Asit K. Biswas

WATER FOR THE THIRD WORLD

Water is used by man for a variety of important purposes, among them irrigation, navigation, hydroelectric power generation, industrial manufacturing, waste disposal, recreation, and wildlife enhancement. The most fundamental use of all, however, is community water supply for immediate and vital needs—drinking, washing, cooking and sanitation.

At present anyone living in a developed country hardly gives thought to the availability of water for these needs. One has only to open a tap at any time of day or night to obtain as much clean water as desired. But often it is not realized that even in industrially advanced countries like the United States or Canada, running water in homes was not available in many rural areas a few decades ago—certainly within living memory. In many instances rural electrification was instrumental in providing running water.

The situation is very different in developing countries, where the majority of people do not have access to clean water. Viewed from a global perspective, availability of potable water to communities falls within two extremes. At one extreme are the highly urbanized cities of advanced industrialized countries, where everyone has in-house water connections and sewerage services. The quality of water is excellent, and it is available in unlimited quantity very economically. Such supplies are considered not only essential but also mandatory, and appropriate institutional, infrastructural and financial arrangements have been successfully established over many decades. In general the quantity of water used per capita in such advanced countries is quite high. For example, in the United States the domestic water use is around 65 gallons per capita per day.

At the other extreme are the rural communities of developing countries, which commonly have no service of any kind, either for potable water or for excreta disposal. Their sources of water could be a well, pond, lake, river or rainwater or some combination thereof. The main sources of water in rural areas of most devel-

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oping countries still continue to be uncovered wells or shallow communal ponds, which are used for all domestic purposes like drinking, bathing or cleaning. Domestic animals not only often drink from the same water source but also are cleaned there. All these diverse human and animal activities and a lack of measures to protect water quality often contribute to severe contamination of the sources. It goes without saying that the continuing use of the resulting polluted water poses a definite health hazard to all.

Sources of water often vary according to the season. For example, a study of several villages in the Kwara State of Nigeria indicated that rainwater, used by some 40 percent of the people in the wet season, drops to zero in the dry season from November to March. The use of stream water correspondingly increases from 12 percent in the wet season to about 48 percent in the dry season.

Similarly, in areas of developing countries, people generally use different sources of water for different purposes. Water from wells may be used for drinking, whereas for bathing and washing a pond, lake or river may be preferred. Often sources near settlements are avoided (both by custom and because of likely contamination), and it is necessary for people to travel considerable distances for access to water.

In the face of such conditions, providing adequate and readily available supplies of clean water moved in the 1970s to the forefront of concerns about the condition of developing countries. With development generally frustrated by energy costs, worldwide recession and other difficulties, this it seemed was both a central area and one where much might be accomplished in a reasonably short time. Now, with a 1980 resolution of the U.N. General Assembly designating the 1980s as the International Drinking Water Supply and Sanitation Decade, it may be useful to take stock of the problem of water. What do we know about it, and where is our understanding weak? Are the goals that have been set realistic? What most needs doing, if not to achieve them by the dates now set, at least to make real and lasting progress on what is undoubtedly an extremely important problem?

II

While it is an accepted fact that a significant percentage of the world's population do not have access to clean water, we do not have accurate information on the actual magnitude of the problem. The best information available at present is an aggregate of "raw" estimates of varying degrees of accuracy from many developing countries, provided by their governments and compiled by

the World Health Organization (WHO) of the United Nations. Its most complete recent survey, as of the end of 1975, rested on questionnaires returned by 71 developing countries (unfortunately not including the People's Republic of China).[1]

According to this survey, 77 percent of the total urban population in these 71 countries had access to piped water through house connections or standpipes, and 75 percent had reasonable sanitation facilities.[2] The situation, as one might have expected, was significantly worse for the rural communities, where only a minority—22 percent—had access to safe water and even less—14 percent—had appropriate sanitation facilities.

WHO estimated that the number of people having access to public water supply schemes in developing countries had increased from about 498 million to around 763 million during the period 1970 to 1975. Despite this dramatic increase, however, the number of persons *not* receiving clean water remained almost the same due to rapid population growth.

A later WHO estimate for 1980, which is not as "rigorous" as the earlier one, indicates that the percentages of urban and rural populations having access to clean water increased to 75 percent and 29 percent respectively.[3] Since rural populations predominate in developing countries, the percentage of total population having such access increased from 38 percent to 43 percent during the five-year period.

