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BANGLADESH SITUATION ANALYSIS WATER SUPPLY AND SANITATION

SEPTEMBER - 1994



LOCAL GOVERNMENT DIVISION
MINISTRY OF LOCAL GOVERNMENT,
RURAL DEVELOPMENT & COOPERATIVES



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WATER AND SANITATION PROGRAM



***Bangladesh
Situation Analysis
Water Supply and Sanitation Sector***

September 1994

***Local Government Division
Ministry of Local Government, Rural Development & Cooperatives
United Nations Development Programme
United Nations Children's Fund
UNDP/World Bank Water & Sanitation Program***

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The views expressed in the document are those of the authors and do not necessarily reflect the views of UNDP, UNICEF, UNDP/World Bank RWSG-SA, or MLGRD&C.

Foreword

In the last decade Bangladesh has achieved commendable success in provision of water supply for its people. Over 85% of the rural and half the urban population have access to safe water. Though sanitation coverage lags behind, progress between the 80s and 90s has been significant with rural sanitation coverage increasing from 1% to 33% and urban from 22% to 42%. Despite improvement in service levels there is little respite from water borne diseases. Interventions have not yielded measurable improvement in general health and well being of the people.

Water Supply and Sanitation (WSS) Sector still suffers from a poor understanding of the health benefits of WSS services. There are still pockets of under-served rural areas and the absolute number of urban poor without services is on the increase. Low cost recovery, relatively high subsidy for services, and low community participation, challenge long term sustainability of WSS service provisions.

At this point in time, towards the close of the Fourth Five Year Plan, when we are contemplating the next plan, it is only proper that we reflect on our past, learn from our successes and failures, and assess our strengths and weaknesses. It is through exercises, such as this, that we can establish our priorities, adopt policies and strategies; and formulate a holistic sector development framework on which all future interventions will be based.

We appreciate the assistance of UNDP, UNICEF and the UNDP-World Bank Water Sanitation Program in undertaking an analysis of the situation to help the government formulate a National Program Document for the WSS Sector. It is through mutual support and cooperation that we can complement each others efforts, adopt realistic policies and strategies, and use our scarce resources cost-effectively to advance the objectives of the WSS sector.



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List of Abbreviations

ADAB	Association of Development Agencies in Bangladesh
ADP	Annual Development Program
ADB	Asian Development Bank
BBS	Bangladesh Bureau of Statistics
BRAC	Bangladesh Rural Advancement Committee
CBO	Community Based Organization
CC	City Corporation
CCC	Chittagong City Corporation
CDA	Chittagong Development Authority
CWASA	Chittagong Water Supply and Sewerage Authority
DANIDA	Danish International Development Agency
DCC	Dhaka City Corporation
DIFPP	Dhaka Integrated Flood Protection Project
DPHE	Department of Public Health Engineering
DS	Deep Set
DTP	District Town Project
DTW	Deep Tubewell
DWASA	Dhaka Water Supply and Sewerage Authority
ESA	External Support Agency
FYP	Five Year Plan
4FYP	Fourth Five Year Plan
FUDP	First Urban Development Project
GDP	Gross Domestic Product
GOB	Government of Bangladesh
HML	Home Made Latrine
HRD	Human Resources Development
HTMP	Handpump Training and Monitoring Project
ICDDR,B	International Centre for Diarrhoeal Disease Research, Bangladesh
IDA	International Development Association
IDB	Islamic Development Bank
IDWSS	International Drinking Water Supply and Sanitation
IMGD	Imperial Million Gallons Per Day
IRP	Iron Removal Plant
JICA	Japan International Cooperation Agency

KCC	Khulna City Corporation
LGED	Local Government Engineering Department
LGD	Local Government Division
LGRD&C	Local Government, Rural Development & Cooperatives
LTIP	Long Term Investment Plan
LWT	Low Water Table
MIS	Management Information System
MLD	Million Litres Daily
MLGRD&C	Ministry of Local Government, Rural Development & Cooperatives
MPO	Master Plan Organization
NGO	Non Government Organization
O&M	Operation and Maintenance
PIU	Project Implementation Unit
PPM	Parts Per Million
PSF	Pond Sand Filter
RAJUK	Rajdhani Unnayan Karttripakha (Capital Development Authority)
RCC	Rajshahi City Corporation
R&D	Research and Development
SAE	Sub-Assistant Engineer
SDC	Swiss Development Cooperation
SIP	Slum Improvement Project
SSP	Strategic Sanitation Planning
SST	Shallow Shrouded Tubewell
STW	Shallow Tubewell
SWM	Solid Waste Management
SWT	Shallow Water Table
TAPP	Technical Assistance Project Proforma
TOT	Training of Trainers
TWM	Tubewell Mechanic
UNCHS	United Nations Centre for Human Settlements
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
VIP	Ventilated Improved Pit
VSST	Very Shrouded Shallow Tubewell
WASA	Water Supply and Sewerage Authority
WHO	World Health Organization
WSS	Water Supply and Sanitation

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Executive Summary

1. This situation analysis of the water and sanitation sector was prepared as the first stage of a three stage process; the analysis includes a review of sector strategies and on-going activities, analysis of achievements and identification of the issues and constraints in the sector. In the second stage of the process, a national workshop was held to identify strategies for the sector for the period 1996-2000. The third stage consists of the formulation of a national program document which outlines and prioritizes national objectives and future developmental activities, and identifies the resource requirements and potential implementors.

Background

2. With an area of only 144,000 square kilometres and a population of 111 million, Bangladesh is one of the most densely populated countries of the world. It is a low-lying fertile deltaic region criss-crossed by numerous rivers and subject to flooding. The population is growing at about 2% per annum, and the urban population at nearly 5%. Currently, the urban population accounts for about 17% of the total population. It is one of the least well-off countries in the world, with a per capita income of US\$210. Over the period 1980-90, the growth rate of GDP was 4.3% per annum.

3. Bangladesh has made tremendous strides in improving access to safe water; half the urban population and nearly 90% of the rural population are reported to be served by a safe water supply. However, water related diseases remain the major cause of mortality and morbidity in Bangladesh. Sanitation coverage is still low; coverage has risen from 20% to 42% in urban areas during 1981-92 and from 1% to 33% in rural areas. While these figures confirm that there has been substantial progress over the last decade, service provision, particularly in urban areas, has been inequitable with disadvantaged social groups being less well served, and the absolute number of people without services in urban areas increasing due to the rapid growth of the urban population.

4. Interventions in the sector have not resulted in significant improvements in general health. From 122 deaths for every 1000 live births in 1981, the infant mortality rate has come down by only 12 to 110 in 1990. The incidence of diarrhoeal diseases persists at a high level. Sanitation coverage, both in the urban and rural areas, is still low and so is the general awareness on the linkage of water, sanitation, and hygiene habits to good health. Despite the general availability of potable water in adequate quantity in rural areas, use of tubewell water for all domestic purposes is limited to only about 16% of the population.

5. The trend in urban population distribution is towards an increasing proportion of slum dwellers and squatters. Most of the migrants to urban areas are poor and without marketable skills. They contribute little to the municipal revenue but nevertheless increase pressure on existing services. Although 77% of the total investment in water supply and sanitation over the period 1981-90 was in the urban areas, slum dwellers and squatters have a relatively low level of service provision with only 30% having access to piped water supply and 20% to sanitary latrines.

6. In 1991, the water table was within eight metres of ground level in about 75% of the country but is gradually falling due to excessive abstraction for irrigation. Increased demand on a

limited water resource requires improved mechanisms for allocating that resource if needs are to be met and excessive investments in water supply are to be avoided. In 70% of the country, groundwater has an iron content in excess of the recommended maximum of 1 ppm. Surface water is generally unsafe for drinking due to high levels of pathogens, and turbidity during the monsoon. In the coastal belt, surface water is brackish, and groundwater suffers from saline intrusion.

7 Drinking water and sanitation programs have been implemented primarily by government agencies in the past. The commitment of the present government to ensuring peoples participation in the decision making process and development activities could create greater opportunities for demand based participatory design and implementation in the sector. Public programs have been stimulating a demand for services to which the private sector and NGOs are responding. The private sector's contribution to service coverage has been significant with about 66% of all tubewells in private ownership. More than half the latrine production centers in the country are private and about half the rural sanitation coverage has been achieved through the private sector including NGOs. There may be scope for restructuring government programs to utilize and further develop the capacity of the private sector and NGOs to deliver goods and services.

8. The Constitution states that local government bodies should be composed of elected members and be vested with the necessary powers including imposition of taxes and levies, and preparation of their own budgets. A revised local government system has been developed based on the Union Parishad (Union Council) at the grassroot level, the Zila Parishad (District Council) at the district level and City Corporations and Pourashavas (municipalities) for the urban areas. Gram Unnayan Committees (Village Development Committees) are being established in each village and they will, among others, be responsible for formulation and implementation of development projects. Thana Unnayan Samannaya Committees (Thana Development Coordination Committees) will coordinate development activities between the Union Parishads, Zila Parishads and the national government agencies.

Institutional Aspects

9. **Objective.** The fundamental institutional objective is to develop institutions which provide effective and sustainable services. In general, this requires a sharing of responsibilities between central agencies, local governments, NGOs, the private sector and communities themselves, as well as accountability to consumers. Each institution should have a well-defined and limited set of objectives so that it can organize its activities, its performance can be monitored, and changes made in the case of shortfalls.

10. The **statutory responsibility** for the water supply and sanitation (WSS) sector is vested in the Ministry of Local Government, Rural Development and Co-operatives (MLGRD&C). The functional responsibility is delegated to the Department of Public Health Engineering (DPHE), the Local Government Engineering Department (LGED), the city corporations (CCs), the pourashavas and in Dhaka and Chittagong, the Water and Sewerage Authorities (WASAs). **DPHE** is responsible for planning, designing and implementing water supply and sanitation services in rural and urban areas except the cities of Dhaka and Chittagong. **LGED** is responsible for urban and rural infrastructure development. Its activities in drainage, solid waste management and rehabilitation of water supply overlap with the responsibilities vested in DPHE.

11. **Urban Institutions.** Urban areas vary in their institutional capacities and responsibilities. **Dhaka WASA** is responsible for water supply, subsurface drainage and sewerage, while **Chittagong WASA** deals only with water supply. **Dhaka City Corporation** is responsible for solid waste management (SWM) and implementation of on-site sanitation, whereas **Chittagong CC** is also responsible for drainage. Rajshahi and Khulna CCs are responsible for drainage, SWM and maintenance of water supply provided by DPHE and LGED. The **pourashavas** are responsible for SWM and maintaining a sanitary environment within their boundaries. Provision, operation and maintenance of water supply is a statutory responsibility of pourashavas but they have limited technical competence and rely on DPHE (or LGED) for design and construction.

12. Despite the responsibilities vested in the WASAs and in the pourashavas for water supply and sanitation, they lack sufficient autonomy to take important decisions on planning, implementation, tariff, staffing and other aspects of service provision. Tariffs have to be approved by central government and do not reflect the cost of water production. Although established under an Ordinance and having a board of members, the Dhaka and Chittagong WASAs do not operate on a commercial basis or as economic units. Government is in the process of addressing these issues through a series of institutional reforms in preparation for the proposed IDA Fourth Dhaka Water Supply Project. The reforms include reconstituting the DWASA Board with members drawn from both the public and private sectors, redefining the Board's role on policy matters relating to corporate planning, tariff setting, appointment of staff and remuneration, and making management accountable for meeting operational and financial targets.

13. **Urban Sanitation.** Because of its high cost, and also the potential for epidemic and economic loss, urban sanitation deserves concentrated attention and a clearly articulated government policy. The institutional (and technical) issues involved in improving sanitation are more difficult than those for water supply. Not only is there a need to deal with supply inefficiencies, as with water, but also to promote demand. Sanitation is not so well-suited to utility supply as water and the range of institutions which must be involved for a satisfactory outcome is also larger. Lack of land tenure and other issues in informal squatter settlements create formidable problems for sustainable service provision. Experience elsewhere suggests that consideration be given to a demand oriented planning approach which includes matching supply and demand in a potentially sustainable set of institutional, technical and financial choices.

14. **Rural Institutions.** DPHE has for many years been the dominant agency in the rural subsector. However, the role of **Zila, Thana and Union Councils** has undergone a change in the new local government system. They now consist of locally elected leaders and are dependent on the technical support of various government agencies for planning and execution of projects. The Union Parishad also plays an important role in creating awareness on environmental sanitation. The introduction of the new local government system is expected to move some of the focus from DPHE (and its engineering orientation) to elected local bodies like the Union Parishads, which are beginning to play an important role in hygiene education and community mobilization as well as in the formation of Union Water and Sanitation Committees. The new local government system is allocating a minimum number of female representatives in the various parishads. This will strengthen women's involvement in the sector but the social status of women and the fact that sector agencies are almost exclusively a male preserve are likely to inhibit their involvement.

15. Provision of water services is channeled through the Union Water Supply and Sanitation Committee. Allocation of new tubewells is based on a set of selection criteria and the tubewell is installed by contractors engaged by DPHE. Communities participate in the selection of the site and make a cash contribution depending on the type of handpump installed. Operation and maintenance of handpumps are the responsibility of the users; spares are bought at cost price from DPHE stores and caretakers undertake minor repairs. Major repairs are done by DPHE or private sector mechanics. In summary, while the government's policy has been successful in achieving physical targets, the highly subsidized service provision and the continued public involvement in operation and maintenance through the sale of spare parts and the free provision of DPHE mechanics, may jeopardize sustainability.

Institutional Issues

16. **Reorientation or Transformation.** At the pourashava level, DPHE takes responsibility for planning and implementation of pourashava water and sanitation schemes. Despite the presence of local DPHE offices, the centralized administrative structure of DPHE coupled with the weak managerial, financial, technical and communication skills of the pourashava has often resulted in inadequate consultation between DPHE, the pourashava and the local community. Under these circumstances, the pourashava does not identify strongly with the scheme and subsequently provides poor maintenance and consumer service. The recent legislative changes in the local government system, designed to facilitate greater local autonomy, will help in addressing this issue but there is a clear need for DPHE to have less of a direct implementation role and more of a supporting and facilitating role, providing effective and efficient technical support and training to local authorities in implementation, operation and maintenance.

18. While several studies have raised this issue and at least two major projects (assisted by the Dutch Government and ADB respectively) are addressing it, there are strong incentives for DPHE to maintain its current mode of operation. A move from implementator to facilitator would involve loss of control over construction contracts, more accountability to local authorities and a major change of attitude on the part of DPHE staff. Such far reaching reform can not be brought about from within DPHE and must be done as the result of a policy decision at high level within government.

19. At the field level, some projects are at present exploring the use of DPHE tubewell mechanics and masons at the latrine production centres as hygiene educators and promoters but masons and mechanics are trained in their respective technical skills and not in health education and communication. Collaboration with the Thana health sections has been considered but never implemented. Motivation and hygiene education should focus on reaching populations, particularly women, through a participatory approach and it is questionable whether male tubewell mechanics and masons are likely to be effective agents.

20. **Planning, Monitoring and Information Systems.** Sector planning lacks both comprehensive policy guidance as well as mechanisms to facilitate participatory planning at the local level. In consequence, planning is project based and suffers from duplication, misplaced priorities, and uncoordinated development. Agencies prefer and are geared to meet physical targets rather than to establish and monitor processes for reaching goals relating to facility operation, utilization or maintenance. Manual information processing impedes timely access by sector agencies to reliable data.

21. **Water quality monitoring and surveillance** is limited, as laboratories lack adequate resources and regulatory power, and municipalities are unable to enforce rules and regulations to ensure a minimum standard of water quality. Contamination of piped water due to intermittent supply and leakages in water mains is a constant threat to general health. The commitment, initiative and interest in establishing a systematic water quality monitoring and surveillance system has not been demonstrated.

Technology Issues

22. **Water Supply Technologies.** Analysis of groundwater levels suggests that groundwater will be within the suction limit of eight metres in 65-70% of the country by 2000 compared to the current 75%. Although this is a relatively small change in terms of percentage, more than one hundred thousand suction handpumps are likely to be affected since the total number of rural handpumps is about 2.5 million. Urban communities relying on shallow wells and suction pumps will also be affected. The economic benefits of current and proposed levels of abstraction for irrigation must be weighed against the costs of the deeper tubewells and new pumps required to maintain potable water supplies.

23. **Sanitation Technologies.** Sanitation programs are largely limited to on-site options and exclude intermediate technology options that may be both cost effective and more suited to user preferences as well as willingness and ability to pay. DPHE provides "slab-plus-one ring" latrines at the subsidized price of Taka 125 per latrine through its latrine production centers. In spite of this subsidy policy, 50% of latrines are constructed by private sector producers. Latrines are often abandoned due to poor construction or because the pit is full, and the owner reverts to traditional defecation habits. Issues regarding the level of subsidy (and its effect on the private sector) and the importance of sanitary disposal need to be addressed.

24. **Operation and maintenance** status vary by technology. The private sector has responded well to demand for maintenance of suction handpumps but has not yet developed capacity for providing services for Tara handpumps, which are relatively newer. In urban areas, piped water supplies are susceptible to contamination. Many municipalities have been unable or unwilling to manage system O&M. Inadequate monitoring and preventive maintenance have resulted in premature abandonment of urban water production wells. Environmental sanitation is generally poor as solid waste management and drainage are seen as municipal functions with no community responsibility. Yet municipalities have limited management capacity or commitment to improve sanitation conditions.

25. **Service Coverage.** Despite the overall gains in water supply coverage, disparities remain within urban areas and within and between regions. The poor are less well served. The coverage in the saline zones and the low water table areas is much lower than the national average. Despite the urban bias in sector investments, water supply coverage in the urban areas is lower than in the rural and inequities in service coverage exist both among and within urban centres. Drainage system development, except in large urban areas, is incremental, disjointed, and biased toward construction at the expense of operation and maintenance.

26. **Research and Development** has won relatively little priority, with primary focus on technical issues and less attention on user behavior and preferences. Investigations are planned or underway to assess groundwater pollution from flooded latrines and to evaluate home-made latrines for

their appropriateness. Modifications of de-sanding techniques for clogged wells are also being tried. A national survey of latrine producers is likely to be undertaken. Field testing of thinner latrine pit liners has been initiated. Applied research is needed to improve traditional WSS options, to investigate user attitudes towards technology options and reasons for non-use, and to investigate new energy sources such as solar power. Further research is needed for the modification of iron removal plants, improvements in pond sand filters, and greater accuracy in identifying aquifers with lower iron content.

Financial Issues

27. Improving **resource mobilization and pricing** of water in the urban areas is urgent for four major reasons:

- a. adequate funding for operation and maintenance is a necessary condition for adequate water and sanitation services, whatever the investments made;
- b. water pricing is an efficient demand management tool;
- c. the current subsidized water supplies are inequitable, frequently not benefiting the poor; and
- d. given resource scarcities, there is simply not enough funding for all desirable (and economic) schemes unless beneficiaries themselves contribute more of the costs.

28. **Cost recovery** for urban water supply and sanitation services is inadequate to meet the operation and maintenance costs. Water rates are not related to production costs and consumption from street hydrants is mostly free. The unaccounted for water in all urban centres is unacceptably high, ranging from 40 to 70% of the water produced; a significant proportion of this water loss is "administrative loss", which is a euphemism for under-billing, non-billing and theft. The lost is covered by government grants, deepening and encouraging the cycle of dependency and inefficiency. In rural areas, user contributions for installation of public pumps have gradually increased to about 10% of the cost. The cost of spare parts is generally borne by the users although the services of DPHE tubewell mechanics are free. The arguments for the users paying the full cost of operation and maintenance and an increased share of installation cost are similar to those listed above for the urban subsector.

29. **Private Sector.** For several years public programs have been stimulating a demand for services to which the private sector is responding. Private sector's contribution to service coverage has been significant with about 66% of all tubewells in private ownership. More than half the latrine production centers in the country are private and about half the rural sanitation coverage has been achieved through the private sector including NGOs. There may be scope for restructuring government programs to utilize and further develop the capacity of the private sector to deliver goods and services.

30. **Resource allocation** has been skewed toward urban sectors, which have less than 20% of the population, and toward water supply. Greater efforts to make urban water systems more financially sustainable may permit allocation of scarce resource more equitably. The attainment of relatively high water coverage may now signal that it is time to dedicate a higher proportion of resources to sanitation than in the past.

Social Issues

31. **Women as Managers and Users.** Women's needs relate not only to their personal use but also to their role as managers of family water and hygiene. Bangladesh is in the unusual position of having water available but not availed; the time and physical effort required to haul tubewell water into the household from across the village makes surface sources nearer the household a handy but unsafe alternative. Until the cost in time and energy is more equal to the perceived benefits of tubewell water for all purposes, surface water will continue to be used as a major source of supply. Women's desire for and use of latrines, for themselves and for disposing of young children's waste, is based on convenience and privacy rather than perceived health benefits, although latrine promotion has aimed at stimulating consumers' health concerns.

32. **Social mobilization** at the community level has recently been adopted as a major strategy by the government in the promotion of water and sanitation services. This requires a degree of decentralization which may be difficult to achieve consistently across time and space. Yet the effectiveness of this strategy is evidenced by the wide range of NGOs active in the WSS sector, and may be particularly important in identifying and reaching the poorest users.

Sector Coordination

33. Planning in the sector is project based and target oriented, with success evaluated in terms of physical achievements alone. Planning lacks a holistic approach and is not based on any sector plan or strategic framework. Duplication of effort, misplaced priorities and mutually contradictory, donor driven strategies are common.

34. As external assistance from bilateral and multilateral donors currently amounts for about 60% of the investment in the sector, it is essential that the donors cooperate with each other in assisting the Government to define appropriate policies and to find areas in which donors can support each other and the Government. The costs of such actions are not trivial and should be paid by the donors.

35. Donors also have a responsibility, once certain policy lines are clarified and agreed, to take all actions necessary to ensure that these directions are followed. The past practice of embarking on major investments and hoping that policy and institutional improvements could be secured in parallel has not worked and should be discontinued. Past poor performance by Government in meeting financial objectives has been encouraged by the willingness of donors to continue funding activities despite defaults.

1

Introduction

A. Purpose

1. This situation analysis of the water and sanitation sector has been prepared as the first stage of a three stage process. The analysis includes a review of sector strategies and on-going activities, analysis of achievements and identification of the issues and constraints in the sector. In the second stage of the process, a national workshop will be held to identify strategies for the sector for the period 1996-2000. The third stage will consist of the formulation of a national program document which will outline and prioritize national objectives and future development activities, and identify the resource requirements and potential implementors.

2. Development programs in Bangladesh take place within the general policy framework of the five year development plans. The policies and strategies for water supply and sanitation sector development are discussed in this situation analysis in terms of the Fourth Five Year Plan (4FYP). Among other things, the 4FYP emphasizes several shifts: (1) a gradual shift of the public service delivery agencies from being "providers" of services to "facilitators" for clients (individuals and agencies), (2) particular attention to human resource development within agencies, (3) involvement of communities in planning and implementing development programs, (4) bringing women into the main development streams, (5) mobilization of local resources, (6) encouraging and supporting the growing contribution of the private sector to development efforts, and (7) restructuring and re-orienting administrative organizations to make (1) through (6) possible.

3. In line with the goals of the 4FYP, this analysis draws on a number of recent documents which discuss the need for a reorientation or reform of the water and sanitation sector, particularly to improve the sustainability and replicability of projects (Churchill 1987; World Bank 1990; UNDP 1991; Matrix 1993). The need for a more client-oriented approach in the WSS sector has been clearly identified to improve use of facilities, project sustainability, and cost recovery. The analysis focuses on evaluation of the current situation in terms of its suitability for adopting such an approach and identifies areas in which changes are needed to be compatible with a client-centered approach. One such area is in the incorporation of women as agents of change and managers of water. Particular attention is paid to institutional and financial issues in improving sustainability, cost recovery, and improved use.

B. Country Profile

1. Economic

4. With an area of only 144,000 square kilometers and a population of 111 million, Bangladesh is one of the most densely populated countries of the world (UNDP 1993). In this semi-tropical, predominantly rural country about 48% of rural and 44% of the urban population live below the poverty line, a reduction by almost half from 15 years ago (BBS 1993). Per capita gross national product in 1991 was US\$220 (World Bank 1993). Households spend 59% of their income on food, and 60% of children below 5 years of age are malnourished (World Bank 1993).

5. The annual growth of the gross domestic product in the 1980-91 period exceeded the population growth rate and averaged 4.3%, an increase from 2.3% in the previous decade (World Bank 1993). While agricultural production averaged 2.6% growth annually during that period, its share shrank from 55% to 36% of GDP, while industry grew from nine percent to 16% and services from 37% to 48% (World Bank 1993).

2. Demographic Trends

6. The population in 1991 was approximately 111 million, and is expected to grow to 131 million by the year 2000. The overall growth rate has dropped from 2.7% in 1970-1980 to 2.2% between 1980-1991. The urban population has been growing faster than the rural population due to migration, increasing from eight percent of the population in 1970 to 17%, or 21.6 million people, by 1991 (World Bank 1993). About 48% of the urban population live in Dhaka, Chittagong, Khulna and Rajshahi, and 40% live in the 108 pourashavas (towns with municipal administrations).

3. Water Conditions

7. Bangladesh is a fertile deltaic region criss-crossed by numerous rivers and subject to periodic and occasionally catastrophic flooding. The hydrology of Bangladesh is characterized by three major international rivers: the Brahmaputra, the Ganges and the tributaries forming the Meghna. Surface water availability varies by region according to rainfall and storage capacity in streams, ponds and lakes. About 37% of the country is permanently or intermittently inundated during the monsoon up to a depth of 30 cms or more.

8. Rainfall is abundant but seasonal. About two thirds of the annual rainfall evaporates and 15% percolates into the ground, raising the water table close to ground level. In the dry season, flood water recedes and ponds and water tables fall, but the general availability of water has remained high in most of the country. However, irrigated agriculture during the dry season draws heavily on groundwater resources, and every year sees the addition of new areas to those affected by low water tables, rendering shallow wells dry.

9. Sand and clay soils which predominate in the country provide a natural filter which rapidly attenuates bacterial contaminants and creates a vast reservoir of potable groundwater for relatively cheap extraction. Although well water is favored for drinking, surface water is the traditional and more convenient source of supply for other uses, and much is polluted with human waste (World Bank 1990).

10. Despite the country's relatively small size, water availability and quality vary and tubewells are not distributed evenly among the regions. In the north, usually spared the severe flooding of the south, groundwater tables are generally shallow but not overly close to the surface. Under these conditions handpumps and latrines are suitable technologies and tubewell coverage is approximately 85% (UNICEF 1993c). In some areas groundwater tables have dropped significantly and require tubewells fitted with lift mode (Tara) pumps; one such tubewell is available for every 380 persons (UNICEF 1993c). Low water tables are becoming more common, from 8% of the country in 1985 to an estimated 50% by the end of the century (UNDP 1991). In the coastal areas, upper aquifers are often saline, usually requiring deep tubewells to reach sweet water, although some potable pockets of shallow aquifers have been tapped with handpumps (GOB-Netherlands 1986). These areas are also underserved. Annual flooding poses a difficult problem for sanitary latrines.

