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WATER SUPPLY AND ENVIRONMENTAL SANITATION

ISSUES, STRATEGIES AND TARGETS FOR THE 1990S

(WITH PROPOSALS FOR THE FOURTH AND FIFTH FIVE-YEAR PLANS)

PAPER PREPARED FOR THE SEMINAR ON STRATEGIES FOR CHILDREN IN THE 1990S, DHAKA
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PANEL B - ISSUES PAPER ON WATER SUPPLY & ENVIRONMENTAL
SANITATION

Prepared by Physical Planning, Water Supply & Housing Wing, Planning Commission

1. Objectives of Panel Discussion

1. Review progress to 1990 against Third Five Year Plan (3FYP) and Decade Targets and the impact on child survival and development.
2. Review constraints and positive developments in 3FYP.
3. Review major issues to be addressed in the 1990s.
4. Review ultimate coverage goals.
5. Recommend feasible intermediate targets for 1995 and 2000.
6. Identify projects to be undertaken, linkages with other sectors and related measures needed to achieve targets.

2. Progress to 1990 against Targets

Table 1 (attached) shows the overall number of DPHE tubewells and latrines installed in Bangladesh by 1989 with the forecast for 1990 assuming 100% achievement against the ADP targets for 1989-90. Percentage achievements against the 3FYP and Decade targets are shown below:

	Expected 1990 Status	Decade Target	% Achvt	3FYP Target	Achvd	% Achvt
New Tubewell				174,000	135,376	78%
New Latrines				500,000	556,200	112%
Person per TW	104				125	120%
Person per Operating TW	133	108	81			
% Using Latrines	6	13	46			
Latrines per Village*	14				13	108%

* assuming 65,487 villages of over 50 households (BBS Pocket Book 1986)

Note: The target population depending on public tubewells is taken as the total rural population minus the population served by private tubewells (1990 estimate 645,00 tubewells at 15 persons per tubewell = 9,675,000).

The achievements against targets are impressive and, in rural water supply at least, studies show that about 80% of rural people claim to use tubewell water at least for some purpose, indicating that 80% have some sort of access to a tubewell. However, if we define "adequate service" as being able to obtain all water requirements from the tubewell (estimated at approximately 50 litres per capita per day) the percentage served is quite different. Ahmed (1) has shown that a maximum of 60 people can conveniently be served by a public tubewell with a large platform and 25 people with a small platform. Therefore the total rural population which can be considered served at 50 lcd by 1990 is approximately 3.3 million with large platforms, 16 million with small platforms and 9.7 million from private tubewells - a total of 29 million, or only 32% of the rural population. In fact, the situation is worse because the people who have access to 50 lcd are not, in fact, drawing this quantity from the tubewell because of lack of awareness.

3. Constraints and Positive Developments in the 3FYP

In the water sector the most significant constraint was the continuing decline in the dry season water table due to irrigation, rendering an increasing number of pumps out of order for 2-3 months of the year and causing a net decline in coverage in the affected area. Until 1989 there has been inadequate attention to this issue and there is still little coordination between the water supply and irrigation sectors.

The coastal belt continued to be seriously underserved during the 3FYP period due to inadequate attention to tubewell unsuccessful areas and inadequate budget for deep tubewells in successful areas.

There has also been little progress in reaching the underserved in the better served shallow water table area, with new tubewells still tending to go to more influential areas already better served while the less influential and more remote areas get few tubewells. This is a consequence of tubewell allocations being mainly under the control of the Union Chairmen, who tend to use tubewells as a political tool.

The principal administrative constraints have been late release of funds, late submission of tubewell applications by Union Chairmen, late finalisation of the PP for Village Sanitation, inability to set up 540 new latrine production centres and late delivery of supplies. On the positive side, in the last two years of the Plan the ADP budget was increased (significantly in 1989-90) and greater priority has been given to the underserved coastal belt and low water table areas than before.

A major constraint to health impact was the continued lack of awareness among rural people of how to achieve the full health benefits from a tubewell, of the importance of preventing pollution of water after collection, and of sanitation and hygiene practices. There is also still inadequate awareness among the general public of how to get access to the Government's programmes for water supply and sanitation. This information tends to be known mainly by the better off.

On the positive side the ADP budget was increased in the last two years of the Plan (significantly in 1989-90) and more funds were allocated to the underserved coastal and low water table areas. A new project started in 1989 for water supply and sanitation in the underserved urban slums and fringes. (However, the relatively well-served shallow water table area still consumes a large share of the Government budget.) In 1988 and 1989 the budget was released in good time and measures taken to speed up the submission and selection of tubewell sites. A recycling system was introduced for latrine sales, rendering latrine production independent of Government budget, and a more liberal selling policy introduced whereby the purchaser may buy a latrine slab and any number of rings up to 5, bringing the purchase of a latrine within reach of poorer people. The new TARA deepset handpump was successfully introduced into the regular programme to cope with the falling water table. Technical developments included larger tubewell platforms to encourage greater water use, iron removal plants, and pond sand filters for tubewell unsuccessful areas of the coastal belt. The self-help system increased the role of the beneficiaries in the installation of shallow tubewells and reduced Government costs.

As far as child survival is concerned the most encouraging development was the introduction by DPHE of the Integrated Approach, whereby groups applying for tubewells are motivated, mainly by DPHE's tubewell mechanics, to build at least 5 latrines (sometimes as many as 10) and to improve hygiene practices. This approach has been enthusiastically supported by Upazila Chairmen and has also involved other Government departments whose field staff now assist in the distribution of tubewell application forms and in many cases motivate the applicants to build latrines. The aim is for the Integrated Approach to be followed in all Upazilas by 1993, by which time the annual construction of latrines could reach some 500,000 latrines per year.

The outbreaks of diarrhoeal disease in the coastal and drought-affected areas in 1989 attracted considerable attention from the press and political leaders, and led to an increasing awareness of the importance of sanitation and hygiene (not just tubewells) in combating diarrhoea. There is a major opportunity now to capitalise on the increased understanding of both public and politicians and generate political support for the achievement of accelerated sanitation targets.

4. Principal Issues for the 1990s

Sectoral Allocation

One of the principal issues to be addressed is the decline in public sector allocation for water supply and sanitation. In the 2FYP the allocation for water and sanitation was 2.1% of the total public sector allocation. In the 3FYP this declined to 1.2%. In the same period India committed 2.4%, Burma 2.9%, Nepal 4.0% and Sri Lanka 6.0%. Although some of the costs for shallow tubewells and latrines was shifted from GOB to the beneficiaries during the 3FYP, the "savings" should have been used to accelerate coverage in the underserved areas where the technology is more

expensive. It is recommended that for the 4FYP and 5FYP the allocation be restored at least to the level of the 2FYP, namely 2.1%.

Within the water and sanitation sector, consideration must be given to the split between rural and urban. In the 3FYP the split was 26% rural to 74% urban. On a per capita basis, the allocation was equivalent to about Tk 170 per urban head compared to about Tk 10 per rural head.

While rural projects are generally very cost effective, not all urban schemes make the best use of limited resources. It is recommended that care should be taken in the 1990s to ensure an equitable distribution of resources between urban and rural areas.

The Plight of the Underserved

The use of national average coverage figures in the 3FYP and Decade targets hides the huge differences in coverage in the underserved coastal belt, low water table area and urban fringes compared to the relatively well-served shallow water table area. In terms of persons per operating tubewell, the expected 1990 coverage will be 804 in the low water table area and 486 in the coastal belt, compared to 91 in the shallow water table area (see Table 2). Despite this imbalance, in the first four years of the 3FYP the better-served shallow water table area received 1.85 times the ADP allocation in the coastal belt and 3.4 times the ADP allocation in the low water table area. There appears to be a historical bias towards the better-served area which needs to be redressed in 1990s. It is recommended that the 4FYP adopts specific coverage targets for the different hydrogeological areas.

Even in the better-served shallow water table area there is a significant proportion of paras which have no tubewell at all, while other paras have more than the average. Specific measures are needed to ensure that the shallow tubewells installed in the 1990s genuinely reach these underserved pockets.

