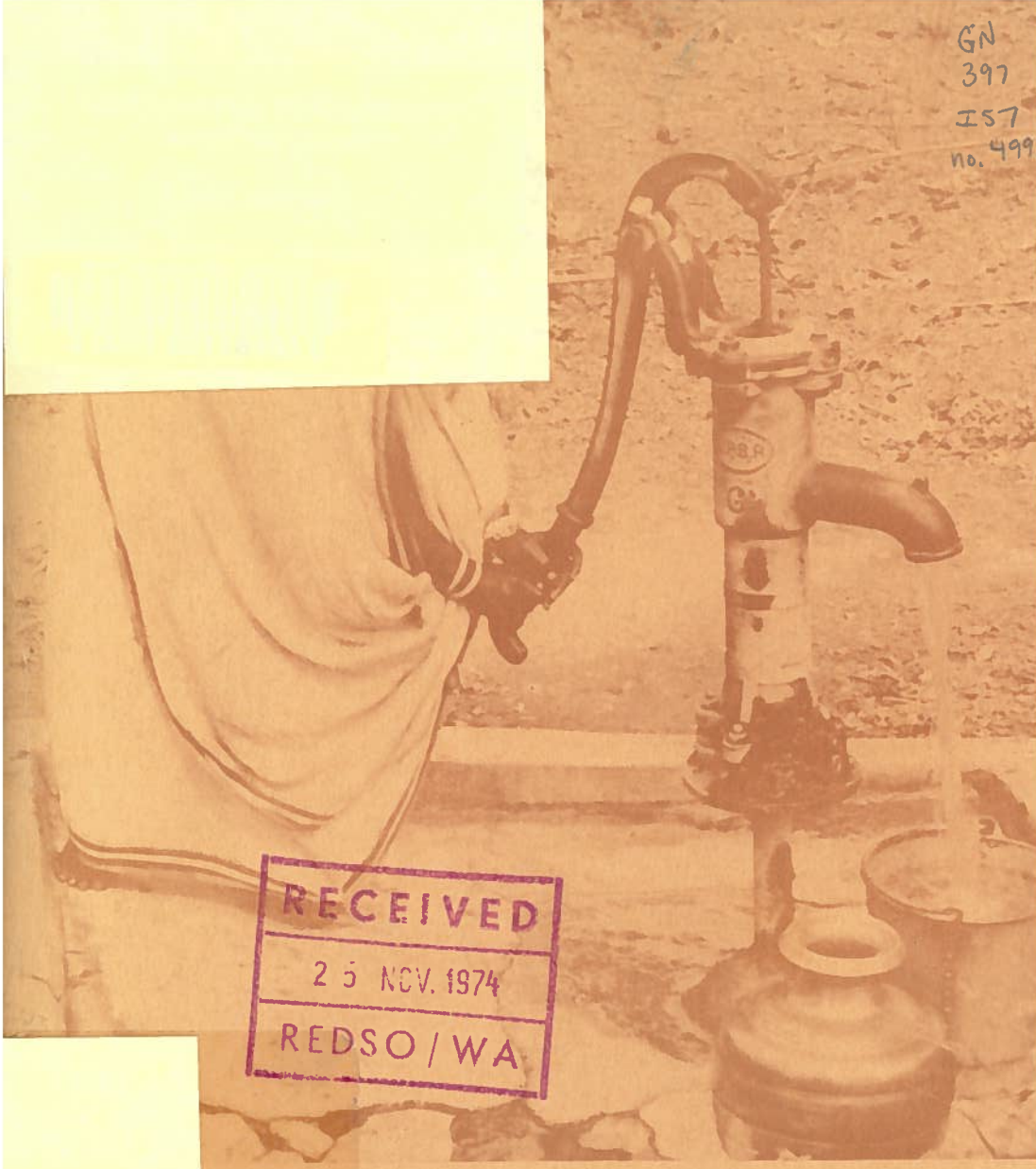

COMMUNITY WATER SUPPLY IN DEVELOPING COUNTRIES

Department of State
Agency for International Development
Washington, D.C. 20523

The history and status of United States technical and capital assistance (a billion dollars since 1942) for water supply in developing countries are reviewed by region and country, including its context as part of foreign aid generally and its growth from early days (1942) in Latin America to a global program and an important element of multilateral programs.

The essential role of water supply in developing countries (why foreign aid for water supply?) is reviewed with particular attention to health (500 million water-related illnesses annually), economic development, nutrition, population control, and political and social development. Current deficiencies and needs are outlined by region.

Six projects from the hundreds undertaken are highlighted as examples of educational assistance (Regional School of Sanitary Engineering for Central America), development and strengthening of a national water supply program (Brazil), institution-building (Department of Public Health Engineering in East Pakistan), technological development (new handpump for wells), capital assistance (John F. Kennedy Memorial Water System in Yemen), and rural water supply (Thailand).