C. Women, Water and Sanitation

11. Women are the prime beneficiaries of water and sanitation projects. It is their productivity and their impact on family health which are most affected by improved access to clean water. Understanding their needs as managers and as water users is important to program success. However, gaining this understanding requires conscious effort to reach women and involve them in projects from the first step, as women operate under constraints not shared by men.

12. Equal rights guaranteed under the constitution are undermined by civil laws originating from a patriarchal interpretation of socio-cultural norms. Female mobility outside the home is restricted by cultural traditions. Women's status and disadvantages are consistently reflected in statistical data. Cultural practices limiting women's access to sufficient food deprives them of energy needed to meet their various responsibilities (World Bank 1990). More than half of the poor population is female (World Bank 1989). Mortality rates of female infants are higher than that of males, and life expectancy of women is lower than for men (World Bank 1993). Female children have about three times the rate of malnutrition as males (World Bank 1990). Seventy-eight percent of women are illiterate and women are paid lower wages than men (World Bank 1993).

13. It is women who are already investing their time and labor to bring water to the household. Projects which increase their time and labor requirements, such as projects in which fetching tubewell water is more costly in time and labor than scooping up water from a nearby surface water source, will succeed only to the extent that women see a compelling reason, and are able, to make a higher investment in water.

14. Women's productivity is underestimated, which consequently undervalues the labor-saving benefits of water projects. Their participation in projects and their utilization of water and sanitation facilities must take into account the value of women's time and the opportunity costs of participation. Much of women's labor is unreflected in national income accounts as it is largely unpriced and uncompensated home-based labor (World Bank 1990). Their tasks include cooking, cleaning, washing, collecting fuel and water, rearing children, caring for the sick, raising fruits, vegetables and livestock, and processing field crop production. In 25% of rural landless families female earnings are responsible for food security. Among male-headed households with female wage earners, female earnings contribute 25% to 50% of family income (World Bank 1990). Non-recognition of their myriad contributions to the economy and household impedes informed decision-making about resource allocation in development planning.

15. The Fourth Five Year Plan (4FYP) recognizes the importance of bringing women into the mainstream of development. Many programs administered by NGOs and community based organizations emphasize benefits for women. About 94% of Grameen Bank beneficiaries are women, many of whom use their credit to purchase tubewells (Khandker *et al.* 1993). There are many NGOs, such as Banchte Shikhi in Jessore, that are founded and managed by women. These provide models for reaching women in water and sanitation programs.

D Health and Hygiene

16. Despite the growing access to safe drinking water, water-related diseases remain a common occurrence in Bangladesh. Infant mortality rates persist at a high level with 103 deaths per 1000 live births in 1991, down from 140 in 1970 (World Bank 1993). In 40 of the 50 common diseases prevalent in Bangladesh, including diarrhoea, dysentery, typhoid, worm infestation, measles, and poliomyelitis, unsafe water and human excreta are the main elements of transmission. Gastroenteritis and diarrhoeal diseases kill 250,000 children below 5 years of age annually and sap the vitality of young and old. In 1989 alone 79 million episodes of diarrhoeal diseases were reported (UNICEF 1991).

17. Intervention in water supply and sanitation sector is premised on the concept that improved access to these facilities will improve health. Research provides some support for this. One study suggests that risk of post-natal mortality (between one month and one year of age) is three times greater in families without latrines (Rahman 1985). In communities that were exposed to hygiene education through home visits, access made a difference: incidence of diarrhoea in children living within 150 meters of handpumps was nearly half the incidence in those living more than 150 meters away, suggesting the importance of convenient safe water for handwashing and other hygienic uses (ICDDR,B 1985).

18. Yet access alone may have little impact on health in the absence of other factors influencing the use of those facilities. One factor influencing their use may be understanding of personal hygiene. "The principal contribution of improvements in water supply and excreta disposal is not so much to eliminate inadvertent exposure to diseases as to facilitate improvement in domestic and personal hygiene that in turn will interrupt numerous pathways" (Golladay and Feachem 1984). Research conducted by the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) in an area where intensive hygiene education was offered, concludes that mothers' handwashing before food preparation and disposal of faeces outside the family compound were the two practices which most closely correlate with reduced incidence of diarrhoea (Stanton and Clemens 1982).

19. Transmission of gastroenteritis and diarrhoeal diseases occurs either directly through ingestion of faeces brought by hand to mouth or indirectly through contamination of food and water. Therefore, control of faecal-oral transmittal of diseases will primarily depend on:

- access to safe water and its use for all household purposes;
- sanitary disposal of faeces and subsequent destruction of the harmful organisms contained in the faeces; and
- personal hygiene, notably the washing of hands with soap or ash after defecation and before meals, as well as before feeding children and babies.

20. The statistical demonstration of a direct relationship between water and sanitation projects and positive health impacts remains an elusive goal (Churchill 1987). Despite improvements in water and sanitation in Bangladesh, the expected health impacts have not been realized. It is likely that water, sanitation, and hygiene education are necessary but not sufficient interventions to improve health. Other important factors include rising incomes and increased education (World Bank 1993). Therefore, while continuing to improve access to and use of water and sanitation facilities, it may be necessary to use non-health measures to assess the impacts of water and sanitation interventions to distinguish their contribution from other actions. Alternative measures may also draw attention to additional, non-health benefits of water and sanitation projects such as increased number of workdays, higher individual productivity, etc.

E. Sector Background: Redefining Sectoral Needs

1. Strategies and Achievements During the IDWSS Decade

21. The decade of the 1980s, designated by the United Nations as the International Drinking Water Supply and Sanitation Decade, witnessed significant efforts in Bangladesh to increase rural and urban populations' access to safe water and waste disposal facilities. During the decade, in which the population increased from about 90 million to 110 million, access to safe water increased in rural areas from 37% to 96% (GOB-Netherlands 1986; Mitra 1992).¹ In urban slum and fringe areas coverage reached 94% of the population (Mitra 1992).² Sanitation coverage expanded less dramatically, from one percent to six percent in rural areas³ and to 27% in urban areas (UNDP 1991).⁴ However, much of the water supply development was in the private sector, and only 16% of all households use tubewell water for all domestic needs. Latrines are not commonly used by children, and as adults use them more for reasons of privacy and convenience rather than for health, many latrines are not sanitary and/or are poorly maintained (Mitra 1992).

22. The primary agency in rural water supply and sanitation, the Department of Public Health Engineering (DPHE), has focused on setting and reaching targets for installation of tubewells, pumps and latrines. A program based on an integrated approach which combined water, sanitation, and health education, was developed to promote sanitation and stimulate demand, and began phased

¹ Estimation methodologies and the resulting estimates vary, the GOB-UNICEF 1992 report 80% coverage in rural areas. Both GOB-UNICEF's and Mitra's estimates include public and private tubewells. The estimate of access to publicly supplied rural tubewells is 59% (UNDP 1991). One difference in methods of estimation is that "access to tubewells within 150 meters" may include everyone within that radius, or it may include only the population within the target number intended to be served by a tubewell. As a hypothetical example, 300 people living within 150 meters of a tubewell may be reported as 100% coverage, or, if the target population is 75 persons per tubewell, only the 75 will be reported as served (25% coverage), and the remaining 225 as unserved.

² The estimate of access to publicly supplied tubewells in urban fringe and slum areas (i.e., outside the core where piped water is provided) is 38% (UNDP 1991), the rest is covered by private wells.

³ As will be noted in a later section, sanitation coverage in rural areas increased dramatically after 1990, to 33% coverage by 1993 (UNICEF 1993c).

⁴ The UNDP-World Bank 1994 analysis gives a figure of 27% coverage by sewerage/septic tanks, and an additional 15% coverage (for a total of 42%) by pit latrines.

implementation in 1992 (GOB-UNICEF 1992). A range of appropriate and low cost technology options was developed and tested, and many private producers have successfully entered the market (UNDP 1991).

23. The success in developing and installing tubewells in rural areas and urban slums and fringe areas has provided widespread access, but use of tubewell water for all domestic purposes remains low. Services and facilities remain less available in some parts of the country than others (UNDP 1991). Training for operation and maintenance is limited, and many tubewells are seasonally unusable due to dropping water tables. Community participation remains low in planning, implementation, operation and maintenance for tubewells funded by the government. Sanitary latrines have neither been widely adopted nor well maintained. Although efforts to stimulate new behaviors or demand for latrines through health education have led to wider use of sanitary latrines, the majority of people still use unhygienic latrines (BBS-UNICEF 1994).

24. Areas of concern identified for WSS in Bangladesh include the need for institutional reform and development, human resources development, a social motivation and hygiene education program, more applied research and pilot projects, performance monitoring, a rehabilitation and upgrading program, reaching underserved and unserved areas, and more precision in financial and economic analysis (UNDP 1991). The sum of these concerns is a need for strategy reorientation which will promote sustainability, improve utilization, and strengthen cost recovery. These goals are interlinked, and may be met by the strategy of taking a client-centered approach, primarily by working through and with women.

2. Sustainability

25. At the conclusion of the International Drinking Water Supply and Sanitation (IDWSS) Decade, the consensus held that sustainability of water and sanitation facilities was the key to success in the next decade. Bangladesh has achieved almost universal access to clean water and has enjoyed some success in providing more people with access to sanitary waste disposal. Extending the gains to have an impact on health will require more attention to increasing the use of both water and sanitation facilities, which remains low (Matrix 1993). Sustaining investment in the WSS sector will depend on looking beyond limited government resources for financing, perhaps by limiting dependence on sectoral subsidies and according higher priority to cost recovery from users.

3. Facility Utilization

26. Recent analyses of the water and sanitation sector arrive at a common conclusion that provision of water supply facilities does not guarantee use nor does use of these facilities by itself improve health (Churchill 1987; World Bank 1993). Health benefits may possibly be achieved by indirect means such as promoting to users the economic and productivity benefits of increased access and utilization. Bangladesh presents a particular problem for utilization rates because, unlike in many other countries, surface water is abundant and more convenient for most users. Persuading users of the health or economic benefits of consuming and employing tubewell water for all domestic purposes poses an important challenge in the WSS sector.

4. Cost Recovery

27. Cost recovery is central to the sustainability of resources for sectoral development. Rural areas, which are home to 83% of Bangladesh's population, receive just 23% of the resources invested in water and sanitation (UNDP-World Bank 1991). Furthermore, urban populations who receive the lion's share of investment do not pay enough for water or sanitation, causing greater imbalance. As resources are likely to remain scarce, this imbalance may not change greatly. Resources for rural areas may best be maximized through more attention to cost recovery from users. Cost recovery may be improved if credit institutions are strengthened. Grameen Bank offers one model for strong repayment records (Khandker et al. 1993).

28. Cost recovery is also more likely to improve if users are given information about and choices of affordable options for water supply and sanitation services (Churchill 1987). In Bangladesh, a significant proportion of rural households can afford the available technologies. Two-thirds of all handpump sets are privately owned (Mitra 1992). Greater access to credit or income generating activities, in the experience of NGOs, may increase the likelihood of households individually or jointly investing in tubewells. In sanitation, estimates of willingness to pay for latrines indicate that 69% can pay the subsidized rate offered by the Government (Chadha and Strauss 1991). Experience has also shown that sufficient information and encouragement will motivate women to build pit latrines with virtually no cash investment (UNICEF 1993a, 1993b, 1993c).

29. Subsidies will likely continue to be necessary for some users. Some may indeed be too poor to pay for latrines, and may not have the option of home-made latrines, as these are not feasible in all types of soils. However, programs in the past may have overestimated the size of this group and allocated resources as subsidies. Subsidies are often captured least by those who need them most. Other means must be explored for bringing technologies within the range of affordability for most users, by reducing costs or improving ability to pay. Scarce resources may then be targeted specifically for the neediest.

5. Strategic Issue: A Client-Centered Approach

30. Improving health is a prerequisite to improving welfare and raising incomes, and safe water and sanitation are necessary for good health. Yet experience has shown the failure of supply-side approaches, particularly in rural areas. Agencies whose targets are solely technical installation may achieve distribution goals without having any impact on increasing the use of those facilities. When users have little voice in obtaining services which have value to them, the result is a mismatch between what users want and what planners provide, and consequently a waste of resources as facilities fail to be accepted and maintained by users.

31. In rural Bangladesh, tubewell water is in great demand for drinking water and is almost universally available through private as well as public pumpsets, yet only 16% use it for their full range of water needs (Mitra 1992). Sanitary latrines, which are owned privately rather than publicly, are less widely available, although the recent growth in demand is encouraging. Facilities which meet needs appropriately will be valued and are more likely to be used. A client-centered approach promotes greater attention among implementing agencies to providing what clients want rather than what the agencies decide they need. A strong incentive to adopt this approach is created if clients are given the opportunity, in some cases promoted by access to credit, to pay for the services they

desire. When clients choose the services according to what they want and for which they are prepared to pay, they have greater incentive to use and maintain the facilities they purchase.

32. A client-centered approach offers a range of options for institutional organization and activities. Users may be served by government efforts, by private sector or NGO efforts, or by a combination. UNICEF has recently proposed a social mobilization strategy which is essentially client-centered, based on community involvement in planning, development, and implementation, and incorporating supportive institutional, training, communication, and resource mobilization activities or reorientation (GOB-UNICEF 1992). The strategy attempts to account for the needs of all stakeholders in the WSS sector, including institutions, communities, and users.

6. Strategic Issue: Working Through and With Women

33. A client-centered approach in the WSS sector translates into a women-centered approach. In Bangladesh, as in most developing countries, women have far more responsibility than men for water and sanitation (Van Wijk-Sijbesma 1985). They decide where to collect water, how much, and how to use it. In other words, as managers of household water supplies and family hygiene, women are already the major investors in water supply, and therefore the primary clients. Their concerns include convenience and privacy, in addition to health. A strategic issue involves meeting the needs of women without increasing their already heavy work burdens.

34. In Bangladesh it is the women who, working primarily within their houses, are the primary users of latrines as well as the caretakers of children, who at present underutilize latrines (Chadha and Strauss 1991; Mitra 1992). When motivated by strong concerns for health, particularly their children's health, women have been willing and able to construct hygienic latrines in less than a day with materials available in the household (UNICEF 1993a).

35. Given the seclusion of women in Bangladesh, working with women requires women in agencies who can interact with them. Relying on males, or on any class of people who are largely male (such as tubewell mechanics), for tasks which involve social motivation and other communication with women is likely to limit success. A recent study of the Department of Public Health Engineering (DPHE), the major WSS agency in Bangladesh, has suggested the strong need to improve staffing to reach rural women (Matrix 1993).

36. Efforts to focus on women in the past have foundered on the lack of women in DPHE which needed to interact with rural women, on the failure to consult with women in the earliest stages of project design, and on a failure to understand the broad set of constraints facing women which lowers the visibility of their needs and decreases their access to services.

F. Scope and Organization of this Report

37. The remainder of this report elaborates on the strategies and current activities of the water and sanitation sector, assessing achievements, identifying issues, and noting constraints. The report is limited specifically to agencies and activities operating directly in the WSS sector, and therefore does not include details of health, education, or environment beyond a mention of their relevance to the sector. It is organized to reflect the sequence of issues which must be considered in developing goals and strategies. Information presented is based on published data, reports from

secondary sources, and discussions with government and donor agencies, NGO representatives, and individuals with experience in the sector.

38. Chapter 2 discusses the technologies which are currently in use and socio-economic aspects of water and sanitation, reviewing differences in access and use of facilities and information, and exploring physical, economic, and social reasons proposed for these differences. Chapter 3 reviews the institutional actors in water and sanitation, describing agencies, policies and planning, finance, agency performance, information systems, and human resources development. Chapter 4 covers the rural situation, covering the resource base, current strategies and service provisions and available technical options. Chapter 5 addresses issues in the urban sector, including pourashavas, and describes not only water and sanitation arrangements but also issues of high population density such as drainage and solid waste disposal. The final chapter summarizes the issues and the suggestions for consideration in the development of a comprehensive strategy.

2

Access Versus Use: Technologies and Social Constraints

A. Introduction

39. Despite limited national resources, extremely high population density and recurrent natural disasters, the people and Government of Bangladesh have made significant progress in increasing water supply and sanitation coverage during and after the IDWSS Decade. As of 1991 there were an estimated 2.45 million drinking water tubewells in rural areas of the country (Mitra 1992). Public tubewells accounted for only 29% of the total but serve about half of the population (Mitra 1992). Counting only operational tubewells, public tubewells serve an average of 115 persons (GOB-UNICEF 1992). Access to tubewells was nearly universal, with 85% of all rural households within 150 meters of a pump, and another 5% were located within 200 meters (Mitra 1992). Shallow tubewells in rural areas numbered over 2.2 million and deep tubewells in coastal saline areas tallied over 50,000 by mid-1991 (UNICEF 1994).

40. Access to tubewells varies by ownership status, region of country, condition of tubewell, and rural/urban location. Some estimates indicate coverage by proximity to tubewells, others to proximity to operational tubewells, and yet others modify proximity figures only to include reasonable or target numbers for population which a well can reasonably serve.⁵ The figures reported in various documents must be interpreted carefully in setting access goals. A UNDP report found that rural coverage still required attention to reach targets (UNDP 1991). Table 2.1 shows population per public tubewell in areas of the country requiring different technologies.

Table 2.1
Public Rural Water Supply Coverage by Handpump, 1993

<u>Handpump Type</u>	<u>Population per Operating Public Well</u>
Shallow	77 persons
Deepset (Tara)	388 persons
Deep Well	215 persons
Average	92 persons *

Source: GOB-UNICEF 1993 / * Mitra 1992

⁵ See footnote 1 in Chapter 1

41. Improved access to water has not resulted in appreciable declines in water-borne diseases. While almost 92% of all rural households drink tubewell water, 75% use it for limited or no other domestic purposes (Mitra 1992). Awareness of the linkage between use of safe water, proper disposal of excreta, practice of personal hygiene and good health is generally low. Only 4% of the respondents both in urban and rural areas mentioned use of tubewell water for all purposes and 16% cited tubewell water for drinking as factors necessary for good health (Mitra 1992). Importance of using latrines was mentioned by only 7% in the rural and 11% in the urban areas. Only 28% of the rural women and 35% of women in urban slums and fringes wash hands with soap or ash after defecation. Almost no respondents knew that indiscriminate defecation was a cause of worm infestation.

42. While some issues of access remain, an important issue for improving health as well as for project sustainability and cost recovery is the improved utilization of both water and sanitation facilities. This is an unusual issue, for water projects often bring water closer than before and generate great enthusiasm for utilization. However, in Bangladesh surface water is plentiful but contaminated, public tubewell water is seldom closer than the nearest source of surface water, and the incentive to use tubewell water for non-drinking purposes is often outweighed by the convenience of the household pond. The remainder of this chapter discusses access and use, describing the technologies which are in use, regional variations which require particular combinations of these technologies, and coverage by region as well as rural and urban differences. The chapter then examines the key issue of why these facilities remain underutilized, looks at exposure to health information and the practice of personal hygiene, and concludes with a summary of issues.

B. Water and Sanitation Technologies

43. A variety of technologies have been developed to serve in different hydrogeological conditions as well as to keep costs as low as possible. The primary tubewell/pump technologies in rural areas include shallow tubewells (STW), deep-set handpumps (DS) such as the Tara, and deep tubewells (DTW). In saline areas technologies used when deep tubewells are not feasible include very shallow shrouded tubewells (VSST) and pond sand filters (PSF).

1. Shallow Tubewells

44. Shallow tubewells are easily sunk and use the well-known No. 6 handpump. Virtually all wells in urban slums and fringe areas are of this type. In rural areas 87% of public wells and 94% of private wells are shallow tubewells (Mitra 1992). They are relatively inexpensive to install and maintain, but can only lift water from about 7 meters below ground level. The growing competition with irrigation (drawing from deep tubewells) in many areas has meant that during the dry season the groundwater drops below the reach of the No. 6 pump.

2. Deepset Handpumps

45. Deepset handpumps are needed where water tables are eight or more meters below level ground. Traditional deepset tubewells were very expensive and needed a mobile professional maintenance crew. A cheaper and less complex handpump called the Tara, which is locally produced, was developed and fielded in the mid-1980s. The Tara has similar service capacity as

shallow tubewell pumpsets. Most DS/Tara pumpsets are in rural public tubewells (Mitra 1992). By 1990 27,000 had been installed (UNDP 1991), and by 1992-93 the annual target was 8,739 installations (GOB-UNICEF 1993). However, in 1992-93 20% of the Tara pumps installed had installation defects (GOB-UNICEF 1993).

3. Deep Tubewells

46. Deep tubewells have casing pipes of between 150 and 300 meters but use the suction-type No. 6 handpumps because the groundwater level is less than seven meters below ground level. They are usually used in saline areas where drillers go deep to find fresh water aquifers. They are expensive and take much longer to construct than shallow tubewells. In 1991 these served 12% of the total rural population (Mitra 1992). The size of the user group is larger for this type of well based on the high costs of the well as well as bottlenecks in installation capacity, not on greater production capacity of the well.

4. Saline Area Technologies

47. Very shallow shrouded tubewells (VSST) are appropriate to pockets in the saline belt and are very inexpensive. However, drilling failure is common as they rely on two very specific conditions for success: they can operate only where a pocket of fresh water exists, and where an aquifer (a sand layer) exists within this fresh water zone. Areas where VSSTs are most likely to work are identified by the disappearance of surface water in the dry season, due to high infiltration rates. Unfavorable zones may be indicated by a limited fall in water level of ponds (GOB-Netherlands 1986). These wells can serve 75 people.

48. The second alternative is a Pond Sand Filter (PSF) which uses a handpump to deliver pond water into a small sand filter unit in which the water quality is significantly improved. It is simple to construct and operate, but performance depends on beneficiary motivation for regular cleaning. The PSF is being installed as a part of the regular DPHE program. A survey of the system indicated a high level of user acceptance of the system. About 92% of the respondents considered PSF water to be safe, clear, and of better taste. Problems identified by the study include poor O&M, pollution, and improper use. Leakage and poor workmanship were also detected in 21% of the PSFs inspected (WHO-DPHE-UNICEF 1991).

5. Subsidiary Technologies in Rural Areas

49. In stony areas such as Chittagong Hill Tracts and parts of Sylhet special drilling equipment must be used to install tubewells. Tapping of streams through infiltration galleries is being tested, while ring wells fitted with Tara handpumps in stony areas have been included in DPHE's regular program (UNICEF 1993d).

50. High levels of iron in much of the country's groundwater lead many consumers to prefer iron-free pond water for many uses. Groundwater utilization may be increased by use of iron removal technology. A simple iron removal plant (IRP) has been developed capable of reducing iron concentration from 15 mg/l to less than 1 mg/l. The handpump discharges raw tubewell water into the plant which removes iron by aeration and filtration. It is easy to construct, cheap and simple to use, but like the PSF, performance depends on consumer motivation for regular cleaning (Danida-SDC 1993a). Further modification of the design in response to user attitude, contribution before

installation, and involvement of water users will be essential for the success of the IRPs (WHO-DPHE-UNICEF 1990).

6. Rehabilitation and Upgrading of Tubewells

51. Tubewells which become choked with sand require either de-sanding or resinking. De-sanding is the cheaper but often unsuccessful alternative. The DPHE success rate for desanding has been low for years, in the range of 25% (Danida-SDC 1993). A pilot project is underway to improve the technique prior to privatizing this service. Initial observation from two thanas in Khulna Circle shows a success rate of 54% with desanding more successful in tubewells of lesser than 17 meters depth. When wells cannot be de-sanded they are resunk, whenever possible with pipes withdrawn from the choked tubewell. Tubewells are upgraded by enlarging small platforms where pumps are used by large numbers of people (GOB-UNICEF 1993).

7. Water Production Wells in Urban Areas

52. For piped urban water supply system, mechanized production wells are most widely used, and likely provide the most cost-effective source. In 17 district towns, however, surface water treatment plants have been constructed. Iron removal plants are used where iron concentration is high. Though the effective life of a surface water treatment plant may be long (one in Dhaka has operated for over 100 years) in the short term it is not seen to be cost effective compared to ground water.

8. Sanitary Latrines

53. Sanitation options include a wide variety of latrines as well as sewers in the major urban areas. While many households have latrines of some sort, many of these discharge directly into drains or surface water sources. Efforts have been directed at encouraging adoption of pit latrines. Low cost on-site options in use are:

'Home-made' Latrine (HML), consisting of an unlined pit covered with a platform with a hole in it. It is cheap and simple to build and maintain, and used in urban and rural areas.

Ventilated Improved Pit (VIP) with lined pit(s). The vent controls flies and creates the updraft removing smell. It is cheap, simple and sanitary, but not in wide use.

Water Seal Latrine with concrete platform, pan and single lined pit. When the pit fills up, a new pit has to be dug and superstructure relocated, or the pit has to be emptied. It is simple and sanitary, and used in urban and rural areas.

Twin Pit Water Seal Latrine is the same as a single pit except that it has two offset pits used alternately. When the first pit fills, user switches to the second pit, leaving the first pit contents for 18 to 24 months to complete biological degradation before removal of harmless contents. When the second pit fills the first pit is used again. This type is mainly limited to urban areas.

54. The most widespread versions in use for rural sanitation are the 'home-made' and single pit, water seal latrines. The pit is lined with up to five concrete rings, the slab is either of ferrocement or reinforced concrete, and the water seal pan is of ferrocement. Burnt clay rings are

used where available. Improper maintenance of water seal latrines leads to water seals clogging which users are unable to clear. This often leads to users breaking the water seal.

55. Limited consumer resources and public sector capacity to deliver sanitation services have led to the promotion of the slab-plus-one ring option. During 1989-92 DPHE produced and sold water seal slabs in combination with one to five pit rings, subsidizing only the slab and the first ring. The ring serves as foundation for the slab rather than as lining for the pit. In sandy soils a pit liner must be used, but in clayey soil pits may be unlined.

56. Home-made latrines are also being promoted. Two recent UNICEF documents describe the success of two efforts to encourage rural households to build latrines using materials at hand (UNICEF 1993a, 1993b). A DPHE-WHO-UNICEF-SDC study has found general acceptability of home-made latrines as a viable option in improving the existing defecation practices. Of those using home-made latrines 6% preferred open defecation and 72% preferred water seal latrines compared to 29% and 34% respectively before constructing home-made latrines. (DPHE-WHO-UNICEF-SDC 1993). Pit collapse in one ring options are known to occur. To avoid pit collapse, the pit is usually less than two meters deep, unless the soil is stable or the pit is lined.