Health Impact

In terms of child survival and development, there is no evidence on a national scale of a decline in disease incidence or mortality attributable to the improvement in water and sanitation. This is believed to be due to the low levels of sanitation and personal hygiene which enable the transmission of faeco-oral diseases to continue as before. However there is a wide perception at a local level that tubewell water is "safe" and there is evidence to suggest that the improved coverage of tubewells has led to a reduction in epidemics, which now persist only where coverage is low. Studies have shown that about 80% of rural people use tubewell water for drinking - a huge improvement compared to only 15 years ago. However, nearly 90% of rural people still use contaminated surface water for 75% of their water needs and only about 30% can be considered adequately served. This indicates that, despite encouraging progress in water supply, increased resources are needed in the 1990s to bring tubewell coverage up to the level at which health impact is achievable.

However, even when the ultimate tubewell coverage is achieved the potential health impact will not be realised unless universal adherence to sanitation and hygiene practices is also achieved. Current sanitation coverage is very low, with only 6% of the population estimated to be using latrines by 1990. Hygienic practices necessary to interrupt the transmission of disease are followed by only a tiny proportion of the population. There is little point in continuing to invest in water supply improvements in the 1990s unless massive efforts are undertaken to improve sanitation and hygiene practices.

5. Ultimate Coverage Goals

For water supply there are indications that the full benefits will not be realised until every family has access to as much safe water as it requires for health and social needs. A family cannot be considered adequately served unless it is able to draw all its water needs from the tubewell. Studies in Bangladesh (2,3) suggest that the current average water consumption from all sources is approximately 50 litres per capita per day (lcd). It seems reasonable to assume this level of tubewell water consumption (50 lcd) as the ultimate goal. However, it is not easy to measure this on a national scale so it is necessary to define the level of coverage at which such a water consumption is possible. This level of service can then be used as a surrogate for water consumption. A study by ICDDR,B (3) has shown that, with health education and a large platform, average consumption of tubewell water reached 49 lcd in households within 50 metres of a tubewell. Ahmed (1) showed that a tubewell with a large platform can conveniently serve a maximum of 55-60 persons. If there are more than this number of people within 50 metres depending on the pump it will not be physically possible for every family to draw its full requirement.

A tubewell within 50 metres means 100 tubewells per square kilometre. Assuming 10% of Bangladesh is settled, the current rural population density is approximately 6,250 per sq.km. (90 million on 14,400 sq.km.), which is equivalent to an average user group size of 62.5 persons per tubewell.

It is suggested that the ultimate coverage goal should be a large platform tubewell either within 50m of every house or for every 60 persons (10 families), whichever is the denser tubewell coverage, with adequate health education to ensure per capita consumption of 50 lcd from the tubewell. This goal should be set as a minimum standard for every household in Bangladesh. Because of uneven distribution, the national average would have to be very much higher than this. The implication of this goal is that the existing tubewells should have their platforms enlarged unless the user group size is 20-25.

For sanitation the minimum ultimate goal recommended is 100% practice of sanitary excreta disposal. As a more measurable surrogate, the ultimate target could be set at one hygienic latrine per family (of average size 6 persons). A hygienic latrine is defined as any latrine which eliminates the possibility of human contact with human excreta in the course of everyday life.

For hygiene, a study by ICDDR,B (4) suggests that the hygiene practices which correlate most closely with reduction of diarrhoea in under-5 children are the mother's handwashing before preparing food and the disposal of children's faeces from the family living area. To this should be added the rigorous (as opposed to symbolic) washing of hands after defecation, which is indicative of an understanding of the dangerous nature of human faeces. It is suggested that the minimum ultimate goal for hygiene is 100% practice of handwashing after defecation and before handling, serving or eating food and 100% disposal of children's excreta in a latrine.

6. Intermediate Targets for 1995 and 2000

For water supply, the principal objective should be to focus on the underserved areas. For this it is suggested that no more than 10% of the allocation for water supply in the rural area and urban fringes for the Fourth Five Year Plan be for shallow tubewells.

The current GOB-UNICEF country programme targets for 1993 can easily be extrapolated to indicate feasible 1995 targets. Separate targets are needed for the coastal and low water table areas, for which extrapolation from 1993 indicates feasible 1995 targets of 250 and 375 persons per operating tubewell respectively (Table 4). In the shallow water table area specific measures are needed to address the imbalance between better- and lesser-served areas. It is suggested that a reasonable intermediate target for 1995 for the shallow water table area is a tubewell in every para. To achieve this, the allocation of tubewells must give absolute priority to paras without a tubewell over paras with a tubewell. This will require union-wise surveys by DPHE to identify such paras and DPHE must have the power to override the Union Chairman if he allocates tubewells to paras with tubewells while other paras still have no tubewell. Extrapolating from the expected 1993 coverage a reasonable coverage target for 1995 in the shallow water table area is 71 persons per year-round operating tubewell. The achievement of these area-specific targets will result in a national average coverage of about 142 persons per year-round operating tubewell in 1995 (Table 3), a net decline due to the falling water table.

From 1995-2000, the installation of tubewells in the underserved coastal and low water table areas can be brought up to the maximum capacity of DPHE, estimated as 20,000 coastal and 35,000 Tara deepset tubewells per year. Shallow tubewells should be installed at a modest rate of 10,000 per year, targetting only underserved pockets. The implementation rates shown in Tables 3 and 4 indicate feasible target coverage figures of 100 persons per operating tubewell in the coastal belt, 220 in the low water table area and 45 in the shallow water table area. National average coverage would come to 120 persons per year-round operating tubewell.

Coverage by private tubewells is significant in Bangladesh, and the contribution of the private sector could be encouraged. The family handpump, originally developed by RDRS, has proved very popular in Rangpur and Dinajpur where over 100,000 have been sold in 6 years, serving an estimated 10% of families in those two

districts. At Tk 130, this pump is about one quarter of the price of other pumps usually found on the market, bringing the option of a private tubewell within a wider range of the public. It is recommended that the Government encourages the private sector to spread this option to other parts of the country. It is estimated that there will be 730,000 private tubewells (all in the shallow water table area) serving about 11 million people by 1995 and 855,000 serving about 13 million by 2000. The population depending on public tubewells in the shallow water table area is thus declining by the increase in population served by private tubewells. (The area itself is also declining as the low water table area increases.)

While the achievement of national water supply targets will still depend largely on GOB and donor resources, **sanitation is affordable by every household in Bangladesh - every family with the means to build its own home has the capacity to build an adequately hygienic pit latrine to the same standard as its home.** The achievement of sanitation targets is thus mainly dependent on creating demand.

Demand can be stimulated by giving higher political priority to sanitation, by the use of mass media, by adopting promotional measures such as obliging every Government servant to have a latrine at his home, ensuring all schools have latrines and that the children use them, and by the integrated approach, obliging tubewell applicants to construct latrines before being eligible for a tubewell.

The supply side can be stimulated by **encouraging the private sector and NGOs to produce more latrine components**, paying government latrine mistris a production bonus, establishing a production centre in every Union, and setting up mobile production teams to bring the point of supply closer to the point of demand. Assuming a maximum Government production capacity of 300,000 latrines per year, the maximum target for DPHE latrines in the period 1990-95 is 1.5 million. By 1993 all Upazilas will be following the integrated approach for tubewell installation, and it is feasible to adopt a target of 10 latrines per new public tubewell installed. Experience in the integrated approach shows that about half the latrines built are of "home-made" type. It is therefore reasonable to assume that an additional 450,000 "home-made" latrines will be installed by 1995. This will lead to an estimated total of 2,900,000 families using latrines by 1995, equivalent to 18% of the rural population, which seems reasonable to assume as the 1995 target. Continuation of the trend for 1995-2000 indicates a feasible target of 6 million families using a latrine by 2000, 35% of the rural population.