Lessons and observations based on a quarter-century of experience include: (1) community water supplies in developing countries are still generally inadequate despite recent progress; (2) community water supplies are essential investments for community development and sustained economic growth, they encourage progressive forces, emphasize human progress, and stimulate self-help concepts; (3) a self-liquidating water supply system is a feasible goal for urban communities of even the poorest countries; (4) well-conceived, well-engineered water supply projects can attract international financing; (5) preventive health programs that ignore water supply are invariably failures; (6) deficiencies in personnel and in institutions are currently the critical factors in development of community water supplies, not technology and probably not capital--a realistic program for improvement will require attention to institution building and personnel training; (7) the major accomplishment of the Community Water Supply Program is not hardware but the progress to date in establishment or strengthening of water supply institutions; however technical assistance must be continued until these have ripened to full maturity.

Key Words: water supply, international water supply, foreign aid, federal government, sanitation, history of water supply.

COMMUNITY WATER SUPPLY IN DEVELOPING COUNTRIES:

A Quarter-Century of United States Assistance

A Report by

Frederick E. McJunkin

for the

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United States Public Health Service

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Much of the factual background was assembled by Mr. Vincent Lamoureax, private consultant, and Mrs. Jean Pease, PHS/OIH, who compiled a massive country-by-country summary of water-related foreign aid projects. The report was greatly strengthened by the assistance, comments, and reviews of Mr. Leonard M. Board, PHS/OIH, and Mr. Arthur H. Holloway, AID/WOH/HS, both direct participants in the programs described herein. The assistance of Dr. H. G. Baity, formerly Director, Division of Environmental Health, World Health Organization, and of Dr. Daniel A. Okun, University of North Carolina, should also be noted.

Where opinion, conjecture, prophesy, or other subjective statement enters the report, the author is solely responsible. Questions of inclusion and omission were also resolved by the author.

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PREFACE

The purpose of this publication is to summarize in general, yet concise, form the community water supply activities of the Agency for International Development (AID) and its predecessors.

This specification excludes many U.S. sponsored direct and indirect activities in overseas water supply development that complement and are related to AID goals and programs. No systematic review is presented, for example, of water-related Peace Corps, Food for Freedom, military civic action, disaster and emergency relief, or Export-Import Bank activities. The United States also provides partial financial support for the multilateral water supply activities of the United Nations Development Program (UNDP); United Nations Childrens Fund (UNICEF), active in water supplies for rural areas and schools; the World Health Organization (WHO); Pan American Health Organization (PAHO); International Bank for Reconstruction and Development (World Bank, IBRD); Inter-American Development Bank (IDB, BID); Social Progress Trust Fund; and others.

Significant water supply related activities through the private sector are also underway. In the developing countries, for example, American consulting engineers, under contract with national or multilateral agencies, are now preparing studies and designs for water supply facilities with a total estimated construction cost of $1,300,000,000. Many wells and village water supplies have been sponsored by American missionaries and church affiliated groups. Numerous volunteer groups, e.g., Volunteers for International Technical Assistance (VITA), are also active, albeit on a smaller scale.

In addition to assistance by the United States and by the multilateral agencies indicated, it is worth noting that some 22 other donor nations, including the Soviet Union, are active in developing community water supplies in Africa, Asia, and Latin America.

Readers of this report are encouraged to read a companion document, "Manual on Guidelines and Criteria for International Assistance to Community Water Supply Activities," to be published concurrently with this document, and which extensively reviews public water supply programs in the developing countries and outlines technological and managerial guidelines for external assistance.

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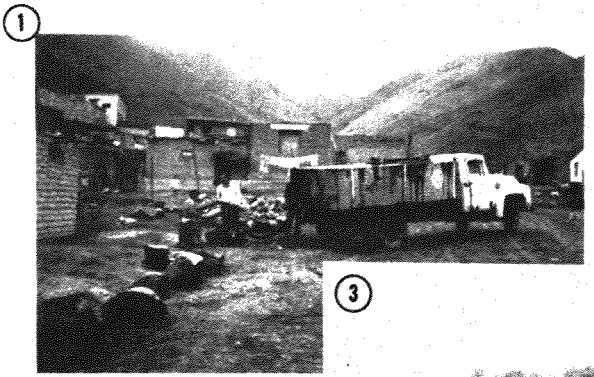

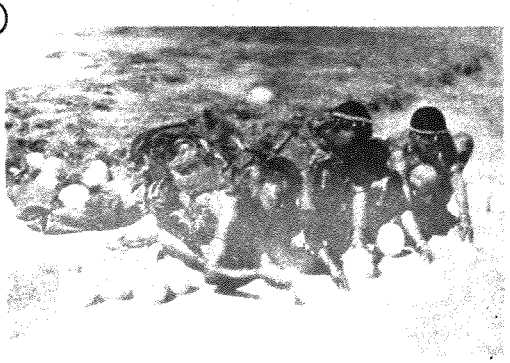

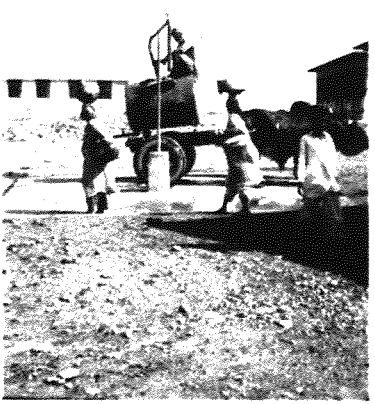

WATER
DISTRIBUTION
WITHOUT
PIPES

WATER DISTRIBUTION WITHOUT PIPES

FIGURE I. (Frontispiece)