9. Problems in Sanitation

57. An apparently major problem in pit latrines is the action taken by individual households when the pit fills up. A WHO study found that many households go back to open space defecation or empty the pit and dump the raw sewage (WHO 1992). This study found failure in structural integrity in 54% of the latrines examined, and that 45% of the pits filled up in less than one year. Shallow pits fill up too soon for households to get into the habit of using latrines, in addition to the inconvenience of frequent cleaning or change of pits (DPHE-WHO-UNICEF 1992). Another study reported that an average latrine took more than 6 years to fill up, and of 1322 latrine-owners surveyed, 73% of the latrines had never filled up and 16% were using the same latrine after emptying it. Presumably the remaining 11% abandoned the latrine. Of those who emptied and continued using the latrine, 91% buried the contents while the rest dumped it on the ground (Chadha and Strauss 1991).

58. Certain pit latrines are also vulnerable in areas which are annually flooded or where water tables rise during the monsoon. The usual practice is to elevate the slab using the soil excavated from the pit. One study found that 30% of the homesteads with a sanitary latrine were not above flood level, but concluded that the latrines nevertheless were better than open defecation at reducing the spread of fecal contamination (Chadha and Strauss 1991). Users are advised to locate pits at least 10 meters from water sources to avoid pollution. The 1992 national study showed that in rural areas over 30% of the latrines were located within 10 meters of a pond, over 24% were within that range of another water source, and 18% were within 10 meters of a handpump. In urban slums and fringe areas the figures were similar for ponds and other surface water sources, but 49% of latrines were within 10 meters of a handpump (Mitra 1992). A study to assess the risk for pollution of ground water from latrine pits has been planned by UNICEF.

10. Sanitation in Urban Areas

59. In urban areas a sewerage system is limited to a small part of Dhaka (serving 18% of the population there); the primary sanitation method is a range of on-site options such as septic tanks

and pit latrines. Yet on-site technology is problematic where population density is high. Siting difficulties are complicated by the low permeability of soil, poor drainage and increased sillage (Kruijff and Macoun 1988). Dhaka WASA is currently installing a small bore sewer system in a part of Mirpur, under the ADB assisted Environmental Improvement Project.

C. Regional Variations in Distribution and Access

60. The 1991 national survey on water and sanitation divided the country into several hydrogeological regions and analyzed data on that basis as well as distinguishing between public and private facilities (Mitra 1992). There were seven categories: shallow water table (SWT) area, low water table (LWT) area, mixed low/shallow (LWT/SWT) area, coastal belt, stony regions, hilly regions, and urban slums/fringe.

61. Tubewell coverage nationwide is good, averaging 92 people to each operating tubewell, but there are pockets where people do not have good access to tubewell water, especially in hilly regions, in the low water table area and in the coastal belt. Table 2.2 shows the service coverage for public and private tubewells (functional or not) in the seven hydrogeological/settlement zones.

Table 2.2
Persons Per Tubewell for Public and Private Tubewells by Different Strata, 1991

<u>Tubewell Status</u>	<u>SWT</u>	<u>LWT</u>	<u>SWT/LWT</u>	<u>Coastal</u>	<u>Stony</u>	<u>Hilly</u>	<u>Urban</u>
Public	47	59	49	123	46	29	50
Private	25	28	18	29	52	104	21

Source: Mitra 1992.

62. The relatively good coverage in SWT areas represents conditions for the majority (64%) of the population. Another 25% of the population live in the low water table areas, while 11% live in saline coastal areas. Stony areas in the Chittagong Hill Tracts and in the Sylhet area are occupied by about 3 million people (UNICEF 1993d; Danida/SDC 1993).

63. The affordability of a tubewell and pump varies by technology and income, so that rural consumers in some parts of the country are less able to afford private access to a groundwater supply. Residents of hilly, stony, LWT and coastal areas are particularly dependent on publicly-provided water sources, as shown in Table 2.3.

Table 2.3
Percentage Distribution of Handpump Systems by Ownership Status,
and Hydrogeological/Settlement Zones, 1991

<u>Ownership</u>	<u>SWT</u>	<u>LWT</u>	<u>SWT/LWT</u>	<u>Coastal</u>	<u>Stony</u>	<u>Hilly</u>	<u>Urban Slums</u>	<u>Fringes</u>
Public	24	31	28	46	59	84	14	11
Private	76	69*	72*	54*	41*	16*	86	89

Source: Mitra 1992 * Most of these tubewells are actually STWs which are still seasonally or under special situations working.

D. Competition for Water Use

64. The drive for food self-sufficiency has led to expansion of mechanized deep and shallow tubewells for irrigation. As most irrigation takes place in the dry seasons, this results in a significant decline in groundwater levels during the dry period particularly in areas of high water extraction. In addition irrigation causes local depression in ground water levels when power driven irrigation pumps are in operation. As the groundwater level falls below the suction limit (7-8 meters), an increasing number of shallow tubewells used for drinking and domestic purposes become inoperative for two to three months a year towards the end of the dry season (April to June). Annual monitoring of the water table showed that in April 1992 water in 36% of all unions was beyond the suction limit. In real terms some 10 million households will be living in the low water table areas by 2000. The estimated cost of replacing 50% of the public tubewells without any increase in service coverage will be US\$ 125 million (Wan 1992). The DPHE Research and Development Committee is working on developing and testing ways of rehabilitating the inoperative suction pumps, but no definitive answer is yet available.

E. Groundwater Quality

65. **Salinity.** In the coastal areas and the region north of Comilla between Brahmanbaria and Habiganj, groundwater is generally saline down to about 250 meters (IWACO 1985). The saline belt extends about 60 km inland. Consumer tolerance of salinity is high. Salinity is considered a problem if chloride levels exceed 1000 mg/l. There are 84 salinity prone thanas in the coastal belt with an affected population of about 8 million; these are primarily in coastal and shallow water table areas (Mitra 1992). Ponds which store rain water are the principal source of water in this area. Water from these ponds is used for all purposes and is susceptible to a high degree of pollution. Where feasible, VSSTs are installed beside the ponds. If VSSTs are not feasible, PSFs are constructed. The traditional system of 'reserve' ponds for drinking and cooking water no longer exists and during the dry season many of the ponds dry up. In general, settlement patterns in coastal areas are more scattered, making provisions for adequate water supply difficult and expensive.

66. **Iron.** Extensive presence of iron in ground water and a high consumer tolerance have led to acceptance of 5 ppm as a standard in Bangladesh. Some 170 thanas with a population of 15 million fall in the high iron concentration category. According to the national study in 1991 the regions most affected are hilly areas, in which 77% of all tubewells discharge water in excess of the standard. In regions with both shallow and low water tables, 43% of all tubewells discharge water with five or more parts per million iron (Mitra 1992). Excess iron is associated with bad taste, discoloration of food, teeth and clothes, and stickiness in the hair. By comparison pond water is iron free and competes with tubewell water where iron concentration is very high, and where 'physical clarity' of surface water is wrongly perceived as 'purity'. Sometimes iron levels in private wells are lower than in nearby public wells. Local drillers know at what depths iron content is lowest, but DPHE does not benefit from the knowledge. Contractors drill to the depth shown in the depth book, even if water at shallower depth is better (Danida-SDC 1993a). DPHE is in the process of identifying 'iron free' depths for the country.

F. Access to and Use of Safe Water

1. General Access to Water

67. Overall, 96% of rural people and 94% of urban slum/fringe residents get their drinking water from tubewells. In less densely populated areas tubewell water is less accessible but still widely available. In coastal areas 85% of the population drink tubewell water, and this increases to 88% in stony areas (Mitra 1992). While access is not everywhere universal, the program to install tubewells has clearly been successful in reaching most of the population.

68. Government efforts have been exceeded in most parts of the country by private tubewell installation. In rural areas, 71% of all tubewells are private; these are shallow tubewells and are confined to about 64% of the country. But public and private tubewells serve quite different numbers. Public wells in rural and urban areas are used by an average of 60 and 50 people, respectively, while private tubewells in rural and urban slum/fringe areas serve 25 and 21 persons each (Mitra 1992). Consequently, public and private tubewells each serve about half the population.

2. Access Varies by Season

69. Access dips in parts of the country during the dry season when the water table drops below the suction level of handpumps in use. The 1991 national survey found that at the peak of the dry season, 8% of public (shallow) tubewells and 7% of private wells in rural areas were dry. The problem was most severe in stony and low water table areas. In stony areas at the peak 15% of public (shallow) tubewells and 30% of private wells were dry. In low water table areas 27% of public wells and 13% of private wells were dry. No data were collected to explain the difference in effect on public and private wells (Mitra 1992).

3. Access Varies by Socio-economic Status

70. The 1991 national WSS study found that perceived distance from a tubewell decreased in inverse proportion to the household head's education level, number/quality of possessions, and ownership of agricultural land. Additionally, the greater the socio-economic status of the household head, the more likely the household possessed a tubewell within the compound. This held true for public as well as private tubewells, in both urban and rural areas, indicating the success of the influential members of a community in capturing public tubewells for their personal use (Mitra 1992).

4. Access is Related to Condition of Well or Pump

71. Non-operational tubewells limit access. The national survey found that public and private tubewells had different records of disfunction and maintenance. While 90% of public tubewells were functional at the time of the survey, 96% of the private tubewells were operational. Parts were missing from 43% of the (still operational) public tubewells but only 27% of the private tubewells (Mitra 1992).

5. Access Does Not Ensure Desired Allocation

72. Given access in terms of the factors above, users will still not necessarily have the opportunity to take a full share. Only 24% of rural households within 50 m. of a tubewell obtained the full requirement (water supply for all domestic uses). Among urban slum/fringe households the comparable figure was 65%. The national survey concluded that a household was more likely to consume the full requirement from the handpump set if it had a higher socio-economic status than if it was from a lower socio-economic stratum (Mitra 1992). A study by ICDDR,B indicated that the per capita daily consumption of tubewell water increased from 19 to 51 liters as the average tubewell user group size reduced from 82 to 12 persons (GOB-UNICEF 1992). Use of tubewell water for all domestic needs appears to be a goal that may only be within reach when population coverage is based on a lower number of users than presently exists. This problem of access is most directly related to limits to tubewell water utilization, as described below.

6. Uses and Limits of Tubewell Water Supply

73. Widespread access has not translated into universal use of tubewell water for all domestic purposes. The 1991 national water and sanitation survey found that in both rural and urban areas about 92% of the population were using tubewell water for drinking (Mitra 1992). Table 2.4 shows how patterns of use for other domestic purposes varies widely between private and public wells and between rural and urban areas. In urban areas more than half of the population use tubewell water for all purposes, while this is true for only 16% of the rural population (Mitra 1992). Utilization of tubewell water for all domestic purposes is significantly more common for users of private wells than for users of public wells.

74. Utilization patterns also vary by region. In hilly and urban fringe areas, with few alternative sources of water, tubewell water is used for some or all domestic purposes by 100% of public well users, and by 67% and 95% of private well users respectively. Conversely, in coastal areas tubewell water serves only drinking water needs for 67% of public well users and 55% of private well users (Mitra 1992).

Table 2.4
Percent of Population Making Use of Water Hand Pump Systems (Public and Private Combined) in Rural Areas and Urban Slum and Fringe Areas, 1991

<u>Area</u>	<u>Don't Use</u>	<u>Drinking Only</u>	<u>Drinking & Some Uses</u>	<u>All Domestic Uses</u>
Rural	8%	25%	50%	16%
Public	*	35%	53%	12%
Private	*	20%	56%	24%
Urban Slum/Fringe	8%	8%	31%	53%
Public	*	11%	50%	39%
Private	*	9%	28%	64%

Source: Mitra 1992. * Households not using wells were excluded from percentage breakdown for extent of water use by users of public and private wells.

75. Reasons offered by survey respondents as to why they did not use tubewell water for all purposes included time, distance, and difficulty in hauling water. Other disincentives inhibiting tubewell use included easier access to a nearby pond and the ownership status of the tubewell (see Table 2.5). These disincentives are key factors to consider in planning to meet users' needs.

Table 2.5
Percentage of Respondents Stating Reasons for Not Using
Handpump Water for All Domestic Purposes, by Rural/Urban Area, 1991

<u>Reason</u>	<u>Rural</u>		<u>Urban</u>
	<u>Public</u>	<u>Private</u>	<u>All</u>
It's hard work	53%	42%	51%
Tubewell belongs to another	37%	42%	47%
Distance too far	46%	28%	28%
Have easy access to pond	37%	38%	21%
Takes too much time	31%	33%	38%
Caretaker/owner objects to frequent collection	9%	25%	28%
Location is inconvenient in terms of privacy	22%	10%	23%
Tubewell will break down if used too much	9%	7%	6%
Too busy with household work	9%	8%	4%
Water level drops	8%	4%	6%

Source: Mitra 1992

76. Table 2.5 also shows the difference in use limitations between public and private wells in rural areas. While "hard work" was the most given reason for either type of well, the ownership status led to different problems, notably the social rationing imposed by owners on neighbors' use, and the privacy issue for public tubewells. Both types of ownership had similar constraints of time, particularly when ponds offered more convenience. Notably, tubewell "ownership" was almost as big a problem for users of public tubewells as it was for privately owned wells.

G. Access to and Use of Sanitary Latrines

1. Latrine Ownership

77. Bangladesh has plenty of latrines, but most of these are not sanitary latrines. In rural areas, 61% of households possessed latrines, but only 26% possessed sanitary latrines in 1991 (Mitra 1992). The remaining latrines generally drain into water bodies or ditches. The most common sanitary latrines in rural areas are pit, water sealed, and septic tank, in that order. In urban areas the coverage is better. Latrines are in 83% of all households, although only 48% of the households have a sanitary type. The favored types of sanitary latrines, in order, are water sealed (single and double pit), septic tank, and pit, just the opposite of rural preferences.

78. Education and land-holding status are associated with latrine (primitive as well as hygienic) possession in both rural and urban areas. Of land-holding households with family heads with at least a primary school education, 80% had latrines. Among landless households with little

or no education, 49% had latrines. The most common reasons given for not having a latrine were poverty (81%) and the lack of the 25 square feet of space needed for a latrine (18%) (Mitra 1992).

79. Latrines are relatively recent additions to most households. The 26% of households in possession of sanitary latrines in 1991 is an increase from 10% just two years earlier (GOB-UNICEF 1992). The national survey found that latrines were on average 3.6 years old. Over one third were less than a year old, and 24% had been constructed between one and two years prior to interview (Mitra 1992). Construction has continued to increase dramatically, to 33% by 1993 (UNICEF 1994).

80. An important route for encouraging behavioral changes and developing demand for latrines is through primary schools. The Ministry of LGRD&C, with support from UNICEF, began a project in late 1992 to construct latrines and train school personnel in hygiene education and facilities maintenance. In the first two phases of the project (1992-94) over 1500 schools in 26 districts were to receive facilities and training (UNICEF nd).

2. Latrine Use

81. Non-owners seldom use latrines. Frequent use of latrines is made by 6% of rural nonowners and 36% of nonowners in urban slums and fringes. Latrines are never used by 76% of rural residents who do not own one, and by 29% of urban slum/fringe households lacking a latrine (Mitra 1992).

82. Latrine use varies by age, sex, and day versus night. Girls and women are more likely to use them than boys or men, and only 9% of children aged one to five used it. Use goes down at night for all age and sex categories. In rural areas during the day latrines are used by 41% of boys, 54% of men, 56% of girls, and 64% of women. In urban areas these figures rise to 73%, 88%, 88%, and 92%.

83. While half of all rural latrines are located inside the inner compound of the household, nearly a third are located outside the outer compound (Mitra 1992). While the national survey noted that latrines located outside the compound were less accessible to women or girls than to males, the report did not provide data on use patterns associated with different locations of the latrine. Given the importance of children's use of latrines to the reduction of diarrhoeal and parasitic disease, and the role of women in assisting children, it is doubly important that latrines be located in areas convenient for women.

84. In the national survey, perceived benefits of latrine use varied from reduced odors to beliefs about sickness and were similarly cited by both urban and rural residents. The two most important reasons for use were privacy and odor control. Health benefits and concern to limit outdoor pollution were cited by fewer than a third of respondents (Mitra 1992). The survey did not ask for reasons for non-use of a latrine.

H. Access to Health Education and Practice of Personal Hygiene

85. Despite the widespread access to tubewell water and the recent increase in sanitary latrines, there has been no measurable decline in the incidence of diarrhoeal diseases and parasitic infection in children (GOB-UNICEF 1992). The 1991 national survey was unable to reveal any

notable relationship between incidence of childhood diarrhoeal disease and household use of tubewell water, household possession of latrine, and respondent practice of handwashing. However, a project in Mirzapur showed significant health benefits achieved by an integrated package of handpumps, latrines, and hygiene education (Aziz et al. 1990).

1. Understanding of Water, Sanitation and Health Relationships

86. In the 1991 national survey respondents were asked to name, spontaneously, specific practices which were important to maintain good health. Regarding activities involving water and sanitation, the majority of respondents in rural and urban areas mentioned taking a bath, wearing clean clothes and using soap. Relatively few thought of drinking tubewell water, and still fewer mentioned cleaning hands with soap or ash after defecation, using a latrine, using tubewell water for non-drinking purposes, or disposing of children's stools in a latrine (Mitra 1992). Table 2.6 shows the water and sanitation related comments and their frequency in rural and urban areas.

87. The national survey also revealed that while the majority of people in both rural and urban areas associate consumption of contaminated water with diarrhoea (90% rural, 90% urban) and stomach disorders (63% and 73%), fewer were aware of water-washed sources of skin diseases (43% and 58%). Less than ten percent saw any connection with malaria or typhoid, and fewer than one percent knew of any relation with polio, eye infections, or jaundice/hepatitis.

88. Similarly, the cause of worm infestation was considered by most to result from eating sugar or molasses, and by about 20% to 28% from eating bananas. Walking barefoot was mentioned as a cause by 8% in rural areas and 14% in urban areas, improper handwashing was seen as a reason by 3% and 7% respectively, and indiscriminate defecation was mentioned by fewer than one percent.

Table 2.6
Percentage of Respondents Mentioning Specific Practices
Relating to Water, Sanitation, and Good Health
in Rural and Urban Slum/Fringe Areas, 1991

<u>Practice</u>	<u>Rural Areas</u>	<u>Urban Slums/Fringes</u>
Take a bath 91%	94%	
Wear clean clothes	76%	84%
Use soap	74%	84%
Properly clean and cover food items	45%	62%
Drink tubewell water	16%	30%
Clean hands with soap or ash after defecation	13%	21%
Use latrine	7%	11%
Use tubewell water for all purposes	4%	4%
Avoid going barefoot to defecate	1%	2%
Dispose of children's stools in a latrine	1%	2%

Source: Mitra 1992.

2. Source of Information on Health and Hygiene

89. The most common sources of information about health for rural residents are, in order, unqualified practitioners, thana-level health complexes, health/family planning workers, union level health centers, qualified doctors, neighbors, and relatives. Four of these were also important sources of information about the health implications of handwashing and using tubewell water and latrines. Of the 7% of rural respondents in the 1991 national survey who had been given information in the previous three months, nearly half had received it from health and family planning workers. Between 25% and 35% had been informed by neighbors, relatives, or doctors, and 15% by schoolchildren. Only 4% received information from DPHE workers (Mitra 1992).

3. Personal Hygiene Practices

90. Handwashing after defecation, after cleaning up a child's bottom, and prior to preparing or serving food is practiced by over 90% of the respondents. However, most handwashing is done with soil or only water. After defecating or cleaning up a child, almost 20% of rural residents and about 30% of urban slums/fringes respondents reported using soap to wash their hands (Mitra 1992).

I. Current Research and Development

91. The Research and Development Division of DPHE has recently increased its activities. Yet in terms of priority the R&D Division is marginal to other DPHE functions, and donors provide the lead. The R&D Division deals with technical aspects, particularly handpumps, despite the fact that in recent years other factors affecting use have become important. UNICEF's social action research and limited research in sanitation partially offset the low allocation of public resources for continuing research. Dhaka WASA and Chittagong WASA do not have any R&D section nor any linkage with the DPHE R&D activities.

92. In recent years, Research and Development (R&D) has largely concentrated on handpumps, including the Mini Tara for declining water table areas (Wan 1992) and Tara II for use in low water table areas, on using duckweed for waste treatment, and on iron contaminated aquifers. A modified version of No. 6 pump developed by an NGO, Rangpur Dinajpur Rural Development Society, is scheduled to be tested for declining water table areas. Options such as tapping of streams in hilly and stony areas are being tested and monitored for subsequent replication. A mechanized rig for drilling in stony areas will be tested with UNICEF support. Private producers of latrines have been trained in producing sanitary platform slabs and 1" thick linings. UNICEF plans to test other latrine components and study the possible groundwater pollution from on-site sanitation. UNICEF will undertake action research on supporting private producers of latrine components (GOB-UNICEF 1993).

93. Many studies on innovative service delivery mechanisms, social mobilization, community development, training and promotional materials have been completed. Action research will further test and evaluate different strategies for social mobilization. A study to forecast declining groundwater level is in progress (GOB-UNICEF 1993).

J. Future

94. The principles adopted for future strategies in Bangladesh include increased use of tubewell water and sanitary latrines and improved personal and domestic hygiene (GOB-UNICEF 1992). While a great deal of research on technology, mapping of aquifers, and management has been proposed or initiated, efforts to understand users' preferences and constraints will be equally important to the goals of increasing facility use and good hygiene practice.

1. Plans and Needs for Water Supply

95. Among the first priorities is the increase in utilization of tubewell water. This will require greater understanding of reasons for non-use so as to avoid focusing resources unproductively on installation. Although increased access to health and hygiene information may provide women with the incentive to invest more time and energy in water hauling, research on ways to make water more convenient by reducing time and energy needed to haul water may help identify ways to improve utilization. Research is needed not only on technologies (including alternative sources of energy, such as solar power) but on institutional mechanisms for stimulating and matching demand with affordable and appropriate levels of service.

96. Efforts to improve utilization may also depend on improvement of water quality through modification of iron removal plants and greater accuracy in identifying depths with lower iron content.

97. Service coverage numbers vary widely and are supply driven. Progress in the future will be easier to assess if standard reporting methods are adopted. Measuring coverage in terms of percentage of population reached within range (150 meters) and within a target size users' group (basis to be determined) will greatly simplify analysis.

98. The 4FYP has adopted a target of 70 persons to an operating tubewell in the shallow areas, 250 persons in the DTW areas and 375 persons in the low water table areas. These targets require the sinking of 211,000 new tubewells (in rural areas as well as urban fringes and slums) and resinking of 60,000 in the 1990-95 period. Because of high coverage in the high water table areas, the government has reduced its allocation for shallow tubewells, to be targeted at remote, poor villages without services.

99. The seasonal dropping of the water table in many areas due to irrigation must be addressed through a combination of policy and technology. Extending service in coastal areas also requires a greater share of resources and investment in the development of cheap technologies.

100. In urban areas the water supply will continue to be expanded through a combination of piped supply and tubewells, with piped water progressively increasing its coverage. For the urban subsector, in 1993 public water supply was provided to 40% of the population (UNDP-UNCHS 1993). The water supply target for district towns is 85% coverage and for the thana centers 65% by the year 2000.

2. Plans and Needs for Sanitation

101. The GOB target for rural sanitation coverage is 35% by 1995 and 80% by the year 2000. By 1993 33% coverage had been achieved (BBS-UNICEF 1994). Urban sanitation, which covered 43% of the population by 1993 (BBS-UNICEF 1994), has been targeted at 66% for district towns and 61% for thana centers by the end of the decade. The GOB strategy to achieve the target, supported by UNICEF, involves massive social mobilization campaigns through building alliances to promote the use of latrines.

102. Social mobilization may usefully build on existing reasons for latrine utilization--convenience and privacy--as well as introduce health reasons. Studies of latrine maintenance are inconclusive, suggesting the need to better understand reasons for inadequate maintenance and owners' responses to filled up pits.

103. Experience suggests that demand for sanitation is stimulated by the satisfaction of demand for water. While social mobilization may stimulate demand, demand may also rise when users have more convenient access to water as well as a choice of sanitation technologies which they see as appropriate.

104. WHO on request from DPHE-UNICEF, has completed a study of home-made latrines to assess their appropriateness. A manual on home-made latrine production has recently been completed. The social mobilization program is likely to have a positive impact on promotion of home-made latrines (GOB-UNICEF 1993).

105. A national survey of latrine producers, including NGOs, will be undertaken by UNICEF and DPHE (GOB-UNICEF 1993). DPHE has initiated several research and development activities regarding sanitation: a training course for private producers, field testing of thinner and less expensive pit liner rings in Village Sanitation Centers, and assessment of the risk of groundwater pollution from pit latrines based on existing information (GOB-UNICEF 1993).

106. As with tubewells, figures on access provide only a partial view of the situation. DPHE and UNICEF pursued an "integrated approach" whereby safe water and sanitary latrines were presented as a package: to get a tubewell, user groups were required to build a target number of latrines. This approach has apparently been seen as coercive and essentially counterproductive, and DPHE has discontinued this practice (Danida-SDC 1993a).

107. Improved technical factors must be matched by improved use of facilities. Increased use of latrines by children is essential to reducing incidence of child diarrhoeal and parasitic disease (GOB-UNICEF 1992). This will require ensuring the convenience of latrines for women and children, as well as improved understanding of the relationship between sanitation and health.

3. Plans and Needs for Hygiene Education and Behavioral Modification

108. To achieve health impacts, the central government plans to use an integrated approach of water, sanitation, and hygiene in every part of the country. Plans include effecting behavioral changes in hygiene, particularly among children, through social mobilization and the promotion of socially acceptable and affordable technologies (GOB-UNICEF 1993).

3

Institutions and Human Resources Development

A. Introduction

109. Drinking water and sanitation programs have been implemented primarily by government agencies in the past. The commitment of the present government to ensuring peoples' participation in the decision making process and development activities could create greater opportunities for demand-based participatory design and implementation in the sector.

110. The fundamental institutional objective is to develop institutions which provide effective and sustainable services. In general, this requires a sharing of responsibilities between central agencies, local governments, NGOs, the private sector, and communities themselves, as well as accountability to consumers. Each institution should have a well-defined and limited set of objectives so that it can organize its activities, its performance can be monitored, and adjustments can be made as needed.

111. Bangladesh is divided into five administrative divisions comprised of 64 zilas, or districts. In rural areas the districts are divided into 460 thanas, and the thanas into 4,451 unions, and the unions into 85,650 villages. Thana is the lowest level of central government administration in rural areas, while the union, with an average population of about 25 thousand people, is the lowest level of self-government. Villages are not part of the administrative structure. In 1993-94 the local government system was reorganized to provide more power and local accountability to the union parishads, or councils which are elected and liaise and work closely with government administration.⁶ They are dependent on the technical support of various central government agencies for planning and execution of projects. The Union Parishad also plays an important role in creating awareness of environmental sanitation.

