in a commercial setting, is an unworkable situation and in effect has lead to the current situation that DWASA finds itself in. Systems are poorly maintained for want of approvals and spare parts. Powers must therefore be delegated to the respective functional levels for decisions to be taken expeditiously with 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 by DWASA not to be incorporated into the proposed project's design.)
	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 by DWASA not to be incorporated into the proposed project's design.)	All the views expressed herein must be maintained. Such system will provide complete information on costs incurred per category, financial status and whether the organisation is functioning optimally.

#	Indicators / Considerations	Risk to sustainability if not effected / achieved
3	Financial performance	The financial performance relates to a multitude of aspects of capital investments, quality of works executed, operation and maintenance, useful life, etc. Many of the specific indicators are highlighted in the following texts.
4	Service coverage	Service coverage can be measured in a number of ways. It is essential however that the expansion of the coverage maintains equal pace with the urban expansion of Dhaka. Measurement can be recorded in number of metered connections and number of people served by each connection.
5	Water availability	Here DWASA faces its greatest challenge as scope to expand water supply is extremely limited for the next few years and any improvement must be found in reduction of water losses due to leakages. This reduction will be achieved through the implementation of the project. The project must therefore be implemented with due speed to reduce the disruption in supply potential. The water table in the production wells will need to be monitored on a weekly basis in order for DWASA to be pro-active on the need for probable replacement of 223 wells in the next few years. Any abstraction from the upper Dupitila aquifer beyond current levels may cause permanent damage to the flow in the aquifer further reducing water availability from this source.
6	Per capita consumption	Current levels of water consumption are unsustainable in the long term. DWASA will have to create a public awareness on the need for conservation of water and a steady reduction will defer the need for further major capital investments in the transport and treatment of surface water.
7	Average tariff	The average tariff must cover the operational cost of the organization, but at the same time it must encourage the conservation in the use of water and subsidize the lowest income groups using public / yard taps.
8	Unaccounted for water	This is the most critical issue for DWASA. The current network has many deficiencies necessitating the implementation of the project. The deficiencies can be summed up as: (i) low quality workmanship and use of poor quality materials; (ii) permit for householder to effect its own connection through a broker; (iii) lack of interest in system maintenance; (iv) lack of performance monitoring; (v) poorly equipped / experienced contractors; and (vi) inadequate quality control during construction. During the implementation of the project care must be taken that all the above are not repeated and that the permission of householders to install their own connection is restricted.
9	Non-revenue water	Non-revenue water is a measure of the total volume of water that is billed and the payments that are actually made on these bills. The monthly amount of arrears is a measure of the efficiency of the organization in running its operation. At most this percentage should be 5%.
10	Unit production cost	Unit production cost comprises various operational and maintenance costs including debt servicing. While there is a tendency to defer maintenance and thus reduce expenditure, the operational cost should reflect sound management practices including regular maintenance. The project must update the existing operation and maintenance manuals and guide the preparation of the maintenance budget to ensure the availability of funds.
11	Operating ratio	The operating ratio, being an expression of annual O&M cost, including depreciation, and annual billing should be less than one. The smaller the ratio, the more comfortable the organization is in its performance. It should be agreed for the project that the ratio, including depreciation, will always be less than one.
12	Accounts receivable	Measured in terms of average monthly billing, it should be agreed that for normal commercial operation the total arrears should be less than three months' billing.
13	Staff / 1000 connections	No specific targets can be set as staffing levels are influenced by the extent to which services are contracted out. However the adequacy of staffing levels is reflected in the financial indicators of DWASA performance. Much will depend to what extent DWASA is in control of its own staff performance evaluation and necessary actions resulting

#	Indicators / Considerations	Risk to sustainability if not effected / achieved
		there from. It is advocated that the company should have complete control and freedom to act in this matter.

D. Cost Estimates

1. Cost Estimates

105. The total cost of the Investment Program from 2006 to 2013 is \$ 864 million, and is presented in Table 1. Indicative cost estimate for the MFF is \$ 273 million.

Table 1: Cost Estimates of the Investment Program
(\$million)

Components	Coverage	Total Investment Requirements	Investments under ADB loans	Share
Component A	Network and OHT rehabilitation, metering, and capacity building	211	165	78%
Component B	Network expansion, construction of new OHT, rehabilitation of zonal offices	36	31	86%
Component C	Primary distribution	94	75	80%
Component D	Source development (BOOT)	373	0	0%
Component E	New DTW, generators	10	0	0%
Component F	225 mld STWP (Sadaibad) DANIDA	138	0	0%
Total Investment Program		862	271	32%

Source: PPTA estimates

106. The Multi-tranche Financing Facility (MFF) will support the investment needs up to 2013. Component-A (to be funded by ADF) will be used for areas where financial return is low: (i) network and OHT rehabilitation; (ii) institutional capacity building (such as consulting services and IT equipment); and (iii) awareness creation and behavioral changes using NGOs and various IEC tools. The objective of Component-A is to improve the EA's financial situation, through reduction of NRW and capacity building aiming at improvement in revenue collection and new tariff. Under the activities of Component-A, the EA has to achieve proper accounting, increase net revenue from tariff reform, reduction in NRW, and increase in collection efficiency. Detailed cost estimates for Component-A to Component-F are in **Appendix 11: Detailed Cost Estimates**.

This consultant's report does not necessarily reflect the views of ADB or the Government concerned, and ADB and the Government bear no liability for its contents. All projects are strategic technical assistance in the view of network expansion and transmission companies and the rehabilitation of DWAS sign buildings. The objective of these Packages, to be funded from OCR, is to increase the financial base by providing better quality service to more people. The separation between B and C is based on time of implementation whereby the loan costs for the Government are reduced.

