A Model of Costs and Resources for Rural and Peri-urban Water Supply and Sanitation in the 1990s

by

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Abstract

This article develops a model of cost and financing strategies for rural and peri-urban water supply and sanitation. It suggests that significant progress towards the World Summit for Children goal of universal access to water supply and sanitation can be made if a combination of strategies is adopted. On the cost side: significant cost reductions should be possible through efficiency in resource use and reduction of system management costs. On the financing side it suggests: restructuring the financing of the sector with improved efficiency and greater cost recovery in urban services; full cost recovery of operations and maintenance costs; cost-sharing through community contributions in kind such as own labour and financially in rural and peri-urban water supply for basic levels of service depending on willingness and ability to pay and full cost-recovery for higher levels of service; a high degree of cost-recovery in rural and peri-urban sanitation; development of institutional structures for both collection and management of revenues; development of alternate financing mechanisms such as rural credit schemes and revolving funds, adapted in specific country contexts, including the required institutional mechanisms; and additional allocations from governments and external support agencies. Additional government or external financing alone , while critical, will not of itself lead to effectiveness in the use of resources. Equally cost-recovery alone cannot lead to universal access and sustainable solutions. A composite set of actions are needed within which building capacities of institutions and people is necessary for sustainability.

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1. Introduction

In 1980, the General Assembly of the United Nations proclaimed the period 1981 to 1990 as the International Drinking Water Supply and Sanitation Decade with the goal of achieving universal access to water and sanitation in developing countries. Although major strides where made in the decade, the achievements fell far short of the goal. In 1990, at the World Summit for Children a historic promise was made by governments to strive for the achievement of the goals for child survival, protection and development, including achievement of universal access to safe water and sanitation by the year 2000. The Convention on the Rights of the Child adopted by the United Nations General Assembly in 1989 also specifies in Article 24 that countries should take appropriate measures to combat disease and malnutrition within the framework of primary health care which requires "among other things, provision of clean drinking water and sanitation services". The UN Conference on Environment and Development 1992 and the World Social Summit 1995 have both underscored the need for urgent actions on this front. In various international fora, therefore, the goal of universal access in safe water and sanitation has been adopted.

Access to clean water and sanitation at an affordable price is a basic right that needs to be addressed by both developing countries and external support agencies. Apart from its health impacts, safe water supply and environmental sanitation have significant backward and forward linkages with multiplier effects on economic development. The 1992 and 1993 World Development Reports (WDR) by the World Bank have focused on environment and health respectively, under the umbrella of "sustainable development" and the WDR 1994 was specifically on infrastructure for development. They have all underscored the importance and urgency of meeting the basic need of clean water and sanitation. Goal and target setting help in mobilizing actions.

This article develops a model of estimates of cost and financing[1] strategies, for meeting the World Summit for Children (WSC) goals for water supply and sanitation. Global cost estimates are "orders of magnitude". Their prime usefulness is for determining the nature and extent of resource mobilization necessary through either inter- or intra-sectoral restructuring, additional allocations from governments and external support agencies and the examination of alternate financing mechanisms, including community contributions along with the necessary institutional structures. The additional resources need not come from the governments and external support agencies alone. Alternate financing mechanisms should be examined with emphasis on usage of the services on the criteria of *quality, quantity, reliability, and sustainability*. The goal of universal access to water supply and sanitation cannot be met without efficiency and effectiveness in resource use; additional resource allocation; and use of alternate financing mechanisms. There are a number of experiences and success cases to learn lessons. The indicative cost figures and suggested financing plan are intended to provide the rationale and examine the scope for generating the additional resources through various means, thereby suggesting a set of actions that are needed. They call for cost-reduction, cost-saving and cost-

[1] The cost and finance estimates in this paper are for rural and peri-urban areas of Africa, Asia and Latin America, where most effort is needed.

shifting reforms, and macro and micro financing strategies.

2. What are the costs?

In 1990, UNICEF had estimated that to achieve the goals using low-cost systems, the costs for water supply and sanitation would amount to an additional US $9 billion per annum. These estimates, and those specifically for Africa[2], were based primarily on the current cost derived from experiences in the late 1980s. Experience shows that costs have come down in some countries and there is scope for further reduction.

Strategies for achieving universal access in water supply and sanitation have to be country specific with individual countries defining their own standards of "access". In arriving at the global cost estimates, however, certain simplifying assumptions are necessary. For our purposes, the standard for rural water supply is defined as the availability of the minimum requirement of water for drinking and hygiene - 20 liters per capita per day - within about 1 mile or 1.6 kilometer from the home - one such water point serving 250 persons. Countries could set higher standards, such as higher daily per capita consumption or water points closer to the household, based upon their individual criteria and resource availability. Also, in the case of water supply, the borehole with handpump is not necessarily the low-cost technology of first choice. Indeed, the scope for utilization of improved hand-dug wells and spring protection or improvement of the traditional sources should be investigated prior to the borehole option. For rural sanitation, the standard assumed for the purpose of this model is a pit latrine. In peri-urban[3] water supply and sanitation intermediate technologies are generally used. Clearly, higher levels of service in both water supply and sanitation will entail different costs. Country level costing will, therefore, be more specific and attuned to individual situations.