112. Urban areas are served by a different administrative structure. The four major cities of Dhaka, Chittagong, Rajshahi, and Khulna are governed by city corporations. An additional 108 urban areas, comprised of zila towns and some thana towns, are administered by municipal governments called pourashavas.

113. The Constitution states that local government bodies should be composed of elected members and be vested with the necessary powers including imposition of taxes and levies, and preparation of their own budgets. The revised local government system which has been developed provides for the establishment of gram unnayan committees, or village development committees,

⁶ Legislation currently under consideration is likely to introduce indirectly elected Thana Unnayan Samannaya Committee (Thana Development Coordination Committee) and directly elected Zila Parishads.

which will be responsible for formulating and implementing development projects at the village level, and will work with the centralized government agencies.

B. Institutions and Stakeholders in the Sector

114. The statutory responsibility for the water supply and sanitation (WSS) sector is vested in the Ministry of Local Government, Rural Development and Cooperatives (MLGRD&C), which shares with the Planning Commission the tasks of policy decisions, sectoral allocation and funding, as well as project appraisals, approval, evaluation, and monitoring. At present there is no framework within MLGRD&C to develop policies or to analyze policy implications in the WSS sector. The functional responsibility is delegated to the Department of Public Health Engineering (DPHE) in all rural and urban areas except Dhaka and Chittagong. The Local Government Engineering Department (LGED) is responsible for all infrastructure, excluding WSS services. It shares responsibilities in some cities and all pourashavas with the DPHE. In Dhaka and Chittagong, water and (Dhaka only) sewerage are handled by the Water and Sewerage Authorities (WASAs). City Corporations (CC) in Dhaka, Chittagong, Khulna, and Rajshahi have responsibilities in waste management.⁷ Figure 3.1 illustrates these institutional arrangements.

115. DPHE is responsible for planning, designing, and implementing water supply and sanitation services in rural areas, thana towns and pourashavas. Some overlap with the work of LGED and the pourashavas which is felt by DPHE to be unnecessary. DPHE has supervisory staff at zila and thana levels and is represented at union parishad level by tubewell mechanics and masons. One executive engineer is assigned to each of the zila offices.

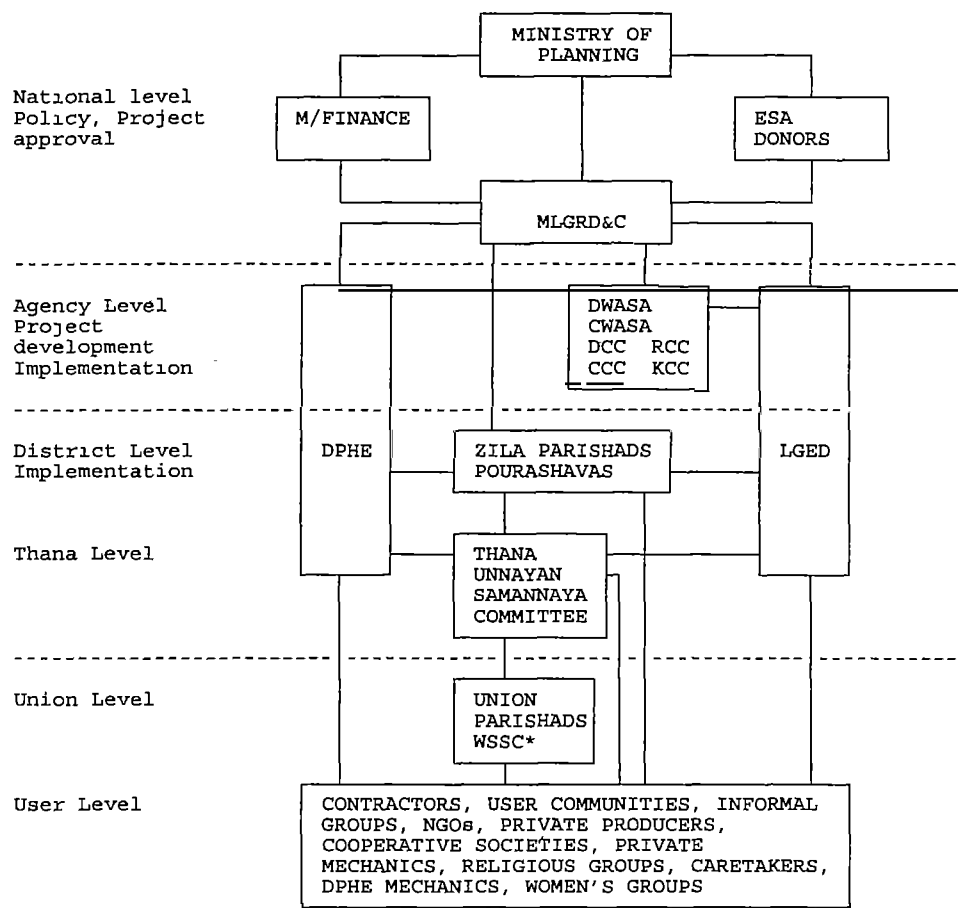
116. LGED has charge of infrastructure development in urban and rural areas, including feeder roads, small culverts, and small scale irrigation. Although it has no mandate to work in WSS services, its limited involvement in drainage, solid waste management, and rehabilitation of water supply overlaps with, and is seen to infringe upon, responsibilities vested in DPHE and the pourashavas. The department implements some WSS activities as components of larger projects. LGED has offices in each zila parishad which provide technical guidance to the thana parishads and pourashavas on infrastructure development projects.

117. WASAs provide services within the metropolitan boundaries of Chittagong and Dhaka. WASAs are semi-autonomous bodies with management entrusted to boards and report directly to MLGRD&C. Dhaka WASA has charge of water supply, subsurface drainage, and sewerage. Chittagong WASA, in the absence of sewerage, deals only with water supply.

118. Dhaka City Corporation is in charge of solid waste management, surface drainage and implementation of on-site sanitation. Chittagong, Rajshahi and Khulna CCs are responsible for surface drains, solid waste management and maintenance of water supply provided by DPHE and LGED.

⁷ Table 5.1 in Chapter V illustrates urban institutional division of responsibilities among water, sanitation, drainage, and solid waste management

Figure 3.1 Existing Institutional Arrangements



* Water Supply and Sanitation Committee

119. The pourashavas have responsibility for solid waste management and for maintaining a sanitary environment within their boundaries. Provision, operation and maintenance of water supply is a statutory responsibility of pourashavas, but they have limited technical competence and rely on DPHE (or LGED) for design and construction, and in many cases O&M.

1. Department of Public Health Engineering

120. With a mission to provide universal access to water and sanitation facilities for the people, DPHE was founded and has developed with a strong technical bias emphasizing WSS infrastructure development. Experience of the IDWSS Decade has shown the need to expand the scope of water supply and sanitation beyond provision of 'hardware' to include more emphasis on health education and the use of facilities. Factors of emerging importance include community participation, involvement of women, social mobilization and hygiene education, all of which require skills and institutional inputs which differ from those in an organization primarily devoted to engineering. DPHE has acknowledged a need to adapt to the situation (Matrix 1993).

121. A recent organizational study of DPHE noted four paradoxes. While demand for WSS services is growing, DPHE does not have the capacity to meet them alone. Without attention to the "qualitative" aspects of service provision, facilities and supply systems are not sustainable. DPHE has the capacity to provide advice on WSS policy development, yet it concentrates on implementation only. DPHE is a government department, yet its work is increasingly being duplicated by the private sector (Matrix 1993).

122. The Matrix report was built on a series of workshops in which DPHE staff chose a future course for the institution which focused on strengthening its organizational effectiveness and operational efficiency as an engineering institution, while improving its coordination of other agencies' work in the "software functions" and becoming more responsive to clients (Matrix 1993). Among the changes advocated within DPHE are a renewed effort to recruit female staff. In an organization traditionally seen as a male domain, six female tubewell mechanics have recently been appointed, five of the 761 SAEs are women, one of the 20 Health Educators is female, and there are three female engineers in a pool of 201 (Matrix 1993). Health education and social mobilization are being intensified and involvement of clients in the development process has been introduced (Matrix 1993). A five year program of agency transformation has been proposed in which DPHE strives to become more "client-oriented" through adopting measures for improving local accountability and through a reorientation of the entire staff toward the role of women in the WSS sector (Matrix 1993).

2. Local Government Engineering Department

123. Local Government Engineering Department (LGED) is responsible for infrastructure development in both urban and rural areas of Bangladesh. With offices in every district, LGED has on occasion provided technical guidance and personnel support to thana parishads in implementing limited rural water supply and sanitation projects financed from thana resources or government allocated funds.

124. Though water supply and sanitation is the mandate of DPHE, LGED is involved in rehabilitation of urban water systems, drainage, solid waste management and provisions of water and sanitation service in urban slums. LGED collaboration in pourashavas is achieved through a Project Implementation Unit (PIU). The staff of PIUs are mainly provided by the pourashava and have responsibility for local planning, tendering, contract administration, quality control, and project operation and management. The project account is maintained under the Pourashava Chairman. One study found that this method of Pourashava-LGED cooperation has been well received by the pourashavas (BKH 1993). LGED seconds executive engineers to first class municipalities,⁸ a category containing 33 pourashavas (Siddique 1993).

125. The Ministry of LGRD&C recently indicated that DPHE and LGED would in future complement each others' infrastructural activities and not overlap in water supply and sanitation as in the past (BKH 1993).

⁸ Based on total revenue earnings, government has categorized municipalities into first, second and third class

3. Urban Administrative Units in the Sector

126. Water and Sewerage Authorities. The statutory responsibility for water supply and sanitation in Dhaka and Chittagong rests with their respective Water Supply and Sewerage Authorities (WASAs). Dhaka WASA plans, implements and operates water supply, subsurface drainage and water borne sewerage services. The Chittagong WASA has so far limited its activities to provision of piped water supply only. The WASAs were meant to be semi-autonomous entities to develop and operate water and sewerage systems on a commercial basis. Yet in matters of policy, staffing, or fixing of water tariff, WASAs exercise little authority (GOB 1984). The World Bank has recently proposed institutional reforms, including autonomy and power to make policy decisions, as preconditions to an IDA credit for the Fourth WASA project (IDA 1993).

127. City Corporations. Four cities have city corporations and each has a slightly different set of capacities. The Corporations provide and maintain drainage, solid waste collection and disposal, and handpump water supply. Except for Dhaka and Chittagong, where the water supply is operated by CWASA, the other corporations maintain and operate water supply systems installed by DPHE. Dhaka City Corporation (DCC), under the Ministry of LGRD&C, provides solid waste collection and disposal service in Dhaka city. On-site sanitation is also the responsibility of the DCC, which is currently implementing the IDA-assisted First Urban Development Project (FUDP) that includes on-site sanitation and a drainage component.

128. With DPHE planning and implementation, the Rajshahi and Khulna City Corporations provide and operate water supply and sanitation services. Chittagong City Corporation (CCC) assisted by UNICEF has started a sanitation program aimed at conversion of bucket latrines into pour flush systems. Though progress in the initial phase was encouraging (some 3000 latrines were built in the first year), the program has now come to a standstill. About 12 of the 40 public latrines in Chittagong under the IDA-assisted FUDP have been built and leased out to the private sector. Under the same project, environmental improvements including latrines, drainage and waste collection are being implemented in a slum in Dhaka and excavation of the Chaktai Khal (canal) in Chittagong has been completed.

129. Pourashavas. Under the administrative control of the Ministry of LGRD&C, the pourashava (municipal) chairman and his committee of ward commissioners are locally elected. The pourashavas are responsible for development and maintenance of social services and physical infrastructure in municipal areas. The pourashavas collect and dispose of solid wastes and are mandated to maintain a sanitary environment. They are also expected to operate and maintain piped water systems which the DPHE may install, despite the fact that pourashava involvement in planning and implementation is minimal.

130. The pourashavas' role in the disposal of human excreta is largely limited to maintenance of trenching grounds; households with bucket latrines must arrange in the private sector to have nightsoil collected. In DPHE-implemented sanitation projects, pourashava inputs are limited to providing lists of households to DPHE. A recent study indicated that community contribution to the improvement of sanitation is encouraging. Among households having latrines (both sanitary and unsanitary), 38% of the households had constructed the latrines themselves, without any external assistance. Another 28% reported having been assisted by pourashavas, and the remaining households were assisted by NGOs, private producers or dealers of latrine components (UNDP-World Bank 1988).

131. Pourashavas have limited capacities in management, technical competence and finance to operate water systems efficiently or to undertake community development and social mobilization. Information collected from 44 pourashavas show that staff size ranges from as low as 5 in Mohespur to as high as 370 in Chandpur. About 40% of the municipalities have staff strength of over 100, 42% over 50 and 16% below 20 (UNDP-World Bank 1988).

4. Rural Administrative Units

132. Zila Parishads (district councils) consist of elected and appointed members and are directly involved in planning, implementation and monitoring of development activities within the district. They review proposals made by the Thana Development Coordination Committees and undertake construction and maintenance of drainage improvements which are outside areas covered by pourashava responsibility (Siddique 1993).

133. Thana Unnayan Samannaya Committees (Thana Development Coordination Committees), chaired in turn by union parishad chairmen, shoulder responsibility for planning, implementation and evaluation at thana level. Though the decentralized upazila system has recently been annulled, the water supply and sanitation committees initiated at thana levels are still in existence. Water and sanitation provisions of the thana centers are the responsibilities of the thana committees.

134. Union Parishads are responsible for promotion of hygiene education and creation of awareness about environmental sanitation among the rural population. The Union Water Supply and Sanitation Committees, which exist in all unions, are comprised of community leaders and DPHE representatives and play an important role in distribution of tubewells. The union parishads co-operate with DPHE and thana committees in identifying households for government funded water supply and sanitation activities. The revised local government system devolves more authority for local planning to the union parishads and village development committees.

5. Non-Governmental Organizations (NGOs)

135. Non-governmental organizations are active in water and sanitation program financing and implementation in both urban and rural areas. Bangladesh is endowed with many NGOs, and most thanas have at least four active organizations working in a variety of development areas. Some NGOs have a national impact. BRAC (Bangladesh Rural Advancement Committee), with 6000 employees, has reached about 12,000 of the nation's 85,650 villages through intensive rural development group formation and has carried out campaigns reaching every village. The Grameen Bank provides credit to 1.5 million women and about 100 thousand men in almost half of all villages (Khandker et al. 1993). The two Proshika NGOs together have formed about 50,000 self-help groups.

136. There are numerous training NGOs devoted to supporting thousands of smaller NGOs at local levels. The NGO Forum, an apex service body associated with ADAB (Association of Development Agencies in Bangladesh) is the premier NGO in the WSS sector, assisting 460 "partner" NGOs by providing hardware support, advocacy, networking, institution building, training, information, research, evaluation, and monitoring. Since 1982 it has assisted in the installation of over 16,000 tubewells and 123,000 latrines. NGO Forum enjoys support from the DPHE and UNICEF in implementing sanitation and hygiene programs in selected thanas. The NGO Forum

shares with the government a strategy of an "integrated approach," combining water, sanitation, and hygiene education. The themes of the NGO Forum and its partner organizations include sustainability, improvement of hygiene behavior, and the involvement of women both in delivering services as well as in managing domestic use (NGO Forum 1992).

137. NGOs endeavor to integrate community participation with hygiene education, water supply and sanitation. Their mode of operation is to focus on village-level activities. NGOs may be more effective than government agencies at identifying the poorest households and delivering services to them. Their extensive presence has offered opportunities for international donors including UNICEF to reach poor rural and urban communities (NGO Forum 1992). In almost all urban communities, there are community based organizations, clubs and individuals willing to assist water and sanitation programs, but the government has not as yet evolved the institutional orientation, attitudes and mechanisms to foster alliances with NGOs toward mutual goals.

138. Despite the more extensive and direct contact of NGOs with the rural population, one study concludes that NGOs have yet to develop as a significant channel for delivery of sanitary latrines (Chadha and Strauss 1991). This may be changing (UNICEF 1994). However, NGO activities more selectively target the poorest who may not be adequately served by other channels or access to credit.

6. Private Sector

139. The government water and sanitation program has stimulated a demand to which the private sector is responding well. Private handpumps comprise 71% of all rural handpumps and 88% of all urban handpumps (Mitra 1992). Sanitary latrines are mostly private, although urban areas have some public latrines. In rural areas 61% of all households have some sort of latrine, and over 25% have a sanitary latrine (i.e., with a pit).⁹ In urban slums and fringes the rates were even higher: 83% of all households had a latrine, and almost 50% had a sanitary facility (Mitra 1992). Latrine components, handpump sets and deepset tara handpumps are widely available. People in many rural communities are making their living as handpump drillers, fitters, repairers and plumbers. In rural Bangladesh there are about 700 private producers of latrine components having an annual production capacity of 140,000 latrine units, compared with 900 DPHE production units with an annual capacity of 265,000 units, and a less significant number of foreign and local NGO-assisted production units, which have provided a total of 230,000 latrines since 1981 (Chadha and Strauss 1991).

140. Private supplies of handpumps have responded well to demand. The 1991 survey finding that 71% of all rural handpumps were private represents enormous growth from just five years earlier, when another study estimated that only one in three shallow tubewells were private (Mitra 1992; GOB-Netherlands 1986). Fewer private tubewells had missing parts (27%, compared with 43% of public tubewells), indicating either better maintenance or better availability of parts in the private sector. In addition, private mechanics provided repair services to 22% of public tubewells and 27% of private tubewells, compared with DPHE mechanics who serviced 10% of the public wells and 3% of the private wells (Mitra 1992).

⁹ The 25% has reportedly risen to 33% (UNICEF 1994)

141. Private producers of latrines feel that the lack of an easily accessible credit system for investment and working capital is a major limiting factor for expanding their production (Chadha and Strauss 1991). Despite the advantage enjoyed by DPHE production centers in their ability to offer latrines at subsidized rates, the private sector has thrived due to lower production costs and better service. While no figures were found on the percentage of latrines which were purchased from government production centers versus private producers, one study provides a figure of 39% of a sample of latrine-owning respondents who had paid no more than the government subsidized price for slabs and rings (Chadha and Strauss 1991). The remaining 61% probably bought their components from private producers. Private producers do not consider themselves in direct competition with the DPHE production centers, and apparently are producing for different market segments (Chadha and Strauss 1991). While the government-subsidized latrines are within the means of most of the poor, about 20% of the population cannot afford even these (Chadha and Strauss 1991). UNICEF/DPHE has commissioned a study to assess the market situation related to latrine producers; this study will be complete in June 1994 and should provide a firmer basis for planning (UNICEF 1994).

7. Donor Organizations and Cooperation

142. Multilateral support has been provided by UNICEF, IDA, ADB, and WHO. Rural water supply has been heavily supported nationwide by UNICEF in partnership with Danida and the Swiss Development Cooperation. Their work has extended to urban slum and peri-urban areas. Most other donors' support in the sector has been provided to urban areas. Support for projects in zila (district) towns has been given bilaterally by Danida, the Netherlands, and JICA of Japan, and multilaterally by the Asian Development Bank. Assistance has been extended to Dhaka and Chittagong by IDA and by the Asian Development Bank. The World Health Organization has facilitated development in operational capabilities and human resources, including project planning, implementation, monitoring, and evaluation (UNDP-World Bank 1991).

143. The UNDP-World Bank Water and Sanitation Program focuses on sustainable WSS services to the poor. Institutional capacity building, human resources development, promotion of community based approaches, and structured learning focussed on informal institutions comprise its agenda. Within the limits of its mandate, the Program responds to government, donor and NGO requests for technical assistance in preparation, appraisal and supervision of sectoral activities. The Program has assisted in developing and testing the Tara Handpump; has completed a study of health impacts and community management of Tara pumps at Mirzapur; has demonstrated low cost sanitation options in pourashavas; and has contributed to building capacity in pourashavas. It has provided technical inputs to IDA and other donor activities and has assisted the two WASAs in improving their management capabilities. The Program is currently working with GOB, UNDP and UNICEF in preparing this Situation Analysis for the Sector, and in formulating a National Program Document and a subsequent Program Support Document for UNDP. DPHE's Danida-assisted Handpump Training and Monitoring Program (HTMP) is being implemented under direct Program supervision.

144. UNICEF's program has been extensive in content and national in scope. UNICEF assistance to the central government by June 1991 supported the installation and maintenance of 732,000 handpump systems, the rehabilitation of 190,000 choked up tubewells, and the production and sale of over 1.2 million latrines. UNICEF has also provided technical assistance and support

to technology design and quality control, to hydrogeological mapping, to the adoption of community participation, and to the development of infrastructure and human resources (GOB-UNICEF 1992).

145. External Support Agencies (ESAs) have also supported NGOs for a wide range of project activities including improving access to water and sanitation. NGO Forum plays an important role particularly for donor assistance through NGOs to water and sanitation development. NGO Forum projects have received multilateral funding from UNDP, World Bank and UNICEF. Bilateral funding has been extended by Misereor of Germany, CAFOD of Britain, Danida, and Swiss Development Cooperation (Interchain 1991; NGO Forum 1992).

C. Legal Provisions

1. Local Government Responsibilities

146. Local governments are required by national law to provide sufficient water supply for public and private purposes. While this may be satisfied by a system of tubewells, pourashavas are also authorized to construct and maintain water supply schemes for water provision, storage, and distribution. They may charge payments for provision of piped water (GOB 1977).

147. Local government ordinances make it mandatory for pourashavas and thanas to maintain a sanitary environment and provide sanitation services, including public latrines and appropriate drainage. Pourashavas also may regulate private drains, and may plan and construct drainage systems. Municipalities and thanas have the authority to fine any person or household contributing to insanitary conditions and may even remove, at owners' expense, any structure that creates insanitary conditions (GOB 1977). Municipalities are at present unable to provide alternatives to insanitary practices or enforce these regulations.

2. Users' Obligations

148. All home owners within the jurisdiction of Dhaka WASA are required by law to pay sewerage rates if sewerage mains are within 30 meters of their property.

3. Water Quality

149. Although municipal governments have the authority to regulate water quality for private as well as public supplies (GOB 1977), there is no agency with legal power to monitor or enforce compliance to a minimum standard of water quality.

4. Water Quantity

150. Despite the growing problem of groundwater overdrafts during the dry season when farming requires irrigation, there are as yet no legal instruments to control extraction rates in rural areas. Seasonal use of groundwater for irrigation lowers the water table below the reach of suction handpumps, leaving many households without a source of tubewell water for domestic consumption. Pourashavas have the right to control the installation of new wells within their jurisdiction (GOB 1977).

D. Sector Policy, Planning and Performance

1. Policy Framework

151. Development programs in Bangladesh take place within the general framework of the five year development plans. The policies and strategies for water supply and sanitation sector development should be seen in the context of the national development strategies as outlined in the Fourth Five Year Plan (4FYP) document. Among other things, the 4FYP (1990-95) emphasizes the following:

- * Gradual shift of the public service delivery agencies from being 'providers' of services to that of 'facilitator';
- * Human resources development;
- * Participatory, group based, bottom up development through involvement of communities in planning and implementation of development programs;
- * Bringing women into the main development streams;
- * Mobilization of local resources;
- * Encouraging and supporting a greater contribution by the private sector to general development efforts; and
- * Restructuring and orienting the administration to make all of the above possible.

However, no framework or action plan has been designed to make this possible.

2. Participatory Development

152. With a view to integrating the poor and the disadvantaged groups within the planning process, the Government of Bangladesh has adopted (but not operationalized) a group-based approach as a strategy, a method which involves encouraging individuals with few or no assets to form groups for purposes of applying for assistance. Social sanction then serves in place of collateral as an incentive for sustained cooperation. The 4FYP emphasizes decentralized participatory planning with villages as the initiators of development activities. Unions are the basic units for preparation of the village plans with the thanas playing a co-ordinating role. Definitive programs to strengthen urban and rural local authorities are still at an early stage (Matrix 1993). The recent change from an autocratic to a democratic form of government reinforces the concepts of accountability and participatory development. Consistent with the national policy statements, there has been a steady increase in the involvement of users, both financially and through self-help. However, in the absence of operational changes, participatory development remains ad hoc.

3. Integrated Approach through Social Mobilization

153. The government is focusing more attention on the problem of low health impact. By 1985 there was growing recognition that water alone cannot improve health and that adequate sanitation and hygiene practices are also indispensable components of interventions in the sector (GOB-Netherlands 1986). By 1988 a strategy for a better balance of water supply, sanitation and hygiene education was developed. The 1992-95 program phase emphasizes hygiene promotion through social mobilization (GOB-UNICEF 1992). The program is gradually evolving from a purely

technical orientation of tubewell installation and rehabilitation into a community oriented water supply, sanitation and hygiene promotion program

154. In the future the program is expected to strengthen the role of communities and the private sector. Swiss Development Cooperation plans to assess and test strategies to draw on the potential of the private sector in sanitation development (Chadha and Strauss 1991). The Action Research Project on Sanitation, focusing on latrine production and the market for latrines, has been handed over to UNICEF to be implemented as an integral part of the UNICEF-DPHE program.

4. Supply-Driven Planning

155. Water and sanitation projects are developed according to the interest and availability of bilateral and multi-lateral funding. Allocations for projects or project components are not based on demand or service deficiencies. During the IDWSS Decade investment in urban sanitation, drainage, and solid waste management in the zila towns was virtually absent, despite the poor degree of urban sanitation. Allocation to high water table areas was consistently higher than in low water table and saline areas, despite the fact that the latter areas had a much lower coverage (Danida 1989). Also several projects assisted by different donors are being implemented in the shallow water table area with different strategies (UNICEF 1993d). Sector activities reflect a gap in the development framework, in spite of the fact that the 4FYP asserts the necessity of a sector plan prior to project planning for a sector. Consequently sector development activities are neither co-ordinated nor do they add up to a comprehensive whole.

5. Institutional Roles in Planning and Implementation

156. In the rural sector project documents are jointly prepared by the DPHE Planning Circle and UNICEF. In project management, operational decisions are taken by project directors, often not subject to consultation or subsequent communication with staff in zonal offices. Most programs of the rural WSS are supported by UNICEF and implemented through DPHE under joint supervision of UNICEF and DPHE (Matrix 1993).

157. DPHE plans and implements urban water supply systems and turns them over for O&M to pourashavas (or maintains them jointly) which play little role in planning and implementing the systems. Planning capability at the pourashava level is low. Municipal involvement in DPHE decision-making processes has been described in terms of being kept informed rather than taking decisions jointly (BKH 1993). DPHE involvement in urban sanitation has been through projects under external funding from Asian Development Bank, the Dutch, Danida and UNICEF.