108. With success in meeting the objectives of the first 3 Components, the private sector and ADB's public sector operation can be persuaded to participate. On this basis, a Build Own Operate and Transfer (BOOT) is expected for Component-D.

109. Beyond 2013, DWASA will need two additional 500 mld STWPs, one in Pagla (2022) and one in Sadaibad (2031) to meet demands of the city. These are also expected to be financed by the private sector.

E. Financing Plan

110. The Government has requested for \$165 million equivalent from ADB's ADF to help finance for Component-A of the Investment Program. The financing will be provided under the MFF in accordance with ADB's policy. Components B and C will be funded from OCR. MFF will extend multiple loans to finance a range of subprojects and components under the Investment Program, subject to submission of a related Periodic Financing Request (PFR) by the Government and execution of the related Loan and Project Agreement(s). The Government has entered into a FFA with ADB, and is required to comply with the FFA requirements. The loans under the MFF will finance civil works, equipment, consulting services, and rehabilitation of offices. The minimum amount of subsequent PFRs will be \$50 million. All of the provisions for ADF and OCR loans apply. For OCR loans, provisions of the ordinary operations loan regulations applicable to ADB's LIBOR-based loans will apply to each loan, subject to modifications, if any, that may be included under any loan and project agreement. The Government has the option to choose between eligible currencies and the interest rate regime for each loan. The specific terms of each loan will be based on the related PFR with interest to be determined in accordance with ADB's LIBOR-based lending facility. The Government has provided ADB with: (i) the reasons for its decision to borrow under ADB's LIBOR-based lending facility, and (ii) an undertaking that these choices were its own independent decision and not made in reliance on any communication or advice from ADB.

111. Although no co-financing is envisaged at this time, if needed, co-financing from commercial sources may be mobilized in the future to complement ADB financing for the MFF. Such co-financing may benefit from ADB credit enhancements, including ADB guarantee instruments, and will be presented separately for Board consideration as and when it arises.

112. The total loan amount from ADB will be 32% of the project cost or around \$271 million, consisting of ADF \$165 million and OCR \$106 million. The financing plan for the Investment Program is presented in Table 2. Component-A project cost of \$213 million will be financed as follows, 78% or \$167 from ADB loan and 22% from GoB. Details for Component-A to F are presented in [Appendix 11](#).

Table 2: Financing Plan of the Investment Program
(US\$ million)

Source	Total Investment Requirements	%	Identified Investments under ADB loans
Asian Development Bank	273	32	273
- ADF	167		167

efficiencies; and (viii) reporting key indicators on zonal level performance to head office for evaluation and response.

2. Implementation Arrangements

117. Component-A is mainly dealing with rehabilitation of the water distribution network. Trenchless technologies will be used when possible, but even though trenchless technologies are much faster than traditional technologies and require less digging of the roads and thus less disturbance of public movement, there will still be periods during construction where the water supply will be cut of for most beneficiaries of the system. The contracts with the contractors will specify that the contractors must mitigate such disturbance by providing emergency water supply to all households during the period(s) where the normal supply has been cut of. This will not be too complicated because most households have underground storage facilities which the contractors can fill during the nights either by hoses or by tankers.

3. Implementation Schedule

118. The Project will be implemented over a period of 6 years in 6 Components. The implementation schedule is included in Appendix 8.

For the Implementation of Dhaka Water Supply Project (DWSP), the ADB has committed to provide funds as a combination of an ADF loan (US\$ 150 million) and OCR loans. MFF may be used as individual loan in line with individual activities, safeguards, financial management and capacity building action plans. There are several advantages in the MFF, especially to the borrower. Uttaranchal Power Sector Investment Program (UPSIP) and North Karnataka Urban Sector Investment Program (NKUSIP) of India are unique examples of using MFF of the ADB.

The MFF modality is particularly well suited for the Investment Program of DWSP because (a) the aim of the investment program is to support DWASA for the long-term sustainability, (b) the implementation period of DWSP is longer than the conventional projects for other sector, (c) the MFF can allow the flexibility required for the investment program to support DWASA with different needs and capacities, (d) the proposed performance-based contract periods that are generally longer than the conventional contract modality, (e) several sub-projects are allowed under one umbrella and individual sub-projects are dealt as individual loan. Each individual loan will be financed by ADB mutually exclusive distinctive Packages / sub-projects &/or components.

The step by step road map of DWSP is proposed as follows:

Step 1 Management of DWASA strengthened

- Institutional bottlenecks resolved by joint efforts by GOB, DWASA, ADB and WB
- Capacity at all levels of DWASA strengthened, including improved IT facilities
- More authority and increased capacity of zonal offices of DWASA established
- Higher level of awareness and involvement of civil society developed
- National and International Consultancy services to be ensured to maintain quality of all works including using of modern trench-less technology as far as practical;
- Resettlement and safeguard issue as per ADB's policy.

