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WATER AND SANITATION FOR HEALTH PROJECT

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1611 N. Kent Street, Room 1001
Arlington, VA 22209-2111 USA

Telephone: (703) 243-8200
Fax (703) 525-9137
Telex WUI 64552
Cable Address WASHAID

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RURAL WATER SUPPLY, SANITATION, AND ENVIRONMENTAL ISSUES IN ASIA AND THE NEAR EAST (ANE)

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RURAL WATER SUPPLY, SANITATION, AND ENVIRONMENTAL ISSUES IN ASIA AND THE NEAR EAST (ANE)

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by

Jahan Tavangar, Ph.D., P.E.

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EXECUTIVE SUMMARY

This paper discusses the role of water supply and sanitation in economic development, health, and quality of life in rural areas of Asia and the Near East (ANE). In addition, it recommends strategies for the further development of the region in the 1990s.

There are more than 1.5 billion people in the ANE region, and this population is growing rapidly. The population is largely rural, and the labor force in agriculture generally exceeds 50 percent of the total and can reach 75 percent. Even though the rural population is decreasing as a percentage of total population in most ANE countries, it is still growing rapidly (see Appendix E). It is a population that is predominantly poor.

Considerable effort has been made to provide water supply and sanitation to the rural population in the ANE countries during the International Drinking Water Supply and Sanitation Decade (IDWSSD) (1981-1990). Yet more than half of this population lacks access to a supply of good quality water, and more than two-thirds does not have proper sanitation.

The benefits of improved water supply and sanitation are dependent upon a well-planned program of community participation and hygiene education. To be effective, a program should have the participation of the community in its planning, construction, operation, maintenance, and financing. It should also make community management of the project a goal.

Among the primary benefits of improving the water supply and sanitation conditions in a community are:

- Reduced incidence of infectious diseases caused by bacteria, protozoa, viruses, and worms
- Convenient access to water and sanitation facilities
- Reduced medical expenses and increased time available for productive activity
- Improved nutritional status
- Services to health care centers, clinics, and schools
- Household irrigation and animal watering
- Promotion of commercial activities

- Strengthened community organization
- Support for other development sectors

Among the major constraints to sector development are:

- Absence of government commitment to rural development and to the required financial and human resource investments
- Institutional weaknesses and shortages of qualified personnel
- Absence of government policies conducive to rural development
- Inadequate funding and personnel for operation and maintenance
- Inadequate public participation in rural development projects
- Ignoring the role of women in sector development
- Use of inappropriate technology
- Insufficient coordination between the various elements of rural development including water supply, sanitation, health, hygiene education, and shelter

Recommendations for Future A.I.D. Activity in the Sector

The following are general recommendations for A.I.D. assistance to the ANE countries in the sector:

- A.I.D. should continue its assistance to the rural water supply and sanitation sector.
- Prior to the implementation of a project, a study by a multidisciplinary team should evaluate its feasibility. The study should include the points below.
  - The degree to which the community (not just the leaders) perceives a problem with the existing water supply and sanitation facilities should be a consideration in ranking and selecting projects.
  - The solution (i.e., water supply or sanitation development project) should be in line with the desires as well as the needs of the community.

  - The community should be willing to meet all or a portion of the cost, depending on its ability to pay.
  - The technical, social, and institutional elements of the project should be evaluated to ensure that it can realistically be carried out and that it will yield the intended benefits.
  - The long-term sustainability of the project should be considered. A project is sustainable when the community perceives it as a benefit, uses it, and makes the effort to keep it operational.

- The main emphasis of A.I.D. assistance to the water supply and sanitation sector is "software" such as technical assistance, training, and institutional strengthening. The benefits of these forms of assistance can be increased by combining them with "hardware" type programs such as construction of water supply and sanitation facilities.

- When planning water supply projects, consideration should be given to the protection of the water source from upstream agricultural, municipal, and industrial activities that may result in degradation of water quality. A water quality protection plan should be prepared and implemented to prevent water source contamination from both on-site and off-site activities.

- A.I.D.'s limited funding makes it more effective to concentrate development efforts on a few selected communities than to spread these efforts over a large number of areas without a focus on long-term commitment.

- An integrated approach should be taken to rural development that will include health improvements, hygiene education, economic development, literacy campaigns, and food production.

- National, regional, and local institutions should be strengthened through personnel training, human resources development, organizational changes, and management training.

- The beneficiaries of development projects should participate in project planning, construction, operation, maintenance, and financing.

- Cooperation with other donors involved in the sector development will provide opportunities for information

exchange, coordinated activities, and learning experiences.

- The capabilities of NGOs and PVOs should be used in the implementation of small-scale, self-help projects, and their expertise and knowledge of community participation exploited in larger projects.
- The long-term impact of development projects on the environment should be considered.
- Governments should be encouraged and guided to enact laws and frame policies conducive to rural development and environmental protection.
- The momentum of the IDWSSD must be continued and increased if the goal of full coverage is to be achieved in many countries of the ANE region.
- Projects should be evaluated periodically to identify their strengths and weaknesses and to improve their effectiveness. Completed projects should be evaluated to assess their accomplishments and the lessons they offer for future projects.

Important Considerations in Future Sector Development

There are several important considerations that should feature in future development projects, if the benefits of A.I.D. assistance to the ANE region are to be maximized:

- Rural water supply and sanitation should be integrated and coordinated with other sectors such as health education.
- Institutional development at all levels is required for the success of any project.
- Training of personnel should be viewed as a long-term effort requiring institutional and financial commitments.
- Active community participation should be an integral part of every phase of a project.
- Cultural, religious, and traditional characteristics of a rural community should be taken into account in the planning and implementation phases.

- Institutional arrangements for adequate operation and maintenance need to be carefully developed and should be considered in selecting technologies.
- Selected development projects and technologies should be appropriate and relevant to local conditions.
- Women should be involved in all aspects of any project, including operation and maintenance.
- An adequate supply of water is important even if the quality is not up to international standards.
- If the safe water supply is inadequate or irregular, people will not use it and will continue to rely on traditional sources.
- Groundwater resources development should be given priority in most rural water supply projects because these resources are less costly to develop and are often cleaner than surface water supplies.
- Convenient access to water supply and sanitation facilities is an important factor in the success of a project.
- Rural water supply sources, both surface water and groundwater, are vulnerable to the threat of contamination by human activities. Common causes of water source contamination in rural areas are excessive or improper application of agricultural chemicals (e.g., fertilizers, pesticides, herbicides, etc.), industrial and municipal wastewater discharge into streams and lakes, overgrazing and deforestation of upland watersheds, salt water intrusion in aquifers caused by over pumping, and improper operation of sanitation facilities in rural areas.

I. INTRODUCTION AND BACKGROUND

Scope

The purpose of this paper is to present an overview of water supply, sanitation, and environmental conditions in the rural areas of Asia and the Near East (ANE). It also discusses the role of water supply and sanitation in economic development, health, and quality of life in rural areas of the ANE region. In addition, it recommends strategies for the further development of the region in the 1990s.

This paper is part of a larger effort by the ANE Bureau of the United States Agency for International Development (A.I.D.), which is formulating a strategy to underline the significance of natural resources management and environmental protection for sustainable development in the region. Sixteen papers are being prepared to address the various aspects of natural resources management, and to identify programming priorities for A.I.D. through the 1990s. The specific goal of this program is to prepare a comprehensive report that will analyze the major natural resources and environmental problems in the ANE region, assess how ANE governments have responded to these problems, review A.I.D. and other donor strategies and programs, and recommend to A.I.D. appropriate priorities for ANE environmental and natural resources programming. A preliminary list of the titles of the resource issue papers appears in Appendix A.

Description of the ANE Region

The ANE region is vast and diverse. It spans more than 60 degrees of latitude and extends over half the globe, from Morocco in the west to Indonesia in the east. Thirty-one of the countries in this region (see Table 1) currently receive development assistance from A.I.D. Hereafter, the term "ANE region" refers to these countries.

Approximately half of the ANE countries are located in the tropics. Thirteen are island nations with dominion over more than 20,000 islands. Several are situated in the mountain ranges of the Hindu Kush and Himalayas. Two rise no more than 20 feet above sea level. Ten have large areas of arid and semi-arid land. One has the most extensive remaining tropical forests in the world. ANE countries have more than 82,000 miles of coastline. They contain most of the world's major ecosystems, which typically extend across national borders and create a community of interest in the midst of diversity.

The ANE region is economically diverse. The per capita GNP ranges from $140 for Bangladesh to $7,800 for Oman. For many countries the long-term rate of increase in GNP is slowing. In some cases, economic growth appears to be peaking. Because of population growth, GNP per capita is declining in some cases.

TABLE 1 - SELECTED STATISTICS FOR COUNTRIES IN THE ANE REGION
(Source: Armstrong[1])

Country	Land Area (KM^2)	Coast (KM)	Population (000)	Population Growth Rate Per Ann (%)	Pop. Per (KM^2)	GDP $/Per Capita (1985)
Afghanistan	647,500	0	14,184	1.44	22	250
Bangladesh	144,000	580	107,088	2.70	744	140
Burma	676,550	3,060	38,822	2.08	57	190
Indonesia	1,904,570	54,716	180,426	2.05	95	510
India	3,287,590	7,000	800,325	2.07	420	250
Nepal	140,800	0	17,814	2.43	127	140
Pakistan	803,940	1,046	104,601	2.74	130	310
Philippines	300,000	36,289	61,525	2.70	205	580
Sri Lanka	65,610	1,340	16,407	1.37	250	390
Thailand	514,000	3,219	53,646	1.78	104	720
Egypt	1,001,450	2,450	51,930	2.74	52	430
Jordan	97,740	26	2,762	3.65	28	1,900
Morocco	446,550	1,835	23,361	2.49	52	510
Oman	212,460	2,092	1,227	3.10	6	7,800
Tunisia	163,610	1,148	7,562	2.33	46	1,250
Yemen Arab Republic	195,000	523	6,533	2.93	34	520
South Pacific						
Cook Islands	240	120	18	0.55	75	1,170
Fiji	18,270	1,129	728	2.25	40	1,254
Kiribati (Gilberts)	710	1,143	66	1.82	93	410
Niue	260	64	3	3.21	12	1,080
Papua New Guinea	461,690	5,152	3,564	2.41	8	717
Solomons	28,450	5,313	301	3.62	11	640
Tonga	700	419	99	0.76	141	1,030
Tuvalu	26	24	8	1.73	308	500
Vanuatu	14,760	2,528	150	3.36	10	600
W. Samoa	2,934	403	175	2.20	60	532

Note: In addition to these 26 countries, five others receive some form of assistance through A.I.D./ANE Bureau programs: Cambodia, Cyprus, Israel, Lebanon, and Turkey. Poland and Portugal, although not geographically part of the region, also receive some assistance through these programs.

Large and Growing Population

More than 1.5 billion people live in the ANE region, and this population is growing rapidly. India alone has more people than the whole of Africa, the Middle East, or Latin America. The annual population growth rate in 20 of the 31 countries is more than 2 percent, and in four of them it exceeds 3 percent. At these growth rates, the population of the ANE region will double in 25 years.

The population is largely rural, and the labor force in agriculture generally exceeds 50 percent of the total and can reach 75 percent. Even though rural population is decreasing as a percentage of total population in much of the region, it is still growing rapidly (see table in Appendix E). Furthermore, the population is predominantly poor (see table in Appendix D). Landlessness often accompanies poverty as, for example, in Bangladesh, where more than 50 percent of rural households are landless. About 40 percent of the population in many of the ANE countries is under 15 years old.[1]

Grouping Based on Economic Conditions

Because of their great physical and cultural diversity, it is more practical to group the countries of the ANE region by economic condition.