It is important to get a perspective on the estimates provided by WHO. To start with, the figures quoted are average ones, and thus mask the tremendous disparities that exist from one developing country to another, and very often within the countries themselves. The range of such disparities can easily be shown by considering the data provided by African countries for the United Nations Water Conference held at Mar del Plata, Argentina, in March 1977.[4] For example, Egypt reported that 94 percent of its urban population and 93 percent of its rural population had access to clean water, which—if correct—would place that country far ahead of the rest of Africa. Senegal had the next best report, indicating service to a high percentage of its population (82

[1] World Health Organization, "Community Water Supply and Waste Water Disposal: A Mid-Decade Progress Report," Document A29/12 Rev. 1, Geneva: WHO, May 6, 1976.

[2] A typical standpipe is beside a road and provides water for a group of houses. It consists of a faucet fixed to a standing pipe, at about three to four feet from the ground.

[3] World Health Organization, "Drinking Water and Sanitation, 1981–1990: A Way to Health," Geneva: WHO, 1981, p. 2.

[4] "United Nations Water Conference: Summary and Main Documents," Vol. 2 of the *Water Development, Supply and Management Series,* Series Editor Asit K. Biswas, Oxford: Pergamon Press, 1978.

percent) and comparatively little disparity between urban and rural areas (98 percent and 74 percent, respectively). Countries like Liberia, Kenya and Madagascar present a different picture. Of the total population, 17 percent in Liberia and 12 percent each in Kenya and Madagascar have access to potable water, but the contrasts between urban and rural situations are remarkable (Liberia, with 100 percent urban coverage and six percent rural; Kenya, with 97 percent urban and two percent rural; Madagascar, with 87 percent urban and one percent rural). Finally, there are countries like Gabon where the situation is very bad for both urban and rural sectors. Only one percent of the total population have access to clean water in Gabon, which includes only six percent of urban dwellers and a negligible number in rural areas.

Two further points are worth noting about such information. While availability of water is synonymous in the advanced industrialized countries with a 24-hour uninterrupted supply, the situation is radically different in most developing countries, where water is often available only on an intermittent basis. It is highly likely that more than half the people having access to piped water receive it on an interrupted basis only. In certain parts of the world like Southeast Asia, probably as much as 90 percent of the population receive only an intermittent supply. In the typical case of Calcutta, the system was not intended to supply intermittent service. Rather, it has become intermittent due to leakage, great increases in population after the system's installation, unauthorized use, and lack of trained personnel and spare parts for maintenance.

Furthermore, continually running standpipes are a very common sight in most developing countries. The total loss of water is quite substantial: while no detailed analysis is available, an informed guess would be somewhere between 15 and 50 percent, depending on the countries and locations. In other words, simple statements of areas "served" may conceal the fact that water supplies are intermittent or that a lot of the water is lost from the system.

Second, the information on which the WHO survey was based was provided by individual countries. While some countries clearly try to provide the best estimates available, even their figures should be noted with a healthy skepticism. Considering the slums and squatter settlements of the urban centers of developing countries, it is a little hard to believe that the entire urban populations of several developing countries have access to clean water. Nor does the survey provide any information on the

effectiveness of the systems being used. Many existing systems have been deteriorating sharply over the years, both in terms of quality and safety. (For example, in certain areas of the older part of Dacca, no water has been available for more than a year now.) Very few countries have reliable data for all their villages, and thus estimates are guesses at best.

In addition, it is not exactly uncommon for countries to provide biased information. Some tend to provide overoptimistic assessments in order to indicate to the outside world that they are more "developed" than they actually are. In contrast, others may present pessimistic data, hoping this will increase the flow of external aid.

III

Even though we do not have reliable data for these various reasons, two important issues emerge from the limited information available. First, the problem is at present overwhelmingly a rural rather than an urban one. This situation has developed over the years not only because of distinct urban bias on the part of the planners but also as a result of prevalent political and institutional pressures. The elites who hold power are urban-based; their policies, in spite of the rhetoric, clearly favor the areas where their power centers normally lie. Rural people tend to be poor, illiterate and malnourished, and thus have very little political power, and the bureaucracies are often not familiar with rural problems and constraints. Furthermore, because of the low population concentration in villages, capital investments appear uneconomic. In addition, as we shall see, inadequate planning, insufficient budget, incomplete execution of plans, and lack of understanding and emphasis by donor countries and agencies have often not helped the cause of water supply in rural areas.