Step 2 Rehabilitation and Strengthening of existing water supply system

- All tertiary and secondary water supply distribution networks must be replaced with quality materials & workmanship, if they are found leaky;
- Strengthening of the existing networks by replacing smaller diameter pipelines by larger diameter pipelines as identified by Network Model;
- All house connections are to be fixed with standard materials and AMR digital water meters are to be installed;
- All existing Overhead Tanks are to be made functioning after minor / major repairing;
- Valves and bulk water meters are to be installed for isolating the MODS Zones and also small hydraulic sub-zones;
- All existing PTWs are to be installed with Chlorination equipment to maintain quality of water supply;

Step 3 New and Rehabilitation of outdated Infrastructure

- Construction of Zonal Offices;
- Construction and Improvement of Training Institute and Laboratory facilities;
- Construction of New balancing Overhead Tanks;
- Limited expansion of networks to cover the fringe area and extend the facility upto the Slums (but not inside the slums);
- Feasibility Study for SWTP # 3, at Khilkhet with Intake at Lakkhya River;

Step 4 Source Development (Construction of New SWTP # 3 site)

- Based on the recommendation of the Feasibility Study, construct SWTP # 3 (500 Mld) at Khilkhet area, may be under BOOT, if feasible;
- Construction of Intake at Lakhya River;
- Construction of Raw Water Transmission Main from Lakhya River to SWTP # 3;
- Commissioning of the SWTP # 3 near Khilkhet area.

Step 5 Source Development (SWTP # 2, Saidabad Phase 2, funded by DANIDA)

- Pre-treatment for removing Ammonia both for Saidabad Phase 1 & 2;
- Construction of SWTP # 2, Saidabad Phase 2 (225 Mld);
- Extension of Primary Transmission Main upto Mirpur
- Commissioning of SWTP # 2 at Saidabad Phase 2.

Step 6 Source Development (Construction of PTW, funded by GOB)

- Construction of New PTW at the Deep aquifer;
- Rehabilitation of PTW at the Deep aquifer;
- Installation of Generators to PTW where there is no stand by Generator.

Step 7 Construction of Primary & Secondary Transmission Mains

- Installation of 2400 and 2000 mm dia Primary Transmission to distribute potable water from SWTP to the distribution networks;
- Installation of 1200 mm to 600 mm secondary distribution pipelines to distribute potable water to the distribution net works;
- Installation of Valves, PRV & Bulk Water Meters in the Primary and Secondary Distribution Mains to maintain the system pressure and measure inflow & outflow.

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- Step 8** Resettlement, Safeguard and Environmental Considerations
- During Land acquisition for SWTP # 3, construction and rehabilitation of pipelines, the resettlements issues are to be resolved as per ADB's own policy;
 - During Land acquisition for SWTP # 3, construction and rehabilitation of pipelines, the Safeguard issues are to be resolved as per ADB's own policy;

- During Land acquisition for SWTP # 3, construction and rehabilitation of pipelines, the Environmental issues are to be resolved as per ADB's own policy;
- Quality Assurance (QA) must be insured in all respect of the Project Intervention.

4. Selection of implementation contracts

119. Given the fact that the project relies heavily on the use of Trenchless technologies that are not available within Bangladesh, the contracts have to be of sufficient size to be attractive to foreign contractors using ICB tendering procedures. It is recommended that during the pre-qualification procedures interested contractors are invited to come and demonstrate their equipment in Dhaka. This will have a dual benefit, DWASA can witness the equipment in operation and the contractors gain a first hand knowledge of the working conditions they are likely to face, leading to more realistic tender prices and work efficiency. For this reason it is recommended that two contract parcels are defined on a zonal basis with approximately the same magnitude of work. More details on the different works contracts are included in section 100 and in Appendix 5.

120. Trenchless technologies are unknown in Bangladesh, and it's not possible to assess in details which pipes which can be rehabilitated using trenchless technologies and which cannot. A general rule of the thumb estimate that the cost of rehabilitating pipes using trenchless technologies are between 20% and 50% of the cost of laying a new pipe, depending on the technology used. In the pricing of this project 50% of the cost of laying new pipes has been used for all pipes to be lined. This is considered adequate to cater for the pipes where trenchless technologies cannot be used due to various reason.

5. Procurement

121. Goods, works and services financed by ADB will be procured in accordance with ADB's *Procurement Guidelines, April 2006*. All procurement contracts will contain anticorruption provisions as specified by ADB. Procurement will be carried out by the PMU. Procurement of goods and services, including civil works, will be carried out in accordance with the procurement plan in Appendix 13.

122. Major procurement of materials such as pipes & fittings, valves, etc. including materials for service connection rehabilitation, shall be included with the Pipeline rehabilitation and expansion contracts and the respective contractor will import the same as per technical specifications and standard. The construction Components shall be awarded based on International Competitive Bidding Procedure from among the Pre-qualified construction firms. Electronic (Digital) Domestic Water Meters and bulk water meters shall be procured based on International Competitive Bidding Procedure following open tendering method by DWASA. The PMU and the Consultants shall be responsible to ensure the quality of materials including testing of materials both at home and abroad in addition to the testing of International Pre-shipment Inspection Agent (s). Tendering shall be processed as per PPR, 2003

6. Consulting Services

123. Experienced International Consultants in association with the experienced Domestic Consultants would be engaged to assist DWASA in all aspects of the project implementation viz. - detail engineering design, preparation of tender documents, technical specifications, bill of quantities, drawings, etc. for different packages of the contracts including construction supervision, quality control, testing of materials, preparation of As-built drawings, certifying measurement of works and contractor's payment. International and domestic Consultants will be selected and

engaged using ADB's **Quality -Based Selection** procedures in accordance with ADB's *Guidelines on the Use of Consultants by ADB and its Borrowers, April 2006*, and other arrangements satisfactory to ADB for engaging domestic consultants. The choice of Quality-based rather than Quality and cost based is considered justified due to the complexity of the project and the overriding importance of quality of construction.

124. Consulting services will be provided in 2 packages at the PMU level: (i) project management, engineering design and supervision and awareness programs; and (ii) institutional capacity building.