This method, used by the Asian Development Bank[2], classifies countries into three groups based on per capita GNP and type of economy (Table 2). Group A contains the low-income countries (per capita GNP below $300); group B includes the middle-income countries (per capita GNP between $300 and $1,000); and group C contains the high-income countries (per capita GNP more than $1,000). The terms low-, middle-, and high-income are used in the context of the ANE region's economic conditions. Group A countries are essentially agriculture-based economies, with low productivity and high population pressure on land. Group B countries are primarily commodity-producing countries highly vulnerable to world demand and the prices of commodities, as well as to the fluctuations of the economies of industrialized

TABLE 2 - GROUPING OF COUNTRIES BY TYPE OF ECONOMY
(Source: ADB[2])

A. Low-income Agricultural Economies
- Bangladesh
- Burma
- Nepal

B. Middle-income Transitional Economies

Egypt	Pakistan
India	Philippines
Indonesia	Sri Lanka
Morocco	Yemen

C. High-income Industrializing Economies
- Jordan
- Oman
- Thailand
- Tunisia

countries. Group C countries are characterized by rapid industrialization, low population growth, availability of natural resources, or healthy tourism. A modification of this grouping method has also been used by A.I.D.[3]

Current Status of Rural Water Supply and Sanitation

A great deal of effort has been made to provide water supply and sanitation to the rural population in the ANE countries during the International Drinking Water Supply and Sanitation Decade (IDWSSD) (1981-1990). Even though the ambitious goals of the IDWSSD have not yet been met, the program has been successful in increasing rural water supply and sanitation coverage, strengthening institutional capabilities, and improving the health of the rural population. Despite all these activities and accomplishments, more than half of the rural population in the ANE region lacks access to a good quality water supply, and more than two-thirds of the population does not have proper

sanitation. Table 3 shows the extent of water supply and sanitation coverage in Southeast Asia, the Eastern Mediterranean, and the Western Pacific, which include the countries of the ANE region.

TABLE 3 - RURAL WATER SUPPLY AND SANITATION COVERAGE IN SOUTHEAST ASIA, EASTERN MEDITERRANEAN, AND WESTERN PACIFIC (Source: WHO[16])

1975			1980			1983			1985			No. of countries reporting			
Rural pop. (mil)	Rural cvrg. (mil)	%	Rural pop. (mil)	Rural cvrg. (mil)	%	Rural pop. (mil)	Rural cvrg. (mil)	%	Rural pop. (mil)	Rural cvrg. (mil)	%	1975	1980	1983	1985
WATER SUPPLY															
937	166	18	1,001	316	31	1,022	430	42	1,076	487	45	27	38	38	33
SANITATION															
937	75	8	1,001	117	12	1,022	116	11	1,076	131	12	25	34	30	30

Many of the ANE countries have concentrated their efforts on rural water supply and sanitation during the IDWSSD—a shift in focus necessary if it is to have the maximum impact on the largest number of people. Great improvements were made in the sector during the 1970s. For instance, in Indonesia, only 1 percent of the rural population had access to a clean and adequate water supply in 1970. This coverage had increased to 4 percent by 1975, and 19 percent by 1980. Indonesia's goal is to provide supplies for another 50 million rural people by 1990, representing a coverage of 60 percent.

Water Shortage in Light of Rising Demand

The arid countries of the Near East have for a long time concentrated their efforts on water resources as the central development issue. Urban supply and irrigation have received high priorities in these countries. With growing populations, many ANE countries are experiencing difficulties in meeting the

ever-increasing demand for water. This is not only true in the arid and semi-arid countries, but also in India, Bangladesh, and the humid countries of Asia. For example, the 1987 National Resources Profile of Thailand indicates that challenges lie ahead in meeting the demand for water in that country. The island countries of the Pacific are also faced with a growing demand for fresh water. Falling water tables in aquifers will eventually result in seawater intrusion and groundwater contamination.

Water Vending in Rural Communities

Water supply projects in developing countries are traditionally based on either (a) piped systems with public taps or private household connections or both, or (b) wells with handpumps. Both of these approaches to improving water supplies have been extensively studied; planning and design manuals for such systems abound. There is, however, a third approach to service delivery which is seldom explicitly recognized or incorporated in design or investment decisions: water vending. Millions of people in villages and cities throughout the developing world are, in fact, already being served by vendors who take water from an available source and then deliver it to households in containers or fill household containers from tanks on their vehicles.

Case Study - Water Vending in Surabaya, Indonesia[5]

A case study in Surabaya, Indonesia, proves instructive. Some 55 percent of the population in the study obtained their water from poor-quality shallow wells. The remaining 45 percent received water directly or indirectly from the piped distribution system: about 18 percent had private connections; about 20 percent purchased water from direct vendors; and about 7 percent purchased water from distributing vendors.

The direct vendors sold to both individuals and distributing vendors at the same price: about US$0.01 per 20-liter container (US$0.53 per m^3). The distributing vendors usually operated in teams of two. One pushed a cart with a 220-liter drum, and the other used a yoke with pails to carry water from the cart to the individual households. The distributing vendors charged from US$1.30 to 2.60 per m^3, depending on the distance the water had to be carried.

People purchased vended water because it was of better quality than that available from many wells.

Regional Environmental Conditions and Need for Conservation

One of the challenges facing ANE countries is how to meet basic human needs while sustaining the resources upon which these needs depend. Appendix F discusses natural resources management in the ANE region.

II. IMPACT OF WATER SUPPLY AND SANITATION ON HEALTH AND ECONOMIC GROWTH

Benefits of Water Supply and Sanitation

The benefits of improved water supply and sanitation are dependent upon a well-planned program of community participation and hygiene education. Installation of pipes, pumps, and sanitation facilities alone does not guarantee long-lasting improvement in the health of a rural community. To be effective, a water supply and sanitation program should have the community participate in its planning, construction, operation, maintenance, and financing.

Prevention of Disease

Most of the diseases which prevail in developing countries when water supply and sanitation are deficient are infectious diseases caused by bacteria, protozoa, viruses, or worms. Disease caused by chemical contamination of water is less common and often of local or regional significance. Two chemical elements, fluorides (naturally occurring) and nitrates, are sufficiently frequent in occurrence to warrant particular attention.

Bacterial diarrhea, cholera, and typhoid, for example, are transmitted partly by drinking water; consequently, the quality of drinking water is of great importance. Water quality is thought to be of lesser importance for other diarrheas, and the most important intervention is an improvement in personal and domestic hygiene (including sanitary handling of food), which can be encouraged by convenient access to adequate quantities of water.[11] Providing clean water alone is not sufficient for preventing diseases. Personal hygiene, proper food handling, washing of clothes and dishes, and bathing are also important in controlling infectious diseases and worms.

The importance of various disease control interventions with respect to some major water and sanitation diseases is shown in Table 4. This matrix further shows the importance of multiple interventions for control of some diseases. Tables 5 and 6 show some quantitative results of the effects of water supply improvements on health.

TABLE 4 - INTERVENTIONS FOR INFECTIOUS DISEASE CONTROL
(Source: UNICEF[13])

Degree of Importance of Intervention: *** high ** medium * low - negligible

Diseases	Water Quality	Water Quality/ Convenience	Personal & Domestic Hygiene	Wastewater Disposal/ Drainage	Excreta Disposal	Food Sanitation
Diarrheas						
(a) Viral Diarrhea	**	***	***	-	**	**
(b) Bacterial "	***	***	***	-	**	***
(c) Protozoal "	*	***	***	-	**	**
Poliomyelitis & Hepatitis A	*	***	***	-	**	**
Worm Infections						
(a) Ascaris, Trichuris	*	*	*	*	***	**
(b) Hookworm	*	*	*	-	***	-
(c) Pinworm, Dwarf Tapeworm	-	***	***	-	**	*
(d) Other Tapeworms	-	*	*	-	***	***
(e) Schistosomiasis	*	*	-	*	***	-
(f) Guinea Worm	***	-	-	-	-	-
(g) Other worms with aquatic hosts	-	-	-	-	**	***
Skin Infections	-	***	***	-	-	-
Eye Infections	-	***	***	*	*	-

TABLE 5 - IMPACT OF WATER SUPPLY AND SANITATION ON DIARRHEA MORBIDITY IN CHILDREN
(Source: Okun[25])

Improvement	Number of Studies	Median of Percent Reduction
Water Quality	9	18
Water Quantity	17	25
Quality and Quantity	18	37
Excreta Disposal	10	22

TABLE 6 - DIARRHEA AND LEVELS OF WATER SUPPLY IN INDIA (1983)
(Source: WASH[17])

Source	Diarrheal Incidence (percent)	Reduction from Open Well (percent)
Open Well	18.4	-
Standpost	7.8	57.7
House Tap	6.2	66.3

Convenience Benefits

In general, new water supplies are designed to give users more convenient access than they had when dependent on traditional sources. Convenient access reduces the effort and energy expended in bringing home the daily water needs of the household - a task that often falls on women. Thus, women will have more time for other domestic tasks, for tending to the needs of their children, and for other possible activities of a developmental or economic nature. Convenience benefits should also result from sanitation programs but these may be tempered by cultural and/or social considerations.[13]

Economic Benefits

Water supply and sanitation usually yield economic benefits, but in the absence of records and precise measurements these benefits will rarely be clearly identifiable. Economic benefits will be in three general areas - savings in the cost of medical

treatment, increased time for productive activities, and opportunities to institute new productive activities.

Other benefits of improved water supply and sanitation include[4]:

- Improved nutritional status
- Services to health care centers, clinics, and schools
- Time released for women
- Household irrigation and animal watering
- Promotion of commercial activities
- Strengthening community organization
- Support for other development sectors
- Improved quality of life

Potential Negative Aspects

The installation of water supply and/or sanitation facilities in a community may create environmental conditions conducive to the breeding of insect vectors of disease. Proper design, operation, and maintenance of facilities can reduce this risk to negligible proportions, especially in relation to the positive health benefits resulting from the facilities.

Improved water supply without satisfactory means for the disposal of water can result in pools of stagnant water which will become breeding places. Similarly, flooded pit latrines or cesspits could be breeding sites, and the numbers of mosquito vectors could increase to cause a corresponding increase in the incidence of filariasis."

Protection of Water Supply Sources

Human activities can adversely affect the quality of rural water supply sources. Both surface water and groundwater sources are vulnerable to contamination. The following are common sources of water supply contamination in rural areas:

- Discharge of untreated or partially treated municipal wastewater into surface water bodies (e.g., rivers, lakes, ponds, etc.).

- Salt water intrusion in coastal areas caused by over-pumping in the case of groundwater or upstream river flow diversion in the case of surface water sources.
- Excessive or improper use of agricultural chemicals causing groundwater contamination as well as the pollution of streams and lakes resulting from surface runoff.
- Increased sediment loading in streams and lakes caused by overgrazing and devegetation of upland watersheds.
- Industrial wastewater discharge
- Improper operation of sanitation facilities in rural areas causing both surface water and groundwater contamination.
- Discharge of irrigation return flow into streams and reservoirs
- Mining activities causing water supply contamination by discharging acid mine drainage and chemically contaminated water into streams.
- Increased health problems, such as schistosomiasis and guinea worm disease, caused by large water resources projects such as dams and irrigation schemes.

Quantity of Water Supply

In conditions of water shortage and poverty, many diseases can be passed from person to person not only by the route of contaminated water, but also by contaminated fingers, plates, and food. For most rural populations, the first health requirement is not only cleaner water but also more water to wash things and to keep them clean. Ready availability of sufficient water also helps control skin infections such as scabies, and eye diseases such as trachoma which can cause blindness. The most effective way to increase water consumption in poor rural communities is to provide water closer to their homes. However, the relationship between consumption and distance is complex (see Figure 1). In general, water consumption increases as the water source comes closer to home. However, there is a plateau in water consumption between 5 minutes and 30 minutes for a round trip to the water source. This is equivalent to about a one-half kilometer distance from home to water source. Only when water is supplied in the house or very close to the house (less than 5 minutes away) does consumption increase dramatically, and this is when major improvements in health are observed. Many researchers have documented this phenomenon. Many water supply planners have been

surprised to find no increase in water consumption or little health improvement when water quality has been improved or water source has been moved a little closer to users along the plateau in Figure 1. In many cases the benefit of water supply has come from increased quantity and closeness to the source rather than from quality improvements alone. When water is readily available people increase their consumption by using the extra water for cleaning, washing, and personal hygiene. This is confirmed in a study done in two Mozambican villages (see Table 7). Note that village B used nearly four times as much water as village A, and 75 percent of it for personal hygiene. Children in village B had a bath every day, while those in village A did not have regular baths and were often dirty. Not surprisingly, village B had only half as many cases of trachoma as village A.