Table 1 provides estimates of the total capital costs, using low-cost technologies for Africa, Asia and Latin America - the three regions where most effort is needed. It is based on population to be covered 1990-2000.[4] The total capital or investment cost is estimated at US $54 billion or $5.4

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[2] OAU/UNICEF (1992).

[3] The definition of peri-urban areas often poses considerable difficulty. For the purposes of this model, the peri-urban population has been defined as constituting 70 percent of the total urban population in Africa, 60 percent in Asia and 50 percent in Latin America.

[4] The coverage figures for the 1990s are primarily from WHO. The period 1990-2000 is considered because benchmark coverage figure are available for 1990. Evidence from different parts of the world suggest that these figures may be substantially inflated. Moreover, coverage does not necessarily mean usage.

Table 1: Estimated Capital Cost of Providing Rural and Peri-urban Water Supply and Sanitation in Africa, Asia and Latin America by the Year 2000 (Population to be covered 1990 to 2000)

	Africa			Asia			Latin America			Total			
	Population to be covered (millions)	Per Capita Cost (US$)	Total US$ (billions)	Population to be covered (millions)	Per Capita Cost (US$)	Total US$ (billions)	Population to be covered (millions)	Per Capita Cost (US$)	Total US$ (billions)	Population to be covered (millions)	Total US$ (billions)	Annual US$ (billions)	Per Capita US $
Water Supply													
Rural	348	15	5.2	818	6	4.9	58	30	1.7	1224	11.8	1.2	10
Peri-urban	130	95	12.4	312	6	1.9	62	100	6.2	504	20.5	2.0	41
Sub-total	478		17.6	1130		6.8	120		7.9	1728	32.3	3.2	18
Sanitation													
Rural	417	10	4.2	1209	4	4.8	78	30	2.3	1704	11.3	1.1	6
Peri-urban	134	25	3.3	305	4	1.2	76	50	3.8	515	8.3	0.9	16
Sub-total	551		7.5	1514		6.0	154		6.1	2219	19.6	2.0	9
Social Mobilization											2.0	0.2	
Total			25.1			12.8			14.0		53.9	5.4	

Source: Coverage data for Africa are from OAU/ICAAC, (1992). Coverage data for Asia and Latin America are from WHO and UNICEF, State of the World's Children Reports. Population data are from United Nations (1992). Africa includes North Africa, Asia includes South East Asia and East Asia and Pacific.

billion per annum (in 1990 prices).[5] The operations and maintenance (O&M) costs should be borne by the beneficiaries. The per capita capital cost for rural water supply and sanitation in Table 1 is $16 which compares with $15 estimated in the World Development Report (WDR) 1993[6]. It is interesting to compare these per capita cost estimates with that of certain other interventions such as that of fully immunizing children which is estimated at $15 per child in low-income countries and $29 in middle-income countries[7]. Rural water supply and sanitation, therefore, is not that costly and with a relatively small investment can provide large coverage.

Water supply The per capita capital cost estimates are based on the actual costs for Asia in India, Bangladesh and Vietnam. In Latin America, the higher wage rates and costs of inputs results in a significantly higher cost. The approach to unit costs for Africa is discussed below. In each case, these are essentially "Best Practice Cost" (BPC) estimates in that they reflect not only what is being achieved now but also the scope of cost-reductions that are considered feasible.

Over the 1980s, there is evidence of a steady reduction in per capita water supply costs. Costs in India and Bangladesh using a borehole with handpump have been brought down to about $4 to $6 per capita[8]. For Africa[9] it was estimated that the weighted average per capita *current* costs derived from the late 1980s for rural water supply is around $32. A number of countries have, however, shown that costs can be reduced further. In Sudan costs have come down by almost two-thirds to about $3000 for a borehole with handpump. Similarly, in Uganda and Nigeria, costs have been reduced significantly. The BPC costs reflect the scope for further cost reductions in countries. Cost-reductions, particularly in Africa, have been identified in a number of areas:

- standardization on handpumps and spare parts;
- reduction of the borehole failure rate;
- reduction in costs of drilling;
- greater use of local materials;
- increased private sector participation;
- incentive schemes;
- increased use of local labour through capacity building; and
- reduction in system management costs.