1. Selling water near Lima, Peru
2. Filling ostrich egg "canteens," Kalahari Desert, Southern Africa
3. Rolling barrels home after filling at community tap near Bangi reservoir project, Guanabara, Brazil
4. Selling water in the outskirts of Karachi, Pakistan
5. Water carriers for suburbs, Keradj, Iran

I

THE ROLE OF WATER SUPPLY IN DEVELOPING COUNTRIES

(Why Foreign Aid for Water Supply?)

Introduction

'Don't drink the water' is standard advice for the North American on his way to a developing country. Is such instruction outdated folklore or updated fact?

Unfortunately the advice is all too valid. A 1962 World Health Organization (WHO) study[1] of the world-wide problems of public water supply may still be considered representative of conditions in the 75 developing countries included. The distressing findings of this study were that, in those countries, only about one-third of the urban population and less than 10 percent of the total population are supplied with piped water. Even where piped supplies exist, their safety is often limited by intermittent service and failure to meet even minimum hygienic standards.[2] An additional one-fourth of the urban population is able to obtain water from public outlets, often several hundred meters from their homes, but the remaining 40 percent of the urban and at least 70 percent of the total population have no access to any safe and reliable source of water.

This existing tremendous backlog of needs for water supply is not only a serious problem in itself but is aggravated by growing population pressures. The rate of population growth in developing countries is almost 40 percent greater than the world-wide rate. This trend is even more evident in urban centers where migration is responsible for an urban population growth rate several times that of the rural rate.

The magnitude in monetary terms of the immediate water supply needs of the developing world is not really known. Authoritative estimates range from 6 billion to 25 billion dollars as the cost of the work that urgently needs to be done. It may be much more--in the first 50 years of this century the United States alone spent over 30 billion dollars (replacement value) on public water supplies[3]

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[1] Dieterich, Bernd H., and Henderson, John M. "Urban Water Supply Conditions and Needs in Seventy-Five Developing Countries," World Health Organization Public Health Papers, No. 23, Geneva, 1963. See especially pp. 14-15.

[2] For example, 100 percent of the piped water supplies in Burma and 74 percent of those in India are reported to be intermittent by the WHO Regional Office for South-East Asia. Ibid., p. 15.

[3] Picton, Walter. "Water Resources Developments, Capital Investment Values, 1900-1965," U. S. Department of Commerce, 11 pp., Washington, D. C., June 1959.

--and it is certain to be much more by the time all needs are met. Increasing population growth, urbanization, and hopefully, increased standards of living with their accompanying higher levels of service can easily multiply any estimate made today.

Another critical shortage is skilled manpower. Specialists in international finance report that a critical shortage today is the lack of well planned projects that meet lending standards, and this in turn, derives from the shortage of trained personnel to carry out the complex planning functions. George D. Woods, at the time president of the World Bank, described this problem to a recent meeting of the Economic and Social Council of the United Nations:

> "One of our major operating problems has been to find projects of high economic priority that have been well conceived and well engineered... .Neither general programs nor even generous supplies of capital will accomplish much until the right technology, competent management, and manpower with a proper blend of skills are brought together and focused effectively on well conceived projects." [4]

Similarly, many of the countries in greatest need of new water facilities lack the technical staff and administrative machinery to operate and maintain them after construction.

Water and Health

The consequences of unsafe water are serious, far more than just the "tourista" or "Delhi belly" that the foreign visitor suffers at his hotel. Each year an estimated 500 million people are affected by incapacitating water-borne or water-associated illness, and as many as ten million people--about half of them infants--die.[5] One hospital bed in four is occupied by a patient ill from water-borne disease.[6] The World Health Organization (WHO) in its recently pub-

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[4] Quoted in "WATER FOR PEACE, A Report of Background Considerations and Recommendations of the Water for Peace Program," Interdepartmental Committee on Water for Peace, U.S. Government Printing Office, Washington, D. C., March 1967, p. 38.

[5] Campbell, Eugene P. "Statement on Community Water Supply Program," in "Hearings on Mutual Security Act of 1959, Committee on Foreign Relations, U.S. Senate, 86 Congr., 1st Sess., pp. 754-761, May 18, 1959. These numbers, obviously educated 'guesstimates,' are widely and authoritatively quoted without source attribution. Campbell's statement is the earliest known to this author.

[6] Anon. "The Spearhead Program is Launched: Water for Everybody," World Health, Vol. 13, No. 3, pp. 22-23, March 1960. See also N.Y. Times, March 20, 1966.