As far as hygiene is concerned, change will depend almost entirely on improved hygiene education. For adults the principal vehicle for this education is the integrated approach for which, in addition to the work of the tubewell mechanics, the upazila health workers are required to concentrate their attention on tubewell applicant groups before the tubewell is installed and for at least one year after installation. For children the principal vehicle for hygiene education should be the school. While hygiene education is part of the curriculum, teachers do not give this subject any priority. There is a need for teaching materials and other methods such as songs which could be sung daily. Progress on hygiene practices can only be

measured by occasional studies in random areas. It is reasonable to assume a 1995 target of 30% of the population adhering to defined hygiene practices, and 75% by 2000.

7. Projects, Linkages and Related Measures

Projects

There are currently 6 water supply and sanitation projects in the rural area and the urban slums and fringes:

Rural Water Supply and Sanitation in the Coastal Belt

Rural Water Supply and Sanitation in the Low Water Table Area

Rural Water Supply and Sanitation in the Shallow Water Table Area

Rural Water Supply Maintenance, Rehabilitation and Upgrading

Water Supply and Sanitation in Urban Slums and Fringes

Village Sanitation

At this stage it seems that it will be necessary to continue each project in the 4FYP, and there does not appear to be any need to add new projects. However, new projects may be identified in the next GOB-UNICEF country programming exercise, especially for the hill areas.

Linkages

In the water supply and sanitation sector there is a need to link with projects operating in the urban sector, particularly in the district towns and rapidly urbanizing Upazila centres. Projects for district towns should as far as possible make provision for water supply and sanitation in non-core as well as core areas. The project for water supply and sanitation in urban slums and fringes is designed as a temporary measure for pourashavas until a specific project is undertaken. It is desirable for all projects in the urban areas to adopt common standards and criteria for water and sanitation in the non-core as well as the core areas.

There is a need for a more formal link between the water supply and irrigation sectors to be able to monitor and plan for the falling dry season water table. It is recommended that the 4FYP makes specific proposals on this issue.

Related Measures

There is a need substantially to improve the education of children in schools regarding sanitation and hygiene. Schools should not be forced to have a tubewell

or build latrines as this approach has been found counterproductive. However, schools should be expected to have a tubewell and latrines and should be given easy access to tubewell materials and latrine components stocked by DPHE. The initiative to build latrines should come from the school itself, just as the initiative for household latrines must come from the householder. There is also a need for teaching materials to encourage the proper teaching of this subject. Consideration should be given to the provision of soap to schools and for handwashing to be made part of the daily routine.

The involvement of field workers of other Ministries (particularly the **Ministry of Health and Family Planning**) and NGOs is to be encouraged to ensure the success of the integrated approach, so that applicant groups for tubewells are encouraged to build latrines and improve their hygiene practices before the tubewell is allocated. These field workers should also be used to help identify underserved groups and be able to help those groups apply for a tubewell.

Measures are needed to stimulate the involvement of the private sector in the production of both latrines and family handpumps. These could include market surveys, promotional seminars, visits to successful businesses, training, provision of tools and moulds for small scale latrine production enterprises, facilitating loans etc. Collaboration may also be sought with major soap manufacturers to examine the possibility of expanding the market by producing cheaper types of soap marketed on the basis of hygiene messages.

A campaign approach to sanitation and hygiene could be undertaken through the mass media and political leaders in order to increase awareness and stimulate demand. The use of radio may be particularly suitable as radio reaches a significant proportion of rural people, including women who are often not reached by extension workers.

Measures are needed to stimulate the involvement of women, both as beneficiaries and as implementing staff. Women are the managers of family water consumption and the sanitation and hygiene practices of children. Their own hygiene practices will also affect the health of their children. Measures could include distribution of tubewell application forms through women's groups and organizations, signature by female and male head of household on tubewell application form, specific site selection exclusively by females, females and males to receive maintenance training, recruitment of female field workers (public health promoters) in DPHE, involvement of other female field workers (GOB and NGO) in water, sanitation and hygiene promotion, recruitment of more female engineers in DPHE, development of information and promotional material especially for women, including radio messages.

8. Summary of 1990 Status and 1995 and 2000 Targets

<u>Water Supply</u>	Persons per year-round Operating Tubewell			New Tubewells			
	1990	1995	2000	1990-95	1995-2000		
Coastal Belt	486	250	100	24,100	80,500		
Low Water Table Area	804	375	220	102,000	180,000		
Urban Slums and Fringes				20,000	50,000		
Shallow Water Table Area	91	70	45	65,000	50,000		
		(and a tubewell in every para)					
Maintenance/Rehabilitation	90%	90%	90%	60,000	60,000		
		serviceable		resinking			
<u>Sanitation</u>	% using latrines			Total latrines (thousands)		New Government latrines (thousands)	
	1990	1995	2000	90-95	95-2000	90-95	95-2000
	6%	18%	35%	1,950	3,117	1,500	1,500
<u>Hygiene</u>	% following hygienic practices						
	1990	1995	2000				
	2%	30%	75%				

9. Summary of Financial Implications (Public Sector Allocation)

	1990-95			1995-2000	
	Overall Unit Cost (Taka)	Target	Cost (crore Taka)	Target	Cost (crore Taka)
Coastal Tubewells	40,000	24,100	96.4	80,500	322.0
Deepset Tubewells	12,500	102,000	127.5	180,000	225.0
Urban Tubewells	7,500	20,000	15.0	50,000	37.5
Shallow Tubewells	3,000	65,000	19.5	50,000	15.0
Resinking Tubewells	2,000	60,000	12.0	60,000	12.0
Government Latrines	250	1,500,000	37.5	1,500,000	37.5
	Total (Crore Taka)		307.9		649.0