On the other hand, while no doubt undue priority has been given in the past to the urban and better-off groups, the urban fringe consisting of urban poor in squatter settlements, slums and shanty towns has been largely overlooked. In some ways they are even worse off than their rural counterparts, who often have at least the choice of using different sources of water. For example, the official Social Survey of 1974 for the Tondo Foreshore, the largest slum and squatter settlement of metropolitan Manila in the Philippines, indicated that 63 percent of the residents bought water from the street vendors at a per capita cost which could be as much as three times higher than their more affluent counter-

parts, who received more water of a better quality in the convenience of their homes. Compared to the rural population, however, this lack of water availability of the urban poor is in part compensated by their better diet, availability of health care facilities, and greater awareness of good hygienic practices.

Second, while major advances have been made during the past 20 years in increasing the percentage of people having access to clean water in most countries, the sad fact is that there have been declines in some regions as well. WHO's first three surveys—in 1962, 1970 and 1975—are not strictly comparable, since the number of countries surveyed changed with time: 75 countries in 1962, 91 in 1970 and 71 in 1975. Furthermore, an examination of even 1970 and 1975 data indicates that individual national estimates by many countries differ significantly from one period to another due to major differences in enumeration.

In spite of these constraints, if we consider the changes in the percentages of urban population served during the period 1962 to 1970, remarkable improvements were noted in Southeast Asia and East Asia, both improving by more than 20 percent. In contrast, the Latin American and Caribbean regions registered a ten percent decline. Similarly, in the 1970 to 1975 period, Southeast Asia and East Asia and the Western Pacific showed most improvement, 15 percent or more, but unfortunately in Africa south of the Sahara the situation actually deteriorated and showed a two percent decline.

IV

As the deplorable situation of water availability to communities became better recognized, a series of goals and objectives have been approved at intergovernmental levels during the last decade. The first was the target for water supply adopted in 1969 as one of the goals of the United Nations Second Development Decade (DD2), the decade of the 1970s. The DD2 target called for potable water to be available by 1980 to 100 percent of the urban population and 25 percent of the rural population in developing countries as a whole.

For almost the identical period, 1972–81, the Ministers of the Latin American States, at a meeting in Santiago, Chile, in 1972, set revised regional targets: 80 percent of the urban population to be provided with house connections by 1981, and 50 percent of the population then not served to be provided with minimum service.

After the WHO survey of 1975, the 29th World Health Assembly, in May 1976, recommended revised 1980 targets differing from region to region. The effect was to reduce the overall DD2 target of 100 percent of the urban population to a little over 90 percent.

Then, in the fall of 1976, the United Nations Conference on Human Settlements ("Habitat"), held at Vancouver, gave a shot in the arm to the community water supply movement by approving a sweeping goal of safe water for all by 1990. The following year, the United Nations Water Conference at Mar del Plata approved a resolution stating that "all peoples have the right to have access to drinking water in quantities and of a quality equal to their basic needs." It recommended that "priority attention" be given to "the segments of the population in greatest need," reendorsed the Habitat target of clean water for all by 1990, and urged the countries to develop by 1980 suitable national plans and programs to meet the targets. It further recommended that the decade 1980–90 should be designated as the International Drinking Water Supply and Sanitation Decade.[5]

The importance of the availability of clean water to all was again stressed at the International Conference on Primary Health Care, jointly sponsored by WHO and UNICEF, at Alma Ata, U.S.S.R., in 1978, and at the World Conference on the United Nations Decade for Women: Equality, Development and Peace, at Copenhagen in 1980. Finally, on November 10, 1980, the United Nations General Assembly officially launched the International Drinking Water Supply and Sanitation Decade, reaffirming the goal of clean water for all by 1990.

V

No sane person would argue with the statement that access to safe drinking water and hygienic disposal of wastes should be an important social goal of every nation. From experience in advanced industrialized countries, we know that water-related communicable diseases are now very rare due to running water in all homes, coupled with good sewage and waste disposal facilities. In addition, however, these are reinforced by the availability and knowledge of health care.

It is not possible at present to define precisely the relationship between quality of water and public health. Other broad and diverse elements like housing, comprehensive health services,

[5] *Ibid.*

availability of nutritious food, energy, education and transportation are also important. Many of the health and other related benefits most people now expect from the provision of clean water to rural communities in developing countries are unlikely to accrue unless rural water supply and sanitation are considered within the overall context of integrated rural development. The necessity for such an integrated approach is becoming evident as many projects in developing countries are now unable to deliver all the benefits expected.