WATER AND HEALTH

ROLE OF WATER	DISEASE	REMARKS
Major Vehicle for Direct Transmission	Cholera	Classic example of water-borne disease
	Diarrhea and Enteritis	Symptomatic of many infections and toxemias; often non-specific
	Dracontiasis (Guinea worm disease)	Ingestion of infected *Cyclops*; 50,000,000 active cases
	Hepatitis, Infectious	100,000 cases in 1955 Delhi outbreak
	Leptospirosis (Weil's disease)	A zoonosis; ingestion of urine of infected animal
	Paratyphoid Fever	Milder than typhoid
	Schistosomiasis (Bilharziosis)	Requires aquatic snail as intermediate host and water contact, with skin penetration by cercariae, or, less often, their ingestion; over 150,000,000 active cases
	Typhoid Fever	Major 19th-Century U.S. disease
Occasional Vehicle	Dysentery, Amebic (Amebiosis)	World-wide endemicity
	Dysentery, Bacillary (Shigellosis)	Many outbreaks due to cross-connections
Possible Vehicle	Poliomyelitis	Virus is found in sewage
	Pleurodynia	Non-fatal; Coxsackie virus
	Tularemia	A zoonosis; usually direct contact
Clean Environment (Lack of Safe Water)	All above except Schistosomiasis and Dracontiasis	
	Ancylostomiasis (hookworm)	Water-borne sanitation best preventive
	Ascariasis	Avoid ingestion
	Echinococcosis (Hydatidosis)	Food and drink contaminated by dog feces
	Enterobiasis	Personal hygiene
	Mycoses	Fungal diseases; personal hygiene
	Relapsing Fever	Louse-borne; poor sanitation
	Scabies	Personal hygiene
	Trachoma	150,000,000 victims with impaired vision
	Trichomoniasis	*Trichomonas hominus, Giardia lamblia*; contaminated food and drink
	Typhus Fever	Louse-borne; crowding, poor sanitation
Vector Habitat	Clonorchiasis	Ingestion of parasitized fish
	Dengue	Mosquito
	Diphyllobothriasis	Ingestion of parasitized fish
	Encephalitis	Mosquito
	Fasciolopiasis	Ingestion of water chestnuts containing cercariae
	Filariasis	Mosquito
	Loaiasis	Aquatic fly (*Chrysops*)
	Malaria	Mosquito
	Onchocerciasis	Aquatic fly (*Simulium*)
	Paragonimiasis	Ingestion of parasitized crabs and crayfish
	Rift Valley Fever	Mosquito
	Yellow Fever	Mosquito
Carrier	Chemical Poisoning	Natural and polluted waters; acute and chronic
	Radiation Exposure	Cumulative

lished Third Report on the World Health Situation[7] lists the world's major health problems in the order of importance assigned to them

[7] World Health Organization. "Third Report on the World Health Situation, 1961-1964." Official Records of the World Health Organization, No. 155, p. 29, Geneva, April 1967.

by the 90 governments reporting. Environmental deficiencies, exemplified by poor water supplies, leads the list.

That impure water is a major cause of debility and death was recognized early, even before the discovery of bacteria. In a classic epidemiological study,[8] John Snow hypothesized that the violent cholera outbreak of 1854 in London was due to ingestion of contaminated water from the Broad Street Pump - a hypothesis quickly and simply proven when removal of the pumphandle halted the epidemic; this almost 30 years before Koch discovered the cholera vibrio in 1883.

Water was also early indicated as a vehicle of transmission of typhoid bacilli. The scientific evidence relating typhoid fever outbreaks to ingestion of impure water is voluminous.[9] There are many examples of gradual reduction and elimination of typhoid fever over long periods of time by provision of public water supplies. The experience of Massachusetts is an oft-cited historical example. (See Figure 2).[10] A similar but more contemporary example is the experience in Greece (See Figure 3),[11] where the number of typhoid cases decreased significantly with increasing investment in water supplies despite a rapidly decreasing number of vaccinations.

Such old enemies as cholera and typhoid seem remote to Americans. However within just the last decade, cholera caused by the El Tor vibrio has spread to new countries, from Korea to Iran. Periodic outbreaks even within our own country remind us that typhoid is still present. Less dramatic enteric illnesses take a heavy toll in the developing countries, especially among the young for whom they are frequently the leading cause of death. The infant mortality rate, i.e., deaths under one year of age per 1,000 live births, has been traditionally regarded as a measure of sanitary conditions in the broadest sense. The relationship between piped water supplies and infant mortality in the Western Hemisphere is

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[8] Snow, John. "On the Mode of Communication of Cholera," London, 1854. Republished by The Commonwealth Fund, New York, N. Y., 1936.

[9] For a summary, see Miller, Arthur P. "Water and Man's Health," AID Community Water Supply Technical Series, No. 5, pp. 23-29, Washington, D. C., April 1962.

[10] Fair, Gordon M., Geyer, John C., and Okun, Daniel A. "Water and Wastewater Engineering, Vol. 1, p. 1-16, Wiley, New York, 1966. The correlation was first shown by George C. Whipple.