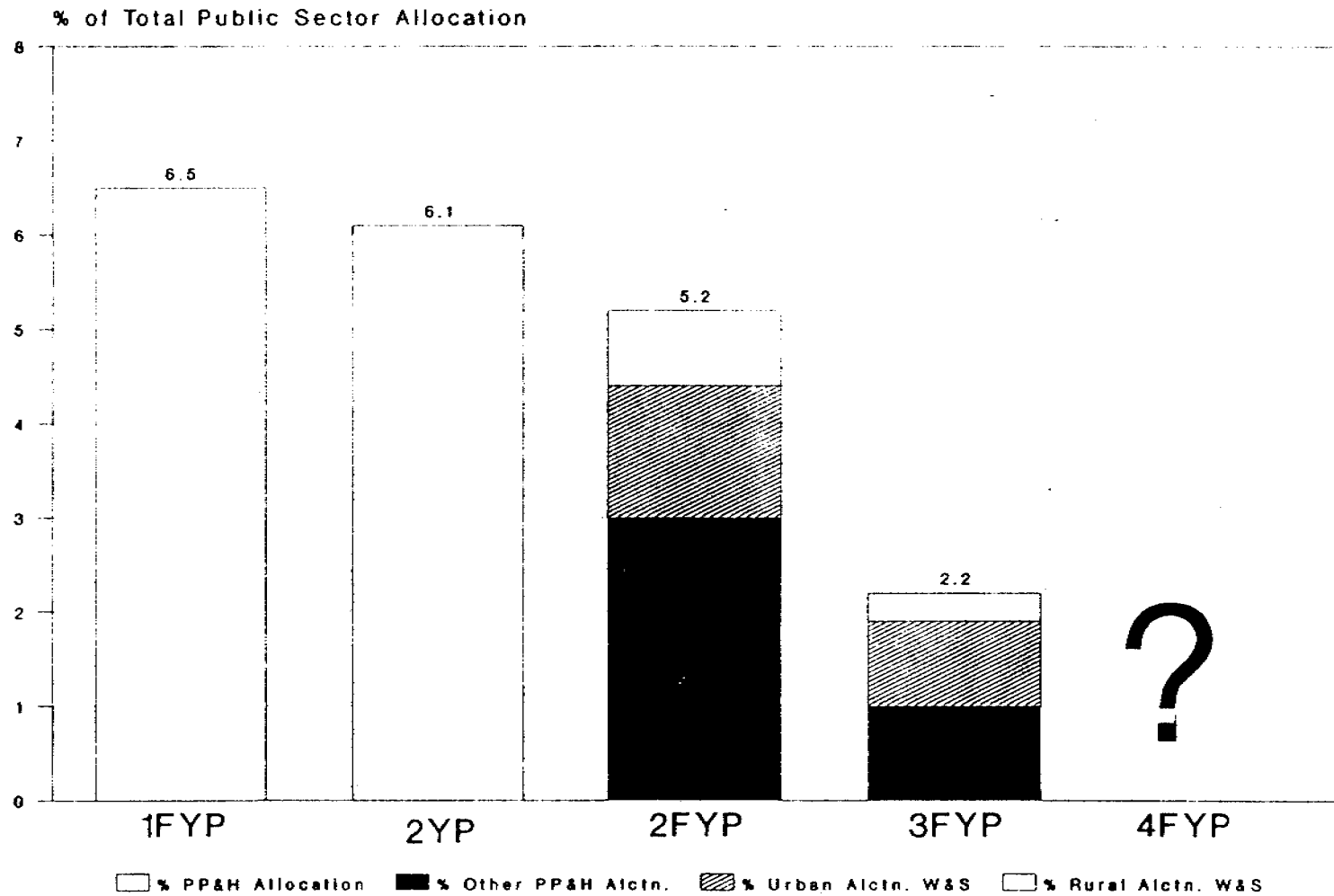
Notes

1. Unit costs include 10% overhead for public health promotion and 10% overhead for establishment costs.
2. Shallow tubewell and resinking unit costs assume self-help installation.
3. Latrine cost excludes local material and labour costs which are recovered through selling price.
4. Water supply and sanitation for Chittagong Hill Tracts, urban core areas and Dhaka/Chittagong are not shown.

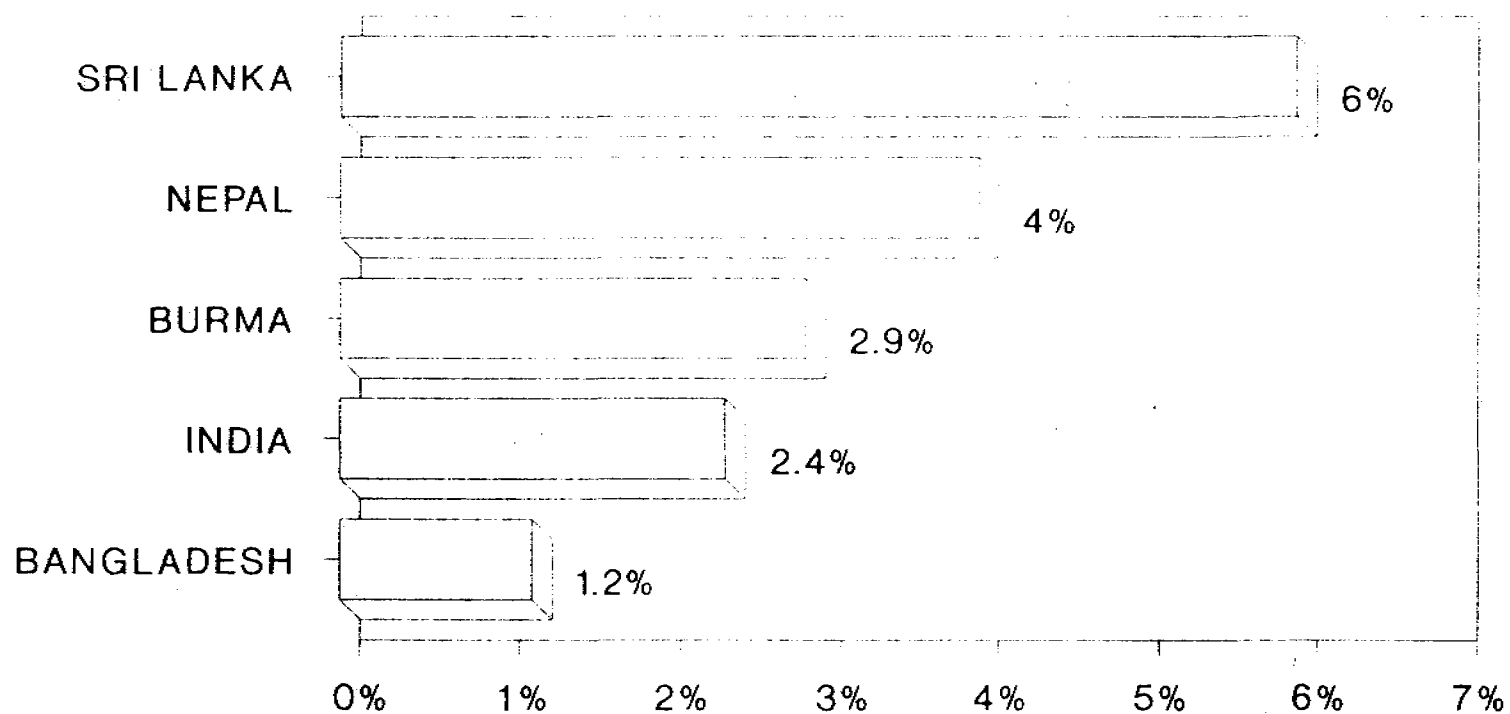
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4. B. Stanton and J. Clemens, An Educational Intervention for Altering Water-Sanitation Behaviors to Reduce Childhood Diarrhoea in Urban Bangladesh, ICDDR,B, Dhaka, 1986.

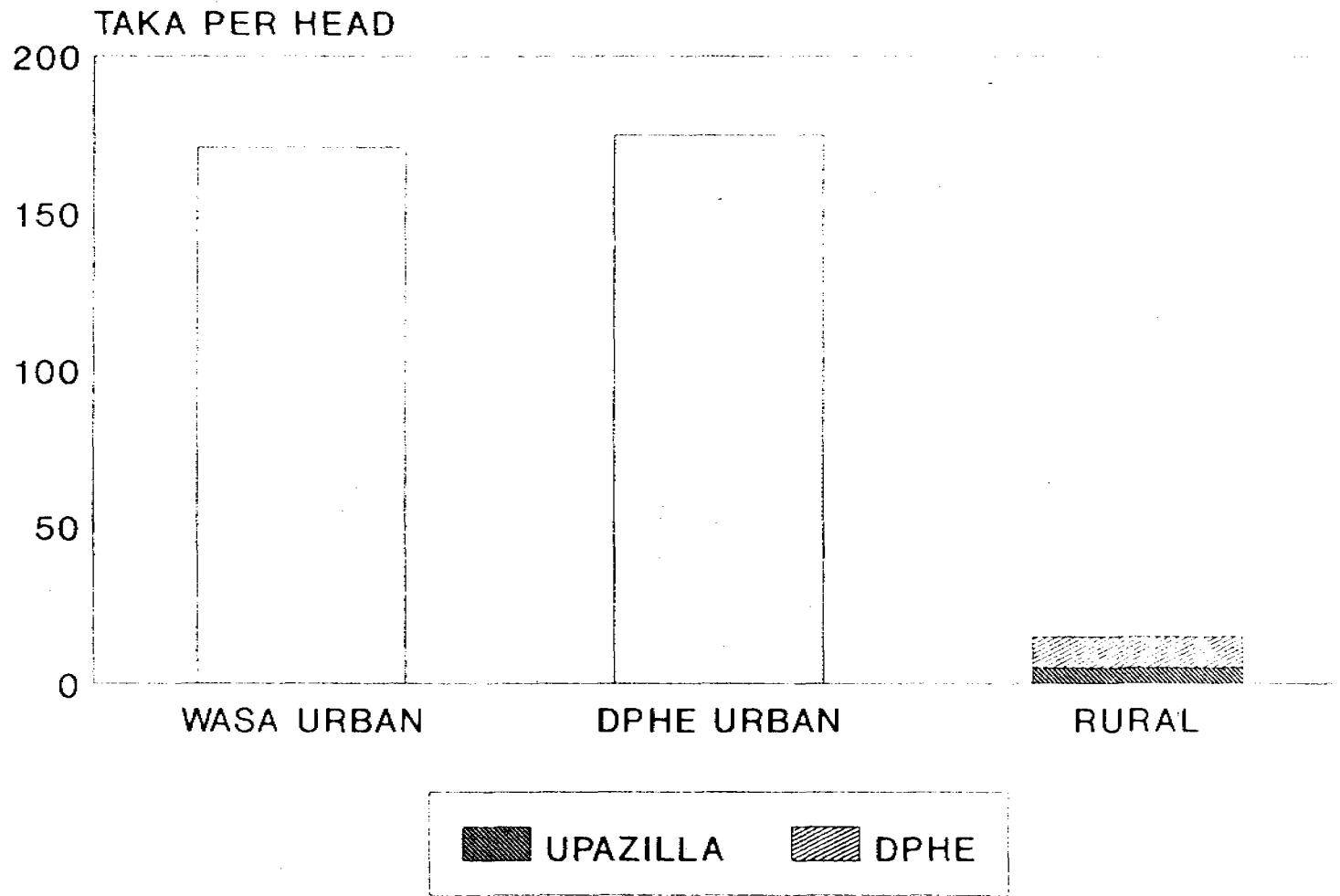
SECTORAL BUDGET ALLOCATION (AS % OF TOTAL PUBLIC SECTOR ALLOCATION)