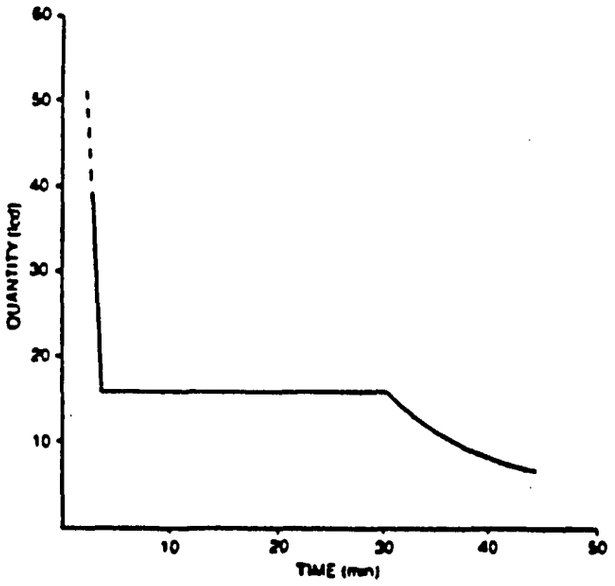

FIGURE 1 - RELATIONSHIP BETWEEN WATER CONSUMPTION AND COLLECTION TIME
(Source: Cairncross[12])

TABLE 7 — MEAN DAILY WATER USE IN TWO MOZAMBICAN VILLAGES, IN LITERS PER CAPITA PER DAY (lpcd). (Source: Cairncross[12])

	Village A		Village B	
Water collection journey time	5 hours		15 minutes	
Water consumption	lpcd	%	lpcd	%
Drinking	0.21	6	0.36	3
Cooking	0.67	21	1.93	16
Washing dishes and food	0.50	15	1.36	11
Bathing	0.80	25	4.75	38.7
Bathing children	0.04	1	1.23	10
Washing clothes	0.54	17	2.64	21
Other (animals, etc.)	0.48	15	0.03	0.3
Totals	3.24	100	12.30	100

Cost of Water Supply and Sanitation Coverage

Analysis of costs of providing water and sanitation services in rural and urban settings under government sector plans up to 1990 (Table 8) suggests that US$86,497 million of new investment worldwide will be required for the second half of the IDWSSD. This figure is dwarfed by the original estimates which costed the whole Decade at US$300,000 million to US$600,000 million.

Per capita unit costs of providing services generally continued to increase despite the development of less expensive technologies. The median costs of urban water supplies through house connections appear to have risen 16 percent between 1980 and 1985. However, there were a number of examples of cost reductions during the first five years, notably in the Eastern Mediterranean, where town sewers, individual urban sanitation facilities, and rural sanitation all became cheaper.[16]

TABLE 8 - ESTIMATED CAPITAL INVESTMENT COST OF ATTAINING NATIONAL DECADE TARGETS BY THE END OF 1990 (Source: WHO[16])

(millions of US dollars)

Region	Urban water supply	Urban sanitation	Rural water supply	Rural sanitation	Total
Africa	2,930.2	4,765.0	2,911.2	2,301.3	12,907.7
Americas	8,625.7	8,293.8	2,257.6	807.2	19,984.3
Southeast Asia	5,530.6	5,234.2	2,827.4	2,405.3	15,997,5
Eastern Mediterranean	11,065.3	13,158.8	6,035.6	1,824.2	32,083.9
Western Pacific	1,998.2	1,624.0	1,576.5	324.7	5,523.4
Total	30,150.0	33,075.8	15,608.3	7,662.7	86,496.8

Cost information for water supply and sanitation appears in Appendix B.

III. INDICATORS FOR MONITORING WATER SUPPLY AND SANITATION SECTOR

Objectives of a Monitoring Program

A program of monitoring the water supply and sanitation sector of a country can be achieved by collecting, evaluating, and communicating data on key indicators. The objectives of such a program should be well-defined. The World Health Organization (WHO) has identified the following objectives for its recommended program":

- To improve the foundation for planning
- To integrate the water supply and sanitation sector in the overall development effort of the country
- To verify progress towards set targets, identify constraints, and adjust targets to realities
- To influence resource allocation towards sector needs
- To detect and reappraise high cost water supply and sanitation sector programmes and projects
- To assess community benefits, in particular, health benefits
- To disseminate sector information to government officials, external support agencies, and the general population

Potential Indicators

WHO has recommended the following categories of information to be collected for the monitoring of the sector":

- General Information - relevant to the water supply and sanitation sector (area, population, demographic growth rate, GNP) but not necessarily produced or used exclusively by the sector
- Institutional Information - specific to the sector and its agencies (scope of agency responsibility, financing, human resources) and generated by the sector
- Information on Existing Services - pertaining to operation and management of existing facilities (service coverage, operational costs)

- Information on Development of Services - referring to sector growth, extension of services, increases in coverage, and capital investment programmes (targets, plans, service upgrading, etc.)

Three levels of detail can be used in collecting and reporting key indicators. The first level represents the absolute minimum needed for the monitoring of the sector. The second and third levels yield more information on the same items and constitute more advanced sector monitoring. Obviously, the cost of data collection and maintenance increases with the level of detail. But increasing the level of detail over time can be one of the goals of the country, and will constitute a direct measure of institutional and managerial progress. The following is a list of key indicators that can be used to monitor the performance of the water supply and sanitation sector of a country":

A. General Information

1. Geographic and Demographic

- Area
  - total
  - by state or province
- Rainfall (average annual)
- Population, total and by state or province, at beginning and end of plan period
  - urban, classified by size into major, medium, and small cities, separately indicating fringe population
  - rural, nucleated (classified by size of centers), and dispersed (including nomadic) populations
  - annual population growth (total, urban, rural)

2. Health

- Infant mortality
- Child mortality (1-4 years of age)
- Incidence of waterborne and filth-related diseases
- Life expectancy at birth

3. Housing

- Total number of dwelling units
- Average number of people per dwelling unit
- Number of electricity connections

4. Education

- Literacy rate (percentage of population aged 15 years and over able to read and write)
- Percentages of population with schooling
  - primary
  - secondary
  - higher education
  - health education in primary schools

5. Economic and Financial Aspects

- Gross National Product (GNP) and rate of annual growth
- GNP per capita and rate of annual growth
- Annual rate of inflation
- Balance of payments situation
- External debt as percentage of GNP
- Exchange rate with respect to US dollar
- Percentage of unemployment and underemployment in the workforce

6. Planning

- National Development Plan (NDP)
  - period covered by current NDP
  - authority responsible at national level
  - is water supply and sanitation sector plan included?
  - total investment proposed in NDP
  - total external support in NDP

- Annual Cost of Public Sector
  - as percentage of GNP
  - recurrent costs as percentage of total public sector cost
  - capital costs as percentage of total public sector cost

7. Sector-Related Programmes

- Scope
- Cost
  - contribution to water supply and sanitation sector
  - contribution from water supply and sanitation sector
- Primary Health Care
  - community involvement
  - health education
- Human Resources Development
- Other

B. Institutional Information

1. Sector Description

- Agencies with sector responsibility
  - responsibility of each agency
  - annual budget (capital and recurrent) by agency
  - number of employees by agency
- Authority responsible for integration of water supply and sanitation sector planning at national level
- Period covered by water supply and sanitation sector plan
- Main water supply and sanitation sector policies and strategies
- Targets

- Main constraints likely to be encountered during plan implementation

2. Overall Sector Financing

   - Source and allocation of funds to water supply and sanitation sector by year, covering the preceding five years and the entire plan period, and including internal fund generation

     - recurrent costs
     - capital costs

   - Total water supply and sanitation sector costs as percentage of total public sector expenditures

     - recurrent costs
     - capital costs

Data Availability

Data are available on most of the indicators listed above. However, the challenge is to obtain accurate and timely data from the several institutions often involved in rural development in each country in the ANE region. A central data base should be established in each country to do the following:

- Collect data from the involved agencies
- Maintain and update a computerized data base that can be accessed by all interested institutions including external support organizations such as A.I.D., World Bank, Asian Development Bank, WHO, and other bilateral aid organizations
- Validate, organize, and analyze data to obtain maximum benefit from the information
- Summarize and present data in a timely manner in report forms for general distribution. Data should be presented in graphical form as well as numerical tables, and interpreted to reflect changes, anomalies, and trends.

Using the Indicators to Monitor Sector Performance

Data collection should not be viewed as an end in itself but as the means to monitor sector performance. Procedures must be established in each country for submission of data reports at least annually to the decision makers involved in the overall

development of the country. Briefings for key decision makers, including legislators, should also be held at which recommendations on courses of action are presented along with a summary of the findings.

The performance of the rural water supply and sanitation sector should be viewed in combination with other development sectors such as urban, housing, agriculture, nutrition and health, education, environment, and the overall economy. The performance of one sector or even one country should not be evaluated in isolation. We live in an interdependent world, in which the conditions in one country may affect those in others. An example of this situation is the price of oil. An increase in the price of oil in the late 1970s significantly affected the economies of most countries and slowed down their growth, which caused a reduction in government spending on rural development.

IV. STATUS OF WATER SUPPLY AND SANITATION IN RURAL AREAS OF ANE REGION

This section presents the status of water supply and sanitation in selected countries of the ANE region, and offers specific case studies and examples. It also offers some predictions for future sector status.

Current Sector Status in Individual Countries

The World Water magazine in collaboration with WHO has prepared a report[21] summarizing the status of water supply and sanitation sectors in most countries of the ANE region. .The status summaries for Bangladesh, Egypt, Pakistan, and the Philippines are presented in Appendix C as examples of the type of information included in this report.

To illustrate the types of effort that have gone into improving water supply and sanitation in the ANE region, several case studies are presented here.

Case Study - Water Supply Project in Rural Thailand[22]

A potable water project was implemented in the northeast section of the country between 1966 and 1972 at a capital cost of US$4.8 million ($2.9 million in A.I.D. funds and $1.9 million in Thai funds). The project was implemented by the Sanitary Engineering Division of the Thai Ministry of Public Health through a contract with a U.S. engineering firm. The water system in each community consisted of a water treatment plant with storage tower and piped distribution system and included disinfection. Water systems were installed in villages whose residents were willing to assist in construction and to develop a rate structure that would pay for operation, maintenance, and future expansion. In most villages residents made financial and labor contributions. In each community a person was selected and trained to operate and maintain the system as well as to collect water use fees.

Most of the systems built under the project continued to function more than 10 years (project evaluation was done in 1980) after the first systems were installed. Most systems are financially self-sufficient, with user fees covering the cost of operation and maintenance.

The greatest impact of the project, according to the villagers, has been economic. Residents enjoy the reliability and ample quantity of water provided close to their homes. This has resulted in increased water consumption as well as in time saving, which in turn permits increased gardening, livestock

raising, and crafts production. The systems have eased the physical burdens of village women and children -- principal bearers of water in Thailand -- and have given them more time for income-generating activities. It is difficult to evaluate the health benefits of the project since no initial baseline data exist. However, health officials indicate that general health status has improved because of more frequent bathing, washing of clothing and cooking utensils, and increased use of water-sealed privies.

A surprising and ironic outcome of the project has been that many villagers do not drink the water because they do not like its taste.

The critical assumption on which design of this project was based was that rural people, once provided with potable water, would drink it. This did not always happen. Many people, including those who have the potable water piped directly to their homes through private taps, still prefer traditional sources. This means rainwater collected from roofs in cisterns or water from open shallow wells. To most rural Thai, shallow well water tastes "heavy" and good but the piped water "too thin" and, because of chlorination, unpleasant. Boiling removes this bad taste, but water boiling is considered troublesome and, according to health personnel, is not common except during epidemics.

Case Study - Social and Cultural Factors Affecting a Water Supply Project in Bangladesh[23]

Wells equipped with hand pumps have been installed in many rural areas of Bangladesh to provide safe water for drinking and other domestic purposes. However, a large number of rural people still use unprotected surface water, despite having access to these wells. A field study in 27 areas totaling 409 households was performed to investigate patterns of water usage in these rural areas.

The average per capita water consumption was found to be about 40 liters per day, with only 30 to 40 percent of this collected from the wells. Reasons for not using well water were traditional habits, lack of awareness of waterborne diseases, "poor" water quality, lack of privacy at well sites, and the distance to the wells. Women are the primary water collectors in rural Bangladesh and do not like to go to an open and public area. To determine the effects of privacy on water use and source, three of the exposed wells were partially enclosed by a fence. As a result, per capita water usage increased by about 10 percent. This additional water was used mostly for washing utensils and clothes.