[11] Costopoulos, J. M. "Water Supply and Public Health," Int'l Conf. on Water for Peace, Vol. 7, pp. 952-958, U.S. Govt. Printing Office, Washington, D. C., 1968.

shown in Figure 4.[12]

In addition to cholera and typhoid, water is an important agent for transmission of such other bacterial diseases as bacillary dysentery (shigellosis), helminthic diseases such as schistosomiasis (bilharziasis), protozoan diseases such as amebic dysentery (amebiasis), and viral diseases such as infectious hepatitis. Illustrative of the continuing attention to water supplies needed even after their provision was the outbreak of infectious hepatitis in Delhi, India in late 1955 with a total case incidence of 97,600 persons.[13] Due to low water in the Jumna River and the location of a drainage ditch discharging sewage some 700 feet below the Wazirabad raw water intake, an estimated 50 percent of the raw water pumpage at the water plant was backflow from the drainage ditch.

In addition to transmission of disease via contaminated water, the lack of water plays an important role. Of all the measures employed in hygiene of the person, washing certainly ranks first.[14] Cleanliness is intimately related to the transmission of bacillary dysentery (and other diarrheal disorders). The small child who rubs his itchy eye with a dirty finger has no realization that he may be pushing trachoma virus into his eye.[15] Given opportunity and encouragement to wash his hands, this might never happen. Cleanliness is inimical to external parasites such as lice and mites and to the fungi responsible for skin diseases. Use and reuse of common dining utensils without adequate cleansing is another route of transmission of disease. Without adequate safe water, conveniently available, many communicable

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[12]The correlation between water supply and disease is a complex matrix of cause and effect interrelated with innumerable other factors. However the downward trend of enteric disease with increasing water availability is universal, irrespective of per capita income and health expenditure. These trends are supported by incontrovertible laboratory, clinical, and epidemiological evidence that water is a major disease carrier. See Miller, op. cit., for a summary of the literature.

[13]Viswanathan, R. "Epidemiology," In "Infectious Hepatitis in Delhi (1955-1956): A Critical Study," Indian Journal of Medical Research, Vol. 45, Supplementary Number, January 1957. Pp. 1-29.

[14]A factor not always appreciated by diplomats. On the accession of Queen Elizabeth I to the throne, the Spanish emissary informed Madrid that her reign was likely to be brief due to her penchant for monthly baths!

[15]A recent investigation of trachoma prevalence in the Ryukyu Islands found eight to tenfold greater incidence among children from villages without treated central water supplies vis-a-vis those with. See Marshall, Carter L. "The Relationship Between Trachoma and Piped Water in a Developing Area," Archives of Environmental Health, Vol. 17, pp. 215-220, August 1968.

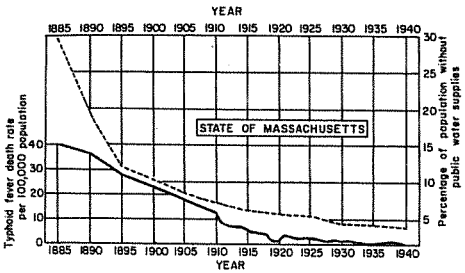

Figure 2: TYPHOID RATE VERSUS WATER SUPPLY OVER TIME: MASSACHUSETTS

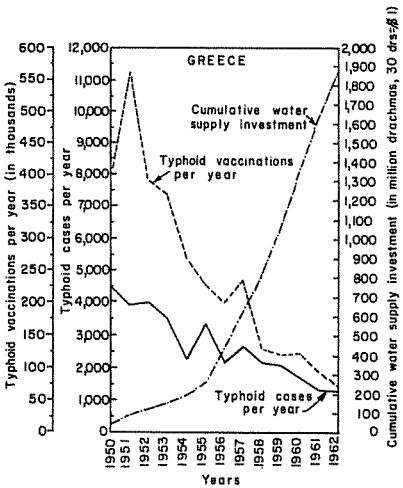

Figure 3

TYPHOID CASES AND VACCINATIONS VERSUS WATER SUPPLY OVER TIME: GREECE

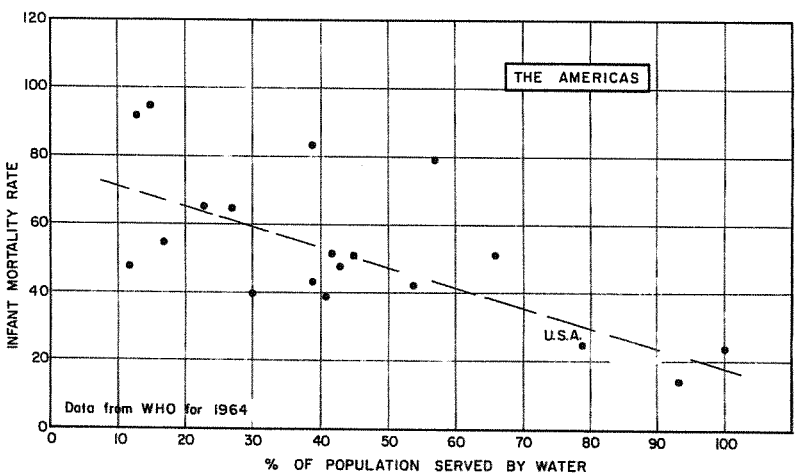

Figure 4: PUBLIC WATER SERVICE VERSUS INFANT MORTALITY

diseases continue to run their disabling course. Dispelling filth, on the person and in the surroundings, requires sufficient clean water to maintain hygienic conditions.