WATER SUPPLY AND SANITATION ALLOCATION AS % OF PUBLIC SECTOR ALLOCATIONS 1985-1990 (3FYP)



PER CAPITA ALLOCATION FOR WATER & SANITATION IN 3 FY

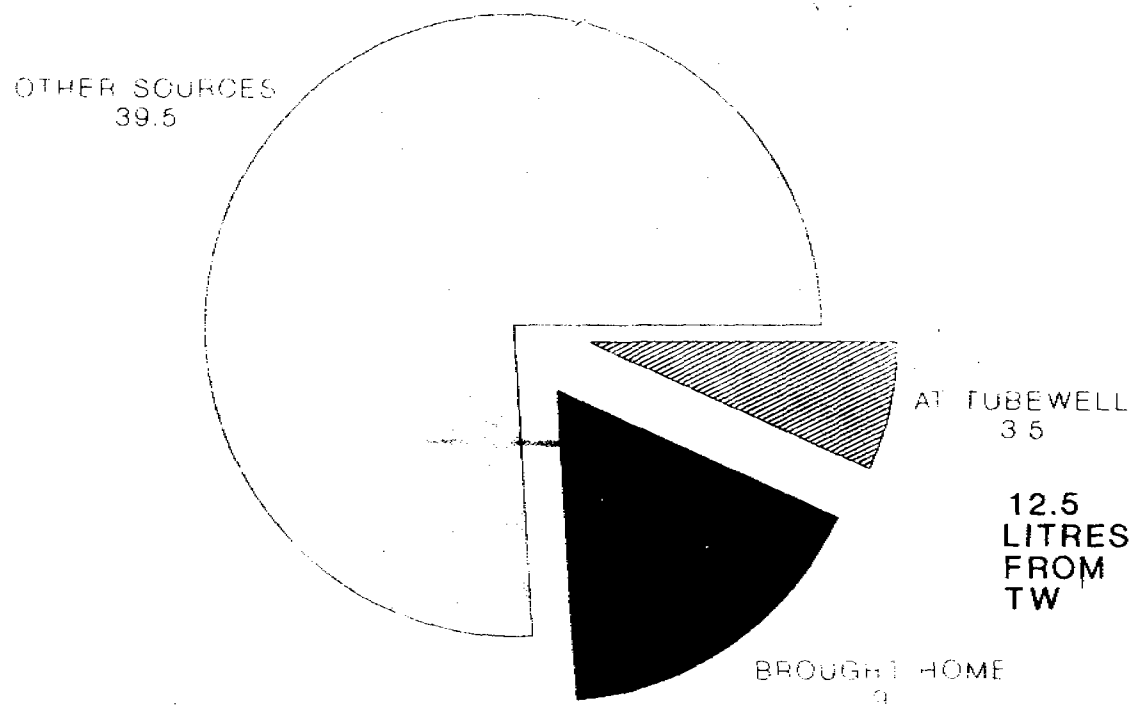


THE PLIGHT OF THE UNDERSERVED
EXPECTED 1990 COVERAGE
(PERSONS PER OPERATING TUBEWELL)

SHALLOW WATER TABLE AREA	• ◆◆	(91)
COASTAL BELT	◆◆◆◆◆◆◆◆◆◆	(486)
LOW WATER TABLE AREA	◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆	(804)

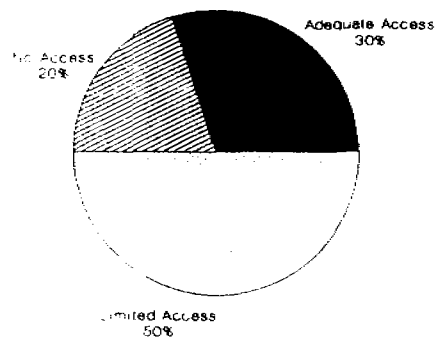
• EVEN IN BETTER SERVED AREAS A
SIGNIFICANT PERCENTAGE OF PARAS (15-20%)
HAVE NO PUBLIC TUBEWELL

WATER USE AVERAGE PER CAPITA DAILY CONSUMPTION OF TUBEWELL USERS (IN LITRES)

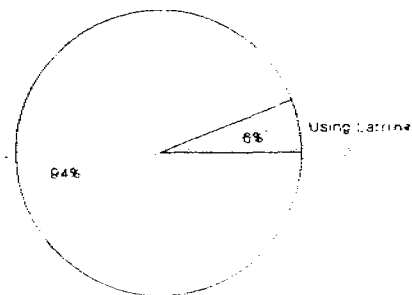


WATER SUPPLY, SANITATION AND HYGIENE 1990 COVERAGE ACHIEVED

WATER SUPPLY



SANITATION



HYGIENE

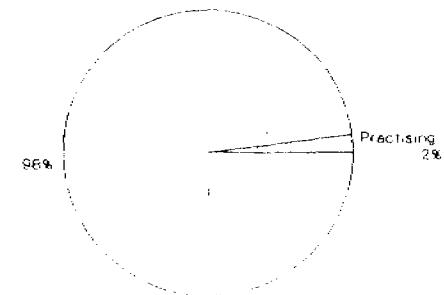


TABLE 1

PUBLIC TUBEWELL AND SANITATION COVERAGE IN RURAL BANGLADESH
1971 - 1990

Year	Estimated total population (000)	Rural % of Population	Estimated rural population (excluding Chittagong Hill Tracts) (000)	Estimated population served by private wells (000)	Estimated population depending on public tubewells (000)	Nos. of Public Tubewell (all types)			Population per Public Tubewell			Rural Sanitation			
						Operational Tubewells	Temporarily non-functional for falling water table	Total Tubewells	Operating THs. (assuming no falling WT)	Operating TH including effect of falling WT	DPHE type latrine	Popn. access to latrine			
1961	54531	96.20	52061												
1971	66179	92.20	60541	100	1500	59041	205891	144124	144124	287	410	410			
1972	67900	91.80	61848	115	1725	60123	205891	144124	144124	292	417	417			
1973	69666	91.50	63253	140	2100	61153	221791	155254	155254	276	394	394			
1974	71478	91.10	64618	160	2400	62218	239981	167987	167987	259	370	370			
1975	73479	90.30	65831	175	2625	63206	263281	184297	184297	240	343	343			
1976	75536	89.40	66989	205	3075	63914	305891	229418	229418	209	279	279			
1977	77651	88.40	68084	225	3375	64709	337191	252893	252893	192	256	256	5331	31986	0.05
1978	79826	87.50	69269	250	3750	65519	380481	285361	285361	172	230	230	13025	78150	0.11
1979	82061	86.60	70467	275	4125	66342	421121	315841	315841	158	210	210	21990	131940	0.19
1980	84359	85.70	71679	300	4500	67179	455011	341258	341258	148	197	197	40296	241776	0.34
1981	87120	84.90	73330	355	5325	68005	496171	421745	421745	137	161	161	76156	456936	0.62
1982	89385	84.20	74585	415	6225	68360	522071	443760	443760	131	154	154	135762	814572	1.09
1983	91709	83.70	76070	470	7050	69020	565691	480837	480837	122	144	144	188357	1130142	1.49
1984	94094	83.20	77582	525	7875	69707	597361	507757	507757	117	137	137	272657	1635942	2.11
1985	100468	82.60	82270	575	8625	73645	629516	535089	535089	117	138	138	361925	2171550	2.64
1986	102860	82.00	83611	585	8775	74836	655442	589898	589898	114	127	132	381980	2291880	2.74
1987	105280	81.50	85062	600	9000	76062	687720	618948	618948	111	123	130	446315	2677890	3.15
1988	107756	80.90	86422	620	9300	77122	710411	639370	639370	109	121	129	512902	3077412	3.56
1989	110290	80.40	87908	635	9525	78383	729792	656813	656813	107	119	143	618125	3708750	4.22
1990	113005	79.90	89511	645	9675	79836	764892	688403	688403	104	116	133	918125	5508750	6.15