This is a case in which the positive impacts of the water supply project can be maximized by taking into account social and cultural factors. This project could have benefited from active community participation during the planning, construction, and operation phases, and from a health and hygiene education component.

Case Study - Village Water Systems in Egypt[24]

In 1979, USAID and the Government of Egypt embarked upon the Basic Village Service (BVS) program, the major thrust of which was to make funds available at the village level for infrastructure projects. From 1980 through 1988, about 920 villages received a total of $104 million, 55 percent of which went to water supply and sewerage projects. In 1986, a team of specialists visited 36 of these villages to evaluate the BVS program. These villages represent 4 percent of Egypt's current rural population of 27 million. The following is a summary of their findings:

- All 36 villages have a functioning water system.
- About 31 percent of the people have direct connections to the water supply systems.
- Villages in areas with saline groundwater are served by regional systems. Most others are connected to systems using wells.
- Engineering planning and design are inadequate.
- Operation of the systems suffers from power outages, lack of funds for fuel and electricity, and insufficient training of operators.
- Maintenance is lacking in most cases.
- Losses of water through leaks and waste are significant.
- High levels of iron, manganese, and hardness in some cases have led people to use less safe water.
- The number of public standpipes is inadequate to serve the 69 percent of the people not connected to the systems.
- None of the villages have piped sewerage systems.

Despite these problems, the village water supply situation in Egypt is far from grim. The program has made a positive

contribution to bringing safe drinking water to rural communities. There has been a large increase in the number of house connections over the past eight years: 31 percent of the villages are connected compared with 5 percent in 1980. This increase is even more significant in light of the rapid growth in population during this period. The evaluation report[24] offers a number of recommendations for increasing the effectiveness of the BVS program. These include focusing on a smaller number of villages to allow more effective use of funds, regionalizing services, providing wastewater services, strengthening and clarifying the responsibilities of institutions, improving planning and design, increasing system efficiency and reliability, and providing effective operation and maintenance services.

Projected Coverage for ANE Region

The most up-to-date data base on water supply and sanitation coverage is for the mid-Decade (1985) presented in a WHO report[16]. When the IDWSSD started in 1980, most countries of the world established ambitious goals and some aimed for 100 percent coverage by 1990. By 1985, many countries had adjusted their targets downward (see Table 9). The proportion of countries aiming for 100 percent coverage fell from 21 percent to 15 percent.

One of the most significant achievements of the first half of the IDWSSD has been a large increase in the number of rural dwellers with access to safe drinking water. Less dramatic has been the change in rural sanitation coverage (only a 3 percent increase from 13 percent to 16 percent). Rural sanitation continues to receive less attention than rural water supply and will be the most challenging task for many years to come. Achieving the IDWSSD goals is even more difficult in light of rapid population growth in most of the countries.

It is difficult to accurately predict the future performance of the sector. The projected (1990) coverage for the various regions of the world (Tables 10 and 11) is probably unrealistically high. For example, to achieve the 1990 goal for rural sanitation, countries must increase the rate of progress in the second half of the IDWSSD (1985 to 1990) by a factor of five over the rate for the first half.

TABLE 9

COVERAGE TARGETS AND DECADE PLANS
(Source: WHO[16])

Region	No. of countries with total coverage targets[a]		No. of countries with low (50% or less) targets in rural areas		No. of countries that have prepared or are preparing formal Decade plans
	Rural water supply	Rural sanitation	Water	Sanitation	
South-East Asia	2	1	2	5	9
Eastern Mediterranean	3	1	4	5	9
Western Pacific	3	3	2	1	8

[a] Countries reporting 96% coverage target or over.

TABLE 10

PROJECTED NEW POPULATION COVERAGE FOR SELECTED REGIONS (1985 - 1990) - RURAL WATER SUPPLY
(Source: WHO[16])

Region	No. of countries selected	% of total Regional rural population[b]	Rural population (million)[a]		Rural coverage			
					1985		1990	
			1985	1990	No. (millions)[a]	(%)	No. (millions.)[a]	(%)
South-East Asia	9	99.0	850.8	979.8	402.7	47.3	634.2	64.7
Eastern Mediterranean	11	66.9	117.5	129.4	32.5	27.7	77.3	59.7
Western Pacific	8	40.9	50.2	50.8	25.1	50.0	32.1	63.2

[a] For those countries that provided the necessary data for 1985 coverage and 1990 targets.

[b] Based on the total population of developing countries/territories in the WHO Regions (excluding China).

TABLE II

PROJECTED NEW POPULATION COVERAGE FOR SELECTED REGIONS (1985 - 1990) - RURAL SANITATION
(Source: WHO[16])

Region	No. of countries selected	% of total Regional rural population[b]	Rural population (million)[a]		Rural coverage			
					1985		1990	
			1985	1990	No. (millions)[a]	(%)	No. (millions.)[a]	(%)
South-East Asia	9	99.0	850.8	979.8	82.1	9.7	267.5	27.3
Eastern Mediterranean	8	52.4	92.0	104.2	8.0	8.7	22.5	21.6
Western Pacific	7	29.6	36.3	38.7	19.8	54.3	23.1	59.5

[a] For those countries that provided the necessary data for 1985 coverage and 1990 targets.

[b] Based on the total population of developing countries/territories in the WHO Regions (excluding China).

V. GOVERNMENTAL PROGRAMS AND DONOR ACTIVITIES

Governmental Policies and Programs

The IDWSSD was proposed at the Mar del Plata conference in 1977. It was to be observed in the 1980s with the overall goal of providing clean drinking water and sanitation to all inhabitants of the globe. In order to achieve this goal, all countries were to develop realistic coverage targets and national programs. Twenty-one percent of the countries initially aimed at 100 percent coverage, but, as mentioned earlier, only 15 percent still held to this target by 1985, the midpoint of the decade.

Despite the fact that most ANE countries will probably not achieve their goals, accomplishments have been made in the following areas:

- International cooperation has been achieved through a steering committee representing most multilateral agencies, bilateral aid agencies, and national governments.
- National and international awareness of the importance of water supply and sanitation has been heightened, resulting in many activities in not only the water supply and sanitation sector, but also other areas of rural development.
- All ANE countries have established coverage goals, and have been monitoring and reporting their progress in achieving them.
- In support of IDWSSD activities, many governments have either established new agencies or strengthened existing institutions to give proper attention to the development of the sector..
- Progress has been made toward the IDWSSD's numerical goals.

A number of constraints have been identified by various reviewers of rural development projects. Among the more important are these:

- Absence of government commitment to rural development and to the required financial and human resource investments. The World Bank has found that lack of real commitment to rural development is a common explanation for unsatisfactory project performance.

- Institutional weaknesses and shortages of qualified personnel
- Absence of government policies conducive to rural development
- Inadequate funding and personnel for operation and maintenance
- Inadequate public participation in rural development projects
- Ignoring the role of women in sector development.
- Use of inappropriate technology
- Insufficient coordination between the various elements of rural development including water supply, sanitation, health, hygiene education, and housing

Multilateral Donor Activities in Rural Water Supply and Sanitation Sector

The United Nations has taken the leading role in sector coordination and has arranged a number of international conferences, including the Mar del Plata conference in 1977. The most active members of the steering committee to coordinate IDWSSD activities are UNICEF, UNDP, WHO, and the World Bank.

UNDP country representatives have been the focal point of activities at the country level, and have greatly facilitated inter-agency and inter-sectoral cooperation. The IDWSSD has also been instrumental in achieving greater cooperation and communication among bilateral donors. For example, six inter-agency meetings held in the past five years have achieved some consensus among external support agencies and most developing countries on the major policy issues facing the sector.

UNICEF spends more than $50 million per year on child survival and rural development. It has recently increased its efforts in integrating water supply and sanitation with health education, growth monitoring, oral rehydration therapy (ORT), breast feeding, and immunization. It currently has 151 staff members in various countries, including 9 countries in the Near East and 16 countries in Asia and the Pacific.

The World Bank plays a leading role in the sector. It started a low-cost water supply and sanitation program in 1978, and since then has provided assistance to 20 countries and currently maintains a staff of 50 in the sector. Its efforts have been concentrated in the following areas:

- Rural water supply handpumps
- Low-cost sanitation
- Resource recovery
- International training network
- Project preparation units in Asia
- Sector development teams in Africa

With UNDP it has taken the lead in developing and testing new approaches and technologies suitable for sustainable development projects in poor rural communities. The two agencies have allocated more than $30 million so far. Other support has come from bilateral agencies such as A.I.D., Canadian International Development Agency (CIDA), German Agency for Technical Assistance (GTE), Norwegian Agency for International Development (NORAD), and Swiss Development Corporation (SDC).

WHO has played a key role in creating and updating a data base on IDWSSD progress. It recently prepared a report titled "Country External Support Information System," which presents information on externally supported projects in the water supply and sanitation sector. WHO is also active in environmental health and human resources development. Its annual budget in the sector is about $20 million. It maintains staffs of 70 in the field and 10 in Geneva.

Bilateral Donor Activities in Water Supply and Sanitation Sector

The major bilateral donors involved in the IDWSSD are Belgium, Canada, Denmark, Germany, Italy, Norway, Switzerland, and the United States. Germany currently has the largest external support program of all bilateral agencies. It increased its already significant contribution by 67 per cent between 1981 and 1984. Table 12 presents a summary of the activities of major bilateral donor agencies in the sector.

TABLE 12 - BILATERAL DONOR ACTIVITIES IN THE WATER SUPPLY AND SANITATION SECTOR

Donor	Major Areas of Activity
GTZ (Germany)	Integration of water, health, and health components; national resources management; use of appropriate technology; operation and maintenance; cost recovery; community participation; and training.
SDC (Switzerland)	Similar to GTZ
DANIDA (Denmark)	Water supply projects in 20 countries; community participation; operation and maintenance by the community; and use of appropriate technology.
ODA (U.K.)	Adequate operation and maintenance through cost recovery; institutional strengthening; hygiene education; adaptation and use of local technologies.
NORAD (Norway)	Development of the poorest countries; provided $40 million for water supply and sanitation in 1984; institutional strengthening; cost recovery; and public participation.
AID (USA)	Sponsors Water and Sanitation for Health (WASH) project, NGO support, institutional development, technical assistance, human resources development, and decentralized activities through USAID missions.
SIDA (Sweden)	Appropriate technology; sanitation; hygiene; institutional development; water resources management; human resources development; standardization and sector policy development; concentrated efforts in India.
JICA (Japan)	Favors multi-sectoral development; promotes economic development; concentrates mainly in Asia (especially Thailand, Indonesia, and the Philippines) and the Pacific; provides low-interest loans, grants, training, and technical assistance.

Role of Nongovernmental Organizations (NGOs) and Private Voluntary Organizations (PVOs)

NGOs and PVOs are very similar in their modes of operation. Most of them are nonprofit groups, funded through individual and corporate donations, grants, contracts from bilateral and multilateral agencies, and governments. They play a significant role in rural water supply and sanitation. In 1985, they spent about $180 million worldwide in the sector, which is about three times as much as the loans made by the World Bank and three times the expenditures of UNICEF in rural water supply and sanitation. NGOs and PVOs usually concentrate on small rural development projects in low-income areas. Their activities often complement the larger national and regional development projects of governments. Because of their strong grassroots efforts, NGOs and PVOs are often successful in establishing community-based water and sanitation projects. They are also more successful than governmental agencies in developing community organizations capable of taking on operation and maintenance responsibilities. NGOs and PVOs often exhibit the following characteristics":

- Their expenditures in rural development are substantial.
- They are often familiar with local conditions.
- Some have established strong local networks.
- They often understand the importance of community participation and of the social aspects of projects.
- They are cost-effective and have low administrative expenses.
- They tend to use appropriate technologies, with locally available materials, which result in sustainable projects.
- Most of them suffer from technical and management weaknesses.
- They often work independently of national governments.
- They have highly motivated staffs, which often include indigenous people.
- Because of their strong water and sanitation efforts, they have a great impact on the welfare of women and children.

VI. LESSONS LEARNED IN WATER SUPPLY AND SANITATION DEVELOPMENT

Over the last few decades, multilateral and bilateral agencies, development banks, governments, the private sector, and NGOs and PVOs have expended a great deal of effort and billions of dollars in developing water supply and sanitation projects. Both successes and failures abound in these projects, and many lessons have been learned. Some of these lessons are described below.