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[5] These cost estimates and those for WSC are for capital costs only and do not include the costs of operations and maintenance (O&M). O&M costs are often estimated at 5 to 20 percent of the capital costs. Water and Sanitation for Health Project (1989) describes and demonstrates techniques for estimating O&M costs.

[6] World Bank (1993), p.93. The WDR estimates that the cost for water and sanitation ranges from $15 per person per year for si l systems to $200 for full fledged systems. Low-cost systems are estimated by the Bank at around $10 per capita each for water su sanitation while per capita estimates for intermediate systems are $100 for water supply and $25 for sanitation (Serageldin, 1994)

World Bank (1993), p. 74

or example, in Bangladesh, the cost of rural water supply in a low water table area with a Tara pump was estimated at $1 per c a deep tubewell at $6 per capita. (UNICEF, 1993). Similarly, costs in India and Vietnam have been estimated at $3 to $6 per capita.

OAU/UNICEF (1992).

The cost-reduction measures must be coupled with improved effectiveness of the programmes and depend on proper planning and government policy changes such as tariff reduction. A tariff reduction would not reduce the economic cost to society as a whole but would allow for the reduction of the cost to households. In effect, this would provide a subsidy for basic levels of service. With these aspects, technical efficiency, allocative efficiency and reduction in system management costs through greater capacity building, local inputs and proper planning, it should be possible to arrive at weighted average per capita costs in Africa of $15[10] as has been demonstrated in a few countries.

Sanitation The cost estimates for rural sanitation are based primarily on the ventilated improved pit latrine in Africa, ring slab latrines in Asia.[11] For Latin America, standards such as pour flush latrines, result in higher costs. A number of lower cost technologies, such as the Sanplat, are being used in some countries. However, increased expenditure will be needed on providing the infrastructure and network for the manufacture of latrines and extensive communications and social mobilization costs. Peri-urban sanitation poses particular problems for costing because it is not clear what is the appropriate technology in a situation where there are severe space limitations; problems of property rights; and the issue of who would be responsible for service provision and maintenance. Although a few examples such as Orangi in Pakistan (where sewerage services have been provided at less than $50 per household)[12]; Kumasi, Ghana (where high levels of coverage was considered feasible with ventilated improved pit latrines); and Sulabh Sauchalaya in urban areas of India and some neighboring countries (on the model of community 'pay and use' with full cost recovery for operations and maintenance and government subsidizing the capital cost) are available, more research is necessary in this area.

Social mobilization, information, education and communication This should form a major investment area, particularly in sanitation. Awareness of health and hygiene education is critical for creating effective demand for sanitation. Sustainability has generally been linked to technology choice but recent observations point to the important role of social and behavioural change for achieving health and hygiene impact. Awareness increases effectiveness and sustainability. Social mobilization and Information Education and Communication (IEC) through such means as a mass campaign of health and hygiene education can have a significant impact on behaviour. Again cost-effective strategies need to be designed and implemented. The costs of social mobilization and IEC, which are included in the total costs, are conservatively estimated at 10 per cent of the capital cost of sanitation or about $2 billion for the decade.

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[10] Costs in Africa show considerable variations (See UNDP/World Bank, 1991) and UNICEF (1990). Nigam, A. and D. Hey 3) discuss in more detail the areas and scope for cost-reduction.

[11] In Bangladesh, for example, the per capita cost of a slab and ring latrine varies from $3 to $6 depending on the number of ri ICEF, 1992).

[2] World Bank (1994), p. 83.

3. How to meet the costs?

Table 2 provides estimates of the investments in the sector in the 1980s from WHO. It is estimated that the total investment in the 1980s in Africa, South-east Asia and Latin America was on the order of US $66 million. In this paper, the costs are compared to investments in these three regions.[13] In these regions, $36 billion was invested in water supply and $30 billion for sanitation - $12 billion of the total was in rural areas and $54 billion in urban, of which it is estimated that $5 billion was for peri-urban areas (Table 2). Furthermore, about 53 per cent of the total investment in these three regions was from external sources (Table 3). On the basis of the total costs for the 1990s and the financing pattern in the 1980s (during which period it is estimated that $17 billion was spent on rural and peri-urban systems), Table 4 provides a suggested financing plan of the additional resource needs (i.e. over and above estimated current expenditure levels).

The additional annual requirement to meet the target through cost-reduction and low-cost technologies is about $4 billion (1989/90 prices) or about $5 billion in 1994 price (assuming an annual inflation rate of around 5 per cent). For consistency, the analysis of possible means for meeting the additional resource requirements is, hereafter, done only in 1989/90 prices. The sources of funds outlined in Table 4 are discussed below.