SOURCES AND NOTES :

- From 1989 Statistical Year Book of Bangladesh
- From An Analysis of the Situation of Children in Bangladesh
- From physical achievements reports of UNICEF-Assisted RWS Programme since 1972 prepared by DPHE
- Assuming 100% achievements of ADP for 1989-90
- Operating tubewells calculated assuming unavailability as follows :
 - Before 1975 : 30% of tubewells
 - 1976 to 1980 : 25% of tubewells
 - 1981 to 1985 : 15% of tubewells
 - 1986 to 1993 : 10% of tubewells
- Affected tubewells due to falling water table calculated based on % of Low Water Table Area increased since 1985
- Calculated @ 6 persons per latrine

PUBLIC TUBEWELL COVERAGE IN BANGLADESH BY AREA

1972 - 90

Year	LOW WATER TABLE AREA								COASTAL BELT AREA					SHALLOW WATER TABLE AREA									
	Estab. Total Population (000)	Estab. Rural popn. (excld. CHT) (000)	% of Rural Popn.	Affected popn. (000)	Total Tube wells	Operating tube wells	Popn. per tube well	% of Rural Popn.	Affected Popn. (000)	Total Tube wells	Operating Tube wells	Popn. per Tube well	Estab. Served by Pvt. (000)	Popn. depending on TMs (000)	Operating TM (assuring no fall of Water Table)	Temporarily non-functional throughout the year	Operating TM throughout the year	Popn. through out the year	Popn. through out the year	Opt. TM (assuming no fall of Water Table)	Total Tube Wells		
1972	67900	61848	8	4948	1979	1385	2500	3572	11	6803	6611	4628	1029	1470	50097	1725	48372	197301	138111	350	350	205881	
1973	69666	63253	8	5060	1979	1385	2557	3653	11	6958	7217	5052	964	1377	51235	2100	49135	212595	148817	330	330	221794	
1974	71478	64618	8	5169	2179	1525	2372	3389	11	7108	7419	5193	958	1369	52341	2400	49941	230383	161268	310	310	239981	
1975	73479	65831	8	5266	2479	1735	2124	3035	11	7241	7953	5567	911	1301	53323	2625	50698	252849	176994	286	286	263281	
1976	75536	66989	8	5359	2979	2234	1799	2399	11	7369	7419	5564	993	1324	54261	3075	51186	295493	221620	231	231	305881	
1977	77651	68084	8	5447	2979	2234	1828	2438	11	7489	7715	5786	971	1294	55148	3375	51773	326497	244873	211	211	337191	
1978	79826	69269	8	5542	2979	2234	1860	2480	11	7620	8157	6118	934	1245	56108	3750	52358	369345	277009	189	189	380481	
1979	82061	70467	8	5637	3669	2752	1536	2049	11	7751	9928	7446	781	1041	57078	4125	52953	408224	306168	173	173	421821	
1980	84359	71679	8	5734	5149	3862	1114	1485	11	7885	10491	7868	752	1002	58060	4500	53560	439371	329528	163	163	455011	
1981	87126	73330	8	5866	7299	5839	804	1005	11	8066	10655	8524	757	946	59397	5325	54072	478217	382574	141	141	496171	
1982	89385	74585	8	5967	8289	6631	720	900	11	8204	11310	9048	725	907	60414	6225	54189	502472	401978	135	135	522071	
1983	91709	76070	8	6086	8769	7015	694	867	11	8368	11875	9500	705	881	61617	7050	54567	545047	436038	125	125	565691	
1984	94094	77582	8	6207	9289	7431	668	835	11	8534	12440	9952	686	858	62841	7875	54966	575632	460506	119	119	597361	
1985	100468	82270	8	6582	9719	7775	677	846	11	9050	13580	10864	666	833	66639	8625	58014	606217	484974	120	120	629516	
1986	102860	83611	12	10033	9769	8792	1027	1141	11	9197	13728	12355	670	744	64380	8775	55805	631945	568751	25278	98	98	655442
1987	105280	85062	14	11909	11519	10367	1034	1149	11	9357	13822	12440	677	752	63797	9000	54797	662379	596141	39743	92	92	687728
1988	107756	86422	15	12963	11997	10797	1081	1201	11	9506	14164	12748	671	746	63952	9300	54652	684250	615825	47898	89	89	710411
1989	110290	87908	25	21977	15231	13708	1443	1603	11	9670	15496	13946	624	693	56261	9525	46736	699065	629159	118841	74	74	729792
1990	113005	89511	22	19692	27231	24508	723	804	11	9846	22496	20246	438	486	59972	9675	50297	715165	643649	100123	78	78	764892

SOURCES AND NOTES :

1. From Table 1
2. From RMSS PPA for 1988-93.
3. From physical achievement reports prepared by DPHE up to 1989 and assuming 100% achievement of ADP for 1989-90.
4. Affected tubewells due to falling water table calculated based on % of low water table area increased since 1985.
5. Calculated @ 15 persons per private tubewell

PUBLIC TUBEWELL AND SANITATION COVERAGE IN RURAL BANGLADESH
SUGGESTED TARGETS FOR 1990-95 AND 1995-2000

Year	Estimated Total Population (000)	1> Rural % of Population	2> Estimated rural population (excluding Chittagong Hill Tracts) (000)	2> Estimated No. of private wells	2> Estimated population served by private wells (000)	Population depending on public tubewells (000)	Nos. of Public Tubewell (all types)			Population per Public Tubewell			Rural Sanitation					
							3> Total Tubewells	5> Operational Tubewells	6> Temporarily non-functional for falling water table throughout the year	Total Tubewells	Operating THs. (assuming no falling WT)	Operating TH including effect of Falling WT	7> OPHE type latrine	8> Other hygienic latrines	Total latrines	% popn. access to latrine		
1990	113005	1> 79.90	89511	645	9675	79836	764892	3> 688403	100123	598292	104	116	133	918125	918125	5508750	6.15	
1991	115672	79.30	90939	660	9900	81039	791061	711955	123013	601243	102	114	135	1275000	1275000	7650000	8.41	
1992	118339	78.60	92214	675	10125	82089	825836	743252	162721	596804	99	110	138	1575000	1575000	9450000	10.25	
1993	121007	78.00	93573	690	10350	83223	866411	4> 779770	205133	595150	96	107	140	1850000	1850000	11100000	11.05	
1994	123674	77.90	95513	710	10650	84863	906411	815770	246311	594090	94	104	143	2150000	200000	2350000	14100000	14.76
1995	126341	1> 76.80	96195	730	10950	85245	954411	858970	288508	599313	89	99	142	2450000	440000	2690000	17340000	18.03
1996	129011	76.10	97333	755	11325	86008	1009911	908920	315901	624609	85	95	138	2750000	717500	3467500	20805000	21.37
1997	131682	75.40	98435	780	11700	86735	1068411	961570	343893	652066	81	90	133	3050000	1025000	4075000	24450000	24.84
1998	134362	74.80	99639	805	12075	87564	1134911	1021420	372486	686183	77	86	128	3350000	1357500	4707500	28245000	28.35
1999	137023	73.60	99982	830	12450	87532	1192911	1073620	401678	712110	73	82	123	3650000	1707500	5357500	32145000	32.45
2000	139693	1> 73.60	101930	855	12825	89105	1264911	1138420	431471	750096	70	78	119	3950000	2057500	6007500	36045000	35.36