Role of Technology in Sector Development

Technology is often the core discipline of water and sanitation projects. It may involve "hardware" such as wells, pipelines, treatment plants, and latrines, or it may deal with the "software" aspects of development such as design manuals, operation and maintenance guidelines, and technical evaluations. For development projects to be successful, it is important to integrate the technological aspects with other disciplines and considerations such as institutional strengthening, operation and maintenance, sustainability, and social relevance. Successful development projects provide these guidelines:

- Offer a variety of technology options. This will allow maximum flexibility in the implementation of the project. Choice of technology often determines the level of service provided. In water supply several levels of service exist:
  - Unprotected traditional sources
  - Improved traditional sources
  - Handpumps
  - Diesel, wind, solar, or other powered pumps
  - Communal standpipes
  - Private yard taps
  - House connections
- Build on existing technologies. Taking an existing technology one step further is more acceptable socially than introducing a new technology.
- Select technologies based on perceived user needs. Cultural practices, family needs, religious beliefs, and traditions are important considerations in selecting technologies.
- Do not make technology the primary driver. It is important to clearly define the objectives of the development project, and not allow preoccupation with a particular technology or system to prevail.

- Consider operation and maintenance requirements when selecting a technology. Personnel training, availability of spare parts, and the cost of operation and maintenance are important to sustainability of a project.

- Use appropriate technology. This will contribute to sustainable projects.

Role of Human Resources Development

Human resources development is more than just training. It also includes planning, recruitment of personnel, personnel management, and management development. Human resources development is an integral part of any successful development project. It has a great impact on the planning, design, construction, operation, and maintenance of a project. It includes all levels of personnel involved in the water supply and sanitation sector. Human resources development often enhances the performance of institutions. Furthermore, training is more effective when it is participatory and is given continually rather than just once.

Health Improvement

Health improvement is one of the primary benefits of water supply and sanitation projects, and is linked to health and hygiene education and the resulting behavioral changes. Therefore, educational programs (particularly those produced locally) should be important components of water and sanitation projects.

Community Participation

Community participation is critical to the long-term success of a project and should be included in all of its phases. Active community participation is much more than getting the villagers to provide free labor for construction. If people are not involved in the planning, design, construction, financing, operation, and maintenance of a project, they will not feel that it is theirs and may not take the responsibility to ensure its continued operation. Worse than that, they may not even use the project to the extent required to provide true benefits. Furthermore, the planning and implementation of a project should be the result of a perceived need of the local community, not of a decision by government planners. It may be necessary to first embark upon an educational program to create an awareness of health and hygiene issues, then follow with a water supply project based on the community's perceived needs.

The benefits of active and full community participation go far beyond the water supply and sanitation project. The experience of organizing people, identifying problems, finding and discussing solutions, and implementing these solutions teaches the community to act on other issues such as those related to health, education, agriculture, and housing.

Role of Women in Sector Development

The effective participation of women in the planning and implementation of a water supply and sanitation project is critical to achieving its intended benefits and to its sustainability. Women are often the primary users of water supply and sanitation projects and provide most of the labor during construction.

Women are responsible for drawing and providing water for the family, cooking, washing dishes and clothes, and bathing the children. Therefore, they have the greatest influence on the impact of water and sanitation on the health of the community. In addition, their example and behavioral practices set the overall hygiene standards for the community. Because of their stability and commitment to the community, women can be effective in operating and maintaining facilities. Yet, despite all these points, there are strong social, cultural, political, and religious barriers to the active involvement of women in project planning and implementation.

Institutional Development

Weak or inadequate institutional development is a major constraint in implementing most water supply and sanitation projects. Unless sectoral institutions are strong and offer relevant plans or policies, they will be ineffective regardless of what financial resources are placed at their disposal. In rural and low-income areas, success in providing self-sustaining services can be achieved only by effective outreach and by using resources from within the community itself. This is difficult, if not impossible, for centralized institutions to achieve without active community participation and training.

Institutional development requires expertise in finance, engineering, human resources development, health, organizational development, and the social sciences. Moreover, the development and strengthening of institutions require long-term commitment and support, both external and internal.

Importance of Operation and Maintenance

The developing world is littered with inoperative water supply and sanitation systems started with good intentions and enthusiasm by external donors or government agencies, but with not enough attention to long-term operation and maintenance. The sustainability of any development project is highly dependent on the involvement of the local community, not excluding women, in all phases, particularly in operation and maintenance. The following elements are important for a successful operation and maintenance program:

- Institutional commitment (both external and community based) to the project
- Institutional development and effective training of personnel
- Routine and preventive maintenance
- Availability of spare parts and required tools
- Availability of funds
- Maintenance of records
- Timely equipment maintenance and replacement

VII. STRATEGIES FOR WATER SUPPLY AND SANITATION SECTOR DEVELOPMENT

The focus of this section is on recommended strategies that would optimize the effectiveness of A.I.D.'s assistance to the ANE region in the 1990s. These strategies incorporate some of the lessons learned in the last few decades in which A.I.D. and other donors have been involved in water supply and sanitation sector development in this region (see Section VI).

Despite these efforts to provide safe water supply and sanitation services, most rural communities of the region are still without adequate coverage. This is partly because the rapid rate of population growth makes the task more difficult every year. The intensified efforts of the IDWSSD have achieved a great deal. This momentum should not be lost at the end of the decade in 1990. Most developing countries now realize that full coverage in rural communities should be seen as a long-term program. To make a significant impact in the 1990s, this program will require sustained effort, substantial external support, and full host country governmental commitment. Future development assistance programs should take advantage of the lessons learned in the sector over the last few decades (see Section VI).

Recommendations for Future A.I.D. Activity in the Sector

The following are general recommendations for A.I.D. assistance to the ANE countries in the sector:

- Continued support - A.I.D. should continue its assistance to the rural water supply and sanitation sector. Despite the fact that rural population is decreasing as a percentage of total population in most ANE countries, it is still increasing rapidly (see Appendix E).

- Project selection - Prior to the implementation of a project, a study by a multidisciplinary team should evaluate its feasibility. The study should include the points that follow.

    1. The degree to which the community (not just the leaders) perceives a problem with the existing water supply and sanitation facilities should be a consideration in ranking and selecting projects. If the community does not perceive a problem in the availability, quantity, or quality of the existing water supply, a solution will not be effective however appropriate and beneficial it may be.

2. The solution (i.e., water supply or sanitation development project) should be in line with the desires as well as the needs of the community. For example, the level of water supply and sanitation service provided should satisfy its preference. If a piped system with in-house taps is what it wants, hand pumps should not be the selected alternative.

3. The community should be willing to meet all or a portion of the cost, depending on its ability to pay. In low-income countries such as Egypt, rural communities cannot afford the cost of a new water supply system. In such cases, the goal should be to win local interest and participation during the planning and implementation of the project. At the least, the community should provide the labor for construction. In the case of medium- and high-income countries such as Jordan, the community should be expected to pay for the improved services. If it is not willing to pay, the project should be considered as not worth the required investment to the community and should not be undertaken.

4. The technical, social, and institutional elements of the project should be evaluated to ensure that it can realistically be carried out and that it will yield the intended benefits. The local USAID missions and individuals familiar with local conditions can contribute a great deal to this evaluation.

5. The long-term sustainability of the project should be considered. A project is sustainable when the community perceives it as a benefit, uses it, and makes the effort to keep it operational. An effective operation and maintenance program is an integral part of a sustainable project. If long-term operation and maintenance cannot be guaranteed, the project should not be undertaken. Financial self-sufficiency is a desirable objective, but total self-reliance should not be the only criterion for sustainability. In very poor areas of the ANE region this should be a long-term goal. Sustainability also assumes that local institutions involved in the management of the project will be able to stimulate a demand for its services.

- "Software" vs. "Hardware" - The main emphasis of A.I.D. assistance to the water supply and sanitation sector is "software" such as technical assistance, training, and institutional strengthening. The benefits of these forms of assistance can be increased by combining them with "hardware" type programs such as construction of water supply and sanitation facilities. A.I.D. can provide technical assistance and training in combination with the construction and equipment delivery projects that some of the multilateral and bilateral agencies undertake.

- Focused programs - A.I.D.'s limited funding makes it more effective to concentrate development efforts on a few selected communities and to provide them with long-term assistance, than to spread these efforts over a large number of areas without a focus on long-term commitment. Over the long run, this approach will result in effective development projects that can be models for other areas.

- Integrated approach - An integrated approach should be taken to rural development that will include health improvement, hygiene education, economic development, literacy campaign, and food production.

- Institutional development - National, regional, and local institutions should be strengthened through personnel training, human resources development, organizational changes, and management training. American universities and research organizations can assist with this task. Employee exchange programs between host country institutions and U.S. organizations are also useful.

- Community participation - The beneficiaries of development projects should participate in project planning, construction, operation, maintenance, and financing. Their financial contribution may be mainly their labor during the construction and operation of the project. When the community perceives the project as a viable solution to a real problem, supports it financially, and has a self-generated interest in it, the project has a good chance of becoming sustainable.

- Cooperation with other donors - Cooperation with other donors involved in the sector development will provide opportunities for information exchange, coordinated activities, and learning experiences. Periodic regional conferences can facilitate this effort.

- NGOs and PVOs - The capabilities of NGOs and PVOs should be used in the implementation of small-scale, self-help projects, and their expertise and knowledge of community participation exploited in larger projects.

- Environmental management - The long-term impact of development projects on the environment should be considered, and economic growth balanced against natural resources management. Consideration should also be given to the impact of upstream human activities on the quality of rural water resources. These could include municipal, agricultural, and industrial activities. Surface water and groundwater contamination could result from the discharge of municipal and industrial wastewater as well as the improper or excessive application of agricultural chemicals. Sufficient data does not exist at this time to evaluate the quality of rural water supply. Baseline data should be developed to assess the impact of upstream activities on the quality of rural water resources.

- Government policies - Governments should be encouraged and guided to enact laws and frame policies conducive to rural development and environmental protection.

- Momentum of the IDWSSD - A great deal of effort has been expended during the IDWSSD to establish appropriate institutions in host countries to provide increased support for water supply and sanitation. This momentum must be continued and increased if the goal of full coverage is to be achieved in many countries of the ANE region.

- Project evaluation - Projects should be evaluated periodically to identify their strengths and weaknesses and to improve their effectiveness. Completed projects should be evaluated to assess their accomplishments and the lessons they offer for future projects. Project cost data collection should be one of the elements of evaluation.

Important Considerations in Future Sector Development

There are several important considerations that should feature in future development projects if the benefits of A.I.D. assistance to the ANE region are to be maximized:

- Rural water supply and sanitation is one component of an overall rural development program. It should be integrated and coordinated with other sectors such as health education.
- Institutional development at all levels is required for the long-term success of any development project.
- Training of personnel involved in all aspects of a project is necessary and should be viewed as a long-term effort requiring institutional and financial commitments.
- Active community participation should be an integral part of every phase of a project.
- Cultural, religious, and traditional characteristics of a rural community should be taken into account in the planning and implementation phases (see Bangladesh case study in Section IV).
- Institutional arrangements for adequate operation and maintenance need to be carefully developed and should be considered in selecting technologies. Moreover, adequate training and financial support should be provided for this important phase of the project.
- Selected development projects and technologies should be appropriate and relevant to local conditions.
- Women play an important role in the sector. It is essential to involve them in all aspects of any project, including operation and maintenance.
- Both the quantity and quality of water are important. In fact, access to an adequate supply often has a great impact on the health of a community even if the quality is not up to international standards.
- Reliability of supply affects the attitude of the people toward the usefulness of a water supply project. If the safe water supply is inadequate or irregular, people will not use it and will continue to rely on traditional sources.

- Groundwater resources development and management should be given priority in most rural water supply projects because these resources are less costly to develop, available in most areas, and often cleaner than surface water supplies. Springs are considered a part of groundwater resources.

- Convenient access to water supply and sanitation facilities is an important factor in the success of a project. If the safe water supply source is considerably farther than the traditional source, it will not be used by the community. To be considered convenient, sanitation facilities should be located very close to the houses.