158. The Dutch-assisted activities involve municipalities and local NGOs in providing services in 30 pourashava towns. The Water and Sanitation Committees, comprised of community and municipal representatives and DPHE officials, play an important role in development and operation of water and sanitation service provisions at the thana and union levels. These committees are project based and have not yet been institutionalized in the new system of local government. The second ADB project on water and sanitation in nine pourashavas proposes giving financial and administrative responsibility to municipalities for project implementation (BKH 1993).

6. Project Monitoring and Information Systems

159. The DPHE and the WASAs are required to submit regular progress reports to ministries on different development activities. Reports consist largely of physical and financial progress. Little monitoring is directed toward targets other than installation, such as caretaker training or participation of women (Matrix 1993). Information and data collected from the field are processed manually and collated at the central level. No summarized information is passed down the management chain to the originators of the data (Matrix 1993).

160. WHO is assisting DPHE to develop a computerized information system, but in terms of staffing and equipment it is still elementary. Though some project based information systems exist, the absence of a central DPHE Management Information System (MIS) to integrate these systems casts doubt on their sustainability beyond the project period. With the increase in DPHE activities in recent years, it is becoming more difficult to access the right information at the right time, with an adverse effect on the quality of management, planning and reporting. The organizational study of DPHE presented proposals for strengthening the MIS for DPHE (Matrix 1993).

E. Sectoral Finance

1. Government of Bangladesh

161. Public outlays for water and sanitation steadily dropped between 1973 and 1990, from 2.48% to 2.14% to 1.25% of the budget in the first, second, and third Five Year Plans, respectively. This is significantly below allocations in neighboring countries such as Sri Lanka (6.0%), India (2.4%), Burma (2.9%) and Nepal (4.0%). The 4FYP (1990-1995) allocation of 1.41% to the WSS Sector is too low to meet the target of the Plan (UNDP-World Bank 1991). During the IDWSS Decade the total expenditure in the sector was US\$ 170 million of which US\$ 97 million was donor contribution.

162. During the 1992-95 period contributions to the rural water and sanitation sector are expected to include US\$ 13.2 million from the government, US\$ 19.6 million from UNICEF (covered by the governments of Denmark and Switzerland), and US\$ 24.7 million from beneficiaries, for a total of US\$ 57.5 million invested (GOB-UNICEF 1992).

163. Investment in the WSS sector is biased towards water supply in the core areas of large urban centers. Between 1981 and 1990 77% of the total investment in water supply and sanitation was in the urban areas. Dhaka and Chittagong alone received 42% of the total sectoral investment. In the 4FYP (1990-95) Dhaka alone was expected to receive 55% of total sectoral allocation (UNDP-World Bank 1991). During the 1981-90 period 93% of the sectoral expenditure went to water supply (WHO 1993).

164. Investment in urban sanitation has been extremely low in the 62 zila towns and virtually nil in the thana towns. Only 15% of the urban sectoral expenditure for zila towns (excluding Dhaka and Chittagong) goes to sanitation. Rural sanitation received just 23% of the sectoral resources targeted at rural areas (UNDP-World Bank 1991).

165. All sectoral expenditures with few exceptions are financed through the DPHE and the WASAs. The municipalities levy their own taxes, and have access to central government development grants. Water and sanitation projects may also be initiated by pourashavas and thanas from their annual government development grants, but this seldom happens. Though pourashavas acknowledge the importance of sanitation, their budgets do not accord a priority to sanitation (UNDP 1991).

166. Except for Dhaka and Chittagong, in most of the pourashavas revenue income rarely covers the operation and maintenance cost and never includes amortization of capital costs. Water supply systems are heavily dependent on government subsidies. A 1986 analysis of WSS in 42 pourashavas showed that only 57% of expenditures were billed, and only half of that was collected, so that revenues amounted to only 29% of expenditures. Despite efforts to change this situation, a second analysis five years later found similar results (UNDP-World Bank 1991).

2. Donor Organizations

167. Foreign assistance through bilateral and multilateral funding accounts for about 60% of the sectoral allocation (UNDP 1991). During the IDWSS Decade donor assistance grew to as much as 80% of investment in the WSS sector, primarily as project assistance (UNDP-World Bank 1991). UNICEF alone has invested about US\$ 80 million between 1973 and 1993 (Matrix 1993). This has given external donors strong influence, but has also made the sector donor dependent.

3. Non-Government Organizations

168. Despite the importance of the work of NGOs in reaching certain segments of the population, in promoting community participation, and in espousing an integrated approach to water, sanitation, and hygiene behavior, they do not generate a significant contribution to sector finance. Although some NGOs provide only credit or subsidies for tubewells or latrines, others such as those supported by NGO Forum provide tubewell materials for free, requiring users only to provide or pay for transportation and installation (Interchain 1991). While this approach may be the only possible way to provide wells to the poorest of the poor, it may hinder the work of NGOs to the extent that they are subsidizing households which could possibly afford to pay, absorbing scarce resources which could be spread more widely to stimulate mobilization of household or community resources.

4. Community Resources

169. In urban areas property based taxes are potentially the most productive form of mobilization of local resources. Yet the revenue base of the pourashava organization is both weak and under-utilized. Holding or property taxes do not respond to population increase or economic activities due to current deficiencies in property assessment practices. Non-realization of taxes and financing of recurrent revenue expenditure from central government development grant are common.

170. The financial conditions of the two WASAs are far from satisfactory. High levels of water loss, poor revenue collection and general dissatisfaction with service are endemic to water and sanitation authorities in Bangladesh. Water through piped house connections is under-priced, while supply from street hydrants is free to consumers. Sanitation services are provided at subsidized prices or on the basis of installments that are seldom realized. Government is expected to bear almost all the cost of installation and maintenance of public sanitation services. Mobilization of

local resources or cost recovery is not assigned high priority. Financial dependency of local authorities further deepens the cycle of dependency and inefficiency (UNDP-World Bank 1991).

5. Private Sector

171. As two-thirds of the 2.3 million rural shallow tubewells are privately owned, it is clear that significant private resources have been mobilized. One estimate of private contributions to the total capital costs of water supply in rural areas is 45% for public and private wells combined, and 9% for government-subsidized wells (Wan 1994). How these resources are mobilized is not clear, but the evidence indicates that much is raised through informal sources. Although some loans from Grameen Bank are used for tubewells, a recent study across all sectors noted that the Grameen Bank together with other formal credit institutions provided only 8% of all credit forwarded to the poor (Hossain 1988). Total lending to all rural borrowers for all purposes was comprised of 28% loans from formal lending agencies and 72% from informal sources such as professional money lenders and relatives (RCSB 1989).

6. Cost Recovery

172. The private sector produces and delivers water and sanitation services at a market price, while those in the public sector, both in the rural and urban areas, are subsidized. In the rural areas consumers contribute 17.5% toward the cost of a shallow tubewell and suction pump, 8% toward a tara pump and 5% toward a deep tubewell (Wan 1994). User contribution for ring wells fitted with a Tara pump in the stony areas is Taka 1000. The current contribution is a marginal improvement over the past. Tubewells spares are available at a cost from DPHE and private producers, while the services from DPHE tubewell mechanics for repair are free. A mechanism for handing over the O&M of suction pumps to users is being developed. Maintenance of suction pumps in seven thanas was turned over to the beneficiaries on a pilot basis in 1992. In shallow tubewell areas, maintenance is provided almost entirely by private mechanics at users' cost (Danida-SDC 1993a). Spare parts were provided free by DPHE until 1992, but are now provided for payment. The proceeds from sale of spare parts are required to be transferred to a central repository to replenish supplies for distribution, but as of early 1993, 17 district offices had not made the transfer (Danida-SDC 1993a).

173. DPHE has revised its policy on latrines from slab-plus-five-rings to slab-plus-one-ring at a subsidized price of Taka 125. Additional rings may be bought at cost from DPHE centers or at market price from private suppliers. The sale proceeds of the latrines are used in a revolving fund. The administration of the fund, however, has not been very encouraging (WHO-DPHE-UNICEF 1991). A recent focus by DPHE-UNICEF on 'do-it-yourself' latrines will not incur public expense other than the cost of building awareness and social mobilization (UNICEF 1993a,b,c).

174. Water tariff in municipalities is based on the diameter of house connections. Water service charges included in property tax are set to partially cover the cost of water consumption from street hydrants. Generally revenue collected for water in municipal towns is not enough to cover the operating expenses as many customers do not pay their bills (GOB-Netherlands 1986).

175. In a recent project on sanitation in municipalities no low income household was reported to have purchased latrines (UNDP-WB 1988). In urban water supply as well, it is the relatively affluent who obtain house connections. A propensity to site tubewells with a bias towards

the economically stronger section of the community is partially responsible for the disparity in coverage in the shallow tubewell areas. The unserved pockets are those which are inhabited by the poor and are unrepresented on union parishads, and those which are remote (Danida-SDC 1993a).

176. Cost recovery for sanitation in the ADB-sponsored urban WSS programs in selected municipalities in five districts was based on a 10% down payment with the remaining 90% to be realized in 40 quarterly installments. Few customers felt the obligation to pay the installments and thus the strategy often represented a 90% subsidy, undermining long term program sustainability (UNDP 1991).

177. NGOs appear to enjoy a high level of efficiency in loan/cost recovery from borrowers (Chadha and Strauss 1991; Khandker *et al.* 1993). Grameen Bank reports a rate of 96% recovery on loans extended without collateral, to people without assets (Khandker *et al.* 1993). The UNICEF-financed Slum Improvement Project has had a loan recovery rate of 96% on small loans advanced to slum dwellers organized into groups (UNDP 1991). Similar successes are also reported by a number of other NGOs. Data specifically on loans used for WSS investments were not available.

F. Human Resources Development

1. Professional Development

178. Human Resources Development (HRD) in the sector can be divided into professional development and local/user training. Professional development is through bilateral or multilateral sponsored scholarship abroad and project-based training at different levels. There is no regular training based on long-term skills needs assessments for upgrading and improving expertise and skills in the sector. No agency in the sector has an active training unit or a high-level staff member assigned exclusively to training (Matrix 1993).

179. In the absence of a systematic training program, the staff lack proper orientation, motivation and communication skills, and are not sensitized to social and gender issues. The interest expressed by DPHE in improving its management of the sector (see Matrix 1993) is seriously undermined by the current absence of a process for achieving agency reorientation from a technical approach to a facilitator and coordinator in the sector.

180. Human resources development extends beyond training to encompass career development. Training without an appropriate incentive structure or criteria for good performance will accomplish little. These require assessment of organizational goals. The current goals of DPHE are inconsistent with the need to emphasize facility use and user management. While training will be a necessary component of institutional reform, it must not be separated from incentive structures and performance criteria. Institutional reforms are needed to facilitate the impact of training.

181. DWASA Training Institute was established in 1981, under IDA assistance. Its courses are open to DWASA, CWASA and DPHE staff. Staff from DPHE have not participated since 1985-86. The Institute has so far offered more than 100 courses involving around 2,000 participants. The courses are short (usually less than a week) and cover technical, financial, and administrative aspects at supervisory, technical and skilled worker level (Matrix 1993).

182. The Institute consists of a Chief Training Officer, four Engineering and Management Training Officers and four support staff. It does not have a workshop, but does have some equipment for demonstration. Practical training activities are conducted in an adjacent DWASA water production well site. The Institute has established international linkages, sends staff abroad for training and invites speakers from abroad. Two of the five trained staff have already left the Institute. A contract for staff training has also been made with Loughborough University of Technology under funding from the British Council and WHO.

183. The contents of courses on water and sanitation in national institutions are not well suited to the needs of the country. BUET's proposed International Training Network (ITN) Centre is expected to address the problem and establish a network among national institutions for information dissemination and HRD in sector agencies, NGOs and local communities (Matrix 1993).

184. Technical training for field staff, mechanics, caretakers, and users has been provided by UNICEF. By the end of 1992 approximately 45,000 Tara pump caretakers and 2500 other caretakers had received one day of training and been given a tool kit. UNICEF also developed a training plan to upgrade the skills of technicians of contractors hired by DPHE for Tara tubewell drilling and installation. Evaluation and follow-up of that training are made by both UNICEF and DPHE.

185. The Dutch-sponsored 18 District Town Project has provided for health education training for DPHE, thana, and pourashava staff associated with the project towns. The focus is prevention of disease through an emphasis on the impact of water, the need for sanitation, case studies of diarrhoeal diseases and parasitic infections, and analysis of how diseases spread. The follow-up of this training is systematic. Trainers are selected and given Training of Trainers (TOT); this group includes women, particularly local teachers and local NGO staff (Matrix 1993).

2. Local Service/User Training

186. Established to train local service workers and users, the DPHE training section has limited communication skills and resources and is attached to the DPHE Planning Cell at headquarters. The Superintending Engineer (Planning), through the Executive Engineer (Village Sanitation, Research and Training), is responsible not only for training but also for health education, zonal laboratories and seven other major functions. Even if DPHE were an organization with a high degree of delegation, it is difficult to envisage a high priority being given to training under the present arrangement. This is reflected in the fact that only 24% and 30-35% of the scheduled caretaker training was held in the 1989-90 and 1990-91 period respectively. The backlog in training for caretakers of No. 6 handpumps reached such a magnitude that it had to be written off (Matrix 1993).

187. Local motivation and skills, rather than limitation in staffing, seem to be the main problem in training (Danida-SDC 1993a). Despite recent (1992-93) improvement in quantitative and qualitative terms, there is room for further improvements in training methodology, materials and improvement of communication skills (Danida-SDC 1993a). About 60% of the backlog in training Tara handpump caretakers has been met. Annual refresher courses have been given to 80% of the SAEs (sub assistant engineers) and TWMs (tubewell mechanics), and contractors and masons in 20 Tara districts have been trained.

188. Female participation in Tara caretakers' training sessions has averaged 49%. About 53% of females and 69% of males trained claimed competence to undertake repairs (DPHE-WHO-UNICEF 1993). In the district towns projects, women have been incorporated into many project components as users: making the decisions on siting tubewells, being trained in day-to-day maintenance and small repairs for handpumps, receiving primary attention from hygiene educators. Women are also represented more among the professionals: as field workers in hygiene education, as staff at the district towns' Community Sanitation Centers, in training programs for masons, and in employment in all project activities (GOB-Netherlands 1993). Training materials for different levels have been produced and for the first time, training has been included as a regular activity in the current national level Annual Development Plan.

189. Some NGOs including the NGO Forum maintain training capability and conduct regular training courses as well as workshops. NGO Forum training focuses on the development of managerial as well as technical skills. Their four courses include training trainers, technical skills for tubewell sinking and maintenance, caretakers training, and technical skills for low-cost latrine production. In 1992 they reached 128, 371, 357, and 2335 persons, respectively, in the four courses. While their collective impact may be limited, their methods may be considered by DPHE (NGO Forum 1992).

3. Training Needs Assessment

190. Training needs were assessed in a recent organizational study of the DPHE, which found that DPHE has no regular in-service training arrangements for its professional staff of any grade or rank. Training for all civil officers including the engineering officers and top managerial, administrative, and policy making officers is provided at the Civil Officers Training Academy at Shahbag and in the Public Administration Training College in Savar. In addition, 72 DPHE officers had been trained in different long or short courses financed by donors and given outside the country. There is no well-laid down procedure of follow-up of training (Matrix 1993).

191. The Matrix report asserted that training is at the heart of the organizational change program selected by DPHE, and that little can be achieved if progress is not made to develop in-house training and to embark on a systematic program of staff development at all levels. Organizational culture and staff career development currently suffer from this deficiency, and training is currently lacking as a criterion for promotions. The report makes a number of recommendations concerning professional training with regard to establishing a training policy, schemes of service and career development, decentralization, linkage with research and development and with social mobilization programming, monitoring and evaluation, and other factors in reorienting DPHE to meet the current challenges in the WSS sector (Matrix 1993).

G. Criteria for Future Sector Assessment

192. Old ways persist despite growing change. Central government planning is still oriented toward installation targets. From the perspective of access to physical facilities the "installation approach" has been successful. Access to service has improved and time for water collection from wells has been reduced; by 1991 the time needed for one trip to fetch water in the dry season averaged 15 minutes in rural areas and 7 minutes in urban areas. The wet season figures were 23 minutes in rural areas and 8 minutes at urban wells (Mitra 1992). Inputs from the local level help

decide allocations of tubewells, choice of technology, selection of site and depth of boreholes. Unfortunately, there has been little measurable impact on health.

193. An SDC-Danida appraisal mission noted that there were positive signs of re-orientation by DPHE toward non-engineering issues (Danida-SDC 1993a). An organizational study in 1993 included opportunity for DPHE to develop a strategy for identifying organizational goals which are consistent with the policies and strategies outlined in the 4FYP, and to outline a process for reforming itself to meet them (Matrix 1993).

194. Installation achievements and health statistics have been shown to be unrelated, possibly due to lack of use, and therefore do not capture the impact of water and sanitation projects. New criteria are needed for measuring progress toward goals in the WSS sector, particularly such goals as sustainability, facility use, and mobilization of resources through cost recovery. It may be useful to state these criteria in terms of agency performance as well as strategy outcomes. Specific criteria should be developed and should include qualitative as well as quantitative attention to changes in budget allocations, in staffing patterns, responsibilities and incentives, in patterns of assistance to pourashavas, and in reporting procedures. Strategy outcomes may be measured both in terms of process and impact: through the time saved in getting water and in the value of that time, through increased use of water for non-drinking domestic purposes, through improved coverage and use of latrines, and through changes in handwashing behavior.

H. Institutional, Planning, Financial and Policy Issues

195. There is a vacuum at present in the Ministry of LGRD&C in the framing and analysis of policies in the WSS sector. This limits the capacity of the sector to look broadly at sectoral needs and develop the institutional arrangements which will be most responsive.

196. In recent years the scope of water and sanitation service provisions has expanded beyond the provision of physical facilities. DPHE's original bias toward technology is gradually changing to espouse the need to prioritize 'software' on a par with 'hardware' delivery. In addition, partly due to donor interest, planners tend to focus on 'supply side' issues. Yet 'demand side' issues can provide valuable information for policy decisions on coverage, tariff and revenue estimation and users' perceived needs. The central government recognizes the need for institutional adjustment, orientation and strategies to foster participatory development, as well as the need to involve women, promote private sector participation and encourage local level initiatives. A coherent plan of action to bring about the changes necessary to meet the new challenge has not yet completely evolved, although the organizational study of DPHE facilitated discussion and planning in that key agency (Matrix 1993).

197. Sector development activities are planned on a project by project basis without reference to a guiding framework or a national sector plan. This results in duplication, misplaced priorities and uncoordinated development. Planning has also excluded clients, both municipal and household users. Despite some attempts to bring urban authorities into the planning process, municipal participation in planning and implementation has been passively discouraged by their limited capacity to contribute professional expertise and by their exclusion from central government processes. Urban users of facilities are passive recipients with little sense of belonging to the utility

systems they use. Rural users' needs have not been met despite the impressive installation achievements, as evidenced by the low use of tubewell water for all purposes.

198. Financial structures and capacities must be reconsidered. Water utilities, especially the WASAs, do not have the autonomy required to operate utility systems on strictly commercial basis. Pourashavas are limited in their financial and managerial capability. Administrative losses due to nonbilling and noncollection must be compensated through government subsidies.

199. Competing demands from other sectors make it difficult to allocate a higher level of resources to the sector. Though mobilization of local resources through beneficiary contribution has improved, consumers still bear a very small share of the total cost of services. Municipalities spend very little on improvement of water supply and sanitation. Underpricing of services and poor collection of water rates/taxes or tariff by water authorities are common and lead to operating shortfalls. National reliance on donor funding and local dependence on government funding perpetuate a cycle of dependency and inefficiency. Current financial deficiencies sap scarce resources.

200. Current division of resources between urban and rural areas is highly skewed toward Dhaka and other urban areas. Similarly, the resources allocated to water supply far outstrip those provided for sanitation or health education.

201. Municipalities are unable to enforce rules and regulations to ensure a minimum standard of environmental sanitation. There is no agency with legal powers to enforce water quality standards.

202. The private sector benefits from the demand for services stimulated by the government but it lacks active government support, encouragement and harmonization. Although services offered in the private sector are generally competitive with those offered by the government because they offer better service and less complex transactions, they are becoming constrained by government subsidies for water and sanitation services.

203. Manpower planning, training and management are constrained by the absence of a permanent training capacity and a national sector plan or guiding framework. Course curricula of technical training institutions in the country do not match practical demands of field conditions. Low priority for training is reflected in the poor staffing of the DPHE training section and an increasing backlog in the training of caretakers. This backlog has partially been met. CWASA has no training facilities, nor is DWASA Training Institute used for the purpose. The priority issues which remain include quality of training and a continuing program of staff development not just for DPHE but also to build capacity in municipalities, local bodies and communities.

204. Increasing sectoral activities are generating large volumes of information and data. Without an information management system, it is difficult to process and effectively use the information in planning, management and reporting at all levels.

205. Impressive physical achievements in the sector have not led to any measurable impact on improvement in general health, primarily due to low sanitation coverage and low social awareness on the relations between water, sanitation, hygiene, and health. While health benefits of water and

sanitation projects remain the overriding (but difficult to measure) goals, other benefits such as time saved and increased productivity may serve as more measurable indicators of project benefits.

206. Despite the general goals of the integrated approach, criteria for achievement are still defined in terms of installation targets. New criteria reflecting a concern for qualitative as well as quantitative targets must be defined by which to measure progress. These criteria should go beyond physical installation targets to include processes and impacts of both agency initiatives as well as additional benefits accruing to clients.

4

Rural Water Supply and Sanitation

A. Introduction

207. While the need for water and sanitation is universal, the physical and organizational challenges vary. In rural areas the major source of variation is in hydrogeological conditions, while in urban areas the major variation is in institutional arrangements and capacities. This chapter therefore describes conditions in rural areas and the water sector in terms of meeting a relatively uniform institutional challenge in different hydrogeological regimes.

B. Achievements, Goals and Programs

1. Water Supply

208. There are today an estimated 2.4 million tubewells in rural Bangladesh, of which about 900,000 are public tubewells (Wan 1994). Installation achievements have been impressive, approaching the goal of universal coverage, and government efforts have helped create a demand for private sector production which did not exist a decade or two ago. Chapter 2 described the types of tubewells and their coverage by hydrogeological region. The shallow water table areas are now relatively well endowed with tubewells, and saline and hilly areas have achieved targets ahead of schedule. The current targets for 1995 and 2000 for different hydrogeological areas are shown in Table 4.1.

Table 4.1
Target and Achievements in Water Supply Provision:
Persons per Operating Tubewell, 1993 and Targets for 1995 and 2000

<u>Region</u>	<u>Existing Coverage</u>	<u>Target Coverage</u>	
	1993	1995	2000
High Water Table Areas	78*	82	84
Low Water Table Areas	326*	174	120
Coastal Saline Belt	216*	270	200
Chittagong Hill Tracts	100*	115	100

Sources: GOB-UNICEF 1992; Matrix 1993 (figures with asterisks).

209. Despite the considerable achievements in total coverage, there remain problems of local and regional inequity in service distribution, maintenance of operational status of wells, and underutilization of tubewells. While there are paras¹⁰ with more than one shallow tubewell, there are also paras having none at all. Regional disparities have also been difficult to overcome, as Table 4.1 illustrates; the different targets for each region are based on tubewell cost and difficulty of installation, but the tubewells themselves all have similar volumetric capacities. Although the high coverage in shallow water tables exceeds the target for the year 2000, effective coverage is actually only 115 persons per tubewell when tubewells which have gone dry are excluded from the calculation (UNICEF 1992).

210. The preparation of the Annual Development Plan, 1992-93, has given due consideration to correct choice of technology and focus to underserved and unserved areas. There are positive signs of change in DPHE towards the non-engineering issues. Social mobilization, community development and involvement of women have been accepted in principle among DPHE field staff. The recently started Handpump Training and Monitoring Project (HTMP) will focus on training of caretakers in a selected Tara area, privatization of Tara spare parts distribution and the handing over of O&M of Tara pumps to the users (Danida-SDC 1993).

211. The current government rural water supply program comprises installation of tubewells, iron removal plants (IRPs), very shallow shrouded tubewells (VSST) and pond sand filters (PSF), and rehabilitation through resinking or desanding of tubewells. In shallow water table areas installation of tubewells is limited to the underserved and unserved areas, but DPHE is considering discontinuing tubewell construction in SWT areas. DPHE's current implementation capacity is approximately 40,000 new wells and resinking of an additional 15,000 to 20,000 tubewells per year. The installation of deepset pumps is expanding rapidly with a yearly target of 10,000 to 15,000 Tara handpumps. The deepset component of the program has already become larger than the shallow tubewell component. The projects are assisted primarily through UNICEF. DPHE also implements special projects entirely financed by GOB or with financial support from Saudi or other governments. Termed as special projects for emergencies, these constitute a significant proportion of the total program. In 1990-91 and 1991-92, 18% and 41% of all DPHE tubewells were installed through special projects. 'Special' projects not following UNICEF-DPHE guidelines in entirety may adversely affect the sustainability of services (Danida-SDC 1993).

2. Rural Sanitation

212. Rural sanitation activities in the public sector began in 1954 with assistance from WHO. Early demonstration projects were beset with problems. Latrine slabs were distributed free and a high proportion fell into disuse. A subsequent policy provided latrines subsidized by UNICEF, and during the 1970s sales were slow but rose to become 60% of latrines installed each year (UNDP 1991). During the IDWSS Decade sanitation coverage rose to 6% of the population, considering only sanitary latrines sold through government centers (UNDP 1991). In the early 1990s hygienic latrine use in rural areas increased dramatically, to 33% by 1993 (Wan 1994). Latrines are used mainly for reasons of privacy and convenience rather than health (Mitra 1992), a fact which explains the low use of latrines by children and the unhygienic conditions of many of the latrines in use (Danida-SDC 1993).

¹⁰ A para is a cluster of households.

213. The DPHE has been active, with UNICEF support, in setting up production centers for latrine components. Over the years UNICEF-DPHE set up 1000 production centers, one in every thana and in 540 unions, to produce and sell latrines at a subsidized price. In addition there are production centers serving rural areas in 33 municipal towns under the Urban Slums and Fringes Project. The centers have a production capacity of 500,000 units a year. In 1991-92 DPHE produced 435,000 latrines and sold 289,000 (Danida-SDC 1993). The 1992-93 ADP production/sale target was reduced to 200,000 in view of the stockpiling from the previous year. Sale was marginally higher than the target (GOB-UNICEF 1993). The government production centers have recently been reduced to 900, as the private sector has responded well to demand, and DPHE and the Ministry of LGRD&C have agreed in principle to close down the centers.

214. DPHE is experimenting with cost-reducing measures such as promoting a "one slab, one ring" option, fielding a limited number of mobile latrine production units which visit villages and produce components on site, and encouraging the construction of "home-made" latrines in soils which are appropriate for them.