SOURCES AND NOTES :

1. From 1989 Statistical Year Book of Bangladesh
2. From An Analysis of the Situation of Children in Bangladesh
3. Assuming 100% achievements of ADP for 1989-90
4. As per planned GOB-UNICEF Master Plan of Operation 1988-93 target
5. Operating tubewells calculated assuming 10% unavailability
6. Affected tubewells due to falling water table calculated based on % of Low Water Table Area increased since 1985
7. Other types of hygienic latrine calculated based on 5 times tubewell implementation
8. Calculated @ 6 persons per latrine

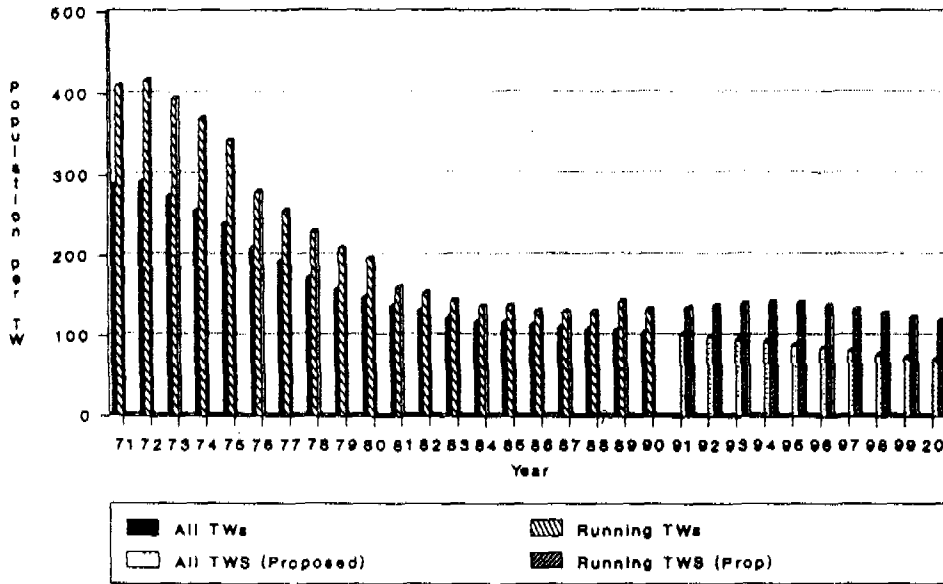
TABLE 5
RURAL WATER SUPPLY AND SANITATION
PROPOSED ANNUAL IMPLEMENTATION TARGETS 1990-2000

	90-91	91-92	92-93	93-93	94-95	4FYP TOTAL	95-96	96-97	97-98	98-99	99-2000	SFYP TOTAL
LOW WATER TABLE AREA (DEESET TWS)	14,500	15,500	17,000	25,000	30,000	102,000	35,000	35,000	35,000	35,000	40,000	180,000
COASTAL BELT (ALL TUBEWELLS)	3,000	3,100	5,000	5,000	8,000	24,100	10,500	13,500	16,500	20,000	20,000	80,500
SHALLOW WATER TABLE AREA (SHALLOW TWS)	15,000	15,000	15,000	10,000	10,000	55,000	10,000	10,000	10,000	10,000	10,000	50,000
URBAN FRINGES (ALL TUBEWELLS)	2,000	3,000	5,000	5,000	5,000	20,000	10,000	10,000	10,000	10,000	10,000	50,000
RESINKING	12,000	12,000	12,000	12,000	12,000	60,000	12,000	12,000	12,000	12,000	12,000	60,000
DPHE LATRINES	300,000	300,000	300,000	300,000	300,000	1,500,000	300,000	300,000	300,000	300,000	300,000	1,500,000
ALL LATRINES	300,000	300,000	300,000	500,000	550,000	1,950,000	577,500	607,500	632,500	650,000	650,000	3,117,500

Ref: Table_5.wk1/L-9

CHART 1 Public Tubewell Coverage in Bangladesh

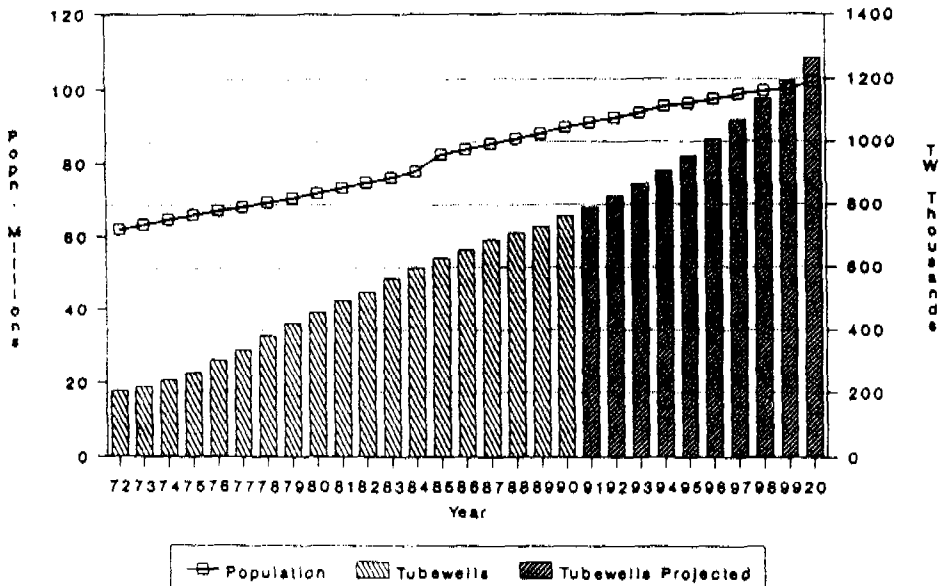
Progress up to 1990 and Proposed Targets for 1991 - 2000



1. Up to 1990 actual; 1991-2000 Projection. 2. Rural Population excluding CHT & Population served by Private TWs

CHART 2 Rural Population and Public Tubewells

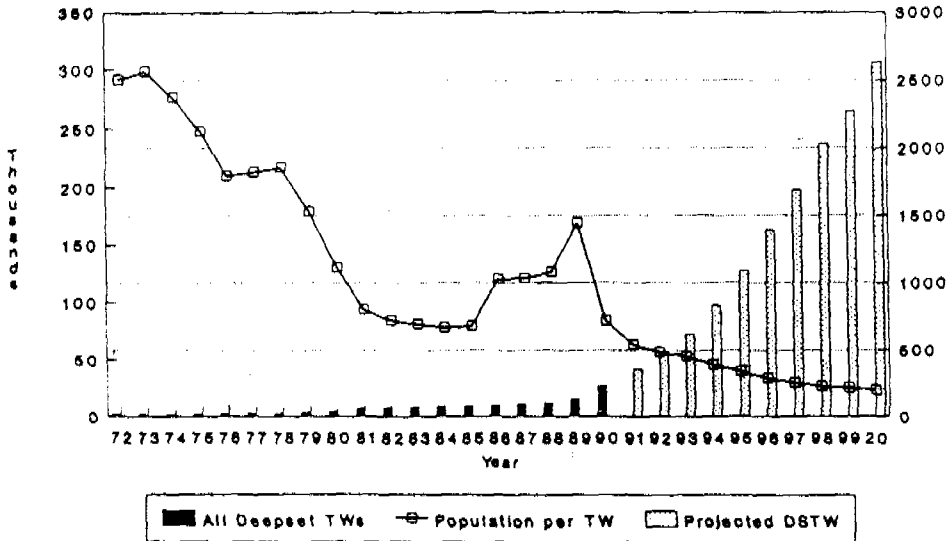
Progress up to 1990 and Proposed Targets for 1991 - 2000