Studies in the United States, Brazil, and Guatemala furnish substantial evidence that the availability and quantity of water supply within homes significantly influence diarrheal disease rates. These studies indicate that:

> "...irrespective of ethnological or sociological differences, provision of potable water supply in sufficient quantitities and conveniently accessible to people will result in 30- to 60- percent reductions of diarrheal diseases."[16] (See Figure 6).

In addition to those diseases whose control may be approached in the provision of water for human consumption and sanitation, there is another group of water-related diseases, namely those for which an insect or other carrier spends an important part of its life in or on water. Measures to control these diseases are elements of water management directly affecting the health and well being of people.

The most widely known of these diseases is malaria; eradication and control measures for which are now focussed on the application of insecticides to the walls of houses. However, there are other fly and mosquito-borne diseases, such as dengue, encephalitis, filariasis, and yellow fever where proper waterflow and drainage are still essential control measures. This is important in elimination of environments conducive to breeding of these insects and also in avoiding potential harbors and breeding places in the design of new hydraulic facilities.

In many countries, 30 to 50 percent of the total population is debilitated by schistosomiasis (bilharziasis), a parasitic disease that requires appropriate fresh water snails as intermediate hosts. Free-swimming cercariae escaping the snails enter man through penetration of wetted skin or mucous membrane. Eggs of the adult worms enter the water via human feces, hatch and the free-swimming larvae enter the snails, completing the life cycle.

Irrigation adds to the danger of spreading this disease, particularly in the tropical zones. In the Gezira area of the Sudan, for example, irrigation increased the number of cases of "snail fever" over a period of 15 years from 1 to 20 percent of the adult population. In parts of the United Arab Republic, the rate increased

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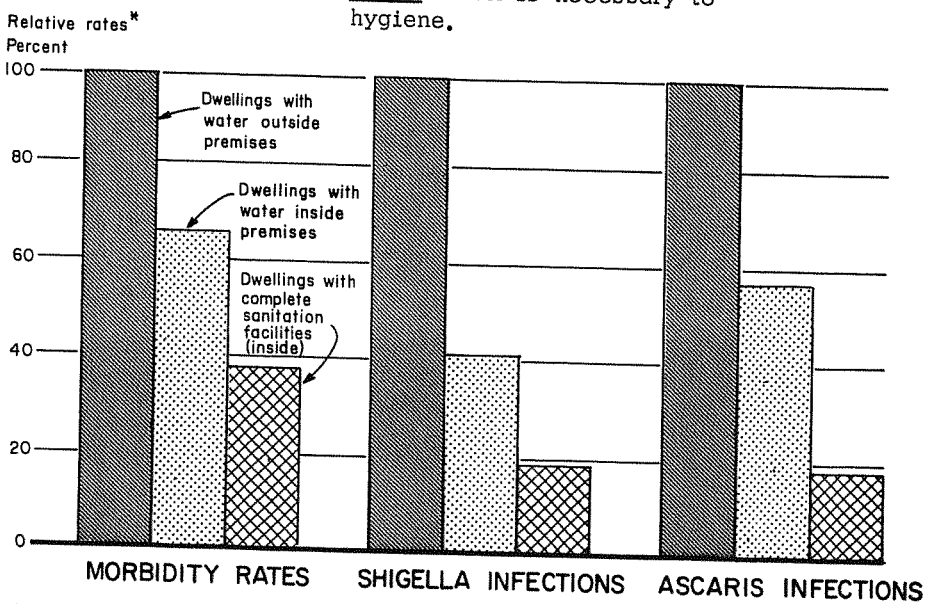
[16] Committee on Government Operations, U.S. Senate. "The U.S. Government and the Future of International Medical Research," Hearings, Pt. II, 86th Congr., 2nd Sess., p. 478, 1961. The statement was prepared by the U.S. Public Health Service.

Figure 5: WASHING THE BREAKFAST DISHES
Clean water is necessary to hygiene.



COMMUNITY WATER SUPPLY
REDUCTIONS IN DIARRHEAL DISEASES

Figure 6

from 5 to 75 percent over the same period. Extensive research is required for the development of practical control measures for both the disease and the snail.

The statistics quoted are descriptive not only of the magnitude of the global water supply problem but of the lack of truly accurate information as well. Although the estimates cited are widely quoted by the best authorities, they are at best gross estimates. However precision is not really needed. A comment from New Delhi is apropos:

> "An astronomer can, if pressed, give detailed figures on the decrease of luminosity which marks the passage of the sun below the horizon, but the least educated human knows that when the sun sets, it gets dark. So it is with water and health."[17]

We know the situation is dark, even if we do not know the exact shade of gray. Consequently, water supply has had a prominent position in cooperative international health programs from their inception and in United States foreign assistance generally. Some of the relative experience reaches back 25 years to agreements among the nations of the Western Hemisphere, and particularly to bilateral health programs set up by 21 Latin American republics and the United States in Rio de Janeiro in 1942. That the water supply picture in Latin America is much brighter than that in developing countries elsewhere is in no small measure directly attributable to these early efforts.