3. Program Objectives and Strategies

215. The current DPHE-UNICEF program for rural water supply and sanitation has two general objectives. First, to reduce the incidence of childhood diarrhoea and parasitic infections by promoting access to clean water, improved sanitation, and better personal hygiene. Second, to strengthen national capacity in the sector, particularly with regard to unserved areas and to facilitating behavioral changes in hygiene. Key issues in the second general objective include enhancing long-term financial sustainability of the program by the government, strengthening institutional capacity to address non-engineering factors, promoting the growth of the private sector, and increasing community participation (GOB-UNICEF 1992).

216. Major strategies to achieve these objectives include effectively integrating water, sanitation and personal hygiene, seeking behavioral change through health education, expanding the health campaign to involve agencies other than DPHE, focusing on underserved areas, reducing subsidies, and strengthening community-based maintenance systems. Social mobilization is a key element in promoting sanitation and improved personal hygiene (GOB-UNICEF 1992).

4. Key Initiative: Social Mobilization

217. Building alliances for social mobilization is the new element in the integrated approach adopted by DPHE and UNICEF in the recent strategy for rapidly increasing sanitation coverage to 80% by the year 2000. A strategy for this massive social mobilization has been sketched out using a participatory process. The recently revised local government system should lend momentum to this change. The extensive and intensive campaign planned will help strengthen and refine the strategy for country wide replication. In the 1993-94 period the focus will be on communication and training, transfer of information to community and assessment of the role of the private sector (UNICEF 1993d). User contributions to the cost of facilities will increase in increments. Between 1991 and 2000, for example, user contributions for Tara deepset wells will jump from 2.8% to 10.7%, and for pond sand filters from nothing to 35.1% (GOB-UNICEF 1992).

C. Service Delivery Mechanism

218. Rural tubewells allocated by DPHE through Union Parishad Water and Sanitation Committees are installed by DPHE contractors on sites selected by the users. The current application procedures are subject to the influence of local union chairmen and local leaders, who may employ political considerations in facilitating applications. Their cooperation is essential for the success of the programs. While political pressure in siting tubewells still persists, especially in the low water table and saline belts where the number of private tubewells is limited, DPHE site selection criteria are generally accepted. Site selection criteria formulated by DPHE-UNICEF aim at reducing local influences to a minimum.

1. Tubewell Siting Criteria

219. The current site selection criteria stipulate that no new well should be within 120 meters of an existing public well, that ultimately every household should have a tubewell within 100 meters, and that no household in the group may have more than 5 acres of land. The site should be selected such that it serves 100 persons for a shallow and deepset and 300 persons for a deep well (Buksh 1993). UNICEF field staff randomly monitor pump sites for fulfillment of selection criteria and inspect installation and training for quality. A recent check in the coastal belt on proposed sites for 189 DTWs, 52 SSTs and VSSTs, and 87 PSFs revealed that 18% of the DTW sites, 88% of SST and VSST and 38% of PSP sites did not fulfill the site selection criteria. While for the proposed DTW sites, this was an improvement over 27% rejection in the previous year, the picture in the high water table area worsened with rejection increasing from 10% in 1991-92 to 25% in 1992-93 (GOB-UNICEF 1993).

2. Well Rehabilitation

220. Ten percent of public tubewells are inoperable at any time. DPHE has rehabilitated approximately 200,000 tubewells so far. Seven percent are out of production due to pump malfunctions, and three percent due to clogging by sand, a growing problem. For the latter, restoring production requires de-sanding or resinking the well. The 1992-95 targets for these activities by DPHE are to de-sand 40,000 tubewells and resink 60,000 wells (GOB-UNICEF 1992). A pilot program is underway to improve de-sanding techniques, which will gradually be privatized (GOB-UNICEF 1993).

3. Latrine Production and Promotion

221. Slab-plus-one ring latrine sets may be bought from DPHE production centers at a subsidized price of Taka 125 per latrine. Customers may also buy additional rings at the cost price of Taka 70 per ring or may opt to buy them from private suppliers. There are a few mobile latrine production units in operation on a pilot basis which manufacture components on site and can sell them for less, as the rings do not have to be as thick as those which must survive transport from a center. The users bear the responsibility of installing latrines either bought or 'home-made'. Staff at the production centers inform customers on installation, operation and maintenance and the actions required when the pit fills up.

222. Responsibility rests with the DPHE tubewell mechanics at the thana centers and masons at the latrine production centers to act as change agents to educate people on the importance of pure water, sanitation and hygiene education for good personal and family health. Masons and mechanics lack communication skills, motivation and orientation to adequately inform customers. Almost all are men, which limits their opportunity to talk with women, who are the primary targets of hygiene information. An agreement for collaboration with thana health section does exist but it has not been operational.

223. The policy of linking latrines to tubewells in the integrated approach is now seen as an ineffective way to achieve sustainable use of latrines, as the possession of a latrine does not guarantee its use (Danida-SDC 1993). This policy is no longer enforced, but the aim of getting households who apply for a tubewell to build a latrine is generally promoted as consistent with the social mobilization approach (UNICEF 1993d).

D. User Participation

224. An estimated 1.6 million private wells have been installed without public intervention. This is indeed a high level of user and private sector involvement in provision of water supply. Additionally, over the years user contribution in public programs has increased from nothing in 1972 to Taka 1000 for Tara pumps, and Taka 2000 for deep wells in 1992 (GOB-UNICEF 1992). User contributions as a percentage of the total cost are still low, yet they offer a positive sign for the future.

225. To ensure that tubewells meet a need felt by the community who will therefore take interest and responsibility in installation, operation and maintenance, a request for a tubewell must emanate from the community. If conditions for the allocation of a tubewell are met, households in groups of ten may apply for tubewells. Application procedures are formulated to ensure the participation of women. A request for a tubewell is required to be supported by women and at least 50% of caretakers trained must be females. Despite women's lower social status and the domination of the program by men not particularly sensitized to gender issues, the participation of women in RWSS program is gradually increasing. This is evident from the increase in attendance of female caretakers in training sessions.

226. Financial contributions are usually borne by the more affluent. About 61% of caretakers surveyed had borne the total contribution themselves, and 64% of user households had contributed nothing (DPHE-UNICEF-DANIDA 1986). Financial contribution has an obvious influence on perception of ownership and access. Contributors sometimes unjustly claim ownership to control access to and use of the tubewell. Social assistance from the rich to the poor is encouraging, but practiced in excess it breeds a client-patron dependency.

227. The cost of spare parts and repair are borne by users while DPHE tubewell mechanics (TWMs) or private mechanics provide technical backup when the repair is beyond a caretaker's competence. DPHE is currently fielding a pilot project to withdraw TWMs from suction pump areas and hand over the O&M entirely to the users. A Danida project in the Rajshahi area has a similar focus for Tara pump areas. Spares for Tara pumps are sold by DPHE while those for shallow tubewells may be bought from DPHE or private suppliers.

E. Involvement of NGOs

228. Except for a few very large NGOs, water and sanitation activities of over 400 small NGOs are coordinated and monitored by the NGO Forum. Mode of operation and service delivery of NGOs differ, depending on source or conditions of funding. Multilateral, bilateral and voluntary international organizations provide funding for NGO activities. Unlike public programs, NGO's water and sanitation activities are integrated with other components such as income generation, education, and family planning. NGOs focus their efforts on delivering services to the poor, through their approach of forming groups for development assistance and activities rather than assisting individual families. The group based approach introduces transparency, empowers a community, targets the poor, and makes cost recovery easier (see analyses of the Grameen Bank, such as Khandker *et al.* 1993). In the UNICEF-supported Social Mobilization for Sanitation, NGOs are expected to play a significant role.

229. Some NGOs maintain substantial training capacity to the extent of running regular training institutes. There are no independent statistics on contributions of NGOs in improving water and water supply coverage; the 1991 national survey did not ask owners about the source of funding or technical assistance for the construction of their tubewell or latrine. An SDC sponsored study estimated that about 43% of existing sanitary latrine coverage (manufactured, not home-made latrines) was attributable to the efforts of NGOs (9%) and the private sector (34%) (Chadha and Strauss 1991).

230. The sustainability of NGO efforts deserves evaluation. NGOs typically do not plan to become a permanent presence in project sites, nor should they. Whether NGO projects or project impacts are self-sustaining or require more permanent support from a community-based organization (CBO) or the public sector is important to future efforts and investment decisions. There have been initiatives to involve NGOs in public development efforts. NGOs procure some of their hardware for tubewells and latrines from government outlets. The administrative orientation, individual attitudes and environment for mutual support and reciprocity are evolving but still limited. The government's acceptance of bilateral and multilateral support for NGOs is an affirmation of this principle.

F. Latrine Production Centers

231. Private producers are manufacturing and selling latrine components almost equal in number to public production centers. It is anticipated that the private sector will play an important part in improving sanitation in the country (Chadha and Strauss 1991). UNICEF has commissioned a study, expected to be completed in June 1995, on latrine producers and the latrine market in rural areas (GOB-UNICEF 1993).

232. A study under the Low Cost Sanitation Project in 84 municipalities reveals marked differences in government and private production (Munch-Peterson 1988). DPHE production is hampered by a dedication to production quotas without a concomitant effort at promotion. The resulting stockpiling has grown to the extent that DPHE has instructed its centers not to stockpile beyond 200 sets (Danida-SDC 1993). As private producers have emerged to meet demand, the government plans to close the production centers in the future.

233. As most production is dependent on donor funding, decision making on product specifications tends to be slow, and once a product has been defined, this prototype will be produced for the future whether the market is receptive or not. Government production centers, having a very limited spread of products (or often a single product only), cannot respond to yearly fluctuations in demand except by laying off such non-permanent staff and local sub-contractors as may have been hired. This is notably the case during the rainy season when demand for latrines is low. Private producers have handled this problem by complementing their production of latrines with production of cement pipes which have a higher demand in the rainy season (Munch-Petersen 1988).

234. For public production centers this has meant low levels of cost-efficiency and motivation caused by unproductive work time for permanent employees as well as limitations in job security for non-permanent staff and sub-contractors. Government production of low cost latrine components in Bangladesh has been subsidized through the years. Government production centers are usually located on government land developed for industrial purposes. Most often there is ample room for production as well as storage of materials and finished products. However, such locations do not attract ordinary customers and link badly with outside sales points because of an underdeveloped marketing and transport structure. GOB agencies which have to follow strict procedural guidelines aim at production targets and are not responsive to market conditions or consumer preferences. The bureaucratic and time consuming procedures for sale and distribution discourage many potential users who may not be able to afford the higher prices charged by private producers (Munch-Petersen 1988).

235. Although the government production centers offer one way to promote and provide subsidized latrines to customers who cannot build home-made latrines and/or cannot afford anything else, the private sector has a role to play particularly in responding to customers with more resources. They serve a wider market by offering customers a choice of colorful and polished latrine pans. In terms of delivery of services, the private sector is more efficient and can serve as a source of technical advice and credit. As noted above, the MLGRD&C has recently agreed in principle to close government production centers in the future.

236. A few DPHE Village Sanitation Centers have sent mobile teams into the field to produce latrine parts for a group of families on demand. These mobile production teams are still provisional but appear to be feasible. The community bears the cost of transporting DPHE raw materials and tools, and promises to buy the finished products at the prescribed government rates (GOB-UNICEF 1992). Latrine rings produced on-site have the advantage of requiring less cement, as they do not have to be made as thick as rings which will be sold from production centers and transported longer distances.

G. Operation and Maintenance

237. At any time 94% of handpumps are operational. Only 5% of private tubewells are non-operational compared to 10% for public handpumps. About 88% of handpumps in urban slums and fringes are operational (Mitra 1992).

238. Operation and routine maintenance of No. 6 handpumps are easily handled by users themselves. Major repairs are done by DPHE or private tubewell mechanics. The technology of

No. 6 pump is widely known and repair expertise is widely available. Spares may be bought from DPHE or private suppliers.



239. The Tara pump is also simple but less familiar, and people are not yet well acquainted with the technology. The skill to operate and maintain a Tara is limited to a few well trained caretakers or DPHE TWMs who also provide the spare parts. Few private dealers sell Tara spare parts. At present the responsibility for keeping most Tara pumps operational goes to TWMs and caretakers. Training of Tara pump caretakers is provided under programs by UNICEF-DPHE and Danida. As community capability improves and responsibility for O&M is gradually handed over to the client users, TWMs will be available for social mobilization for sanitation, although they may not be a good choice for this role.

240. Care and maintenance of latrines are the responsibility of individual households. Information for users has either been insufficient or unpersuasive. Faulty installations, breaking of water seals and dirty slabs are common. Pits collapsing or filling up frequently have adverse effects on the program and inhibit habit formation in use of latrines. A DPHE-WHO-UNICEF study found that pit failure has occurred in 54% of a sample of cases and 45% of the pits filled up in less than a year (WHO-UNICEF-DPHE 1992). About 54% of the respondents did not decide on the right course of action when the pits were full. Another study estimated that pits filled up in an average of 6 years (Chadha and Strauss 1991). The problems in care and maintenance of latrines relate to motivation and to poor knowledge of technology options and implications of insanitary disposal of excreta.

H Service Sustainability

241. → The rural water supply program has been very successful in making safe water widely accessible. Essential to the current success were appropriate technology, involvement of users through cost sharing and partial responsibility for O&M and the involvement of the private sector. Yet questions of sustainability remain. A high level of subsidy and continued DPHE involvement in target oriented service delivery and O&M are partly responsible for current underutilization of facilities. The involvement of the private sector in provision of shallow tubewells has been so successful in meeting demand that this sub-sector can now thrive without public intervention. This has not been the case with Tara pumps or the deep tubewells. As the number of tubewells increases, DPHE will find it difficult to cope with the increased maintenance workload without additional resources or restructuring of these responsibilities.

242. The sanitation program is endangered by the structural failure of pits and the high proportion of households resorting to improper actions when pits become full. Sanitation technology options and the importance of sanitation are still not adequately comprehended by potential clients. Sustainability of improved sanitation depends on changes in users' habits and attitudes, and on continuing research to devise appropriate technology based on the needs of users.

243. The health significance of sanitation and hygiene education in tandem with clean water have only recently become the focus of plans for social mobilization. Although the DPHE has espoused the concept of organizational reorientation to reflect the new goals of promoting more use, it remains to be seen if the agency successfully makes the transition to an instrument of facilitation rather than hardware installation and becomes able to promote the development of the private sector.

J. Summary: Sectoral Issues for Rural Areas

1. General

244. → Health impacts have been negligible due to low coverage by sanitary latrines and poor recognition of the linkages between clean water, sanitation, and good personal hygiene, and consequently low use of latrines and of water facilities for non-drinking purposes.

245. DPHE's past orientation toward installation targets must give way to a more results-oriented approach focusing on behavioral change. Provision of access must move on to promotion of use.

246. Social mobilization will depend on identifying an appropriate group or groups of communicators who can interact with rural women, and providing them with information, communication strategies, and incentives for reaching consumers. The appropriateness of male masons and tubewell mechanics for this work needs reconsideration.

247. Women's participation in water and sanitation programs has improved, but the social status of women and the current domination of the WSS program by men not sensitive to gender issues combine to inhibit the involvement of women.

248. ★ The private sector has responded well to the market for pumps, for installation of tubewells, for repair services, for spare parts, and for production of latrines. Policies to withdraw from efforts in which the private sector is doing well, and to encourage the private sector in other areas such as Tara pump installation and repair and in well rehabilitation, may free the government to invest resources more selectively where they are most needed. Quality control will remain an important area for government oversight.

249. ↘ The social mobilization program has much to offer towards the longevity of water and sanitation facilities and the ultimate improvement of health. Monitoring of the sustained practice of latrine use and management and personal hygiene practices will be important for the evaluation of this approach.

250. ✈ Financial sustainability in rural areas may depend on reducing subsidies and concentrating on the provision of a range of products and services from which users are able to choose that for which they are able to pay.

2. Water Supply

251. The private sector has responded well to meeting demand for tubewells, and in shallow water table areas government intervention is needed only in remote pockets which are unserved or underserved.

252. Service coverage remains uneven among regions and within regions. Coverage is lowest in coastal and hilly regions as well as areas with low water tables.

253. Local influence adversely affects broad based user participation and introduces bias in siting of tubewells. The positive aspect of locally affluent residents bearing the cost of tubewells

is undermined by the potential for their control of the well and the perpetuation of patronage relationships.

254. Tubewell pump repairs are well within the capacity of the private sector's response. It should be possible to confine the government's role to repairs beyond the capacity of communities and local mechanics.

255. The growing problem of clogged wells is not well met by current methods of desanding wells. Applied research on new techniques may reduce the number of wells which must be resunk, a more costly solution than desanding.

256. While the main program of DPHE follows guidelines to promote sustainability and program goals, special projects financed either by GOB or bilateral agencies sometimes do not follow these guidelines on service delivery.

3. Sanitation

257. The public sector is less flexible than private producers in terms of product diversification and service delivery, and efforts at production are not equalled by efforts at promoting sales. The continued need for public sector involvement should be examined particularly in terms of meeting the needs of the poorest.

258. People already use latrines for convenience and privacy. It is important to convince them of the need for sanitary, or pit latrines. Once they are persuaded of the need for this type of latrine, the next step is to convince them that everyone in the family must use it and keep it clean to promote good health. There may be scope for achieving good health by appealing to the already perceived benefits of convenience and privacy.

259. It is already apparent that many users do not properly dispose of the contents of filled pits, leading either to abandonment of the latrine or to unsanitary dumping of waste. This problem is exacerbated by the construction of pits which are too shallow. Pit filling will occur more rapidly when efforts to increase use are successful.

260. Flooding undermines the durability of latrines and contributes to the contamination of surrounding groundwater.

261. Mobile latrine production teams offer opportunities for rural consumers to see the product, to save on transportation costs, and to purchase rings at lower prices. Rings are needed in many areas with unstable soils. Ways of encouraging the development of these units should be considered.

262. The DPHE-UNICEF Sanitation in Primary Schools program offers an opportunity to stimulate demand for sanitary latrines in rural households.

5

Urban Water Supply and Sanitation

A. Introduction

263. The water and sanitation sector in cities and pourashavas is institutionally complex. The Department of Public Health Engineering (DPHE) is responsible for planning and implementing water and sanitation projects everywhere except in two cities, Dhaka and Chittagong, which have Water and Sewerage Authorities (WASAs). Statutory responsibility for operation and maintenance are in the hands of the WASAs and pourashavas, but pourashavas' capacity to handle O&M is limited and they have generally been excluded from the decision making prior to the completed projects. Water and sanitation facilities comprise many of the same technologies used in rural areas but also include piped water and (in Dhaka) one sewer system.

264. The cities and pourashavas also provide drainage and solid waste management services. In the four largest cities these are the responsibility of City Corporations. Table 5.1 shows the institutional responsibility for the major areas associated with water and sanitation. It should be noted that this refers primarily to the core areas of municipalities; urban slums and fringes do not receive the same services, but are under the jurisdiction of the pourashava or city corporation. A general description is provided in Chapter III.

Table 5.1
Institutional Responsibility for WSS Subsectors in Core Areas of Pourashavas and Cities

	<u>Water</u>	<u>Sanitation</u>	<u>Drainage</u>	<u>Solid Waste</u>
Pourashavas	DPHE/pourashava	DPHE/pourashava	DPHE/pourashava	DPHE/pourashava
Dhaka	DWASA	DWASA (sewerage) City Corp (on-site)	DWASA (subsurf) City Corp (surface)	City Corp.
Chittagong	CWASA	DPHE/City Corp	DPHE/City Corp.	City Corp.
Rajshahi	DPHE/City Corp	DPHE/City Corp	DPHE/City Corp.	City Corp.
Khulna	DPHE/City Corp	DPHE/City Corp	DPHE/City Corp	City Corp.

265. Despite the responsibilities vested in the WASAs and in the pourashavas for water supply and sanitation, they lack sufficient autonomy to take important decisions on planning,

implementation, tariff, staffing and other aspects of service provision. Tariffs are approved by central government and do not reflect the true cost of water. Although established under an ordinance and having a board of members, the Dhaka and Chittagong WASAs do not operate on a commercial basis or as economically autonomous units.

266. While the urban areas of the country are experiencing an increased population growth rate, the growth of infrastructure to service the population has not kept pace. As a result, large sections of the urban population have no access to municipal services such as water, sanitation, refuse collection and health. Only 47% of the total urban population have access to public water supplies and 42% to hygienic sanitation¹¹. Of the total urban population, more than 50% of the people are below the poverty line; about 30% of the total are the very poor (UNDP-UNCHS 1993). In recent years, the rural poor migrating to urban areas have settled in slums where less than 30% of the people have access to public water supply and less than 20% to proper sanitation facilities (UNDP-UNCHS 1993). In 1989 the government, with UNICEF assistance, began a program of assistance to urban slums and fringes.

267. Urban drainage and solid waste management (SWM) have so far received very little attention. Apart from some areas of Dhaka and Chittagong, the overall condition of drainage and SWM is generally poor. Growth of the urban population coupled with unplanned and unregulated settlements continue to degrade the urban living environment. Assessments of urban WSS sector projects have concluded that sustainability has been poor, and asserted that sustainability and project effectiveness depend on reaching unserved and underserved people, involving women at all levels, enhancing community capacity for management, and optimizing the use of existing resources (UNDP 1991; BKH 1993).

268. Planning and implementation in the urban sector has been largely a supply-driven, top-down process. Lessons of the IDWSS Decade suggest that goals of sustainability, equity, and efficiency may be met by focusing on demand-driven planning and implementation which emphasize identifying and meeting consumer demands (Cairncross 1992). The success of future efforts in the WSS sector will rest in making a shift from a supply-driven to demand-driven approach. This will require significant institutional reform. This chapter considers the present status of water supply, sanitation, drainage and solid waste in the urban areas, focusing on coverage and access, ongoing and future programs, and operation and maintenance. Sustainability issues specific to the urban sector are discussed in Section E, and sectoral issues are summarized in the last section.

B. Water Supply Situation

1. Service Coverage and Access

269. DWASA provides water to only 55% of the 5.5 million population within its service area. About 2.7 million people have house connections and an additional 300,000 obtain water from 1209 street hydrants. The remaining population rely on private hand tubewells, lake or river water. In Chittagong, a city of about two million people, the total coverage by piped water is 50% of which 40% is through house connections and about 10% by public standposts. Specific data on coverage

¹¹Estimated by the consultants based on available data

by hand tubewells in the core areas of both Dhaka and Chittagong are not available but according to the WASAs such coverage is insignificant. However, the 1991 national survey found that over 69% of the population in urban slums and fringe areas use water from private wells, and over 23% use water from public wells (Mitra 1992). Table 5.2 shows the water supply status in cities and towns.

Table 5.2
Public Water Supply Status in Cities and Towns

City/Category:	<u>Dhaka</u>	<u>Chittagong</u>	<u>Zila Towns</u>	<u>Thana Towns</u>
Present Total Coverage (Percent of population)	55%	50%	19%	50%
Total Population (in millions)	5.5	2.0	6.5	no data
<u>Physical Facilities:</u>				
water production (IMGD)*	145	34	58	0.3
production wells	172	29	319	19
surface water plant	1	1	20	---
water mains (kilometers)	1240	425	1850	---
house connections	124000	23000	90700	2152
standposts (PS)	1209	680	4192	30
hand tubewells	---	---	23000	(no data)

* Imperial Million Gallons per Day

270. Only 20% of 1.2 million population in Khulna city is covered by public water supplies of which 10% have access through house connections, 3% through public standposts and 7% obtain water from public hand tubewells. The water supply coverage in Rajshahi, another city with a population of about 0.8 million, is 40%, with 14% having access through house connections and 7% through public standposts. About 19% of the Rajshahi city population obtain water from hand tubewells. Though Khulna and Rajshahi have city corporations, their service delivery and O&M are similar to those of the zila towns. In these cities the DPHE installs the service facilities while operation and maintenance are the responsibilities of city corporations.

271. The 60 zila towns, with over 6.5 million people, vary in size from 40,000 to 500,000 people. Piped water supply coverage, estimated to serve only 19% of the population, is generally limited to the core areas. Another 27% depend on public hand tubewells. The remaining population use private wells, ponds and rivers. The overall coverage of 46% in the zila towns, however, hides the disparity that exists among towns. For instance, the coverage in Borguna, a town of about 50,000 people, is only 8% while the coverage in Jamalpur with a population of about 140,000 is over 90%. Thirteen out of 60 zila towns provide water to a third or less of their populations. Water supply coverage in individual zila towns is given in Annex B.

272. Available information on water and sanitation service provisions in the thana towns is unreliable and sketchy. The water supply coverage in thana towns is primarily based on handpumps. Based on DPHE data on 155 thana towns, an estimated 50% of all thana town population is covered

by public handpumps. About 60% of the tubewells are public and the rest are either private or installed by other agencies. Of the 460 thana towns only 46 have pourashavas of which only 10 towns have limited piped water supply. This serves only 2,000 house connections together comprising only 4% of the population in the ten towns.

273. Disparity in service coverage exists not only among but also within cities and towns. A recent study on WSS in urban slums and fringes found that in slum areas, occupied by 22% of the urban population, there is one operating tubewell per 527 persons. Latrines averaged 13 users. In fringe areas, home to 41% of the urban population, one operating tubewell is shared by 393 persons, and each latrine serves about 7.5 persons (UNICEF-CMD 1994).

274. As access to public tubewells remains limited, slum residents obtain water from a variety of sources. Around 50% of an estimated one million slum dwellers in Dhaka use street hydrants, 14% have access to community tubewells installed locally, and the remaining 36% obtain water from neighbors or nearby lakes or rivers (Baqui 1993; CUS 1988). DWASA does not provide house connections to unregistered households. According to a local NGO estimate, about 15% of Chittagong's slum population have limited access to public water supply primarily through standposts (BKH-AQUA 1989). The situation in urban slums and fringes varies so widely among pourashavas that generalization provides only a limited picture (UNICEF 1994).

2. Service Delivery

275. Groundwater is the preferred water source in all urban centers except Chittagong where 20 of 34 IMGD is produced through the Mohra surface water treatment plant. Of the 145 IMGD water produced in Dhaka, 96% is from a network of 172 deep wells linked in a grid to minimize costs of transmission and pumping, while the remaining is from the Chandnighat surface water treatment plant. Only 19 district towns partially depend on surface water. Large industries and institutions in major cities and towns operate their own deep tubewells.

276. In Dhaka and Chittagong water is delivered primarily through house connections. Community standposts or street hydrants provide shared access to piped supply for the cities' urban poor. Water in district towns is delivered through house connections, public standposts, and public hand tubewells. DPHE estimates 13 persons/house connection, 100 persons/standpost and 75 persons/handpump. In Dhaka however, one standpost serves about 250 persons. In many towns, in the absence of metered delivery several houses share one connection and families residing in multistoried buildings have one connection per building.