1. Up to 1990 actual; 1991-2000 Projection. 2. Rural Population excluding CHT & Population served by Private Tubewells

CHART 3 Low Water Table Area Population Coverage per Public Tubewell

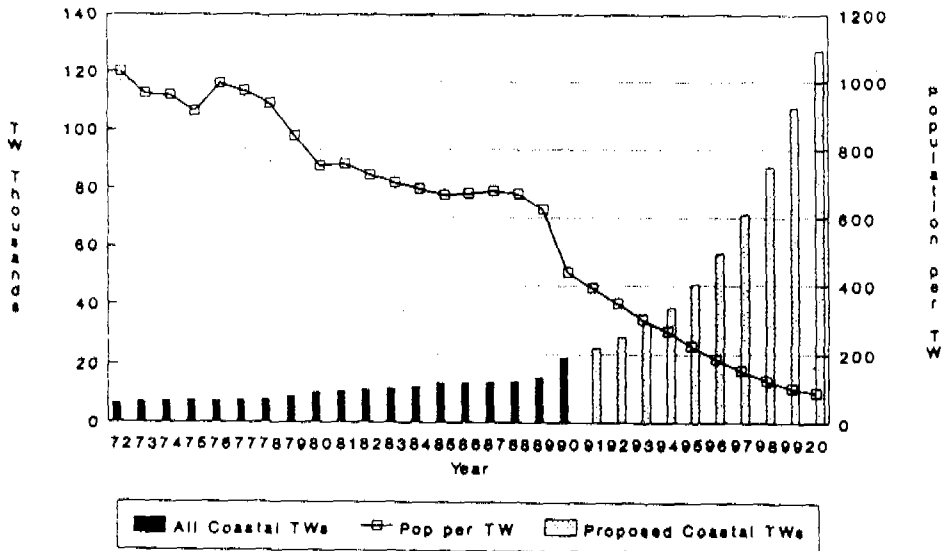
Progress up to 1990 and Proposed Targets for 1991 - 2000



1. Up to 1990 actual, 1991-2000 projection. 2. Population increasing due to falling dry season water table.

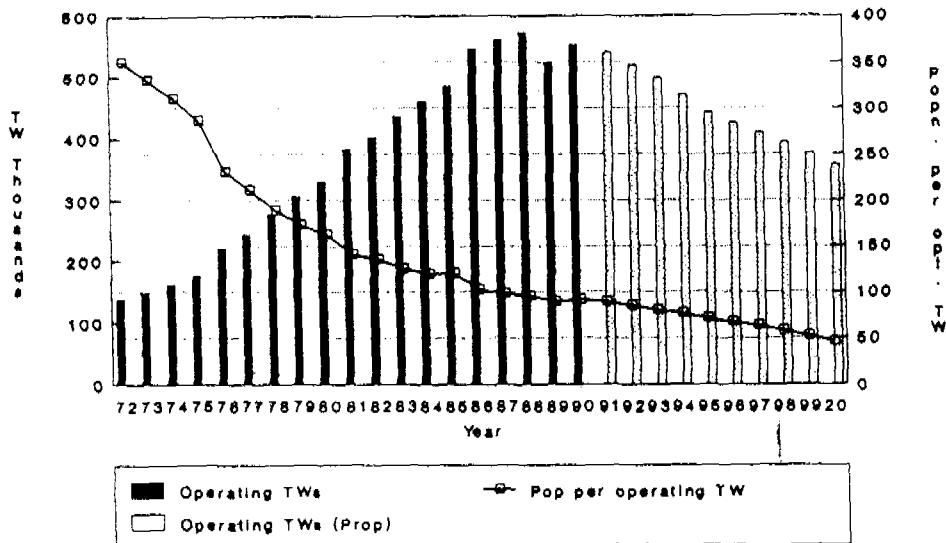
CHART 4 Coastal Belt Area Population coverage per Public Tubewell

Progress up to 1990 and Proposed Targets for 1991 - 2000



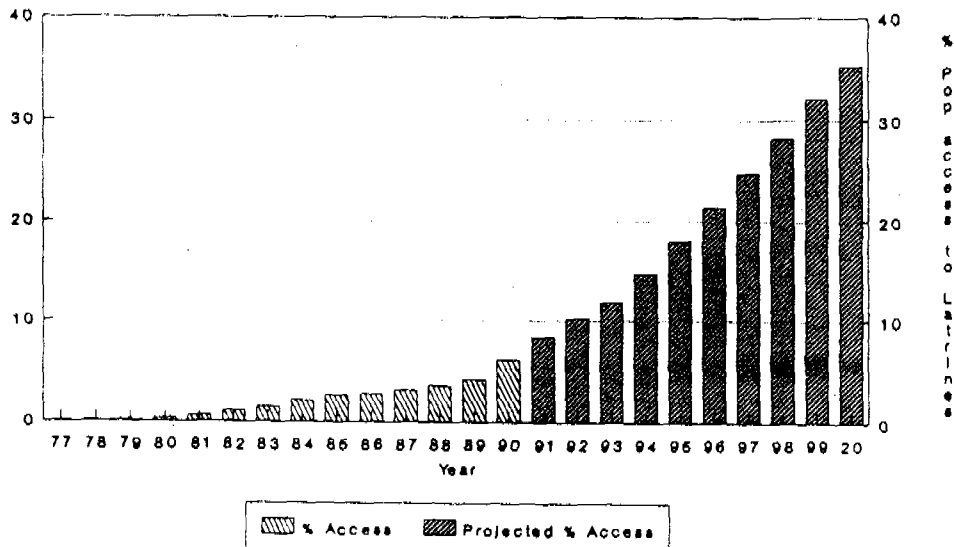
1. Up to 1990 actual, 1991-2000 projection. 2. TWe including Deep Tubewell. V387, 387, P&F

CHART 5
Shallow Water Table Area
Population per Public Shallow Tubewell
 Progress up to 1990 and Proposed Targets for 1991 - 2000



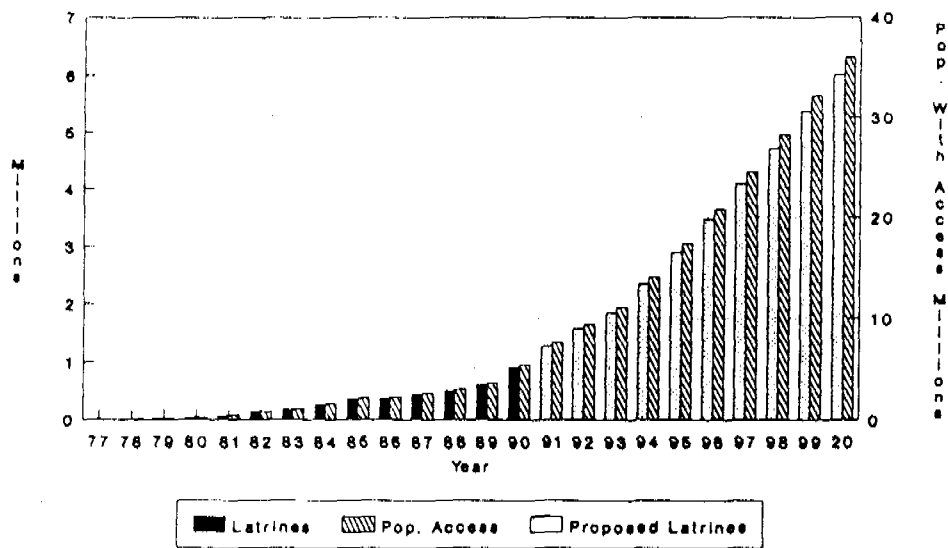
1. Population per BTW operating throughout the year. 2. Population decreasing due to falling dry season water table.

CHART 6
Percentage of Rural Population access to Latrines.



1. Up to 1990 actual, 1991-2000 projected. 2. Access calculated @ 8 persons per latrine.

CHART 7
Rural Sanitation
Population Access to Latrines



1. Upto 1990 actual, 1991-2000 projection.
2. Access calculated @ persons/latrine.
3. Population all rural except CHT