Intra-sectoral budget restructuring and efficiency in urban systems

The impression generally is that developing country expenditure in water supply and sanitation is high with a considerable amount of money spent by governments. In fact, national expenditures in water supply and sanitation, which are difficult to monitor since they are often expended by more than one ministry and at different levels of government, are estimated on average to be only about 0.4 per cent of GDP.[14] This compares to about 4 per cent for infrastructure expenditure as a whole and a similar percentage for health. Moreover, while the majority of the unserved population is in rural areas, over three-quarters of the investment was on urban systems as seen in Table 2. Revenue from the urban areas is, however, low with estimates of subsides sometimes being as high as 70 per cent of the costs[15].

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[3] The WHO classification differs somewhat. For example, Western Pacific includes countries such as Australia, Singapore, Japan, and, and Korea much of whose investment even in the rural areas is on high-cost systems. Even in China much of the earlier rural s stment was shifted to piped-water supply schemes. Similarly, the Eastern Mediterranean region includes countries such as Syria, Jor non, Cyprus, Iran and Iraq which also adopt high-cost investments even in the rural areas. Including these regions would inflat stments in low-cost systems.

[4] World Bank (1994), p.92.

[5] World Bank (1994), p. 47.

TABLE 2
Estimated Investment in
Water Supply - Sanitation 1981-1990
(US$ billion)

	WATER				SANITATION				TOTAL
	Urban		Rural	Total	Urban		Rural	Total	
	Total Urban	Peri-urban (1/10 of urban)[1]			Total Urban	Peri-urban (1/10 of urban)[1]			
Africa	5.1	0.5	1.9	7.0	5.8	0.6	0.4	6.2	13.2
Latin America	14.8	1.5	0.9	15.7	15.4	1.5	0.5	15.9	31.5
S.E. Asia	5.9	0.6	7.2	13.1	7.2	0.7	0.8	8.0	21.1
Sub-Total	**25.8**	**2.6**	**10.0**	**35.8**	**28.4**	**2.8**	**1.7**	**30.1**	**65.8**
Eastern Mediterranean	8.8		2.7	11.5	10.6		1.2	11.8	23.3
Western Pacific	10.9		15.7	26.6	14.3		3.8	18.1	44.8
Total	**45.5**		**28.4**	**73.9**	**53.3**		**6.7**	**60.0**	**133.9**

Note: [1] It is estimated that about 10% of total urban expenditures was on peri-urban intermediate systems.
Source: Compiled from WHO (1992)

TABLE 3
Total Funding for Water Supply and Sanitation
1981-1990 (US$ billion)

	Total	External	Internal
Africa	13.2	9.8	3.4
Americas	31.5	15.7	15.8
S.E. Asia	21.1	9.1	12.0
Sub-Total	**65.8**	**34.6**	**31.2**
Eastern Med.	23.3	8.3	15.0
Western Pacific	44.8	3.1	41.7
Total	**133.9**	**46.0**	**87.9**

Source: WHO (1992)

Table 4

COST AND RESOURCES FOR RURAL & PERI-URBAN WATER SUPPLY & SANITATION 1990 - 2000

(U.S. $ billions)

1. FINANCIAL RESOURCE REQUIREMENTS

	Total (1990-2000)	Annual (1990 prices)	Annual (1994 prices)
Total Costs (1)			
Water supply	32	3.2	4.0
Sanitation	20	2.0	2.5
Social mobilization & IEC 2	0.2	0.3	
Total	54	5.4	6.8
Less:			
Estimated current investment level (2)	17	1.7	2.1
Additional required	37	3.7	4.7

2. SOURCES OF FUNDS

		Annual (1990 prices)
Domestic		
2.1. Intra-sectoral budget restructuring and efficiency in urban systems (3)		0.6
2.2. Cost sharing/recovery		
(i) Rural		0.9
(ii) Peri-urban		0.7
2.3. Additional domestic financing (government, capital markets, private, communities)	0.5	
External		
2.4. Additional external funding		1.0
TOTAL	3.7	

Notes:

(1) Costs are for low-cost systems in Africa, Asia and Latin America, where maximum financial resources are required. Comparative current levels of investments are for Africa, Latin America and S.E. Asia - regions with investments in low-cost systems.

(2) Estimated from WHO (1992) based on investments in the 1980s. The assumption is that business as usual has prevailed in the early 1990s and that in real terms the level of investment is the same as the average for the 1980s.

(3) This involves reallocation of sector resources to rural and peri-urban areas through improved cost recovery and savings from leakage control in urban systems.

Of the $49 billion estimated to be spent on purely urban systems in the 1980s, let us assume that about 10 per cent had been reallocated to the rural areas; this would generate at least about $500 million per year. This does not necessarily mean an overall reduction in real terms in the urban areas, but rather a greater percentage of urban costs could be met through improved cost-recovery. Indeed, given the level of subsidies, greater cost-recovery in urban systems needs particular attention which could release resources for service expansion.