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APPENDIX A

PRELIMINARY LIST OF ANE NATURAL RESOURCE STRATEGY PAPERS

APPENDIX A
PRELIMINARY LIST OF ANE NATURAL RESOURCE STRATEGY PAPERS

1. Tropical Deforestation
2. Biological Resource Conservation
3. Global Warming
4. Soil Loss and Watershed Degradation
5. Watershed Management: Land Use
6. Coastal Resource Degradation
7. Rural Water Supply, Sanitation and Environmental Issues in Asia and the Near East
8. Environmental Aspects of Rapid Urbanization and Industrial Growth
9. Inefficient Irrigation Systems
10. Inefficient Energy Systems
11. Institutional Strategies for Sustainable Development
12. Strengthening NGOs for Natural Resource Management in Asia
13. Hazardous Wastes/Toxics
14. Agricultural Chemicals
15. Women and Natural Resource Management
16. Nonprogram Support

APPENDIX B

COMPARATIVE COSTS OF WATER SUPPLY AND SANITATION PROJECTS IN SELECTED COUNTRIES

APPENDIX B

COMPARATIVE COSTS OF WATER SUPPLY AND SANITATION PROJECTS

WATER SUPPLY PROJECTS -- INVESTMENT COST PER CAPITA (US $/PERSON IN 1985 PRICES)

Type of System / DMC's	Dug Well with Hand Pump	Shallow Drilled Well with Hand Pump	Deep Borehole Well with Distribution System and Untreated Water	Deep Borehole Well with Distribution System and Treated Water	Surface Water with Gravity Feed Distribution and Treated Water	Surface Water with Pumped Distribution System and Treated Water
Bangladesh	10 - 30	20 - 40	40 - 90	90 - 110	100 - 120	100 - 200
Bhutan	20 - 50	40 - 80	50 - 150	80 - 150	80 - 150	100 - 200
Burma	5 - 20	15 - 40	30 - 60	60 - 100	80 - 120	100 - 150
Hong Kong	40 - 80	60 - 110	90 - 150	100 - 160	100 - 200	150 - 550
India	10 - 25	15 - 35	40 - 80	40 - 80	50 - 130	60 - 150
Indonesia	5 - 15	15 - 30	30 - 60	60 - 100	70 - 120	120 - 300
Korea	15 - 30	20 - 50	40 - 80	70 - 100	90 - 200	100 - 350
Laos	10 - 30	15 - 30	30 - 60	60 - 100	80 - 120	100 - 200
Malaysia	20 - 40	30 - 80	50 - 100	70 - 120	80 - 200	80 - 350
Maldives	5 - 20	20 - 40	30 - 60	60 - 100	60 - 120	60 - 150
Nepal	20 - 50	40 - 70	60 - 100	70 - 120	80 - 150	100 - 200
Pakistan	10 - 30	20 - 60	50 - 100	80 - 110	100 - 140	100 - 200
Papua New Guinea	20 - 50	40 - 70	60 - 100	80 - 120	100 - 180	150 - 400
Philippines	30 - 60	40 - 80	60 - 110	90 - 130	110 - 200	120 - 450
Singapore	30 - 80	50 - 100	80 - 150	100 - 150	100 - 200	150 - 400
Solomon Islands	15 - 30	20 - 50	40 - 100	60 - 100	80 - 120	110 - 250
Sri Lanka	10 - 20	20 - 80	50 - 150	50 - 150	80 - 200	100 - 250
Thailand	10 - 20	20 - 40	40 - 60	50 - 100	70 - 120	90 - 250
Viet Nam	20 - 50	30 - 50	30 - 90	60 - 130	70 - 110	100 - 200
Average Range	20 - 40	30 - 60	50 - 100	70 - 120	80 - 150	110 - 260

SANITATION PROJECTS -- INVESTMENT COST PER CAPITA (US $/PERSON IN 1985 DOLLARS)

Type of System / DMCs	Pit Latrine	Water Seal Latrine	Septic Tank	Sewerage
Bangladesh	5 - 15	15 - 25	25 - 150	150 - 300
Bhutan	25 - 40	40 - 75	75 - 200	200 - 400
Burma	20 - 30	30 - 50	50 - 100	100 - 400
Hong Kong	30 - 50	50 - 150	150 - 250	250 - 600
India	10 - 30	25 - 45	30 - 50	50 - 150
Indonesia	5 - 10	10 - 50	50 - 200	200 - 400
Korea	30 - 50	50 - 100	100 - 300	300 - 500
Laos	10 - 20	20 - 50	50 - 150	150 - 350
Malaysia	15 - 30	30 - 65	65 - 250	250 - 500
Maldives	5 - 25	25 - 55	55 - 100	100 - 200
Nepal	20 - 40	40 - 100	100 - 300	300 - 400
Pakistan	15 - 30	30 - 70	70 - 400	400 - 600
Papua New Guinea	10 - 50	50 - 200	200 - 350	350 - 650
Philippines	5 - 30	30 - 150	150 - 400	400 - 700
Singapore	25 - 50	50 - 175	175 - 300	300 - 800
Solomon Islands	5 - 20	20 - 100	100 - 200	200 - 450
Sri Lanka	10 - 20	20 - 60	60 - 200	200 - 400
Thailand	10 - 20	20 - 160	160 - 300	300 - 500
Viet Nam	5 - 20	20 - 100	100 - 250	250 - 400
Average Range	15 - 30	30 - 95	95 - 235	235 - 460

COSTS OF WATER AS OF DECEMBER 1983[a]
(Source: Okun[25])

Region	Construction, US$/capita			Operation
	Rural	Urban Standposts	Urban House Connections	US$/m³
Africa				
median	39	56	98	0.48
range[b]	8-200	2-200	12-300	0.20-1.18
Americas				
median	94	50	122	0.11
range	25-410	5-500	25-350	0.04-1.15
Southeast Asia				
median	14	58	61	0.16
range	2-70	6-111	60-150	0.10-1.00
Western Pacific[c]				
median	38	--	130	0.35
range	5-210	--	19-400	0.18-0.80
Summary				
median	38	56	80	0.25
range	2-410	2-500	12-400	0.04-1.18

[a] Adapted from WHO 1986. Europe and Eastern Mediterranean excluded.

[b] Range by countries.

[c] Excluding U.S. territories

COSTS OF RURAL SANITATION AS OF DECEMBER 1983[a]
(Source: Okun[25])

Region[b]	Construction, US$/capita
Africa	
median	30
range[b]	8-300
Americas	
median	45
range	6-536
Southeast Asia	
median	9
range	3-20
Western Pacific[c]	
median	12
range	2-34
Summary	
median	21
range	2-536

[a] Adapted from WHO 1986. Europe and Eastern Mediterranean excluded.

[b] Range by countries.

[c] Excluding U.S. territories

APPENDIX C

STATUS OF WATER SUPPLY AND SANITATION SECTORS IN BANGLADESH, EGYPT, PAKISTAN AND THE PHILIPPINES

(Source: IDWSSD Directory, Volume 1)

Bangladesh

Currency: Taka 30.8 = US$1.00
Population: 100 million (18% urban)
Official language: Bengal
Population growth rate: 2.17%
GNP per capita: $136
Life expectancy: 54 years
Infant mortality per 1,000 births: 121
Water diseases per 100,000: N/A
Adult literacy (M/F): 43/22

UNDP resident representative: House No 60, Road No 11A, GPO Box 224, Dhaka 1000.

WATER AND SANITATION AGENCIES

Chief Engineer of Public Health, Ministry of Local Government & Rural Development, Bangladesh Secretariat, Dhaka.

Bangladesh Water Development Board, WAPDA Building, Motijheel C/A, Dhaka 2.

Ministry of Health, Secretariat Building, Dhaka.

Ministry of Works & Urban Development, Bangladesh Secretariat, Dhaka.

Dhaka Water & Sewerage Authority, WASA Bhaban, Kewran Bazer, Dhaka.

Chittagong Water & Sewerage Authority, Chittagong.

Much of Bangladesh's 144,000 km² area lies below 30m, which is why many parts of the country suffer perennial flooding. Three major rivers and a large amount of groundwater constitute the main water resources. Although groundwater is plentiful, it tends towards hardness or salinity in some areas and can contain large amounts of iron, manganese or fluoride.

Rainfall varies from about 1,250mm/year in the west to about 5,700mm in the south-east. Some 80% falls between June and September.

The country is divided into four administrative divisions, subdivided into 21 districts, 71 sub-divisions, 496 *thanas* and 4,334 unions. The urban population (18 million in 1985) lives in two cities - Dhaka, the capital, and Chittagong - and in 404 urban centres. The rural population (82 million) lives in more than 60,000 villages.

Though no figures are currently available, there is a high incidence of waterborne disease. In 1975, 30% of all deaths of children under 10 were caused by diarrhoea.

A National Action Committee responsible for implementation of the IDWSSD Decade was established in January 1979. An initial plan was completed in October 1980 as an integral part of the primary health care plan. A new plan was due in 1986.

In 1985, 56% of the population still lacked access to a safe water supply source, while a frightening 93% still had no adequate sanitation. In urban areas, however, the proportion of people with no safe water supply rises to 76% with a similar number lacking adequate sanitation.

Thus in water supply, the proportion covered in rural areas is higher than in the urban areas, reaching almost 50%, while for rural sanitation a mere 3% have adequate means of excreta disposal.

Current targets for 1990 are 30.5% for urban water supply (23.8% with house connections), 36% for urban sanitation (5.2% with sewer connections), 5.9% for rural water supply and 11.29% for rural sanitation. All these fall far short of the original targets declared in 1980 of 58% for urban water supply, 50% for urban sanitation, 77% for rural water supply and 13% for rural sanitation.

ACTUAL AND TARGET LEVELS OF COVERAGE

Urban population served (000's)					Rural population served (000's)		
Population	House Connections	Standposts	Sewerage Connections	Other	Population	Safe water supply	Sanitation
(1980 Actual)					(1980)		
10,000	- 2,000 -		- 2,000 -		80,000	31,000	1,000
(1985 Actual)					(1985)		
18,000	3,300	1,024	800	3,550	82,000	39,858	2,460
(1990 Targets)					(1990)		
25,000	5,950	1,920	1,300	7,700	88,000	51,970	9,933

UNIT COSTS OF CONSTRUCTION (US $ PER CAPITA)

Urban				Rural	
House connections	Standposts	Sewer connections	Other	Water supply	Sanitation
N/A	N/A	81	15	2	5

COST ESTIMATIONS FOR DECADE TARGETS AND INVESTMENT TOTALS

Estimated cost to reach decade targets (US $ millions)	1,157
Investment totals (US $ millions 81-85)	102.82

WATER CONSUMPTION l/c/d

For design		Actual	
Urban	Rural	Urban	Rural
180	50	115	30

UNIT COSTS OF WATER PRODUCTION (US$/m³)

Average cost	Operation average water tariff	Progressive water tariff
0.09	0.08	SOME AREAS

Egypt

Currency: Pound 0.70 = US$1.00
Population: 48.5 million*
Official language: Arabic
Population growth rate: N/A
GNP per capita: $610*
Life expectancy: 61 years*
Infant mortality per 1,000 births: 93**
Water diseases per 100,000: N/A
Adult literacy (M/F): 59/30
UNDP resident representative: 29 Sh Taha Hussein, PO Box 982, Cairo.

*World Bank 1985
**UNICEF 1985

WATER AND SANITATION AGENCIES:

General Organization for Sewerage & Sanitary Drainage (GOSSD), Tahrir Square, Cairo.
Telex: 93057 GOSSD

General Authority for Drinking Water, Ramsis Street, Cairo.

The Arab Republic of Egypt covers 1,000,250km² and is divided into three major regions - the Nile Valley and Delta covering 24,000km², surrounded by desert and bounded in the north by the Mediterranean.

Ninety-eight per cent of the population live in the Nile Valley and Delta at an average density of 1,000 /km². The country is highly urbanised with 46% living in towns. Greater Cairo accounts for a quarter of the population with densities reaching 76,000/km². Several new towns are in the process of development. One fifth of the urban and a quarter of the rural population live below the absolute poverty line.

Egypt is divided administratively into 26 governorates, then into districts, towns, quarters and about 4,000 villages. There are 160 city councils and 29,000 settlements below village level.

Life expectancy at birth is 61 years and in 1981 the incidence of waterborne diseases was 16 per 100,000 for typhoid and paratyphoid, 46 for infectious hepatitis and 16 for dysentries (probably under-reported). Schistosomiasis in lower Egypt claims 20% of the general population (1979).