7. Anticorruption Policy and Transparency Measures

125. The Government was advised of ADB's Anticorruption Policy and Policy relating to the Combating of Money Laundering and the Financing of Terrorism. Consistent with its commitment to good governance, accountability and transparency, ADB will require the Government to institute, maintain, and comply with internal procedures and controls following international best practice standards for the purpose of preventing corruption or money laundering activities or the financing of terrorism and covenant with ADB to refrain from engaging in such activities. The investment documentation between ADB and the Government will further allow ADB to investigate any violation or potential violation of these undertakings. In particular, all contracts financed by ADB in connection with the Project shall include provisions specifying the right of ADB to audit and examine the records and accounts of the EA and all contractors, suppliers, consultants, and other service providers as they relate to the Project.

126. The Project incorporates several other measures, in addition to the standard ADB requirements, to deter corruption and increase transparency. Dhaka WASA will be required to create a project website to disclose information about various matters on the Project, including procurements related to the Project. With regard to procurement, the website will include information on, among others, the list of participating bidders, name of the winning bidder, basic details on bidding procedures adopted, amount of contract awarded, and the list of goods/services procured. Further, ADB will engage a TA consultant on grant money for quality control of procurement and other project activities.

8. Disbursement Arrangements

127. Withdrawal of loan proceeds will be in accordance with ADB's *Loan Disbursement Handbook* of January 2001, as updated periodically and with arrangements between the Government and ADB. Imprest account and statement-of-expenditure procedures will be used. An imprest account will be established immediately following loan effectiveness at Bangladesh Bank.⁵ DWASA will manage the imprest account. The imprest account ceiling will be limited to 10% of the loan or the forecast expenditure for the next 6 months, whichever is lower. ADB's statement-of-expenditures procedures will be used to replenish and liquidate the imprest account for eligible expenditures not exceeding \$50,000 per payment.

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⁵ Or other bank as agreed by ADB and the Government.

9. Accounts, Audit and Reports

128. The Government, acting through DWASA, will maintain records and accounts to identify all goods and services financed by loan proceeds. The Government will ensure that accounts and financial statements are audited annually, in accordance with sound accounting principles, by independent external auditors acceptable to ADB. The EA will furnish to ADB, not later than 6 months after the close of each fiscal year, certified copies of audited accounts and financial statements, and the report of the auditor on these. Imprest accounts and statement of expenditure records will be audited annually and a separate audit opinion will be provided for each.

129. The PMU will prepare quarterly progress reports and submit them to ADB and LGD within 20 days of the end of the applicable period. The reports will be prepared in a format acceptable to ADB and will include, among others, the following: (i) project progress in each zone; (ii) the status of institutional development activities; (iii) delays and problems encountered and actions taken to resolve them, (iv) compliance with loan covenants; and (v) expected progress during the next 6 months. Within six months of the Project's physical completion, the Government will prepare and submit to ADB a project completion report, including costs and compliance with loan covenants.

10. Project Performance Monitoring and Evaluation

130. The PIU in each zone will be responsible for ensuring that a comprehensive program for PPME acceptable to ADB is carried out to (i) examine the Project's technical performance; (ii) evaluate the delivery of the planned facilities; (iii) assess the achievement of the Project's objectives; and (iv) measure the Project's social and economic benefits. A set of PPME indicators will be developed at the start of the Project by the PMU/consultants in consultation with the zones. Indicators will include, among others, the number of household water connections, the number of participants in awareness campaigns, incidence of waterborne disease, volume of water produced, volume of unaccounted-for-water, and billing and collection efficiency.

131. The PMU will conduct initial baseline physical and socioeconomic surveys and submit a detailed implementation plan for monitoring performance and for preparing benchmark information for ADB's review and concurrence within six month from loan effectiveness. Annual PPME reports will be prepared by each zonal PIU, consolidated by the PMU and submitted to ADB throughout project implementation.

11. Project Review

132. ADB and the Government will jointly review the Project progress at least twice a year. In addition to the regular reviews, ADB and the Government will undertake a comprehensive review at the end of the rehabilitation phase when Component-A have been substantially completed. A midterm review will also be undertaken within thirty months from loan effectiveness. These reviews will include a detailed evaluation of the project scope, implementation arrangements, and achievement of scheduled targets. They will also assess progress on zonal reform criteria compliance, institutional development, sub-project implementation, and the performance of consultants and the EA.

IV. PROJECT BENEFITS, IMPACTS, ASSUMPTIONS AND RISKS

A. Poverty Reduction and Social Development

1. Socio-Economic Situation

133. More than 2 million poor people living in slums and squatters, unserved pockets and fringe areas of Dhaka mega city, of which an estimated 1.3 million lives in the DWASA service area as per 2006, do not have direct access to WASA water. Many of them have been obtaining water from various 'agencies' at higher than WASA rate. Women are the main collector of water in the poor households. They spend usually 2 hours a day for water. Water borne diseases, malnutrition, unhygienic sanitary situation, etc are common in slum areas.

134. The project if implemented properly is expected to provide 24-hour water supply at sufficient pressure with reasonable quality standard to city dwellers including the poor households in the slum and fringe areas. For water supply the project targets the poor in terms of the following: community water tap, shared standpipes on payment basis, yard tap, etc. These facilities will be managed by the community with participation from partner NGOs and WASA. Poverty impact analysis shows that the project, apart from 24-hour direct water supply, will significantly reduce water collection time for women, collection cost, health care cost, the prevalence of water borne diseases, malnutrition, improve hygienic situation in the localities where the poor people live. This will ultimately increase the number of their working days and hence income, which is crucial for poverty reduction. The Summary Poverty Reduction and Social Strategy is given in [Appendix 14](#) while the Socio-economic situation is outlined in [Appendix 15](#) and the poverty profile of the project area is outlined in [Supplementary Appendix J](#).