In addition, the urban water supply systems in most countries suffer from inefficiencies in operations and maintenance due to unaccounted for water, primarily through leakage. The extent of the losses from leakages is not well known but some estimates put it at around 40 per cent of operating and maintenance (O&M) costs. There now exist a number of means for leakage control which would be cost-effective in the long run. O&M costs for urban systems are estimated at about 20 per cent of the annual capital investments in urban water supply services amounting to about $0.5 billion per year and loss from leakage is 40 per cent of these costs. Even if half this loss, could be saved, this would amount to about $0.1 billion per year - a small amount but it highlights the importance of improving efficiency and reliability of urban services.

Intra-sectoral restructuring and greater efficiency in urban systems through leakage control, could release about $0.6 billion for meeting rural and peri-urban needs. There is scope for further restructuring in water supply through greater cost-recovery from irrigation. In India, for example revenues cover only 7.5 per cent of the cost of operating and maintaining irrigation systems. This amounts to a subsidy of almost $735 million per year in India alone (The Economist, 22 January 1994). This subsidy has other detrimental effects such as encouraging excessive pumping which has led to a decline in the water table, drying of shallower tubewells and saline intrusion, destroying water aquifers permanently. Water supply must be looked at as an economic resource in order that is managed with a long-term perspective. This would entail recovering the costs of its provision in all its competing uses, particularly agriculture and industry, which together account for nearly 80 per cent of all freshwater consumption.

Cost sharing/recovery in rural and peri-urban areas.

The underlying rationale for cost sharing/recovery is that water supply should be treated as an *"economic resource"*. It seems to have become customary, in dealing with the economics of water in developing countries, to regard water as an 'economic good'. Treating water as an economic good suggests that market principles should be used in its allocation and pricing, much like any other commodity. However, water is arguably a public good with considerable externalities for public health and significant, though often non-quantifiable, backward and forward linkages. It needs to be managed by governments, communities and the private sector together as a 'resource'. Water as an 'economic resource' is intended to convey that: (i) water is a limited resource which entails a cost for provision; (ii) water resource use and management should be inter-temporal, which would suggest due attention to environmental factors and; (iii) water resource allocation should be equitable, assuring provision to the poor, with a first call for drinking water supply.

In designing policies towards charging for water supply in developing countries, it must be recognized that subsidies will remain important, particularly in alleviating the burden on the rural and peri-urban poor and to initiate the programmes with catalytic support. However, there is scope for greater cost-sharing/recovery. Cost-sharing suggests meeting part of the initial capital costs either in kind, such as through providing own labour and management in the construction of the facilities and/or

a monetary contribution. Cost-sharing in water supply it is suggested should be primarily for basic levels of service i.e. for low-cost systems. Cost-recovery on the other hand is intended to mean meeting almost the full cost (capital and recurrent) particularly, for higher levels of service.

Cost-sharing/recovery could provide significant resources for the sector but such mechanisms must be sensitive to the needs of the poor. For effective implementation of policies on cost-sharing or cost-recovery, there is need for efficient, transparent and accountable institutions at both the local, state and national levels and building the capacities of people to manage. In some instances, such institutions already exist at the local level while in other cases they need to be promoted, as in South Africa through the setting up of local water committees.

Cost-sharing must be based on the *ability* of the households to contribute to the capital and recurrent costs. Typically, in water supply, the indicator of the extent of their contribution has been willingness to pay based on surveys and observations of what people are already paying for water. Willingness to pay, however, does not necessarily imply an ability to pay for the initial capital cost unless there are appropriate financing mechanisms which reach the poor. Women, who have to fetch water from considerable distances, and are most willing to pay are not always able to pay from the household purse, which is often not controlled by them. Moreover, people are often forced to pay but at immense opportunity cost to their health, education, nutrition and even food. Although, in some peri-urban areas the poor are paying 30-40 per cent of their income most people even here cannot muster the initial capital cost required. Furthermore, the lack of funds with governments and political factors typically result in water utilities failing to reach the rural and peri-urban areas.

For sanitation, however, cost-sharing/recovery for rural and peri-urban systems is expected to contribute about 80 percent of the capital cost amounting to $1.6 billion. Despite the low incomes of the poor in the rural and peri-urban areas and the continued need for subsidy, there is a serious rationale for considering higher cost-recovery in sanitation from the point of view of effectiveness. Indeed, experience has shown that provision of free sanitation facilities, even for the poor, is not a guarantee for their proper usage. In the use of sanitation the individual beneficiary/user should merely have accessibility to different technology choices and their easy availabilities. The major share of the capital cost needs to be borne by the user. Fully subsidized programmes for either the communities or households does not result in sustainability or effective usage. To ensure use of facilities and hygiene, there must be *effective demand* which means that people would pay for most of the costs. A greater proportion of the sanitation costs can be recovered partly because they are low in absolute terms (though not necessarily as a proportion of household income), but more for ensuring that when the facilities are installed there is awareness, effective demand and utilization.