Water and Nutrition

Poor environmental sanitation, enteric disease, and malnutrition form a sinister and synergistic trio all too common in the developing world. Nutritional diseases rarely exist in isolation; they are often the combined effect of infection and malnutrition. The same individual often suffers from several deficiencies; deficiency diseases are the culmination of a slow process that is difficult to detect.

Much observed secondary malnutrition in developing countries is due to increased metabolic demands due to disease. One of the manifestations of infection, acute or chronic, is fever. For each degree rise in Fahrenheit, heat production by the human body increases about 7.2 percent. On the basis of the inadequate vital statistics available, in many areas, as many as one-third of the population will have an acute febrile infectious disease at any one time. A rough calculation of the "food" costs, i.e., caloric consumption, of these fevers for a population of one million, an average added

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[17] World Health Organization, Regional Office for South East Asia. "Community Water Supplies," SEA Env. San. 125, Annex 1, p. 2, New Delhi, October 23, 1962.

burden of fever of at least 20 percent, and for 30 percent of the population is 5000 tons of rice per month.[18]

In addition to increased metabolic demands, interference with absorption secondary to increased peristalsis from diarrhea leads to further nutritional deprivation and accentuation of malnutrition.[19]

Referring to the universal prevalence in developing countries of intestinal parasites, one medical observer is quoted as saying that "the worms of a certain semi-tropical country metabolize more of the produce of that country than do the inhabitants."[20] Most of these parasites can be attributed to impure and inadequate water supply and unsanitary disposal of wastes.

A possible relation between protein deficiency and diarrheal disease is suggested by data obtained on seasonal distribution of both conditions in Guatemala and El Salvador. Using hospital conditions in Guatemala and deaths in El Salvador, reported as being due to these conditions, definite seasonal patterns are noted - the peaks of hospital admissions and of deaths from nutritional deficiency occurring two to three months after the peaks noted for diarrheal disease[21] (See Figure 7).

Water and Economic Development

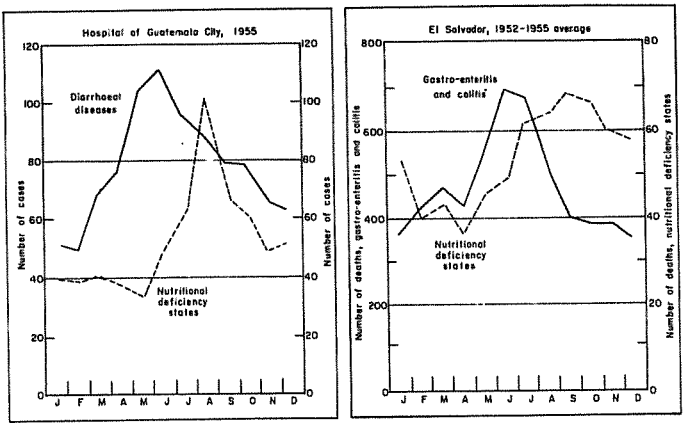
In developing countries, both internal development and foreign assistance programs today are tied, and desirably so, to economic development. Much of the success of the Community Water Supply Program is attributable to its demonstration within developing countries that water supply is an essential element in economic development, that water works can and should be financially self-supporting, and that the cost in urban areas of not having water supply and sewerage inevitably exceeds the cost of such facilities, even if only human productivity is considered. As a high-priority measure for community development, water supplies have certain favorable characteristics: improvement of the quality of human

[18] Pollack, Herbert. "Disease as a Factor in the World Food Problem," Institute for Defense Analyses, Research Paper P-378 (Revised), p. 7, April 1968.

[19] Lindenbaum, John. "Malabsorption During and After Recovery from Acute Intestinal Infection," British Medical Journal, Vol. 1965, II, pp. 326-329, August 1965.

[20] Hyde, Henry van Zile. "Sanitation in the International Health Field," American Journal of Public Health, Vol. 1, No. 1, pp. 1-6, January 1951.

[21] Verhoestraete, Louis J., and Puffer, Ruth R. "Diarrheal Disease with Special Reference to the Americas," Bulletin of the World Health Organization, Vol. 19, 23-51, 1958.



SEASONAL DISTRIBUTION OF CASES AND DEATHS FROM DIARRHOEAL DISEASE AND NUTRITIONAL DEFICIENCY STATES IN THE HOSPITAL OF GUATEMALA CITY AND IN EL SALVADOR

Figure 7

life, widely spread and readily visible benefits, assured public acceptance, catalytic effect on other development, high cost-effectiveness as a health measure, and high probability of success as a public investment.