Let us briefly take two examples. One is a disease that can indeed be eliminated by providing clean water, with minimal added steps. But for the second disease—rather a whole range of waterborne diseases—clean water is only a part of the answer.

First is the guinea worm disease, which is currently widely prevalent in developing countries of Asia and West Africa but can be eliminated by the provision of clean water and education.[6] Current estimates of people infected range from 10 to 48 million every year; 20 million infections per year is a likely average. In some places, like Andhra Pradesh in India, many people become infected 50 to 100 times during their lifetime, and some have suffered for 20 to 30 years at a stretch.

Provision of piped water has already reduced guinea worm infections from 60 percent to zero in some towns in Nigeria. By educating the people about the intermediate host—Cyclops—and by simply sieving the contaminated water through a double-thickness cotton cloth, the incidences can be eliminated. Similarly, by enclosing the step-wells (so-called because one has to step in to draw water) by a brick wall and thus forcing people to draw water by a rope, the transmission cycle can be easily broken. Such measures successfully eradicated the disease in Tashkent and Samarkand in the Soviet Union some 40 years ago, and have already reduced its incidence in the Indian provinces of Andhra Pradesh and Rajasthan.

[6] Guinea worm disease is transmitted by drinking water containing a crustacean water flea—Cyclops—which carries the larvae. The larvae develop in the walls of human digestive systems, from which the adult female worm migrates toward the skin. It then grows and causes sores. After about a year it emerges, usually through the victim's legs or skin. When the victim comes in contact with fresh water, the larvae are released, which are then eaten by Cyclops. When another person drinks the water, the cycle starts again.

The mature worm can reach up to four feet in length. The only well-known but highly unsatisfactory treatment is to wind the worm around a stick and pull it out slowly day by day. If it breaks a severe abscess results. Guinea worm infection seldom kills, but it does cause disabilities due to painful abscesses and ulcers—usually in legs and feet. About five percent of the victims become permanently disabled. In some areas, epidemics have incapacitated 30 to 50 percent of the inhabitants.

The contrasting case is the incidence of diarrheal disease. Studies in Bangladesh,[7] Guatemala,[8] Lesotho[9] and the United States[10] have failed to demonstrate that improvements in water quality had any marked impact on the diarrheal disease incidence. The reasons for such findings are complex, but a brief discussion is in order.

Unfortunately, water is not the only means through which fecal-oral diseases like cholera, typhoid, diarrheas, dysenteries or hepatitis are transmitted. Unless it is clearly known that diarrheal disease is almost exclusively waterborne in a specific community, improvement of water quality alone is unlikely to change the incidence of the disease significantly.

Moreover, improving water quality via standpipes does not automatically improve personal hygiene practices which have developed over centuries. In very few instances where potable rural water supply schemes have been developed have provisions also been made for bathing and laundry facilities. People thus continue to use contaminated sources for such purposes, and these continue to remain sources of infection. House connections or communal washing and laundry facilities need to be provided before a marked decrease in such water-related diseases can be expected.

Thus the importance of educating the public about good hygienic practices cannot be overemphasized. At present such services in rural areas are mostly nonexistent, even for those households which are looking for information.

The second major benefit expected currently from the provision of potable water is that it will significantly reduce, and in many cases eliminate, the time now spent in collecting water. The time thus freed could be used for learning or productive work.

There is no doubt that the major beneficiaries of the widespread availability of safe water are going to be the women and children of the developing world, who currently spend considerable time in fetching water and collecting firewood. According to studies conducted in Africa, 90 percent of all water and fuel is collected

[7] R.J. Levine et al., "Failure of Sanitary Wells to Protect Against Cholera and Other Diarrhoeas in Bangladesh," *The Lancet*, July 10, 1976, pp. 86–89.

[8] J.E. Gordon, M. Behar and N.S. Scrimshaw, "Acute Diarrhoeal Disease in Less Developed Countries," *Bulletin of the World Health Organization*, Vol. 31, 1964, pp. 1–28.

[9] R. Feachem et al., eds., *Water, Health and Development: An Interdisciplinary Evaluation*, London: Tri-Med Books Ltd., 1978.