277. Assuming a daily per capita consumption of 180 litres, DWASA's present water production could serve 70% of the population in its service area. Yet a large number of people suffer from chronic water shortage in many parts of the city. With 26% water loss due to system leakage and another 30% due to poor revenue collection, the total unaccounted for water in Dhaka stands at 56% (GKW 1989).

278. In Chittagong, past development focused more on water production than distribution expansion, thus limiting piped water supply coverage despite a high production capacity. Waste, leakage and illegal withdrawals account for 30% of water loss, and about 15% of the water produced is either not billed or payment not received, for a total of 45% of water supplies unaccounted for in Chittagong (Choudhury and Rahman 1991). The two WASAs claim that water loss is being

gradually reduced through greater administrative control. CWASA claims that its total water loss has been reduced to 33%, with 20% due to leakage, wastage and illegal withdrawals and another 13% due to non-billing. With IDA support, both the WASAs have recently introduced computerization of their billing system in an effort to improve their revenue collection efficiency.

279. Intermittent water supply in the zila towns coupled with leakage in distribution mains and house connections lead to poor consumer services. One study estimated water loss through leakage and wastage to be 78% in Khulna, 54-64% in Rajshahi and 40% in another 5 district towns (GOB-Netherlands 1986). Water loss through leakage or faulty joints also results in pressure loss and contamination of the water supply.

3. Ongoing and Future Programs

280. Since the early 1960s the development of the Dhaka water supply system has been assisted by the IDA. The IDA-assisted DWASA Third Project (the Urgent Expansion Project) is nearing completion and a crash program to serve underserved areas of the city has recently been completed. These projects aimed at expanding the physical facilities through installation of production wells and expansion of the distribution network. Several studies on environmental impacts, groundwater extraction and ground subsidence, and leak detection and waste prevention have also been completed under the third project. The ADB-assisted Dhaka Urban Infrastructure Improvement Project - Mirpur, with a WASA-implemented water supply component for a low cost housing area, is expected to be completed by 1995. The Slum Improvement Project (SIP), assisted by UNICEF and implemented by LGED through the Dhaka City Corporation, provides water and sanitation in selected slums.

281. DWASA's fourth project (the Emergency Water Supply Project) proposes the development of surface water in order to offset the uncertainty of future sub-surface water and to meet the rapidly growing water demand. This project includes institutional reforms such as reconstituting the DWASA Board with members drawn from both the public and private sectors, redefining the Board's role in policy matters relating to corporate planning, tariff setting, appointment of staff and remuneration, and making management accountable for meeting operational and financial targets. Under French assistance a Master Plan for DWASA, developed in 1992, proposes a long term investment plan (LTIP) for DWASA in three phases each of about 10 years (BCEOM-EPC 1992). The first phase of the LTIP (1992 - 2000) comprises the DWASA fourth project and the ongoing projects. The DWASA fourth project includes a 50 IMGD surface water treatment plant at Saidabad to be installed by 1995 and expanded to 100 IMGD by 2000. On completion of the LTIP, DWASA with a production capacity of 559 IMGD, will be able to provide water to 80% of the population in 2020. This scenario, however, assumes a gradual reduction of water losses to about 15%. The French government has agreed to fund a part of the treatment plant subject to IDA participation. The IDA participation is conditional on GOB implementing institutional and financial reforms to improve DWASA's performance.

282. With financial assistance from the IDA, the water supply system in Chittagong has improved through implementation of two CWASA projects. A third CWASA project was proposed which would include rehabilitation and expansion of existing facilities to improve present service level and optimize CWASA's existing production capacity. The project however, has been deferred and CWASA, in the meantime, has undertaken a GOB-funded interim project to meet the increasing water demand. The project is expected to be completed by 1995. The LGED-implemented Slum

Improvement Project is providing an average of one tubewell per 235 users in 14 slums in Chittagong. CWASA, with IDA support, is currently studying unaccounted for water in preparation for developing a management plan to limit water losses.

283. Among the ongoing DPHE projects in the zila towns are the Dutch- assisted 18 District Towns Water Supply and Sanitation Projects (18 DTP), Danida's Laxmipur and Choumahani water, sanitation and drainage project, and the ADB assisted Second WSS project in 9 district towns. The 18 DTP focuses on institutional and financial improvement, hygiene education, involvement of the community and women, and expansion of facilities. On completion in 1995, the project will serve 75% of the estimated 865,000 population in 18 towns. The Second WSS project is similar and is expected to provide water supply coverage to 90% of the population in 2000 in the nine towns. The UNICEF assisted WSS in Urban Slums and Fringes is being implemented in 33 pourashavas and LGED is working on the UNICEF funded Slum Improvement Projects in 22 towns including the four city corporations.

284. DPHE is developing proposals for water, sanitation and drainage projects for 23 Pourashava thana towns under German/French support and 22 Pourashava thana towns with Islamic Development Bank (IDB) assistance. DPHE is preparing TAPPs for piped water supply system and sanitation for 150 thana towns for consideration in the next planning cycle.

285. There is a need to think strategically about meeting the needs of the widely varying conditions in urban slums and fringes in pourashavas throughout the country, as these areas are generally not included in projects targeted at core urban areas. UNICEF's study on WSS and hygiene in urban slums was carried out to support the formulation of a national policy on this aspect of the WSS sector (UNICEF-CMD 1994).

4. Operations and Maintenance

286. DWASA O&M is limited to the pumping stations and their surrounding area and does not include regular checks on distribution mains for leaks or anomalies. CWASA lacks the skilled personnel and the equipment needed for proper O&M. CWASA repairs leaks of service connections and water mains up to 150 mm diameter while repairs on larger mains are contracted out. CWASA repairs about 350 leaks every month.

287. In pourashava towns, the O&M of water systems and revenue collection are a municipal responsibility. O&M of water systems are generally poor with users playing no role at all. To provide in-service training to municipal officials, DPHE maintains water supply systems for 3 years after commissioning. But as municipal skills and resources for O&M are limited, many pourashavas are unwilling to take over O&M of water systems after the 3 years are over. In the zila towns water connections are not metered and users often do not bother to repair household water leaks and taps. Municipal governments maintain the water systems in only 16 zila towns. DPHE handles maintenance in 4 towns, and the remaining 12 are under joint DPHE-pourashava operation. Maintenance of public handpumps are done by DPHE tubewell mechanics. The cost of spares are borne by users.

288. While the bias towards installing new facilities has contributed to increased coverage, the low priority accorded to operation and maintenance has seriously undermined the sustainability of the facilities.

5. Financial Aspects

289. About 65% of DWASA's 124,000 house connections are metered. Two categories of water tariff are currently applied to metered connections. The DWASA's domestic connections are charged a water rate of Tk 3.17 per 1000 litres while the commercial/industrial rate is Tk 10.32 . The domestic rate in Chittagong is Tk 3.83 per 1000 litres while the non-domestic rate is Tk 10.71. Tariffs charged by the WASAs have to be approved by the government. The unmetered connections in Dhaka pay a flat rate of about 20% of annual property valuation or a fixed construction rate if the holding is under construction. Bimonthly bills are prepared by the revenue inspectors in six zonal offices. However, there is no control over regular payment of bills, resulting in huge revenue losses. In Chittagong all domestic and commercial connections are metered but 30% of them are reported to be not functioning.

290. According to DWASA's MIS report, the revenue income of DWASA marginally balances its revenue expenditure with large financial losses being incurred mainly due to shortcomings in meter reading and revenue collection (DWASA 1993). An affordability survey conducted as part of the DWASA fourth project's feasibility study in 1992 indicated that an increase in water tariff could be absorbed by consumers. However, it also indicated that an inequitable situation exists at present whereby in the absence of a progressive tariff system the low income groups are paying a higher proportion of their income than the high income group, who use more water at subsidized prices. According to DWASA, a further increase in water tariff without reducing administrative loss would enhance the disparity among different income groups and amount to penalizing customers who pay their bills regularly. CWASA has been unable to cover operational expenses with revenue collected, due to poor billing, huge arrears, large water losses, and low water tariff.

291. In district towns monthly water taxes vary, for instance, from Tk 20.00 in Rajshahi, Dinajpur, Kushtia and Netrokona to Tk 50.00 in Gazipur. Water rates also vary with connection types and sizes. Water rates charged by the local authorities have to be approved by the concerned ministry. Revenue earnings levied through a property tax are insufficient to cover even the O&M costs. In the absence of metered connections in the district towns, house connections are used by more people than residing in the household, resulting in large revenue losses. The municipal authorities apparently have no control over such losses. This has an obviously adverse effect on the level of services, the standards of O&M, and management.

292. Improving resource mobilization and pricing of water in the urban areas is urgent for four major reasons: (a) adequate cost recovery for operation and maintenance is a necessary condition for sustainable services; (b) water pricing is an efficient demand management tool; (c) the current subsidized water supplies are inequitable, frequently not benefiting the poor, and (d) given resource scarcities, there is not enough funding for all desirable and economic schemes unless users themselves contribute more of the costs.

C. Sanitation Situation

1. Service Delivery, Coverage and Access

293. Of the overall urban sanitation coverage, some 72% is through individual and private initiatives and the remaining 28% is through pourashavas or local authorities. A conventional waterborne sewerage system exists only in Dhaka, where DWASA manages 39,640 sewer connections. The only sewage plant at Pagla discharges treated waste into the river Buriganga.

294. At the municipal level water sealed sanitary pit latrines are produced and delivered by government agencies, pourashavas, NGOs and the private sector. DPHE subsidizes latrines while projects vary in providing latrines free, subsidized, or at full cost. The private sector and user communities play a significant role in sanitation service provisions.

295. Sanitation coverage by waterborne sewerage system in Dhaka is around 18%. About 40% have septic tanks, 15% sanitary pit latrines and the remaining population resort to unsanitary latrines and open defecation (see Table 5.3). Some 87% of inhabitants in slums and squatters in Dhaka rely on kutchā (low quality) latrines (CUS 1988). Children defecating in open drains in slum areas are a common sight. The transient nature of settlements and poor awareness of health-sanitation relationships deter the building of sanitary latrines in squatter settlements. Limited public sanitation facilities are constructed and operated by DCC on a pay-and-use basis. About 20 such facilities with latrines, showers and lavatories, exist in densely populated areas.

Table 5.3
Sanitation Status in Cities and Towns by Percent of Population, 1993

	<u>Dhaka</u>	<u>Chittagong</u>	<u>Zila Towns</u>	<u>Thana Towns</u>
Total coverage (Percent of population)	73%	38%	38%	22%
Water-borne sewerage	18%	--	--	--
Septic tanks	40%	31%	22%	6%
Sanitary pit latrines	15%	7%	16%	16%
<u>Physical Facilities</u>				
sewer network	455 km			
lift stations	15			
treatment plant	1			
sewer connections	39640			

296. Chittagong does not have a waterborne sewerage system at present. Septic tanks account for about 31% sanitation coverage in Chittagong. Sanitary pit latrines serve around 7% of the population. About 15% of the population still use bucket latrines. Recently the Chittagong CC has discontinued servicing these bucket latrines as they are unsanitary and hence undesirable. About 14% of the urban population living in Chittagong's slums and fringe areas do not have access to

proper sanitation. They use poorly maintained bucket latrines and open drains. There are 92 small (1-2 seats) public latrines that are very poorly maintained (BKH-AQUA 1989).

297. Sanitation coverage in zila towns is limited with the majority using unsanitary facilities. Households in the core areas of the towns generally have septic tanks which serve about 22% of the district towns' population. Sanitary pit latrines are used by 16%, and a significant 26% of the population still use unsanitary bucket latrines. Hang latrines and open defecation are common in slums and fringe areas. Most people in thana towns are without acceptable sanitation. Only 6% of the population in thana towns have septic tanks, and 16% use pit latrines.

2. Ongoing and Future Programs

298. The expansion and rehabilitation of the sewerage system under the DWASA third project is nearing completion, while upgrading the Pagla treatment plant with JICA assistance has been completed. The plant is now operating at its maximum capacity of about 120 MLD.

299. Work is in progress on 80 km of "small bore sewerage" system in Mirpur under the Dhaka Urban Infrastructure Improvement Project. Due to funding constraints, the project does not include the treatment of effluent prior to discharge into adjacent low lying areas. Effluent from small bore sewerage systems receives only partial treatment in septic tanks. Discharging such effluent without some form of secondary treatment will have an adverse impact on the local environment.

300. Dhaka CC's IDA-assisted First Urban Development Project (FUDP) has a sanitation component for selected slums of old Dhaka. The project encourages households to buy sanitary latrines on installments and leases community facilities to private operators. So far commitments for about 700 of the proposed 5000 latrines have been obtained and only two community facilities have been planned (UNDP-UNCHS 1993). The Slum Improvement Project implemented by DCC and supported by UNICEF provides sanitation and handpumps in selected slums of the city. The IDA-supported fourth DWASA project feasibility study proposes sewerage expansion integrated with a long term investment plan for water supply. A Strategic Sanitation Planning (SSP) concept is being considered for inclusion in the fourth DWASA project.

301. Installation of public latrines by CCC under the First Urban Development Project (FUDP) is in progress. Ten of the 40 latrines proposed have been completed and leased to private operators. These facilities, with separate provisions for males and females, are to be constructed in dense areas of the city. To facilitate implementation and O&M of the public facilities, a sanitation unit has been established at CCC. The sustainability of these facilities is doubtful as no effort was made to involve user communities in planning, implementation or upkeep of the facilities. The acceptability of public latrines by women has been questioned (World Bank 1990). FUDP also proposes the construction of septic tanks and upgrading of existing facilities.

302. The DPHE 18-DTP (District Town Project), to be completed in 1995, will provide community sanitation centers and 3,600 latrines in all the project towns. The sanitation centers will be established and managed through NGOs for a year, after which the municipal health section is expected to take over. NGOs will, however, remain involved in hygiene education. The LGED-implemented Secondary Towns Infrastructure and Services Development Project targets 13 community latrines and 49,000 household latrines in 10 district towns. So far about 2800 latrines

have been built. SIP, also with LGED, have already built 5,200 of the 12,000 latrines to be provided in selected slums in 20 towns. DPHE's Choumahani and Laxmipur WSS project has provisions for 6,500 latrines, 50 community latrines and 17 public toilet facilities. So far 3000 latrines have already been constructed. The ADB's 2nd WSS project also has limited sanitation service provisions.

303. DPHE has submitted a TAPP for water supply, sanitation, drainage and SWM project for 350 thana towns for the next FYP. Another DPHE project with IDB assistance, for WSS in 22 non-district municipal towns has also been proposed.

304. The use of public latrines appears to need careful study as well as the involvement of the community in all phases of planning. The acceptability of public latrines for women is low as modesty norms require latrine use, including entry into a latrine, to remain private (Matrix 1993; WB 1990).

3. Operation and Maintenance

305. DWASA is responsible for the O&M of waterborne sewerage system in Dhaka city. O&M of sewage lift stations and the treatment plant at Pagla constitute a major regular task for DWASA. Unauthorized connections to sewer mains, particularly by industries, constitute a major concern, resulting in revenue loss and adding unanticipated volume to collection and treatment capacity.

306. O&M of individual latrines are a household responsibility in all urban areas. Municipal activity in sanitation O&M is limited to maintaining trenching grounds, and does not include periodic inspection to ensure that latrines are kept sanitary. Private sweepers who clean septic tanks dispose of the waste by dumping the sludge in drains, ditches or into storm sewers, despite municipal rules against contaminating the environment. Septic tank effluent flowing into storm sewers, drains or ditches is common, as are overflowing latrine pits. Community facilities are operated either by the municipalities, NGOs or private enterprises. Communities are seldom involved in O&M of common facilities. The maintenance of community facilities leave much to be desired. Chittagong CC and other municipalities have discontinued servicing bucket latrines. Bucket latrine owners make their own arrangement with sweepers.

4. Financial Aspects

307. Tariff for sewer connection is directly based on water consumption. DWASA doubles the water bills for households having sewer connections. Households within 30 metres of public sewer lines but not connected to them, must pay around 7% of the assessed property value. DWASA's present billing system, therefore, results in double revenue loss in the cases of non-payment of bills or under billing for water.

308. In other urban centers including Chittagong, the local municipal authorities are responsible for sanitation and charges for services are included in the conservancy tax. Cost recovery in urban sanitation programs is generally poor. As mentioned earlier, low cost latrine units are sold to consumers at subsidized rates or in some cases free for installation on self-help basis. In the ADB 5 District Town Project cost recovery has been attempted with 10% down payment for sanitary latrines with the remaining 90% realizable in forty quarterly installments, i.e., 10 years. The

Dutch-assisted sanitation program in 30 municipal towns tried a concept of sliding scale subsidy based on household income and assumed willingness to pay (GOB-Netherlands 1993). These attempts were unsuccessful primarily due to a low level of awareness among consumers and administrative complexity involved in implementing such a concept.

D. Drainage and Solid Waste Management

309. Drainage and solid waste management are the most ignored and least studied areas in environmental sanitation of urban centers in Bangladesh. Most of the benefits of WSS services are lost when poor drainage and inadequate solid waste collection contribute to an unhealthy environment. It is only recently that the government and relevant agencies have begun to consider these areas to be inseparable components for improved public health.

310. In most towns the condition of drainage systems is poor. Drains are constructed in bits and pieces without reference to a plan or the natural drainage system. Indiscriminate dumping of solid wastes into drains, poor solid waste management, and the destruction of natural drainage through physical development are common.

1. Existing Facilities

311. Dhaka is surrounded by rivers on all sides and its low-lying areas are subject to frequent external flooding from these rivers. Heavy rainfall causes water logging in many places within the city. Rapid urbanization in recent years has further worsened the drainage problem. Since the mid 1970s a number of crash programs for alleviating water logging have been implemented. The internal drainage system consists of about 140 km of small to large diameter (300 to 3000 mm) sub-surface drains constructed by DWASA, and approximately 100 km of canals. Another 120 km of surface and small diameter sub-surface drains are constructed and maintained by the DCC. Altogether, the city's internal drainage system is capable of serving only 30% of its population, largely in western and old Dhaka. Inadequate provisions for drainage maintenance coupled with improper disposal of solid wastes in the city lead to frequent drain blockages and water logging even after moderate showers.

312. Only half of the solid waste generated every day in Dhaka is collected by the DCC, which dumps and spreads the waste in low lying areas at Mirpur and Jatrabari, without much concern for the residents in the vicinity (Ahmed 1993). More than 90% of the slums dwellers do not receive solid waste collection service (CUS 1988). A large percentage of uncollected waste is deposited into local drainage ditches, storm sewers, open manholes, and khals (canals). The ragpickers collect and recycle a significant portion of the wastes. DCC has a fleet of 184 garbage trucks of 1.5 to 7 ton capacity, and about 2,080 hand-drawn carts to collect wastes from about 4500 waste bins located throughout the city (Haque 1993). The resources available with DCC for SWM are not being efficiently used (UNDP-UNCHS 1993).

313. In Chittagong, drainage is comprised of a network of micro-drains, large main drains and khals. Portions of existing drains are in poor condition. Blockage by garbage, heavy siltation in the main drainage canals due to upstream erosion, a fragmented drainage system, and improper gradients render the city drainage ineffective. Indiscriminate dumping of large volume of domestic refuse into drains and culverts adds to the problem.

314. On average, 500 tons/day of solid wastes are collected by the CCC which is estimated to be 50-66% of the total waste generated (Ahmed 1993). Only the city center benefits from road sweeping and solid waste collection services on a regular basis. Uncollected refuse lies strewn about and ends up in drains. An inadequate number of collection vehicles and dust-bins are major factors in poor SWM. The collected waste is dumped in two tipping sites - Haliashahar and Ayerkoop Nagar.

315. In most zila towns there is no systematic drainage network except for bits and pieces of drains built by municipalities along public roads. Drainage problems in all district towns arise from inadequate drainage networks, inefficient planning and design of drains, and poor SWM. Drainage, often limited to core areas, is unsatisfactory with sullage frequently pooling along main roads.

316. Collection of solid wastes in the zila towns varies from about 0.05 kg/capita/day in Natore to 0.15 kg/capita/day in Rajshahi (Ahmed 1993). Total waste generation is estimated at 1.5 to 2.0 times the volume of waste collected. Reliable information on SWM in district towns is limited. SWM in district towns mainly comprises street sweeping in commercial areas and waste collection from dust-bins in core areas. Collected waste is dumped in essentially unmanaged disposal sites on the outskirts of the towns. Dumping of solid waste locally in household pits, adjoining ditches, vacant land and roadside drains is a common feature in all district towns (BKH 1993).

317. Drainage in thana towns is virtually non-existent. A recent report shows a total of only 148 km drains in 46 pourashava thana towns which is only about 7.5% of the total existing road length (DPHE 1993). Clogging, inundation, stagnant pools and poor O&M are perpetual problems. According to a survey in 7 municipal and 5 thana towns, an average of only 0.02 kg/capita/day of solid waste is collected (GOB-Netherlands 1986). Solid waste collected in all the thana towns together amounts to only about 5% of the total amount generated. The remaining wastes are disposed off by residents themselves either in ditches or low lying areas. The wastes are collected in push carts or rickshaw vans. Most municipalities have large trucks which are inappropriate for narrow, winding roads in the thana towns. The trucks remain off the road much of the time due to lack of maintenance.

2. Ongoing and Future Programs

318. The Dhaka Master Plan Project, funded by UNDP and implemented by RAJUK (Rajdhani Unnayan Karttripakha, or Capital Development Authority), proposes a drainage plan which incorporates all drainage projects under implementation. DWASA is executing a drainage project under the Dhaka Integrated Flood Protection Project (DIFPP) with ADB assistance. On completion of the project in 1996, the drainage system in Dhaka will serve 70% of the city population. A JICA-assisted drainage project is expected to serve the remaining 30% of the population in the eastern part of the city. JICA has additional projects to address water logging at Uttara, Badda and portions of Mirpur,

319. The First Urban Development Project (FUDP) is providing technical assistance and equipment to DCC in solid waste management. A study is underway to increase collection efficiency through improved management and resource allocation. Purchase of new collection vehicles and selection of new landfill sites are also being considered by the DCC.

320. In Chittagong the re-excavation of the Chaktai khal and construction of the Mirza-Noa and Sk. Mujib khals are drainage components of the ongoing IDA assisted FUDP. The activities will be accounted for in the drainage plan under the UNDP financed and the CDA implemented Master Plan Project for Chittagong.

321. The Chittagong CC's FUDP aims at improving management and providing hardware support. The project has already procured 42 garbage trucks and has constructed more than 100 dustbins. A maintenance workshop has also been set up. A new land fill site will be identified for sanitary landfill.

322. Drainage master plans for Khulna and Rajshahi are also expected to be included in the proposed IDA assisted Master Plan Projects for the cities. Most ongoing and future WSS & Drainage projects have SWM components. These projects provide limited roadside dustbins and waste collection vehicles, but do not include improvement in local authorities management capability or initiatives for community involvement.

323. Under the DPHE's 18 District Town Project, the drainage component in six towns has already been completed and work in another seven towns has started (GOB-Netherlands 1993). The drainage component of the DPHE WSS and Drainage project for Choumohani and Laxmipur has been completed. The LGED's Secondary Towns Infrastructure Development Project Phase I and Phase II has a drainage component for 30 district towns. The SIP provides micro drainage in selected slums of city corporations and 16 municipal towns. The drainage components of these projects however, are too small to make any significant improvement to the overall drainage of the towns. The Secondary Towns Integrated Flood Protection Project in 6 district towns provides flood protection, drainage rehabilitation and new drains and culverts to minimize flooding of low lying areas. Construction of roadside drains and improvement of existing drainage have been included in DPHE's proposed 2nd WSS Project for 9 district towns.

324. There is no ongoing drainage project in thana towns. Future drainage programs integrated with WSS for thana towns have been proposed by DPHE. There is no project to improve SWM in thana towns. Proposed projects have SWM components integrated with WSS & Drainage.

3. Operation and Maintenance

325. DWASA is responsible for O&M of the major sub-surface drains and the pump stations at Narinda and Kalyanpur while DCC is responsible for surface drains and some small diameter sub surface drains constructed by the DCC. Over the past two years DWASA has taken up cleaning programs for removal of major blockages in the city drainage khals.

326. Regular maintenance involves cleaning of major storm sewer lines. Although yearly cleaning of catchpits and manholes of the entire drainage system is necessary, it is not done primarily due to funding constraints. Consequently, water logging in some parts of the city is common even during moderate showers.

327. In Chittagong the CCC is responsible for maintaining drains. The O&M activities primarily involve cleaning blocked drains and re-excavating khals as necessary. The situation in district and thana towns is similar.

E. Sustainability of Services

1. Water Projects

328. The fourth FYP proposes water supply coverage of 80% in Dhaka, 65% in Chittagong, 85% in the district towns and 65% in the thana towns. While expansion of facilities will be required to meet the targets, institutional strengthening, policies and strategies will have to be addressed to ensure service sustainability.

329. High water loss is common to all the piped water systems. If losses can be minimized a good part of the fourth FYP target could be achieved with the existing capacity. While reducing technical loss may require substantial capital investment, revenue can be increased through reduction in administrative loss and greater accountability in the collection of user fees.

330. Traditional emphasis on expansion of facilities alone has not resulted in development of the WASAs and the Pourashavas as institutions. They are financially and technically weak and are unable to operate and maintain service facilities efficiently.

331. The pourashava authorities, excluded from project design and implementation, lack interest in the O&M and are incapable of maintaining the service facilities efficiently due to shortage of skilled manpower. There has been a recent change in policy to strengthen the pourashavas to enable them to participate in planning, design and implementation of projects as well as assume full responsibility for the O&M of existing facilities. Two projects, the ongoing 18 DTP project and the upcoming ADB-assisted second water supply and sanitation project, include technical assistance to reinforce the technical, administrative and management capabilities of the pourashava authorities.

2. Sanitation Projects

332. The fourth FYP sets targets of 80% sanitation coverage in Dhaka and Chittagong, 66% for district towns and 60% for the thana centers. It is unlikely that the targets will be met in absence of a comprehensive sanitation plan. The conventional waterborne sewerage is not always viable due to high initial cost. A range of intermediate cost options has not been tried.

333. Urban sanitation programs in Bangladesh use either conventional waterborne sewerage systems or on-site options such as septic tanks or pit latrines. However, in dense urban areas, on-site options are not always suitable because of space limitations or insufficient soil capacity to absorb a higher quantity of waste water generated as a result of an improved water supply. This very often results in non-functioning of septic tank soak pits or latrine pits filling up too soon. The user response to the problem is to dispose of pit and septic tank sludge into the open environment, thus undermining the sustainability of sanitation service provision.