2. Participation

135. Participation is a key element of the Project particularly in targeting vulnerable households, and ensuring sustainability. At the community level, stakeholder participation in project planning and implementation will be through extensive information campaigns, and community organization and mobilization activities through NGOs and CBOs. Through community organization, water user associations (including women's user groups) will be formed to facilitate necessary information campaigns. An information and education campaign will be formulated based on identified needs. Skills development, training, and provision of linkages to institutions will also be undertaken as part of the Project to ensure participation.

3. Gender

136. Primary and secondary data have been analyzed to assess the status of women in the DWASA service area, see [Supplementary Appendix K](#). The assessment shows gender gaps in male-female ratio, employment, income, education, household roles, and decision making. Water collection and water and sanitation management at the household level are traditionally female roles. Thus, women are vulnerable to health risks imminent due to deficiencies in water, hygiene, and sanitation in the households. Even though most people in Dhaka are served with DWASA water, the service level is not always adequate and much time is spent by the woman to collect and boil water for the household use. A Gender Action Plan is in [Appendix 16](#).

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1. Environment

137. An Initial Environmental Examination (IEE) has been prepared for the project following ADB's *Environment Policy* (2002) and *Environmental Assessment Guidelines* (2003). The IEE has assessed the environmental impacts of all infrastructure proposed by the DWSP and has concluded that all negative impacts will be successfully mitigated and that the project will deliver major benefits to the people of Dhaka. No further studies are necessary to address any uncertainties. Three types of further study are required however, to conform to the mitigation plan, and to comply with ADB policy and Bangladeshi law. These are:

- an EIA of river dredging and sand filling in the floodplain to determine whether sand dredged from the river can be used as infill in the pipeline trenches and whether waste soil from excavation can be deposited in the floodplain (see Table 3);
- separate IEEs of work proposed during each year of construction so that the impacts of any changes in the project can be assessed and mitigated;
- an EIA to comply with the Bangladesh Environmental Conservation Rules 1997, which classify the construction of water treatment plants and the laying of water distribution lines as red category activities for which an EIA is mandatory.

138. The project involves significant construction over 5 years in an overcrowded urban area so it is not possible to avoid all negative impacts. The IEE identified impacts as a result of project location, design, construction and operation. However, none are expected to be highly significant, and all can be mitigated by relatively straightforward measures.

139. Thus the findings of the IEE are that there should be no negative impacts from constructing or operating the infrastructure. This should mean that the overall impact of the project is highly beneficial, as once the infrastructure is in operation, the citizens of Dhaka will be provided with a constant supply of better quality water, which will serve a greater proportion of the population, including slum-dwellers. This should improve the quality of life of the people and benefit individual and public health by improving hygiene and reducing the incidence of water-borne disease. The salient points of the IEEs including impacts and risks and mitigation measures are summarized in [Appendix 17](#) (the full IEE is [in supplementary Appendix L](#)).

2. Involuntary Resettlement

140. To ensure compliance with the Government and ADB's policy and requirements on involuntary resettlement, a resettlement framework (RF) to guide the implementation of sub-projects has been formulated by DWASA. A summary of the RF is in [Appendix 18](#) while the main RF is in [Supplementary Appendix M](#). DWASA will prepare resettlement plans (RPs) for each year of implementation following the Government's *Acquisition and Requisition of Immovable Property Ordinance of 1982* (ARIPO amended in 1993 and 1994), ADB's *Policy on Involuntary Resettlement* (1995), and the resettlement framework (RF) for the Project. The Project is designed to minimize land acquisition and resettlement impacts. Most new construction and rehabilitation will be undertaken in Government land or within premises of existing facilities. Impacts due to the rehabilitation and expansion of water supply networks will be temporary and minimal, as these will be undertaken in road shoulders, and under roads should there be structures on the shoulders.

3. Indigenous Peoples

141. The Project provides social benefits through improvement and expanded access to water supply resulting in significant environmental and public health benefits. Social assessments undertaken do not indicate significant adverse impacts on vulnerable groups, and did not identify any indigenous people living in the project area. The RF provides additional entitlements to vulnerable APs including IP-headed households should vulnerable APs experience resettlement impacts.

C. Economic and Financial Benefits

1. Economic Benefits

142. The ADB-project is planned to be implemented throughout year 2008-2013, and to be in operation until around 2045. Investment cost is estimated in total to USD 860 million, and the project includes rehabilitation of the entire DWASA distribution and main network, and besides the establishment of one additional surface water treatment plant. The subject area for analysis is the DWASA service area, including slum, pocket and fringe areas now also to be serviced by piped supply as an impact of the project.

143. The water demand in the service area is driven upwards throughout the period by a succeeding growth in the number of inhabitants, and by the various commercial and public institutions that are providing services to the inhabitants. Hence, the number of inhabitants in the service areas is expected to grow from actual 8,6 million to around 29,4 million in years 2045.

144. Actual unit household demand is at average around 113 l/c/d, however much fluctuating across the service area due to varying conditions of supply, whereas tariffs at the present level is found to have no impacts on level of consumption. The quality of water supplied is in general below drinkable standard.

145. The household unit consumption is expected to increase in general on short-terms and to equalize across the service areas, until tariff incitements will return succeeding unit consumption level to stabilize on long-terms at around 125 l/c/d. Actual unit consumption of other consumer categories (e.g. commercial businesses and public institutions) are not assumed to change over time, and hence only to vary with the increasing number of such consumers.