[10] D.J. Schliessmann et al., "Relation of Environmental Factors to the Occurrence of Enteric Diseases in Areas of Eastern Kentucky," *Public Health Monograph No. 54*, Washington: GPO, 1958.

by women and children.[11] In some places like Wayen in Upper Volta, women walk for two to three hours every day to the water sources, and carry about 50 pounds of water on their heads. The process burns off 600 calories per day, about one-third of their average food intake.

Freeing women and children from such chores will ultimately provide enormous benefits. Women will have more time to spend with their families and in the fields, and children will have more time for education. However, in order to maximize the benefits, women must have productive work and children must have schools and other facilities. These would not automatically come with the provision of clean water! Integrated rural development would certainly help, but the realization of full benefits will take time, and there is even a possibility that the situation could worsen initially.

VI

As the examples just given suggest, quality of water alone is unlikely to bring all the benefits expected. Especially for the key objective of better health, two other factors need to be considered: quantity of water used and education.

From the empirical studies available so far, it is becoming increasingly evident that quantity of water used has an important impact on health. How much water do we need per person per day? There are no simple answers. Even the needs for basic survival depend on body size, climate, type of work being performed, etc. Normally, the basic survival requirement per person is about one gallon a day.

But survival needs are very different from health needs, which are significantly higher. Information on the minimum amount of water consumption needed to maintain adequate health is scarce, but some indication can be obtained from a ten-year study carried out in Singapore from 1960 to 1970. This study attempted to correlate domestic water use in relation to waterborne diseases reported in Singapore hospitals. Predictably, it indicated that as domestic use goes up, disease goes down. However, there did not seem to be much improvement beyond 20 gallons per capita per day of high quality consumption. Hence, it could be concluded that this amount represents a "social minimum" for that area.

[11] A Nigerian survey indicates that the task of fetching water falls more on older children than the younger ones, but the situation is exactly reversed for the wives, whose responsibility decreases with seniority.

Unfortunately other studies of this nature are not available to enable us to draw firm conclusions. For example, we do know that as the standard of living increases, so does water consumption. Accordingly, for the Singapore study, it is highly likely that some socioeconomic indicators changed as well when per capita water consumption increased, which means that the reduction in incidence of diseases cannot be solely attributed to the increase in water use.

Presently most water consumption figures in developing countries are arbitrarily fixed at around three to five gallons per day. This seems well below any reasonable health minimum, although it may also understate the amounts actually consumed once community supplies are available. On the other hand, the simple provision of standpipes does not appear to increase water use patterns in the villages; the change really occurs when taps are available in individual houses. Once a household has a tap and bathing facilities, water use increases and health improvements are appreciable. But plainly an enormous effort still needs to be made not only to provide facilities but to persuade people to make full use of them.

This leads to the second point—the importance of education. With the rural people, some of the basic points of personal hygiene must be instilled: i.e., discontinuing use of contaminated water for drinking, cooking, washing and bathing, boiling of contaminated water if it has to be used, storage of water, and basic sanitation requirements in handling food products and disposing of waste products. The effectiveness of education will ultimately decide whether all the benefits of community water supply programs are realized. Unfortunately this simple lesson has still not been fully grasped by most national and international agencies dealing with community water supply.

Let me illustrate the point briefly, using the example of my home town in India, Balasore, where standpipes and some house connections have been provided in recent years.

— People have no information on how to store water, so that contamination takes place at home.
— Although they may have safe water at home, people think nothing of drinking from the nearest water source, regardless of its condition, when they are away from home and thirsty.
— Small children, who normally have the highest incidence of diarrheal diseases, often are not taught to use the improved water supply.
— In most instances, there is no provision for drainage of spilled

water at the standpipes, with the result that pools of stagnant water (a common sight in most developing countries) become breeding grounds for mosquitoes and other insects—Balasore now has more malaria than before, and has in effect traded waterborne for mosquito-borne diseases!

— When the system breaks down, as it does frequently, people resort to contaminated sources—and are now more vulnerable to infection after having used clean water for a time.

— Provision of standpipes has not increased the volume of water use per capita.

In short, providing quality water is only the beginning in terms of the ultimate goal of improved health. There must be enough of it, and people must be educated in its use. While these aspects of the problem must be primarily the responsibility of national and local authorities, they affect the plans of international agencies as well.

VII

The functional appropriateness of many rural water supply schemes is often dubious for a variety of reasons. Technology transfer in this area has created many problems, and only a few major ones will be mentioned.