It is not very useful to estimate costs of latrine construction unless there is awareness and acceptance with which may well follow a high degree of community contribution. As a result, a major cost in sanitation would be that of widespread communications and awareness campaign to create effective demand. Governments must launch a massive social awareness and social marketing campaign along with the promotion of the infrastructure for the local manufacture by private entrepreneurs of low-cost sanitary latrines. With the creation of awareness and effective demand the private sector, with its profit motive, could be relied upon for the widespread construction of latrines paid for largely by the consumers.

The strategy envisages that the government and donor agencies will play the critical role of catalyst and promoter of the infrastructure for sanitation and that service delivery would be through the private entrepreneurs composed largely of small scale manufacturers and promoters of sanitary latrines. This would not only provide rural employment opportunities but result in a snowballing effect in the

construction and usage of latrines. The private sector has successfully promoted health and hygiene education and also helped to create demand. Indeed, there already exist experiences in India with the setting up of Rural Sanitary Marts and the promotion of hand washing by soap manufacturers. A key aspect is a choice of options and the availability and accessibility to a wide range of technologies at varying costs. The government has an important role to play in promoting private entrepreneurship and dealing with the difficult issue of property rights, particularly in the peri-urban areas. Through the strategy articulated here as much as 80 per cent of the sanitation cost should be recovered. In the peri-urban services the marginal cost of extension for higher levels of service can be shared on the principle of the 'basin-management' approach, as discussed later.

By the same token, and in light of the above financing strategies, the approach to sanitation argues, in some cases, for a de-linking of water supply from sanitation. The two do not have to be managed by the same government agency. It is not necessary that they be supported by the same Ministries or Departments or that public water supply engineers will build sanitary latrines. This does not mean, however, that there should not be integration at the planning and community levels. Integration at the planning level will be necessary for improving cost-effectiveness and creating effective demand.

Cost-sharing/recovery must be linked to alternate financing mechanisms such as a credit schemes and revolving funds which help spread the recovery of the initial capital investment over a longer time horizon, thereby, mobilizing the stream of payments that the poor are able to make. Such institutional mechanisms will be an equally important area of attention if community contributions in rural areas are to be mobilized effectively. If such mechanisms are developed and institutions for mobilizing community contributions are strengthened, they could provide ways and means for increasing resources. Cost-sharing/recovery for the initial capital investment must also go hand in hand with the development of institutional mechanisms for collection and management of funds, which entails administrative costs, at the community level. These aspect need to be explored in specific country situations.

Experiences in some countries has shown how aspects of the above financing strategy can be implemented. For example, the Grameen Bank in Bangladesh has been successful in extending credit to about 2 million poor and landless persons. In 1993, it lent $18 million for rural water supply and sanitation (triple the amount of the previous year) and has since 1992 provided loans for about 70,000 suction tubewells (See Box 1). The Umgeni Water Board in South Africa has been able to extend piped water supply services to rural areas through a basin management approach to cost recovery - spreading the capital cost of service extension throughout the basin through cross-subsidies from the urban areas and financing the capital investments through loans and bonds which are recovered over the long-term from households (See Box 2). By looking at the entire basin as the basis for recovering the capital cost of service expansion, it moves away from the classic cost accounting approach to cost recovery. Since both the urban and rural areas derive benefits from the management of the basin, the cost of service extension should be shared by the urban areas and the net burden on households in each of the areas is kept within manageable levels. These experience shows that cost recovery must be supported with adequate financing mechanisms for the poor. The financing mechanisms and resource availability will drive the choice of technology.

Box 1

Bangladesh - Grameen Bank Financing for Rural Water Supply and Sanitation

The Grameen Bank in Bangladesh is well known as a provider of credit to some two million of the poor and landless in Bangladesh, mainly women. The bank is also a successful example of extending credit for rural water supply and sanitation. The bank's significant innovation is to organize people into groups of five, and ask each person to guarantee the repayment of a loan to any of the other four members. The security provided to the bank is in the form of collective collateral, relying on peer pressure and close supervision by the bank. The leader of each group has a weekly review meeting with a staff member of the bank.

The bank is financing rural water supply and sanitation in Bangladesh. In 1992, it provided $5.7 million in loans for tubewells and sanitary latrines which more than tripled to $18 million in 1993, 9 percent of which was for sanitary latrines. The interest rate charged on loans for tubewells is 20 percent while for sanitary slabs and rings it is 8 percent, repayable over 2 years. Repayments are made in weekly installments of 1 percent of total disbursement. All Grameen Bank members are eligible, although in the case of loans for sanitary latrines, a member normally needs to be a second time borrower. The loan amount for tubewells is about $125 individually ($250 jointly); and $18 for sanitary latrines bought from the Grameen Bank manufacturing units ($12 if procured elsewhere due to the difference in quality). Since March of 1992, the Grameen Bank has provided loans for about 70,000 suction tubewells.