Water resources

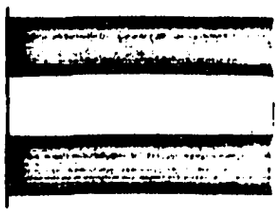
Egypt's main water resource is the river Nile, which is regulated by the Aswan dam. The Western Desert has substantial groundwater resources as yet unexploited. There is virtually no rainfall except along a narrow coastal strip around Alexandria.

By the year 2000 it is estimated that potable water needs will amount to only 5% of the amount available from the Nile and groundwater resources. However increasing agricultural demands have called into question the adequacy of this source. A master plan for the use of Nile waters has been prepared by the World Bank with UNDP financing.

Decade plans

Prior to the Decade, the water and sanitation sector suffered years of neglect. Consequently although high priority is now attached to the Decade, the targets have been put back to the year 2000. After the national launching, a sector workshop, supported by WHO and UNDP, all concerned in this sector put papers forward to update the 1977 WHO/World Bank Sector Study.

The recommendations that arose are being implemented starting with a pilot training programme for most levels of the sector; the foundation of the national authority; and increased decentralisation. The Technical Support Committee has met and a network of collaboration is growing. Egypt's Decade plan has been spread over 20 years because of the magnitude of the problem and the Ministry of Housing and Reconstruction has recently prepared a list of additional projects it would like to see aided in the first phase.



In urban areas in 1981, 88% of the population were served by house connections or had reasonable access to safe water. In rural areas only 64% had reasonable access. Rapid population growth has led to water shortages in city centres and too little or no access in suburban areas. There are many cases of water shut-down and failure to reach high storeys. About 120 lhd is available compared to 140 lhd for other Middle Eastern countries. Water losses, unaccounted for, are estimated to be 40%.

Sanitation facilities lagged behind water with 45% of the 1981 urban population served by sewers. Only five per cent of the rural population had adequate facilities. Sewage flooding appeared due to over-loading and 80% of sewage was discharged into water courses without treatment. Only a small proportion of cities had sewers.

Water quality and effluent is monitored by the Ministry of Health and the National Research Centre is studying water quality as part of a study on the impact of the Aswan dam on the Nile ecosystem. In 1981, a newly-constituted National Organistion for Potable Water and Sanitation was established responsible to the Ministry of Housing and Reconstruction. Greater emphasis will be given to decentralisation to make local authorities responsible for water, sewerage and sanitation projects.

Tariff structures are inadequate to cover maintenance, operating and expansion activities. For example, in 1980, the operating and interest expenses of the Greater Cairo/Helwan Water Authority were two and a half times its total revenues and all expansion costs had to be met by subsidies. The process of making undertakings profit-accountable (that is, after receiving government subsidies) is in hand. The policy is to provide water at a price all can afford. There is no charge made for sewerage services.

Pakistan

Currency: Rupees 17.308 = US$1.00
Population: 93,800,000 (29% urban)
Official language: Urdu
Population growth rate: 3%
GNP per capita: $390
Life expectancy: 55
Infant mortality per 1,000 births: 80
Water diseases per 100,000: 315
Adult literacy (M/F): 40/19

UNDP resident representative: Block no 2, Diplomatic Enclave no 1, Sector Ramma, (PO Box 1051), Islamabad, Pakistan.

WATER AND SANITATION AGENCIES

Federal Ministry of Planning & Development, P Block, Islamabad
Telex: 5171 PLAN

Ministry of Power & Natural Resources, A Block, Islamabad
Telex: 5714 POWER

Water & Power Development Authority, WAPDA House, Shahrah-e-Quaid-e-Azam, Lahore
Telex: 44869 WAPDA PK

Karachi Water Supply & Sewerage Board, Water House, MR Kayani Road, Karachi

Bordered to the north by the Himalayas, the Karakorams and the Hindukush, and to the south by the Arabian Sea, Pakistan is an arid country, composed mainly of mountain and desert.

Rain, which falls mainly between July and September, depends on the monsoon and varies from barely 130mm/year in Upper Sind (where temperatures of 52°C were recorded in 1984) to 1,250mm in parts of the Himalayan mountain region. Evaporation varies from 1,250 to 2,800mm in a year.

Without irrigation, Pakistan would be barren. The Indus plain, where most people live and most food is produced, receives less than 150mm of rain a year but the 60,000km Indus irrigation canal irrigates 12M.ha of fertile land. In spring and early summer when snows melt in the high mountain ranges of the north, river discharges rise dramatically. Drinking water supplies are drawn from both ground and surface sources and rainwater is collected in the arid zones and dry, hilly regions.

Pakistan has frontiers with Iran, Afghanistan, China and India and is divided into four provinces, Baluchistan, North West Frontier Province, Punjab and Sind. The Federal Capital Territory of Islamabad, the Federally Administered Tribal Areas and the Northern Areas are administered by the Federal Government which also has responsibility for Azid Jammu and Kashmir.

Sector responsibilities

Three tiers of Government - federal, provincial and local are involved in water and sanitation programmes. The federal government is responsible for overall development planning reflected in National Development Plans prepared by the National Planning Commission, in close consultation with the provinces.

The Environment & Urban Affairs Division looks after overall environmental health programmes of the country, including water and sanitation in urban areas; and the Rural Development Division deals with water supply and sanitation in rural areas. At present, the Ministry of Planning & Development coordinates the efforts of the sector at federal level.

Implementation, operations and management are the responsibility of:
- Larger cities - Development Authorities through their water and sewerage agencies;
- Medium towns - Provincial Public Health Engineering Departments;
- Rural areas - Piped systems: Provincial Public Health Engineering Departments; Handpumps: Local government departments and local organisations.

Operation and maintenance is the responsibility of water and sewerage agencies, public health engineering departments and other local organisations.

Decade plan

During the Decade 1981-90, the overall population is expected to grow at an average rate of 2.64% a year and the projected total population in 1990 is 107.10 million, with 33% living in urban areas and 67% in rural. At present, Pakistan is also looking after about four million refugees, most of them from Afghanistan.

At the start of the Water Decade, Pakistan set a 100% target for urban water supply but it was acknowledged that this could not be achieved in rural areas. In 1981, rural coverage was only 18% and the aim is to increase this to 66% by 1990. Coverage of the 45,000 villages is proposed through installation of 260,000 handpumps, storage reservoirs, shallow wells and piped water supply schemes.

Urban sanitation coverage is planned to increase from about 42% to 65% by 1990. Rural sanitation, available to only 2% of the population in 1981, may, with maximum effort, be extended to 13% of the rural population by 1990 through use of surface drains and pit latrines.

In mid-Decade (1985 figures), potable water supply was available to about 43% of the population (83% in urban and 26% in rural areas) while sewerage/sanitation of an acceptable standard was provided for about 20% (51% in urban and 6% in rural areas).

Targets for the Sixth Five Year Plan (1983-88) are: Water Supply: Increase overall coverage from 38% in 1983 to

ACTUAL AND TARGET LEVELS OF COVERAGE

Urban population served (000's)					Rural population served (000's)		
Population	House Connections	Standposts	Sewerage Connections	Other	Population	Safe water supply	Sanitation
(1980 Actual)					(1980)		
23,700	7,100	9,900	10,000		60,100	12,000	1,000
(1985 Actual)					(1985)		
26,900	22,282		13,800		66,900	18,094	4,020
(1990 Targets)					(1990)		
34,200	34,200		22,230		77,300	51,018	11,595

Pakistan (cont.)

59% in 1988 (urban areas from 78% to 90% and rural areas from 22% to 45%); and Sewerage/Drainage: Increase overall from 17% in 1983 to 26% in 1988 (urban areas from 48% to 60% and rural areas from 4.5 to 10%).

Government has allocated $400M to the sector under the Sixth Plan - about 1.5 times the amount previously spent under the Fifth Plan. Additional resources will be allocated to Special Development Programmes in Karachi and Baluchistan for which funds from international agencies such as the World Bank, Asian Development Bank, Kuwait and ECC countries will also be available.

To coordinate Decade activities, the government has established a committee within the existing Central Development Working Party which is headed by the Secretary General, Federal Planning and Development Departments and other Federal/Provincial Division/Departments concerned with implementation of the water supply and sanitation programme.

UNIT COSTS OF CONSTRUCTION (US $ PER CAPITA)

Urban				Rural	
House connections	Standposts	Sewer connections	Other	Water supply	Sanitation
40	N/A	45	N/A	30	15

A multi-faceted approach to the problem of lack of trained manpower is being followed. The Institute of Public Health Engineering, Lahore, is increasing the number of graduates in public health engineering; the University of Karachi will start a Masters Programme in environmental engineering; Lahore College of Technology is studying the feasibility of establishing a school to train skilled technicians at middle management level in water supply, sewerage and drainage.

A pilot programme is underway in 184 rural primary schools to train instructors who will in turn train the students in basic hygiene, public health, water supply/sanitation. Adequate safe drinking water and sanitation facilities will be provided at each of these schools to compliment the software training.

The Federal Ministry of Planning and Development has appointed consultants to develop National Standards for optimal quality/quantity for water supply, sewerage and drainage in both urban and rural areas. A national Decade Plan has been prepared with funding assistance from WHO.

Philippines

Currency: Peso 25.50 = US$1.00
Population: 55,336,000 (40% urban)
Official language: Pilipino/-English
Population growth rate: 2.47%
GNP per capita: US$585
Life expectancy: 63 years
Infant mortality per 1,000 births: 56.60
Water diseases per 100,000: 785.38
Adult literacy (M/F): 86/85

UNDP resident representative: 106 Amorsolo Street, Lagaspi Village Makati PO Box 1864, Manila, 2801

WATER AND SANITATION AGENCIES:

Ministry of Public Works and Highways, Second Street, Port Area, Manila.

Metropolitan Water Works and Sewerage System, Katipunan Road, Diliman, Quezon City.

Department of Health, San Lazaro Hospital Compound, Sta. Cruz, Manila.

Office of Human Settlements; c/o Office of the President, Malacang, Manila.

Department of Foreign Affairs, PICC Complex, Roxas Boulevard, Manila.

The Republic of the Philippines is grouped into three major islands, Luzon (the largest), Visayan and Mindanao, and covers 300,152km². It has a population of 55.34 million. There are 13 regions which consist of 75 provinces and within the provinces are 1,535 municipalities and 60 cities of 42,000 *barangays*.

The urban areas have good communication facilities, but in the rural areas communication networks are scarce.

Before the Water Decade, there were six water supply construction agencies and each agency did its own construction work which resulted in poor coordination and overlapping functions. The Integrated Water Supply Programme was formed by the government to alleviate this problem and to define the responsibilities and jurisdictions of each agency: National Water Resource Council - a multi-agency body which coordinates and regulates all activities related to the development, management control, conservation and proper use of water resources; Metropolitan Waterworks and Sewerage System; Local Water Utility Administration; Rural Waterworks Development Corporation; Ministry of Public Works and Highways; Ministry of Local Government; Ministry of Health.

Decade plans

The Water Decade has been considered as a special project by the government and, to ensure success, all the different agencies created a Project Management Office. A Project Implementation and Review Committee was created to achieve effective implementation and the PIRC reviews the progress of the whole Water Decade programme, evaluating implementation, recommending solutions to constraints and redirecting the implementation whenever necessary.

Water supply

The number of water supply facilities constructed by different agencies in 1985 were: 6,972 (level 1); 193 (level 2); and 54 (level 3).

Priorities in selecting water supply systems for rural areas are based on: community commitment and capacity; community needs; community development level and potentials; and capital cost.

Groundwater from springs and wells which requires little or no treatment to make it safe is preferred to surface water when selecting appropriate water supply projects in rural areas Shallow wells wherever possible are much preferred to expensive deep wells.