The question of water quality standards is an important one. The one very often used is the standard prepared by WHO, which is more suitable to urban water supply schemes of temperate climates than to rural tropical areas. Blind adherence to WHO standards has often necessitated expensive types of equipment and trained people to operate them, neither of which are easily available or essential. The WHO recommendation—that water should be condemned if it is repeatedly found to contain one *Escherichia Coli* per 100 milliliters—would mean that a significant percentage of existing supplies in developing countries would have to be condemned. Further, one must question the appropriateness of the total coliform index in limiting health hazards in the tropics, for it could often provide misleading results.

What is necessary is the concept of a variable standard, which could be location-specific, depending on the number of people involved, risks of infection, present quality of water, and investments available. The important point should be that the new schemes provide better quality water than available at present, but it need not necessarily be up to the best available standard. If the WHO standard were adhered to universally, some rural people would undoubtedly get very good quality water, but most others

would have no potable water at all for a long time to come. Voltaire's statement that the best is the enemy of the good is most appropriate here, since the best cannot be realistically achieved everywhere quickly and with the resources available.

However, it may not be easy to get the concept of variable standards accepted quickly by some politicians in the developing countries. In many instances their standard reaction can be summed up as: "You mean it is good for the North Americans and the Europeans but not good for us?" For these urban elites, who already have access to potable water, it seems more important to score political points than to accept what could constitute a significant improvement in water quality for the rural areas. Confronted with such attitudes, many agencies have been reluctant to press the issue.

Another problem of standards is that Western engineers who go to developing countries are often trained to stick rigidly to the codes of practice approved by their professional associations. Thus they often automatically use the design standards of the West, which are more suitable for urban water supply systems of temperate climates than for the rural areas of the tropics. Setting design criteria and technology too high will generally be counterproductive.

VIII

What, then, might it cost to achieve the targets for the Decade, and where might the required funds come from? In 1970 it was estimated that the original DD2 target for the urban sector (100 percent service) would require an annual investment of $1,081 million, for a total of some $11 billion at 1970 unit costs over a ten-year period. These estimates were for capital costs only; maintenance, operation and replacement costs were not included.

This estimate has already proved far too low. The report prepared for the 1977 U.N. Water Conference by WHO, with initial assistance from the World Bank, calculated that, during the five-year period from 1971 to 1975, $9 billion was expended for urban water supply and $2.25 billion for rural water supply at 1973 price levels.[12] It further estimated that the investment necessary to meet the Conference's community water supply target (clean water for all by 1990) would be $3.43 billion annually at 1977 prices for the urban sector and $2.72 billion annually for the rural

[12] "Water Development and Management: Proceedings of the United Nations Water Conference," Vol. 1 of the *Water Development, Supply and Management Series*, Series Editor Asit K. Biswas, Oxford: Pergamon Press, 1978. The figures in this paragraph are at pp. 985 and 988 of Part 3 of that volume.

sector. Over the period from 1975 to 1990, the total investment required was estimated at $92.2 billion for water supply and another $40.74 billion for sanitation, for a total of $132.94 billion. This again was a gross underestimate.

The most recent estimates were made in 1980 by the World Bank. Assuming complete urban and rural coverage with the urban population "to be served at commonly accepted levels of house connections for water and sewerage and the rural population at a lower standard of service," total costs would be more than $600 billion (in 1978 dollars). The Bank also provided a second option, using "a wider mix of service levels and the use of more appropriate technologies, in urban and rural areas alike," which might cut costs to $300 billion or possibly less.[13] Even this lower estimate amounts to an investment of $82.2 million every single day for the next ten years!

This $300 billion estimate has been quoted recently so extensively that it has almost enshrined itself in the literature and discussions at international meetings. However, to any real expert who has lived and worked in developing countries and is familiar with the local situations, the cost estimate for the 80 percent target fulfillment will still come as a serious underestimate.

The Bank's new estimate is based on the following average per capita capital costs in 1978 dollars.[14]

Water supply with	*Urban*	*Rural*
house connection	120	150
standpipe	40	40
hand pumps	—	25

However, other experienced observers share my judgment that the real costs incurred are likely to be much higher, probably by as much as 20 to 30 percent.

Furthermore the $300-billion cost is only for new installations: it does *not* include any estimates for operation, maintenance and repair (OMR). This is an important omission, which gives a false view of the total investment required during the Decade. Unfortunately, recipient and donor countries have thus far shown very little interest in OMR. The WHO surveys mentioned earlier provided no information on the services that have become non-operational in recent years. By failing to include OMR costs, the Bank's estimate may have missed an excellent opportunity to sensitize the relevant agencies to their urgency and importance.