The handpumps and latrine parts are procured locally by the borrowers. The bank also has units for manufacturing sanitary slabs and rings which are provided to borrowers at affordable prices. The borrowers can also procure these supplies from the Public Health Engineering Offices and local private manufacturers.

The Grameen Bank system shows how a high degree of community level participation can be effectively combined with financing mechanisms to expand coverage. The community, in particular women, (since the two million members of the bank are mainly women) is not only the decision-maker but their willingness to borrow results in an effective demand for the services. In UNICEF supported tubewell installations, it is estimated that the community contributes about 45 percent of the total capital costs; and about 93 percent of the installation cost of sanitary latrines. Community participation must be supported with adequate financing mechanism if rural water supply and sanitation coverage is to be expanded.

Box 2

Umgeni Water - interdependence in the provision of rural and urban services.

Umgeni Water, the largest water board in the province of Natal, takes a long term view in the provision of water supply to a catchment of 24,000 sq. km. and a population of 5.5 million people: 1.5 million rural and 4.0 million urban, informal and transitional settlements with a projected population increase to 13 million by 2030. Almost eight years ago, Umgeni Water took a bold decision to invest in rural and peri-urban water supply and sanitation. With modest investments in the early years, the investment in these areas increased almost four fold in the last financial year. There were clearly sound economic reasons for this investment illustrating the interdependence in this catchment which contributes approximately 20 percent of the South African GNP.

Development and growth is putting water resources under stress. The Water Board identified a major source of pollution to be from the discharge of raw and treated sewage into the basin resulting from increasing urbanization and informal settlements. In addition, soil erosion in the headwaters is causing increasing silt loads in rivers and reservoirs. As a result, the cost of water to urban users is increasing due to expensive treatment processes. Service expansion to rural areas could, therefore, be justified on economic and environmental criteria, indicating how water supply to urban areas must take account of the overall management of the river basin and environmental considerations both upstream and downstream.

Umgeni Water is demonstrating that services can be provided jointly to rural and peri-urban areas within its catchment area in a cost-effective manner, with full cost recovery for the operations and maintenance cost but with a non-stifling cross-subsidy from the urban to rural areas for the capital cost. The charges for providing rural and urban water supply is estimated at R1.36/ cu.m and R1.85/cu. m respectively The latter includes a capital subsidy for the rural areas of 2.35 cents. Apart from a connection charge of R200 to R280 for household connections in the rural areas, the capital cost of rural water supply is being recovered over a 20 year period. The excellent cost recovery record in urban areas and the relative affluence of the urban districts of Durban and Pietermaritzburg have provided the board with a 'cash cow' but this has been managed judiciously, spreading the benefits from economies of scale. Umgeni Water Board is a parastatal which receives no subsidies but issues is own bonds which have a triple A rating on the capital market.

The board has an excellent record of cost-recovery in rural areas and has contributed to employment creation in the catchment area. This was achieved by:

- the provision of services which the community is willing and able to pay for;
- providing services only after the community is mobilized: the community forms a local water committee which approaches the board and agrees to manage the project - the utility bills each consumer for the household connections and the community for the standposts, the local water committee undertakes collection and banks the receipts;
- keeping cost of service delivery low through the use of local water committee for the administration of the rural schemes. The community employs a cashier whose salary is partly contributed by the board;
- community development training in negotiating skills, water management and hygiene is promoted by the Board through rural planning officers employed and paid by the Board. Their work includes promotion of sanitation through low-cost but acceptable pit latrines (VIP's or the Phungalutho);
- employment of local people during the construction of the pipelines and the promotion of local businesses and artisans for the supply of materials, including their training.

Additional domestic financing Despite improved efficiency and cost-recovery in sanitation, from both the rural and peri-urban areas, additional financing to the sector will be needed from governments, capital markets, private sector and communities. This could be through various means: inter-sectoral restructuring or raising funds through capital markets, where feasible. While the thrust of the emphasis is to secure resources from existing allocations to the sector (given the budgetary constraints in many developing countries, particularly those undergoing a period of structural adjustment) additional government expenditure from outside the sector will no doubt be necessary.