146. The expansion of water consumption on short-terms is one impact of the ADB-project, since significant reduction in actual system loss and additional surface water treatment capacity will release more water for consumption, though part of the additional capacity is planned to reduce the quantity of water now supplied from the DWASA ground water sources. On mid to long-terms more surface water treatment capacity is required to ensure a satisfactory level of customer supply without increasing again the utilisation of ground water sources. Alternatively the growth in inhabitants in the service area has to be restricted on long-terms by the establishment of urban centres outside the area.

147. Part of the water consumers have to spend time on water collection from various out-house sources, and all consumers have to spend time on treatment of part of their supply to ensure a water quality at drinkable standard. Due to insufficient supply in part of the service area, moreover a significant proportion of consumers have found it convenient to install sucking pumps, though in particular the implied cost of electric power is extensive. Hence, whereas the unit cost of DWASA water supply is actual only around 7 BDT/m³, the overall unit cost inclusive of the said individual consumer processing is actual around 77 BDT/m³ for water supplied by DWASA, and around 90 BDT/m³ if accounting also for water supplied by other suppliers in the area. Due to the planned and later expected project improvements in the quantity and quality of water supply, these additional costs will decline significant on mid to long-terms, and the unit cost will consequently approach the unit DWASA cost of water supply on long-terms.

148. In economic terms the ADB-project is found viable with an internal rate of return meeting ADB requirements, even by the accounting for general uncertainty of long-term projection. 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.)

149. At the expected DWASA tariff and average unit consumption level of metered households this implies, that households in the serviced area will face no affordability problem. Hence, even in

the mid-term period as tariff is at the maximum level around 13-14 BDT/m³, households will only spend around 30% of the income part preferred / affordable for water service.

150. Accounting for the assumptions and expectations presented, the EIRR is found to be 11.5%, why the ADB-project meets the standard criteria. This EIRR estimate is most probable to be considered a conservative estimate, since not quantified key parameters if possible quantified definite would increase the EIRR estimate. The economic analysis is in **Appendix 19**.

2. Financial Benefits

151. The financial analysis presents a cost benefit analysis to determine the financial feasibility of the project and an assessment of the required tariffs. The major benefits considered are revenues due to (i) additional volume from recovery of non revenue water due to rehabilitation of the network and additional water sources, and (ii) increase in tariff. Incremental costs included investment costs as well as incremental operating and maintenance costs.

152. Financial internal rates of return (FIRRs) were computed for Component A and B, Component C and D, Component E, Component F and All Components. Table 1 shows the results of the FIRR and WACC calculations.

Table 1: Cost Estimates of Components Covered in Analysis

Components	Coverage	FIRR	WACC
Components A & B	Network and OHT rehabilitation and expansion, metering, capacity building	10.62%	3.75%
Components C & D	500 MLD SWTP and distribution mains	11.66%	3.69%
Component E	DTW and generators	130.79%	5.66%
Component F	Saidabad 2 and pre-treatment	7.73%	3.80%
All 6 Components	All works above	11.22%	3.75%

153. The table shows all Components to be feasible, and the entire project is feasible, with internal rates of return (IRR) significant higher than their respective WACCs. The lowest IRR is 7.73% for Components F (Saidabad 2 and pre-treatment) because of the high investment cost compared with the incremental volume of water generated. The highest IRR is 130% for Component-E (deep tubewells), understandably due to the low investment cost compared with the incremental volume of water. Three possible scenarios for all Components/ combination of Components (including 20% decrease in benefits, 20% increase in costs, and combination of 20% decrease in benefits and 20% increase in costs) were run for the sensitivity analysis. The project remains feasible under all scenarios.

154. The combination Component A & B was subjected to additional sensitivity analyses⁶ to test the project feasibility against operating risks. The analysis shows that the project is highly sensitive to non revenue water and tariff and the two components are no longer financial sustainable if the non revenue water is not reduced from the present 40% or the target tariff is not implemented.

⁶ The additional sensitivity analyses considered the following scenarios (i) NRW does not improve from the present 40%, (ii) collection efficiency does not improve from present 62%, (iii) only 50% of target tariff is implemented, and (iv) no tariff increase is implemented

3. Tariffs

155. The current tariff has the following major features: (i) a fixed rate per m³ of Tk 5.25 for domestic and community connections and Tk 17.50 for offices, commercial and industrial connections, (ii) a tariff structure consisting of one rate regardless of consumption block, and (iii) sewer tariffs set at 100% of the water tariff. The tariff structure does not encourage conservation of water. During the stakeholders workshop last August 14, 2006, other tariff structures like increasing block tariffs (IBT) were explored. Issues related to DWASA's lack of autonomy in exercising authority to approve tariffs were also discussed. More workshops to review the DWASA Act and to explore civil society's role in the sector are being planned. It is expected that a clear tariff policy can emerge from these workshops following a participatory approach.

156. The proposed tariff increases that will fully recover all costs (Cost Recovery Tariff) during the project implementation period are shown in Table 2. This is compared with two other levels of tariffs namely, (i) tariffs that will ensure that DWASA has sufficient cash equivalent to 2 months cash operating requirements (2 months cash O&M Tariff), and (ii) economic tariffs (Affordable Tariffs). Cost recovery tariffs require a tariff increase in 2007 to cover increase in costs (salary costs have increased by 40% as a result of a general salary upgrading). Tariff increases could however be postponed to 2008 if we only consider the cash requirement since DWASA still has a cash balance that could absorb the deficit in 2006.