[13] World Bank, "Water Supply and Waste Disposal," *Poverty and Basic Needs Series*, September 1980.

[14] *Ibid.*, p. 16.

There simply is not much point in installing new services if they cannot be maintained. Past studies indicate that 40 to 80 percent of all hand pumps break down within three years of installation. For example, a survey carried out in 1971 in northeast Thailand indicated that 87 percent of rural water supply systems investigated had difficulties in operation.[15]

In 1976, as many as 80 percent of the tubewells established with foreign aid in South India and Bangladesh were out of service.[16] Currently, 30 to 40 percent of the tubewells in Bangladesh are inoperative at any time, and some have not been used for the last two to three years. Around 50,000 of the tubewells are now inoperative because the wrong materials were used, or the pipes are old and choked with silt. Extracting old pipes and installing new ones is an expensive process and adequate funds are not available.

Finally, even though the "accepted" Decade cost of $300 billion is a serious underestimate, it should be noted that in real terms it is about ten times the total investment made during the decade 1971–80.

IX

What are the chances of success in achieving the goals of the Decade? A realistic answer has to be that they are not very great, since many constraints have to be overcome.

First, let us consider the investment costs. The bulk of the funds required for investment have to be generated by the developing countries themselves: external aid as a percentage of total investment for the 1971–75 period varied from a mere nine percent for rural water supply to 12 percent for the urban sector.[17] Such funds can only be forthcoming if governments radically alter their priorities. With major food and energy problems looming over the horizon, it seems unlikely that changes will be forthcoming. Where they have been, however, results have been striking. Thus, in Bangladesh, where rural water development has become a national priority, 55 percent of the people in the rural areas have access to clean water, as compared to neighboring countries like India (10.1 percent), Pakistan (17.1) or Nepal (5.1).

External aid from bilateral and multilateral aid agencies is

[15] Economic and Social Commission for Asia and Pacific, "Rural Community Water Supply and Rural Sanitation in Relation to Over-All Management of Water Resources," Document E/ESCAP/NR.7/2, ESCAP, Bangkok, June 23, 1980.

[16] Asit K. Biswas, "Water Development in Developing Countries: Problems and Prospects," *GeoJournal*, Vol. 3, No. 5, 1979, pp. 445–56.

[17] *Loc. cit.* footnote 12, p.985.

difficult to predict. The World Bank's commitments to water supply and waste disposal are expected to increase from an annual average of just over $300 million in the period 1974–78 to an average of more than $700 million between 1979 and 1983.[18] Many bilateral donors have indicated that they will increase their support for the Decade's goals, but whether they will do so in a period of economic recession is another question. (There is a real danger that the aid budgets may even be reduced in real terms for the immediate future.) Even if donors do increase support, it is still not clear whether these would be additional funds over and above the existing aid, or would be generated merely by shifting funds from one budget line to another.

The second problem is the lack of adequate institutional infrastructure. In many developing countries urban water sectors are reasonably well established, and these can be further strengthened by better management. However, rural water sectors are often the subsidiary responsibility of a ministry of health, or public works or rural development, whose main concern is with other issues. Sometimes there are several ministries responsible for the sector and thus the coordination leaves much to be desired. Furthermore, administratively different levels of government—federal, provincial, city and village—often have an interest in the area, providing further compartmentalization of agencies and tasks. All these often contribute to stop-go programs, which are clearly inefficient.

The third constraint is a lack of trained manpower at all levels—management, planning, construction, operation, maintenance, and training. The scarcity of trained technicians and lack of local support staff at the sub-professional level present real problems. Training centers are urgently needed. Unfortunately, some of the arrangements being made at present are open to question. Bringing sub-professionals from rural areas of developing countries to advanced countries like the Netherlands for training is unlikely to be most efficient. It would be more economic and efficient if such training programs were established within the countries concerned or on a regional basis, in a selected country, for a group of countries with similar social, economic and institutional conditions.