Additional external financing

It is estimated by WHO (1992) that external support agencies contributed about half cent of the total investment in the water and sanitation sector in Africa, S.E. Asia and Latin America in the 1980s (Table 3). In this model, for the sector as a whole, it is envisaged that one-third of the additional funds could come from external sources and the remaining two-thirds from domestic sources. The level of external commitment will, therefore, need to be intensified with an additional $1 billion per annum. Critical external support would be needed as a catalyst for water supply, sanitation, hygiene education and public awareness campaigns, including support for private sector participation. The "20/20" Initiative endorsed at the 1995 World Social Summit provides a sound basis for mobilization of government and donor resources. This initiative calls for developing country governments to allocate 20 per cent of their government budgets for basic social services, which includes low-cost water supply and sanitation, and for a 20 per cent aid allocation by donor countries to basic social services.

4. Private sector participation and NGOs

The private sector has played an important role in the past and will continue to do so in the future in development of technology and the delivery of both rural and peri-urban water supply and sanitation if the sector is to go to scale and be sustainable. This participation needs to be fostered and developed with adequate regulatory controls, where competitive forces are not or cannot be present due to the market size, bulk services, or other constraints, to ensure that the price charged is not prohibitive to rapid coverage. While private sector participation has been influential at different levels in the delivery of services, the government will continue to play a lead role, particularly in providing services to the poor. In sanitation, private entrepreneurs have a significant role. Low coverage and low investment costs for production of low-cost latrines provides the conditions for the participation of a large number of producers. The government will need to promote capacity building to ensure that there are adequate local technicians in water supply and artisans and masons in sanitation. This will be important for long-run cost-reduction and sustainability.

The NGOs have played a pivotal role in the delivery and effectiveness of rural water supply and sanitation systems. Their role needs to be strengthened in widespread health and hygiene education which will have to move from pilot projects to a large scale social mobilization campaign. This will involve the NGOs, communities and communications experts and various types of media in a cost-effective manner. NGOs have also developed appropriate and acceptable technologies and played a key role in the dissemination of health and hygiene education. Indeed,

rural sanitation cannot go to scale without their active participation. They also play the critical role in building capacities of people and local institutions.

5. Conclusions

This article has suggested some actions that can be taken for accelerating universal access to water supply and sanitation. While clearly the achievement of the goals in the remaining years of the decade would be unrealistic, major strides can be made. The analysis of global costs and financing with emphasis on sustainability and cost-effectiveness suggests that neither massive government or donor financing alone can mobilize the necessary resources. Equally, cost-recovery alone cannot lead to access to services and sustainable solutions. Similarly, dependence only on the private sector and beneficiaries to take up the challenge will not lead to the mobilization of the additional capital required.

Actions are needed on a number of fronts: providing a range of technology options in cost effective sanitation; cost-reduction; restructuring the financing of the sector; cost-sharing with sensitivity to willingness and ability to pay; cost-recovery for higher levels of service; and alternate financing mechanisms such as credit schemes and revolving funds. Cost-recovery must be seen as only one of a combination of tools for mobilizing sector resources starting with agriculture, industry and the rich urban domestic sector which is consuming the lion's share of the resources. Private entrepreneurship needs to be promoted and supported and even here the government and external support agencies have a critical catalytic role. At the same time national capacities will need to be built so that the communities can implement schemes and are empowered to take actions. There is no single solution but composite actions can go a long way towards universal access sooner rather than later.

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References

The Economist, January 22, 1994.

Nigam, A. and D. Heyward (1993). "Improving Cost-effectiveness in Rural Water Supply and Sanitation", UNICEF.

OAU/UNICEF (1992). " Facing the Challenge of Water Supply and Sanitation Goals for Africa (1993-2000), International Conference for Assistance to African Children (ICAAC), Background Sectoral Papers.

Serageldin, I. "Water Supply, Sanitation and Environmental Sustainability: The Financial Challenge" , Ministerial Conference on Drinking Water and Environmental Sanitation, Noordwijk, 1994.

UNICEF. State of the World's Children Reports.

UNICEF (1990). Cost Analysis Standardization Study of UNICEF WATSAN Interventions.

UNICEF (1993). The Cost of UNICEF assisted Water Supply and Sanitation Intervention in Bangladesh.

United Nations (1992). World Population Prospects.

UNDP, UNESCO, UNFPA, UNICEF and WHO (1995) "The 20/20 Initiative: achieving universal access to basic social services for sustainable human development"

UNDP/World Bank (1991). Regional Water and Sanitation Group West Africa, Seven West African Case Studies of Community Management of Rural Water Supply.

UNDP/World Bank (1992). Water and Sanitation Programme, Household Demand for Improved Sanitation Services: A Case Study of Kumasi, Ghana.

Water and Sanitation for Health Project (WASH) (1989). "Estimating Operations and Maintenance Costs for Water Supply Systems in Developing Countries."

World Bank (1993). World Development Report, Investing in Health.

World Bank (1994). World Development Report, Infrastructure for Development.

World Health Organization (1992). International Drinking Water and Supply and Sanitation Decade, End of Decade review, as at December 1990).