Intensification of a toilet construction campaign is being pursued through a community participation in the same way as water quality control in all public water sources is being stressed through the Primary Health Care Approach. **continued on page 148**

ACTUAL AND TARGET LEVELS OF COVERAGE

Urban population served (000's)					Rural population served (000's)		
Population	House Connections	Standposts	Sewerage Connections	Other	Population	Safe water supply	Sanitation
(1980 Actual)					(1980)		
17,392	9,303	2,012	206	13,955	30,522	13,034	20,486
(1985 Actual)					(1985)		
22,243	7,851	3,094	789	17,676	33,093	17,705	18,519
(1990 Targets)					(1990)		
26,716	17,000	3,737	1,024	22,174	35,458	26,000	21,275

UNIT COSTS OF CONSTRUCTION (US $ PER CAPITA)

Urban				Rural	
House connections	Standposts	Sewer connections	Other	Water supply	Sanitation
33.90	1.05	31.07	41.00	21.93	11.60

Philippines (cont)

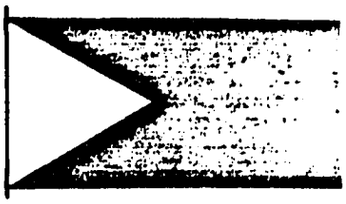
The programming of Decade implementation activities starts from the community, based on the necessary data and information and is then passed on to the Municipal, Provincial, Regional and up to the National PMOs. Whereas policy, guidelines, technical assistance and logistic support is provided from the national level down to the *barangay* level.

Of the factors influencing the success of the decade aims, community participation, intensified health education, government support in funding projects, international and bilateral financial support and WHO technical assistance are seen to be amongst the most influential features of the Decade fulfilment to date.

WATER CONSUMPTION l/c/d			
For design		Actual	
Urban	Rural	Urban	Rural
194	60	155	50

UNIT COSTS OF WATER PRODUCTION (US$/m³)		
Average cost	Operation average water tariff	Progressive water tariff
0.05	0.15	Yes

COST ESTIMATIONS FOR DECADE TARGETS AND INVESTMENT TOTALS	
Estimated cost to reach decade targets (US $ millions)	1,943
Investment totals (US $ millions 81-85)	566



APPENDIX D

POPULATION BELOW POVERTY LEVEL IN SELECTED COUNTRIES OF ANE REGION

APPENDIX D
POPULATION BELOW POVERTY LEVEL IN SELECTED COUNTRIES OF ANE REGION

(Source: A.I.D. Annex II Asia/Near East - Fiscal year 1990)

Country	Urban	Rural	Year of Data
Philippines	52	64	1985
Burma	40	40	--
Pakistan	32	29	1979
Bangladesh	29	47	1986
Morocco	28	45	1979
India	28	35	1984
Indonesia	26	44	1978
Egypt	21	25	1978
Thailand	15	34	1978
Jordan	14	17	1979

Absolute poverty income level is defined as that below which a minimal nutritionally adequate diet plus essential nonfood requirements are not affordable.

APPENDIX E

TRENDS IN TOTAL POPULATION GROWTH IN SELECTED COUNTRIES OF ANE REGION

APPENDIX E

TRENDS IN TOTAL POPULATION GROWTH IN ASIA AND THE NEAR EAST

(Millions)

Country	Year			
	1950	1980	1990	2000
Near East				
Morocco	9	19	25	30
Tunisia	4	6	8	9
Egypt	20	42	53	64
Jordan	1	3	5	6
Yemen A.R.	3	6	8	11
Oman	0.5	1	1	2
Asia				
Pakistan	40	86	112	141
India	358	689	827	964
Bangladesh	42	88	115	146
Sri Lanka	8	15	17	20
Nepal	8	15	18	23
Burma	18	34	41	49
Thailand	20	47	56	66
Philippines	21	48	61	74
Indonesia	80	151	181	211

TRENDS IN RURAL POPULATION IN ASIA AND THE NEAR EAST

(Millions)

Country	Year			
	1950	1980	1990	2000
Near East				
Morocco	7	-	13	14
Tunisia	3	3	3	3
Egypt	11	23	27	28
Jordan	0.6	1	2	2
Yemen A.R.	-	5	7	8
Oman	0.5	1	1	2
Asia				
Pakistan	37	62	78	88
India	296	541	584	634
Bangladesh	40	78	97	120
Sri Lanka	7	11	13	15
Nepal	8	14	16	19
Burma	15	26	31	32
Thailand	18	36	43	52
Philippines	15	31	35	38
Indonesia	70	100	111	134

RURAL POPULATION AS PERCENTAGE OF TOTAL POPULATION

Country	Year			
	1950	1980	1990	2000
Near East				
Morocco	77	-	52	47
Tunisia	75	50	38	33
Egypt	55	55	51	44
Jordan	60	55	51	33
Yemen A.R.	-	83	40	73
Oman	95	90	90	90
Asia				
Pakistan	93	72	70	62
India	83	79	71	65
Bangladesh	95	89	84	82
Sri Lanka	88	73	76	75
Nepal	95	93	89	83
Burma	83	76	76	65
Thailand	90	77	77	79
Philippines	71	65	57	51
Indonesia	88	66	61	63

APPENDIX F

NATURAL RESOURCES MANAGEMENT IN ANE REGION

APPENDIX F

NATURAL RESOURCES MANAGEMENT IN ANE REGION

In the Asia-Pacific region, the demand for natural resources is expected to increase dramatically over the next 15 years because of accelerating population and economic growth and more capital- and technology-intensive production. The region's population will increase by about 40 percent (in the cities by about 90 percent) and economic activity will double the demand for natural resources. Consequently, without careful planning and management, the following environmental conditions may materialize:

- The loss of about 11 percent, or 80 million hectares, of current forest cover, and the consequent danger to critical watersheds and habitats, increase in soil erosion, and frequency of flooding and drought
- The salinization, alkalinization, and waterlogging of existing and newly irrigated land, and the widespread incidence of malaria, schistosomiasis, and other diseases
- The possible desertification of many marginal areas as a result of grazing by an increased number of livestock
- The depletion or destruction of many near-shore fisheries because of certain fishing practices near coral reefs, the clearance of mangroves, and water pollution
- A five-to-ten-fold increase in air and water pollution because of a 300 percent increase in the number of motor vehicles and a 150-200 percent intensification of industrial and mining activity
- An increase in environmental and health problems because of a possible doubling in the use of pesticides and their misuse

Underlying such problems are strong political, economic, and social factors which often limit opportunities to find or implement more beneficial methods of natural resources usage. Economic pressures force many developing nations to rapidly exploit their natural wealth at the expense of future needs. Rates of exploitation exceed the regulatory capacities of governmental and traditional institutions, and cultural values and popular attitudes discourage resource management.

In addition, planned interventions generally lack an appreciation of the complexities and dynamics of interactions within and between natural and man-made systems, define objectives in narrow sectoral terms, use production technologies inherently unsuited to particular conditions, overvalue immediate production gains, and fail to internalize the costs of their impacts on other economic development activities.

Despite these enormous problems there are signs of change for the better, partly because of a realization that constraints on effective natural resources management also hold back economic and social progress. In some areas forests are being replanted. A few nations are taking steps to reduce soil loss and desertification. The need for family planning is becoming better understood. Water supplies are being protected and pest management practices involving the use of pesticides are being reappraised.

Encouraging though these developments are, they are far from the adequate, vigorous, determined initiatives needed if greater human suffering and environmental degradation are to be avoided. There are no quick and easy answers. The problems of population, natural resources, and environment are complex and long-term and are exacerbated by linkage with poverty, inequality, and social conflict.[6]

Case Study - Natural Resources in Indonesia[7]

Natural resources management practices in Indonesia are predominantly influenced by the government's economic policies, private business objectives, and the socioeconomic interests of rural, and increasingly, urban communities. Present economic policies, particularly those which stimulate export earnings, favor short-term resource exploitation and undervalue the long-term benefits and costs of promoting sustainable development. Sectoral policies, which are frequently translated into inefficient production targets, are producing distortions in resource use, are stimulating the development of marginal land resources in the Outer Islands and upland areas of the Inner Islands, and are leading to rapid watershed and forest degradation. While the decline in government revenues has meant sharp reductions in sectoral budgets and funding for natural resources analysis, it has also highlighted the need to reduce inefficient and environmentally harmful programs and policies (e.g., subsidies on pesticides).

Ultimately, these economic forces, reinforced and often biased by government institutions, strongly influence individual actions and capabilities to manage natural resources, and frequently act as disincentives to sustainable resource use. The environmental effects of these factors can be readily seen in

Indonesia and are constraining sustainable development. Some of the major problems include:

- The deforestation of nearly 50 million hectares of Indonesia's rich tropical hardwoods since 1950 at a rate of 0.6 to 1.0 million ha annually. At current harvest rates and under present practices, it is estimated that within 30 years all of Indonesia's concession areas may be selectively logged.

- The degradation of 36 of Indonesia's 125 watersheds, in which 8.2 million hectares are considered critical. Erosion rates have reached 40 tons/ha, the utility of the downstream infrastructure has been reduced, and hydrological functions have been threatened in the degraded watersheds.

- The loss of biological diversity and of the habitats of rare and endangered species from the conversion of forest land to agriculture. By the year 2000, an estimated 6 to 12 million ha may be converted.

- A nearly 200 percent increase in pesticide use since 1981, increased contamination of food products, and decreased effectiveness in controlling rice pests. In 1986 alone, 1 million tons of rice were lost to insecticide-resistant pests.

- The degradation of water quality and declining water supplies as a result of poor upstream agricultural, industrial, and urban management practices. This has led to high levels of heavy metals, pesticides, and sediment load, declining fish and shrimp productivity, and fish kills.

- Increasing quantities of liquid, solid, and toxic wastes from industrial and processing activities.

Case Study - Natural Resources in Thailand[8]

Faced with ever-keener competition for jobs and for space to live, work, and relax, Thais are beginning to confront a number of questions which hitherto seemed comfortably remote. There is a feeling that many economic development projects have paid too little attention to the long-term sustainability of their natural resource base; that laws and regulations have sometimes been weighted in favor of the unscrupulous, rather than the conscientious; and that a fair distribution of the wealth derived from Thailand's natural resources is as distant a prospect as ever.

Malpractices are certainly prevalent in some areas, reducing the potential wealth to be derived from natural resources. In the mining industry, for example, outsiders have encroached upon the extraction rights granted to legal concession holders. Instances of this problem have been reported from Phangnga, in offshore tin mining; from Doi Ngom and Khao Soon, in wolfram ore mining; from Doi Mok, in scheelite ore mining; and from Chonburi, in antimony ore mining. The mob mining scene in some of these areas denies equality of wealth distribution, and short-changes the nation in terms of lost royalties and revenues and the reduced maximum ore recovery from affected concessions.

In the forestry industry, encroachment and poaching are very much the order of the day; even the national parks and wildlife refuges are not immune. In some areas the thinking has changed from maximum sustainable yield to last-ditch protection. National policy calls for the preservation of 40 percent of Thailand's surface area under forest cover, yet the latest data show that only 29 percent remains under forest - and the downward trend seems set to continue. At the current rate of reforestation, restoring the missing 11 percent of forest cover, which would involve rehabilitating more than 35 million rai of deforested land, will take well over 115 years, always assuming that today's deforestation can be stopped in the meantime.

In the Gulf of Thailand, the maximum sustainable yield of major fisheries is clearly being exceeded by as much as 50 percent in some demersal and pelagic fisheries. Illegal fishing practices, including fishing out of season, in off-limits protected areas, or with destructive equipment, combine with the destruction of mangrove ecosystems and increasing pollution to threaten commercially important fish stocks. Pollution in the upper Gulf has crippled important mariculture operations; the production of bivalves by upper Gulf mariculture was cut by two-thirds between 1977 and 1983.

Inevitably, the rules and regulations designed to ensure the proper management of fishery resources, however well-intentioned, will fail unless they have the support of those who do the fishing. If those who fish cannot be persuaded that today's overfishing undermines tomorrow's yields -- the yields on which their own children will depend -- then there is little hope of arresting the process of decline.

Ultimately, Thais may have to accept the fact that highly valued foods like fish roes and sea-turtle eggs will have to be dropped from the menu to ensure that future generations may harvest these species for food.

As far as renewable land resources are concerned, too many upland farmers are ignorant of - or ignore - the need for soil conservation. The loss of topsoil and the decline in soil productivity are real growing threats to future security. Whereas slash-and-burn agriculture was once more closely attuned to the ecosystems exploited, it now causes untold ecological damage. In part this is because hill tribe and other upland farmers believe that they are immune from prosecution under the forest laws if no trees are left standing on the land they have cleared. The result is that natural regeneration is slowed, if it ever takes place at all.

In the process, major watersheds are being denuded and increasing silt loads washed down into the nation's rivers, silting up dams and causing extensive downstream flooding. Meanwhile, the mistaken idea that abundant clean water is a free resource still persists, discouraging investment in water-efficiency technologies and practices.