Table 2: Proposed Residential Tariffs (Tk/m³, 2006 prices)

	2006	2007	2008	2009	2010	2011	2012	2013
Cost Recovery Tariff	5.25	7.88	7.88	7.88	8.66	8.66	8.66	12.56
% increase		50%			10%			45%
2 mos cash O&M Tariff	5.25	5.25	6.30	6.30	7.56	7.56	7.56	9.07
% increase			20%		20%			20%
Economic Affordable Tariff, Serviced area	44	45	46	47	48	49	50	51
Economic Affordable Tariff, Slums	41	40	39	38	37	36	35	34

Table 3: Proposed Increases, 2006 – and nominal prices (Tk/m³)

	2006	2007	2010	2013	2016	2019
% Increase		50%	10%	45%	5%	10%
Proposed Tariffs 2006 prices (Tk/m ³)						
Residential	5.25	7.88	8.66	12.56	13.19	14.51
Commercial/Industrial	17.50	26.25	28.88	41.88	44.97	48.37
Proposed Tariffs, nominal prices (Tk/m ³)						
Residential	5.25	8.27	10.53	17.67	21.48	27.35
Commercial/Industrial	17.50	27.56	35.10	58.91	71.61	91.20

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connections consuming less than 10 m³/month will not be affected by any tariff increase more than the normal 5% yearly increase.

Table 4: Proposed increasing block tariff (Tk/m³), 2006 and nominal prices

	2006	2007	2008	2009	2010	2011	2012	2013
2006 prices								
Tariff without project intervention	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25
Needed average tariff with project interventions	5.25	7.88	7.88	7.88	8.66	8.66	8.66	12.56
Proposed Increasing block tariff (IBT)								
Up to 10m ³ (basis)		5.25	5.25	5.25	5.25	5.25	5.25	5.25
More than 10 m ³ (average +15%)		9.06	9.06	9.06	9.96	9.96	9.96	14.44
More than 25 m ³								18.84
More than 50 m ³					12.99	12.99	12.99	25.12
Nominal prices (5% yearly increment due to inflation)								
Tariff without project intervention	5.25	5.51	5.79	6.08	6.38	6.70	7.04	7.39
Needed average tariff with project interventions	5.25	8.27	8.68	9.12	10.53	11.06	11.61	17.67
Proposed Increasing block tariff (IBT)								
Up to 10m ³ (basis)		5.51	5.79	6.08	6.38	6.70	7.04	7.39
More than 10 m ³ (average +15%)		9.51	9.98	10.49	12.11	12.72	13.35	20.32
More than 25 m ³								26.51
More than 50 m ³					15.80	16.59	17.42	35.34

The financial analysis of the project is [in Appendix 20](#).

V. FINANCIAL ANALYSIS OF DHAKA WASA

A. Past Performance

158. Based on Income Statement figures adjusted for unrecorded pension and power costs based on the Audit Report, DWASA's performance resulted in net losses for the years 2002 to 2005. The adjusted Cash Flow shows that DWASA has been generating cash surpluses but this was only possible because DWASA has been delaying debt service payments for most of its loans resulting in an accumulation of interests due which amounted to Tk1.6 billion in 2005. The key problems are high operating ratios (this has improved however from 98% to 93% in 2005), 40% NRW, and 62% collection efficiency on water accounts.

B. Projected Performance

159. The basis for the projection of DWASA's performance includes the investment program outlined in this report. DWASA will need to develop two more STWP's during the period 2014 to 2030. These, however, are not considered in the base scenario because the plans still need to be further studied. An additional real tariff increase of 35% will be required as early as 2022 if DWASA

construct the 2 additional SWTPs using commercial loans. If, on the other hand, the plants are not constructed, the average residential consumption will be reduced to 73 lcd by 2032 compared with current estimated demand levels of 150 lcd. It would be advisable for DWASA to prepare a long term strategic plan to develop sources beyond what is provided in the 2006-2013 Investment Program.

160. DWASA's financial performance is expected to improve significantly with the project, resulting from (i) reduction in NRW (from 40% to 25% in 2012), (ii) higher volumes of water sold, (iii) improvement in collection efficiency of water accounts (from 62% in 2005 to 95% in 2013) and the tariff increases mentioned above. DWASA will substantially build up its fixed asset base as a result of the Investment Program, with the addition of the project assets primarily funded by ADB and DANIDA loans. As a result, the debt equity ratio temporarily worsens during the critical years following implementation of the program (2013 to 2019). Although current ratios are at safe levels between 1.5 to 2.5 during this period, the quick ratios show that ending cash balances (after providing for full debt service payments for the current year) will barely be sufficient to cover current liabilities. Around 90% of current liabilities during these years consist of current maturing loans and interest payable. Beyond 2019, profits and cash flows are expected to become relatively stable.

161. A serious concern about DWASA financial management is related to its foreign borrowing and debt management procedures. Loan funds are usually re-lent by the Central Government to DWASA at higher interest rates and shorter maturity than those for the original loan. DWASA's audited financial statements report significant delays in repayment of loans. As a result, arrears in principal repayment resulted in a buildup in interest liabilities with subsequent increase in debt service. It is critical that DWASA achieves the tariff reform and operational targets (reduction of NRW and improvement of collection efficiency) to ensure that it is able to service its debt based on the recently updated repayment schedule of existing loans and that it is able to pay debt service on future loans under the Investment Program. Details of the financial performance of DWASA is included in [Supplementary Appendix N](#).

C. Major Risks and Safeguards

162. There are two primary risks to the project. The first is the lack of political will to implement reforms, including tariff changes. It should be noted that this was the reason why the WB in its evaluation of the 4th Dhaka Water Supply project classified it as not having been successful mainly because of the low commitment from the part of both the Government and DWASA management. The project will address this risk by requiring the essential reforms to be implemented before loan effectiveness, and requiring such implementation to be complete in order to qualify for the investments. The process of reform will be supported through aggressive public awareness campaigns as well as training and capacity building. Required reforms will be clearly spelled out in the project agreements as well.