The fourth constraint is often the form of the external aid itself. The present trend among the donor countries is to provide more bilateral aid directly to the countries rather than through international organizations. The professed reason is that it is more efficient to channel aid bilaterally. While this argument may

[18] *Loc. cit.* footnote 13, p. 41. These figures are in 1979 dollars.

contain an element of truth in individual cases, the use of bilateral channels tends to raise problems of coordination and may inhibit the development of a solid core of experts able to learn and apply the lessons learned in a variety of countries. Moreover, some of the underlying reasons for the use of bilateral channels seem to involve control and prestige. The basic objective of improved water supply may not be served by attempts to stipulate that equipment and consultancy services may be obtained only from the donor country, or by efforts to obtain national credit for the donor country rather than an international agency.

Other problems have been created by the foreign experts. It was mentioned earlier that in certain countries as many as 80 percent of the tubewells established with foreign aid are currently out of service. In too many cases, well-intentioned foreign "experts" have very little understanding of the social, cultural, economic and technological conditions prevailing in the developing countries. In fact, a cynic might be tempted to say that a new multinational industry, having a very high growth rate, has developed: the proliferation of organizations in the developed countries offering instant solutions to all Third World problems!

There has also been a lack of consultation and coordination among donor countries. For example, during the drought of 1972, several Western countries provided different varieties of pumps to Ethiopia. Because they needed different spare parts and maintenance procedures, local technicians were unable to handle the maintenance adequately. Had all the pumps been of the same type, it might have been possible to store spare parts to keep them running and train technicians to service one type of pump.[19] Obviously more coordination between donor countries and consultations between donor and recipient countries would improve this situation.

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Goals and targets are easy to design, and resolutions are easy to pass. International agreements on targets will in no way guarantee that the necessary plans will be developed and implemented, or that necessary funds and trained manpower will be available for

[19] These types of problems and experiences have increased the mistrust of aid and the motivation behind it. Recently, a leader of an important Asian country told me that technical assistance programs are starting to become a major headache, since certain projects appear to be designed to solve the unemployment problems of donor countries by dumping equipment and imposing foreign consultants at fancy salaries. The indigenous experts, who can perform the same task, have started to resent the high-living foreign experts, whose performance and knowledge of local conditions often leave much to be desired.

their execution. In a world full of resolutions on targets and designated decades for different areas, national and international interest in a specific area often tends to be ephemeral. One is reminded of a resolution of the World Food Conference in 1974, which stipulated that no child should go to bed hungry by 1984—even today that target appears hollow indeed.

So resounding and pious declarations are not enough. The proclaimed objective of clean water for all by 1990, in the International Drinking Water Supply and Sanitation Decade, is a worthy one, and may be capable of achievement in a number of countries. But in a great many others it will not be realized and should be considered as only the beginning of intensified programs and activities that proceed on a realistic timetable and in doable stages—the first stage aimed at providing even intermittent water supplies in urban areas and standpipes in rural areas, and the final phase being the provision of running water in all homes.

The failure to make realistic estimates of costs is a particularly grave problem. The existing serious underestimates, while having the apparent advantage of suggesting that required investments can be obtainable, are bound to be detrimental over the longer term. Estimates must take into account not only the initial cost of new installations but the substantial sums required to keep those installations in good working order and to make the facilities provided in the past fully reliable.

It is equally important to make pragmatic assessments of how much external investment can really be expected. It is all very well to point out that the total cost of the Decade would not be great in comparison to global military spending of $500 billion a year, or that North American and European consumers currently spend on tranquillizers one-half the amount of external aid required for the success of the Decade.[20] But there are no signs that expenditures for either purpose will be reduced in the near future, or that if they were the savings would be channeled to provide clean water to all.

Next, too many of the agencies concerned with water supply and sanitation, both internationally and at the national level, continue to pursue a "top-down" approach under the management of urban technocrats. These agencies need a major infusion, combined with training, of personnel who understand rural problems and are capable of bringing to bear the necessary knowledge of overall health, social and educational needs.

[20] See, for example, the special August–September 1980 issue of *World Health*, the magazine published by WHO.

Finally, both national and international agencies need to pay far more attention to the operation, maintenance and repair of water facilities after they are installed. This means not only keeping the physical water delivery systems running, but continuous monitoring of the quality of water delivered.

In short, like many other development problems, the problem of providing adequate water supplies to the Third World will not yield simply to the application of money and other resources—although these are of course vital for success. Its solution calls for a major reshaping of existing institutions all the way from the local to the international level, and for a massive effort to train both operators and recipients to make proper use of new facilities and water supplies. Only if these steps are undertaken together will the goal of clean water and sanitation for all—if not by 1990, at least reasonably soon thereafter—cease to be an "impossible dream" and become the reality it could indeed be.