3. Lack of Linkage with Hygiene Education

334. Linkage of sanitation and health is not yet fully understood by the general public. Until recently, sanitation interventions have concentrated on providing hardware support with little emphasis on hygiene education and awareness of the benefits of sanitation. According to an estimate the total requirement of latrines by the turn of the century for urban areas is 5.0 million units of which about 1.8 million would be needed in the pourashava towns alone (UNDP-World Bank 1992).

It is unlikely that the government alone, without involving the private sector, NGOs and the community, can sustain an urban sanitation program for long.

4. Drainage and Solid Waste Management Projects

335. Poor SWM and lack of public participation in planning and maintenance of drainage system adversely affect drainage systems. Drainage networks developed on an ad hoc basis without reference to overall drainage plans for the towns will not lead to sustainable drainage service provisions.

336. As SWM is an important component of environmental sanitation, WSS projects in most urban centers now include components to improve collection and disposal of solid wastes concomitant with water supply, sanitation improvement. Lack of community participation in planning and operation of SWM systems, poor management capability of local authorities, and few alternatives to insanitary landfill practices leave the sustainability of SWM services in doubt.

F. Summary of Issues in Urban Water Supply and Waste Management

1. General

337. Urban slums and fringes have generally been unserved or underserved by past WSS programs focusing on urban areas. Several studies have been conducted which provide data which are useful in the formulation of policy. These areas will require technologies which are low cost but appropriate to areas of high population density, and strategies for promotion which may differ from those in rural areas.

2. Summary of Water Supply Issues

338. The overall coverage of urban water supply hides disparity among cities and towns and also within cities and towns. It is the urban poor who are unserved or underserved and who are least able to overcome this service deficiency through private sector provisioning. Strategic programs based on newly available data on urban slums and fringes are necessary to reach these sectors of the urban population.

339. Water supply projects are biased towards expansion of the physical facilities with very little attention paid to O&M and management of the existing facilities. This is reflected in the poor level of services to the consumers, low standards of O&M and extremely high losses of water through leakage, wastage and illegal connections.

340. Underpricing of services and poor realization of revenue by water supply authorities are common. These local level authorities lack autonomy in decision making and at the same time face limitations in financial, management and technical skills as well as resources.

341. Ultimately all the issues above undermine the sustainability of water and sanitation facilities and services. Poor service and deteriorating facilities will continue to characterize the sector unless improvements are made in operation and management, control of water loss, billing and revenue collections.

3. Summary of Sanitation Issues

342. The sanitation component of the WSS projects in the urban areas have always had low priority resulting in low coverage. Sanitation interventions have been concentrating on the provision of hardware with very little emphasis on hygiene education and awareness. The relationship between sanitation and health has not been successfully conveyed to the general public.

343. Technology options in urban sanitation projects have been limited to simple pit latrines or conventional waterborne sewerage system. Intermediate technology options which may be cost effectively used based on user preferences and willingness to pay have not been tried. The high cost of conventional sewerage has resulted in very limited implementation and pit latrines have not been assessed for local sustainability.

344. The sustainability of sanitation facilities will depend on the acceptability of the facilities to users. The involvement of the community in planning and implementation enhances the likelihood of the facilities being used as well as the community taking responsibility for operation and maintenance. However, a number of projects do not incorporate this component.

345. Individual latrines comprise a large segment of urban sanitation, yet the commonly unhygienic disposal of waste when pits are full contravenes the health purpose of sanitary latrines. As long as the perceived benefits of latrines continue to be limited to privacy and convenience, and unhygienic disposal of waste remains a convenient and inexpensive method, this situation is likely to continue.

4. Drainage and Solid Waste Issues

346. Drainage and solid waste management are the most ignored and least studied areas of environmental sanitation. Their integration into WSS projects has occurred only recently.

347. Most of the urban centers suffer from inadequate drainage facilities and solid waste collection services. Drains are constructed on an ad hoc basis without a perspective of the whole. The focus is on constructing new facilities rather than on O&M of existing facilities.

348. Poor drainage infrastructure and condition is further aggravated by the indiscriminate dumping of uncollected solid wastes. Inadequate capacities of the local authorities in terms of skilled manpower, equipment and other resources coupled with lack of motivation lead to poor solid waste collection and drainage maintenance. Informal ragpickers contribute significantly to SWM, yet they work in very unhygienic conditions.

349. Traditionally, SWM and drainage are seen as municipal functions with no community involvement. Lack of general awareness among people regarding the benefits of clean drains and proper disposal of solid wastes have resulted in the total absence of community initiatives for the development of these service provisions.

5. Sustainability Issues

350. Traditionally, WSS agencies have emphasized installing new service facilities rather than O&M of existing facilities, as construction involves large funding and is easier to manage. Consequently, services deteriorate very fast thus affecting long term sustainability.

351. Local authorities' commitment to O&M is very low. Furthermore, they do not have sufficient financial resources and technical competence to operate and maintain the services efficiently.

352. The sense of community ownership for service provisions has not developed in the absence of community involvement in planning and developing services. This has adverse effects on service sustainability.

353. Poor cost recovery has left the WSS sector underfunded and unable to respond with reliable service or to extend service in a sustainable manner.

6

Sectoral Issues

A. Introduction

354. Bangladesh has made tremendous strides in improving access to safe water. Experience since 1972 has shown that this alone will not bring about improvements in health, particularly in childhood diarrhoeal disease and parasitic infection. While recognition has grown of the importance of good sanitation, of information and of motivation to use safe water and latrines, the achievements in these aspects have been modest.

355. The progress made in tubewell installation must now be joined to the use of safe water for all domestic purposes and widespread access to and use of latrines. Securing this aim will involve efforts at the institutional level to reorient toward new goals for sustainability: facilitating choices for users, both individual consumers as well as municipal governments, and providing guidance rather than outcomes in planning and implementation. Addressing the needs of women, as the primary managers of domestic water supplies and family health, will require drawing them into the planning process and shaping interventions specifically to reach them. Putting the sector on a sustainable financial basis will require improving the contributions of users, in many cases up to full recovery of capital and operating costs, while continuing to provide subsidies and possibly other services for those most in need within and among different hydrogeological regions.

356. There is considerable evidence to suggest that in rural areas sustainability of service is facilitated through community involvement in O&M and that this requires a sense of ownership. Ownership is developed through participation in planning and implementation of service provisions. While some sense of ownership is present in a majority of the suction handpumps in the rural areas, it is not the case for urban water systems. The sense of municipal ownership for urban water systems is low. The centralized administrative structure restricts community participation and does not promote a decentralized system. The preference for capital investment to maintenance undermines service sustainability. These along with a continuing high level of subsidy and low commitment to mobilization of local resources and cost recovery cast doubts on long term sustainability of WSS service provisions.

357. The achievement of new goals will be difficult to measure without developing alternative criteria to the installation target. While the ultimate goal is improved public health, additional or intermediate goals may measure progress more clearly. New criteria must be developed, and may usefully include important aspects such as the numbers of women working to provide hygiene information, percentage changes in households using tubewell water for all domestic purposes and in people using latrines all the time, and the cost recovery for facilities in both rural and urban areas.

B. Institutional Issues

1. Reorientation or Transformation

358. The WSS sector lacks capacity for policy development and analysis. There is an urgent need to set up a unit, most usefully within the MLGRD&C, which can develop comprehensive policy, analyze policy implications, update and modify policy, and oversee implementation of policy. Without such a unit, the transformation of implementing agencies will be very difficult.

359. The government recognizes the need for institutional readjustment, orientation and strategies to foster participatory development, involve women, promote the private sector, and build partnership with community based organizations. Gradual changes are discernable, but they fall far short of an active strategy to bring about the requisite changes. The DPHE and the WASAs have a centralized structure with little delegation of decision making power to the local level. This institutional arrangement leaves little room for participatory planning and implementation of service provisions.

360. Reorientation towards new goals may not be possible without substantial institutional changes, amounting essentially to institutional reform. While training issues are important in developing institutional capacity, the organizational change required to make use of employees with new sets of skills includes restructuring employee incentives for performance, and developing new organizational goals focused on facilitation rather than implementation and on promoting behavioral changes rather than reaching installation quotas.

361. WASAs, despite being responsible for planning, implementation and O&M of their systems, do not have the autonomy to take policy decisions. This undermines the viability of the organizations to operate on commercial lines. Pourashavas also lack autonomy in decision making. Pourashavas are elected bodies, yet all important municipal decisions on staffing and tariff have to be approved by relevant ministries. Pourashava access to financial, management and technical skills is also limited. This has been the reason stated for excluding local authorities from planning, design and implementation of water supply systems. This problem is not invoked when turning facilities over to the municipalities for operation and maintenance.

362. Local authorities play a passive role in an essentially client-patron relationship with DPHE. They do not have a sense of ownership of the systems installed, and are either unwilling and/or incapable of running the systems efficiently. The pervasive inefficiency and dearth of resources result in huge water losses, low service levels and poor environmental sanitation in most urban areas of the country.

2. Human Resources Development

363. Human resources development at the central, local, and community levels will be an integral part of building institutional capacity to cope with the new sectoral challenges. Current investment and regular programming in HRD is nearly nonexistent. Training is either project based or dependent on donor sponsored fellowships rather than derived from an assessment of long term manpower needs in the sector, and therefore does not systematically upgrade skills, develop careers and improve the organization. Responsibility of local level training is thrust upon DPHE TWMs and SAEs who lack interest, motivation, orientation and communication skills.

364 Improvement in training is vital to building institutional capacity, but can only be sustained by organizational reform which provides career development opportunities and a structure of incentives and accountability for performance.

365. The involvement of women as workers in the sector is low, stifling the capacity of government agencies to reach women, the main managers of domestic water, sanitation and hygiene. Though there are government female field workers providing health and family planning advice at the local level, inter-sectoral cooperation between DPHE and these health workers do not exist. Efforts to recruit women into the DPHE bureaucracy have had minimal success to date.

3. Planning, Monitoring, and Information Systems

366 In the absence of comprehensive policy guidance, sector planning is project based and lacks a holistic approach. This results in duplication, misplaced priorities, and uncoordinated development, and consequently in wasted efforts and resources.

367. DPHE incorporates limited local inputs in its planning process, but is hindered by an administrative structure that does not delegate much decision making to the local level. Under the current arrangement planning is a central, target oriented function with little opportunity for communities and local authorities to articulate their aspirations and needs. Urban services are planned and implemented by DPHE with minimal municipal inputs despite the fact that municipal committees are elected. Agencies prefer and are geared to meet physical targets rather than to establish intangible processes.

368. Ready access to a reliable data base influences the quality of management and planning. Information processing in the Sector is largely done manually. With the expanding activities, the Sector agencies are finding it increasingly difficult to access the right information at the right time.

4. Service Coverage

369. While average water supply coverage in most parts of the country has met or exceeded targets (see Table 4 1), the figures do not reveal the disparities in service coverage within regions. There are paras in suction handpumps areas with more than one handpump, with adjacent paras having none at all. Local political influences hinder broad based user participation and affect programs' ability to reach the poor. The coverage in the saline zones and the low water table areas is much lower than the national average. Despite the urban bias in sector investments, water supply coverage in the urban areas is lower than in the rural and glaring inequities in service coverage exist both among and within urban centers. The WSS service provisions are biased towards high capital investment for the rich while service coverage of the urban poor in slums and squatters are appalling.

370. Drainage system development, except in large urban areas, is incremental and disjointed. It is not based on a guiding framework or the drainage network. The preference is more towards capital intensive development of drains than their operation and maintenance.

5. Water Quality Monitoring and Surveillance

371. Water quality monitoring and surveillance, an essentially regulatory function, is also vested in DPHE. The laboratories do not have any regulatory power. Municipalities are unable to enforce rules and regulations to ensure a minimum standard of water quality. DPHE laboratories report back test results to headquarters, but the results are seldom acted upon. Contamination of piped water due to intermittent supply and leakages in water mains is a constant threat to general health. The resources allocated for sampling and testing are often inadequate. The commitment, initiative and interest in establishing a systematic water quality monitoring and surveillance system is absent.

C. Technological Issues

1. Water Supply Technologies

372. Technology options used in Bangladesh are generally applicable in most parts of the country, but there are a few areas of concern. The cost of providing water supply in the saline belts and low water table areas is relatively high. Deep tubewells are not always successful because of inadequate information on the hydro-geological profile of the areas. Difficulty in locating and mapping 'lenses' of sweet water in saline areas limits the application of very shallow shrouded tubewells. Drilling equipment used in stony areas and for urban water production wells, are expensive to acquire and maintain.

373. The declining water tables beyond the suction limit may, by the year 2000, render an estimated 30-35% of existing No. 6 handpumps inoperable for 3-4 months during peak 'dry seasons. In addition to aggravating the existing inequity in coverage, the temporary failure of such a large number of suction handpumps may have serious adverse effect on general health in the area.

2. Sanitation Technologies

374. Rural sanitation suffers from poor understanding of the health benefits of latrine use, with the result that many latrines drain into water bodies or open spaces, and pit latrines may be emptied improperly or abandoned. Latrines are used for reasons of convenience and privacy, and a variety of styles at different price levels are available through private producers. Home-made pit latrines with covers are the cheapest low-cost option but may not be appropriate for all soil types. Latrine problems include inappropriate emptying or abandonment of full pits, collapse of pits and pit flooding during the monsoon. Ground water pollution from latrine pits and densities at which on-site sanitation options do not work have not yet been ascertained for conditions in Bangladesh. (1)

375. The urban sanitation program is limited to on-site options or conventional sewerage and excludes a range of intermediate technology options that may be cost effectively used based on user preferences and willingness and ability to pay.

3. Operation & Maintenance

376. The technology of the suction handpumps is widely understood in Bangladesh and the private sector is very active both in provision of services and maintenance. There is no problem of

O&M in the suction handpump areas. The majority of water services will be sustained even if the government withdraws entirely from the suction handpump areas. The Tara handpump, however, is a relatively new handpump, with which the people are not yet familiar. Until community competence is built up and the private sector responds to the demand, O&M of Tara handpumps will remain a problem.

377. Intermittent supply, low pressure in water mains and leakages in transmission network make urban piped water susceptible to contamination. Municipal interest, willingness or capacity to undertake O&M of the systems are limited. Water utility personnel have a stronger preference for capital investment than O&M. Due to absence of regular monitoring and preventive maintenance, urban water production wells are prematurely abandoned in favor of construction of new wells.

378. SWM and drainage are conceived of as municipal functions with no community responsibility. Dumping of solid wastes into drains, sewers and vacant and low lying areas is the general norm. Limited management capacity, and lack of interest and commitment of local authorities and traditional approach towards drainage and SWM improvement will in all probability worsen environmental sanitation.

379. The problems associated with maintenance of individual household latrines are linked to inadequate knowledge and awareness on the importance of sanitation in maintaining good health.

4. Research and Development

380. R&D activity has a low priority, with primary focus on technology. Most R&D activities are donor driven and financed by external assistance. Applied research is needed to improve traditional WSS options and to investigate user attitudes towards technology options and reasons for non-use. Given the stated reasons for nonuse of tubewell water, research on ways to reduce time and effort to haul water and to address other water use concerns of women may be required. Energy sources such as solar power may be usefully investigated.

381. Modification of iron removal plants, improvements in pond sand filters, and greater accuracy in identifying depths with lower iron content have all been identified as areas needing research.

382. Investigations are planned or underway to assess groundwater pollution from flooded latrines and to evaluate home-made latrines for their appropriateness. Modifications of de-sanding techniques for clogged wells are also being tried. A national survey of latrine producers is likely to be undertaken. Field testing of thinner latrine pit liners has been initiated.

D. Financial Issues

383. Competing demands from different sectors make it difficult to allocate a high level of resources to the WSS Sector. External funding which comprises the lion's share of sector investments discourages mobilization of resources and perpetuates a cycle of dependency on external resources. As the financial sustainability of the sector depends on improved resource mobilization,

allocation, and recovery of costs, it may be useful to consider how external funding can be used to stimulate resource mobilization.

1. Resource Mobilization, Cost Recovery and the Private Sector

384. Producers and consumers have left no doubt of the existence of a capacity to mobilize resources for water and sanitation outside of the government institutions. It is neither necessary nor possible for government alone to meet the demand for services. There appears to be scope for policies to encourage private sector resource mobilization, leaving government resources available for tasks other than providing widespread subsidies.

385. Mobilization of local resources does not enjoy a high degree of commitment by implementing agencies. Subsidies for services are high and cost recovery for services both in the urban and the rural areas is low. Consumers are charged only a small fraction of the total cost of services in the rural areas while revenue collected for most urban water utilities is seldom enough to cover even the operating expenses much less amortization on capital expenditure. Capital investment for services is given as grants to municipalities. Tariff is subject to non-economic considerations. Services are underpriced and even the low water rates imposed are not properly collected. The unaccounted for water in all urban areas is in the range of 46% to 70% of the total water produced with a significant part of the loss assigned to underbilling, nonbilling and theft. The shortfall in operating expenditure is met from regular government grants. Continual dependence of local government on central government grants discourages cost recovery for services and deepens the cycle of dependency and inefficiency.

386. Improving financial sustainability in the sector will require better resource mobilization from consumers. Resources are accessible when products or services are desired by consumers. Two thirds of rural tubewells are privately owned. Ninety percent of respondents in a rural survey were willing to pay some amount for latrines (Chadha and Strauss 1991). Subsidies have often not been well targeted at the neediest, and often benefit those who do not need them.

2. Resource Allocation

387. The current division of resources between rural and urban sectors is highly skewed toward Dhaka and other urban areas. In conjunction with plans for cost recovery and financial sustainability, the ratio should be reviewed in terms of sectoral needs.

388. The proportion of resources in the WSS sector allocated to water supply provision far outweighs those given for sanitation or hygiene education. In light of revised goals and new strategies, the resource allocation ratio among these activities should be reconsidered.

E. Social Issues

1. Women as Managers and Users

389. The importance of safe water, sanitation and good hygiene to general health is not widely appreciated in the population. The importance of involving women to achieving the goals

of improved health cannot be overstated. Though this has been recognized in principle it has yet to be reflected in practice.

390. Despite adequate quantity of water within 150 meters of most homes, only 16% use tubewell water for all domestic purposes. To use tubewell water for all domestic purposes requires a lot of hard work by women, and the relative ease with which surface water is fetched undermines the goal of encouraging full use of tubewell water. Women make decisions as to the value of tubewell water, and until the cost in time and energy is more equal to the perceived benefits of tubewell water for all purposes, surface water will continue to be used as a major source of supply.

391 Just as women factor in not only health but also the time and energy costs when calculating the value of another trip to the well, their reasons for using latrines do not prioritize health but rather focus on convenience and privacy. Efforts to increase use of latrines rightfully promote health reasons but may also appeal to existing motives to increase consumer demand and use

2. Social Mobilization

392. Despite a nominal emphasis at the planning and central level on community involvement in the provision of services, such decentralization is constrained by the existing degree of centralization in institutional structure and orientation. While there are many officials who support community participation, there are others who see it as reducing their power and influence. There is an obvious self-interest in maintaining the status quo which guarantees control over implementation of services.

393. There is a natural role to be played by NGOs in testing and demonstrating social mobilization strategies in the WSS sector, particularly in identifying and reaching the poorest users. Other opportunities for demonstration and social influence may be provided by schools and religious leaders.

F. Sector Coordination

394. Planning in the sector is project-based and oriented primarily toward installation goals. Planning lacks a holistic approach and is not based on any sector development plan or strategic framework. Duplication of effort, misplaced priorities and mutually contradictory donor driven strategies are common

395 As external assistance from bilateral and multilateral donors currently amounts to about 60% of investment in the sector, it is essential that the donors cooperate with each other in assisting the government to define appropriate policies and to find areas in which donors can support each other and the government. The costs of such actions may not be trivial and should be assessed.

396. Donors should encourage the development of a clear policy framework by the GOB within which to offer assistance. The past practice of embarking on major investments and hoping that policy and institutional improvements could be secured in parallel has not worked and should be discontinued. Past poor performance by government in meeting financial objectives has been encouraged by the willingness of donors to continue funding activities despite defaults.

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ANNEX - A

On-going DPHE Program

Project and Donor	Components	Quantity	Achievement June '93
Rural Water Supply (RWS) in Shallow Water Table Areas, 1988-95. UNICEF	STW	75,000	60,386
	IRP	12,000	1,388
RWS in Low Water Table Areas 1988-95. UNICEF	Tara	60,500	49,122
	IRP	12,000	67
RWS in the Coastal Areas, 1988-95. UNICEF	SWT	10,000	7,000
	DTW	15,500	17,528
	SST	500	84
	VSST	2,500	1,662
Rehabilitation of RWS 1987-95. UNICEF	Resinking:		
	STW	70,000	80,000
	Tara	1,500	231
	DTW	1,500	336
	Desanding:		
	STW	90,000	None
	Tara	2,500	None
	DTW	3,000	None
	Installation: Platform		
	IRP	20,000	8,371
	7,000	2,772	
WSS in Urban Slums & Fringes, 1989-95 UNICEF	STW	12,200	2,500
	Tara	895	884
	DTW	490	179
	VSST	325	None
	SST	960	None
	Latrines	46,000	5,212
Special RWS 1993-94. GOB	STW	27,000	9,000
	DTW	1,667	677
	Tara	2,000	200
RWS in Coastal Belt 1993-94. Saudi Government	STW	1,700	
	DTW	650	
Rural Sanitation Program, Third Phase 1985-95. UNICEF	Production Centre		
	Latrines	540	540
		2,000,000	1,000,000

ANNEX B

Table B1 : Service Coverage of Water Supply in District Towns (as at 1992)

(Source: Buksh, K., The Status of Water Supply and Sanitation in Bangladesh, DPHE, Dhaka, 1993.)

Sl. No.	Towns	Population (1992)	Daily water demand million gal.	Daily water supply million gal.	% of demand supply	% population coverage			Total	Coverage by other sources
						House conn-ect-ion	Stand post	HTW		
1.	Khagrachari	42000	0.84	0.19	23	14	3	30	47	53
2.	Faridpur	102274	2.45	0.79	32	30	11	33	74	26
3.	Tangail	152203	3.04	0.90	30	17	1	24	42	58
4.	Madaripur	74000	1.48	0.37	25	15	7	38	60	40
5.	Shariatpur	47982	0.96	0.90	9	1	1	27	29	71
6.	Gopalganj	71672	1.43	0.23	16	12	3	34	49	51
7.	Chandpur	140000	2.83	0.74	26	21	22	8	51	43
8.	Cox's Bazar	39571	0.79	0.54	60	15	1	28	44	56
9.	Rangamati	100000	2.00	1.04	52	19	2	11	32	68
10.	Kurigram	69000	1.38	0.48	35	13	3	65	81	19
11.	Gazipur	71113	1.42	0.27	19	20	5	33	58	42
12.	Noakhali	124750	2.50	0.45	18	20	1	32	53	47
13.	Jamalpur	140000	2.80	0.93	33	13	4	75	92	8
14.	Munshigonj	55000	1.10	0.36	33	25	11	15	51	49
15.	Bogra	116791	2.34	1.89	81	25	6	10	41	59
16.	Nawabgonj	186040	3.72	0.36	50	7	2	41	50	50
17.	Nilphamari	48625	0.97	0.09	9	2	1	28	31	69
18.	Noagaon	100407	2.01	0.36	20	14	1	42	57	43
19.	Perojpur	99900	2.00	0.31	16	21	4	19	44	66
20.	Gaibandah	46713	0.93	0.51	55	31	3	28	62	38
21.	Pabna	155126	3.10	1.26	41	22	2	13	37	63
22.	Lalmonirhat	83200	1.66	0.18	11	2	1	17	20	80
23.	Rajshahi	508000	10.16	2.00	20	14	7	19	40	60
24.	Chuadanga	76400	1.53	1.02	67	26	1	30	57	43
25.	Magura	41870	0.84	0.26	31	17	2	26	45	55
26.	Borguna	50000	1.00	0.04	4	6	1	1	8	92
27.	Bhola	108000	2.16	0.45	21	9	1	10	20	80
28.	Moulavibazar	40000	0.80	0.27	34	19	2	15	36	64
29.	Natore	51551	1.03	0.27	26	18	4	33	57	43
30.	Narail	54535	1.09	0.17	16	7	1	38	46	54
31.	Barisal	300000	6.00	3.90	65	25	18	5	48	52
32.	Netrokona	73275	1.47	0.40	27	9	5	33	47	53
33.	Rajbari	59500	1.19	0.27	23	9	6	58	73	27
34.	Rangpur	256000	5.12	1.34	26	9	1	17	27	73
35.	Comilla	210690	4.21	3.21	76	20	11	3	34	66
36.	Meherpur	45000	0.90	0.19	21	15	4	30	49	51
37.	Kishoregonj	100000	2.00	0.85	43	18	9	37	64	36
38.	Satkhira	89070	1.78	0.18	10	7	1	33	41	59
39.	Kushtia	165380	3.30	0.94	28	19	3	32	54	46
40.	Jhenidah	76595	1.53	0.40	26	20	2	59	71	29
41.	Norshindi	150000	3.00	1.17	39	11	1	13	25	75
42.	Panchagar	44800	0.90	-	0	0	-	67	67	33
43.	Bagerhat	125000	2.50	0.42	17	11	5	10	26	74
44.	Manikgonj	70000	1.40	0.20	14	8	1	50	59	41
45.	Sunamgonj	50234	1.00	0.33	33	37	2	16	55	45
46.	Bandarban	40000	0.80	0.26	33	18	9	11	38	62
47.	B. Baria	105400	2.11	0.42	20	18	2	49	69	31
48.	Thakurgaon	45289	0.91	0.18	20	9	3	28	40	60
49.	Khulna	1200000	24.00	9.37	39	10	3	7	20	80
50.	Sherpur	71959	1.44	0.14	10	4	3	50	57	43
51.	Peni	88155	1.76	0.66	38	13	3	10	26	74
52.	Joypurhat	65936	1.32	0.12	9	2	1	41	44	56
53.	Sylhet	500000	10.00	1.86	19	9	1	5	14	86
54.	Mymensingh	189593	3.79	2.60	67	20	15	12	47	53
55.	Patuakhali	75000	1.50	0.41	27	24	10	7	41	51
56.	Sirajgonj	149789	3.00	0.40	13	6	1	30	37	63
57.	Jhalakati	60000	1.20	0.21	18	16	3	10	29	71
58.	Dianjpur	125600	2.50	0.68	27	12	3	19	34	66
59.	Hobigonj	50000	1.00	0.45	45	17	4	26	47	53
60.	Jessore	230000	4.60	2.26	49	19	5	14	38	62
61.	Laxmipur	58425	1.17	0.09	8	1	1	39	41	51
62.	Narayngonj	650000	12.00	7.00	58	10	9	15	34	66
District Towns		8517413	165.12	57.64	34	15	4	27	46	54
Total/Average.										