163. Other risks to the project include: (i) substantial delays in project start-up due to delays in staffing the PMU and PIUs; (ii) inadequate capacity of the zones in project implementation; (iii) non-compliance with agreements and understandings reached during the Project; and (iv) corruption. These risks will be addressed through (i) assurances from LGD and DWASA that the PMU will be staffed as soon as possible and will begin initial project activities well before loan effectiveness; (ii) ADB and the Government cannot be held liable for its contents. (For project preparator/technical assistance, substantial consulting support to DWASA for project management and implementation; (iii) the involvement of NGOs and CBOs to ensure broader support for and commitment to project agreements and assurances at the local level; and (iv) requiring external audits of Project accounts, minimizing the number of contracts/procurements, establishment of a procurement

disclosure web-site, and close involvement of civil society in all project aspects to add significant transparency to Project processes.

VI. ASSURANCES

164. In addition to standard assurances, the Government has given the following Project specific assurances, which will be incorporated in the legal documents:

- (i) The Government will provide counterpart funds for the Project implementation on time. The PMU DWASA will make timely submission of annual budgetary appropriation request and ensure prompt disbursement of appropriated funds during each year of Project implementation.
- (ii) Before the loan Effective Date, the existing training center at DWASA will be revived by filling in all the vacant positions with qualified training people from outside DWASA;
- (iii) The Government and DWASA will ensure that it will not approve any sub-project that involves significant involuntary resettlement according to ADB's *Policy on Involuntary Resettlement* (1995). The Government will further ensure that all land and right-of-way required for the Project will be made available in a timely manner and adequate compensations have to be paid to affected people prior to any civil works contract's award. Any involuntary resettlement will be carried out in accordance with the Resettlement Framework (RF) agreed upon between the Government and ADB, and ADB's *Policy on Involuntary Resettlement* (1995). A Resettlement Plan (RP) will be prepared for each contract involving land acquisition or resettlement and will be submitted to ADB for review and approval prior to any related civil works contract's award. Draft RPs and updated draft RPs will be disclosed to affected people prior to submission to ADB for review and approval.
- (iv) To ensure that women benefit equally from the Project and interventions avoid gender bias, the Government and DWASA will ensure that the Project will be carried out in accordance with ADB's *Policy on Gender and Development* (1998) and the gender strategy contained in the Gender Action plan that has been prepared and agreed between the Government and ADB.
- (v) The Government will ensure that design, construction, operation and implementation of the project facilities will be carried out in accordance with the environmental assessment and review procedures and IEE for the project as agreed between the Government and ADB, and complies with the Government's environmental laws and regulations and ADB's *Environment Policy* (2002) and *Environmental Assessment Guidelines* (2003). Any adverse environmental impacts arising from the construction, operation and implementation of the project facilities will be minimized by implementing the environmental mitigation and management measures, and other recommendations specified in environmental assessment report. The Government will ensure the satisfactory preparation and implementation of the asbestos management plan and other safety plans, and that qualified and competent personnel will be recruited to carry out the work. The Government will ensure environmental requirements will be incorporated in bidding documents and civil works contracts.
- (vi) Although the Project does not envisage any adverse impact on indigenous peoples, the Government and DWASA will ensure the subprojects will be prepared and implemented in

accordance with ADB's *Policy on Indigenous Peoples* (1998), in order to increase the quality and access of water supply and sanitation received by indigenous peoples.

- (vii) The Government will cause each of the zones to carry out a Project Performance Monitoring and Evaluation (PPME) program. The PIU in each zone will be responsible for ensuring that a comprehensive program for PPME acceptable to ADB is carried out to (i) examine the Project's technical performance; (ii) evaluate the delivery of the planned facilities; (iii) assess the achievement of the Project's objectives; and (iv) measure the Project's social and economic benefits.
- (viii) Not later than six months as of loan Effective Date, the PMU will conduct initial baseline physical and socioeconomic surveys and submit a detailed implementation plan for monitoring performance and for preparing benchmark information to ADB, for review and concurrence. Throughout Project implementation period, annual PPME reports will be prepared by each PIU, consolidated by the PMU and submitted to ADB.

B. Possible Conditions for Loan Effectiveness

165. Prior to Loan Effectiveness, the following will have been completed:

- (i) The Government will have established a PMU within DWASA, headed by a Project Coordinator and three full time Project Directors and fully supported by key technical, accounts and finance staff;
- (ii) The Government will have established a Steering Committee, chaired by the Secretary of Local Government Division and consists of the Managing Director DWASA; Project Coordinator, DWASA; and the Project Director of PMU; representative from DCC; representatives from the ERD; representative from the Finance Division of the Ministry of Finance; and representative of the Planning Commission.
- (iii) A draft Agreement and a draft Subsidiary Loan Agreement, in the form and substance acceptable to ADB, shall have been submitted to ADB.
- (iv) DWASA will have issued an office order stating that all future service connections will be constructed according to certain standards using specified materials by contractors enlisted by DWASA and supervised by DWASA engineers.
- (v) The Government has approved the Rules for the implementation of the WASA Act 1996.
- (vi) The Government has approved the revised tariff structure as outlined in appendix 20
- (vii) The Government has prepared and endorsed Policy Statement in consultation with ADB
- (viii) The Regulatory Commission has been established and is functioning
- (ix) Approval of proposed DWASA organogram by GOB
- (x) Recruitment of MD and DMDs

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