In terms of economic development, investment in water supply is part of social overhead capital, usually defined as comprising those basic public services, e.g., police, public health, and transportation, necessary in order that directly productive activities may function. Statistical and historical research has shown the importance of social overhead capital in the total investment picture and, as a result, development economists are acutely conscious of its role. Investment in social overhead capital is advocated not because of its direct effect on final output, but because it permits, indeed stimulates, directly productive activities.

However, investment in social overhead facilities is not amenable to the usual investment criteria, particularly for those elements with high social content such as for example, education, health, and of course, water supply. To a large extent, "SOC [social

overhead capital] is largely a matter of faith in the development potential of a country or region."[22]

The many urgent and competing needs and the severe shortage of investment capital within developing economies have accentuated the search for rational, quantitative systems of capital allocation. These concerns for economic quantification have resulted in demands and attempts to assign "value," beyond the question of financial feasibility, to water supply projects in order that they may be ranked by the same criteria as other proposed investments. That this can be done or should be done is open to question.

> "At root, the issue would seem to be whether partial measurements of the economic attributes of intangible costs and benefits should be preferred to the frank admission that an economist has neither the qualifications nor the right, qua economist, to say anything at all about them. One argument has it that some information is better than none. But an argument of equal, if not greater force, is that some misleading quantitative information is worse than none; for it tends to allow the imponderables to masquerade as scientifically justified valuations in the decision-maker's frame of reference."[23]

One economic criterion that can be applied to water supply and other investments simultaneously is the social discount rate. The timing and scale of water supply investment are highly sensitive to changes in the discount rate.[24,25]

The application of concepts of benefit-cost analysis to water resources projects within the United States[26] has led to similar

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[22] Hirschman, Albert O. The Strategy of Economic Development, Yale Univ. Press, New Haven, Conn., 1958, p. 84. Hirschman popularized the term "social overhead capital."

[23] Scott, Norman. "Some Problems of Cost-Benefit Analysis of Social Investments," in Cost-Benefit Analysis of Social Projects, Rept. No. 7, United Nations Research Institute for Social Development Geneva, 1966, p. 57.

[24] Manne, A.S., ed. Investments for Capacity Expension: Size, Location and Time Phasing, MIT Press, Cambridge, Mass., 1967.

[25] D. T. Lauria of the University of North Carolina has extended Manne's work to the specific case of water supplies in developing countries. Publication is pending.

[26] President's Water Resources Council, The. "Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources," Senate Doc. 97, 87th Congr., 2d Sess., Washington, D. C., 1962.

practices for AID-assisted water resources projects overseas.[27] With a few exceptions, the federal government does not play a leading role in water supply investment within the U.S. Local and private investment analysts are not concerned with formal analysis of water supply benefits for U.S. systems; financial feasibility satisfies their requirements. For water supply projects, benefit analyses, considering the current state of the art, are largely futile exercises which for practical purposes are meaningless; financial feasibility and public desire control the decision.

Few quantitative studies exist as to the economic benefits involved, probably because most water supply professionals never felt them necessary. Res ipsa loquitor.[28] Those few that have been made generally have concentrated on economic returns in increased labor force productivity and savings in medical expenses.[29] They have generally found investments in water supply justified, e.g., returns conservatively exceed 800 percent,[30] repay the investment in 4 to 5 years,[31] and considering only public health benefits, break even in 10 years.[32]

Reviewing these studies, however, an economist might ask whether one must have full employment of the work force in order to credit

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[27] Agency for International Development. "Benefit-Cost Evaluations As Applied to AID Financed Water or Related Land Use Projects," Supplement No. 1 to "Feasibility Studies, Economic and Technical Soundness Analysis, Capital Projects," Washington, D.C., May 31, 1963. This manual suggests that where direct evaluation of benefits is difficult or impossible, "the usual practice is to consider that the benefit is equal to the cost of the most economically attractive alternative project which will produce the same products ... ." p. 3.

[28] The thing speaks for itself.

[29] In U.S. water supply practice, savings in fire insurance premiums are significant; fire protection is not yet a major consideration in planning water supplies in developing countries.

[30] Wagner, Edmund G., and Wannoni, Luis L. "Economias Previstas en Venezuela por Medio de la Construccion de Abastos de Agua Potable in Zonas Rurales," Bulletin of Inter-American Association of Sanitary Engineering, Vol. 1, No. 4, pp. 381-389, April 1948.

[31] Atkins, C.H. "Some Economic Aspects of Sanitation Programs in Rural Areas and Small Communities," World Health Organization Working Document Eng-San 156, 1953.

[32] Pyatt, Edwin E., and Rogers, Peter P. "On Estimating Benefit-Cost Ratios for Water Supply Investments," American Journal of Public Health, Vol. 52, No. 10, pp. 1729-1742, October 1962. Also in "The Quantitative Relationship Between Municipal Water Supplies and Economic Development," Northwestern University, Final Report, Project ICAc-1424, various paging, April 30, 1961.

increased productivity by individuals, i.e., is it a net benefit to the national economy if a sick worker can be replaced with an unemployed healthy one? A partial answer is that any investment in training the first worker is lost. Also, a healthful water supply through its effects in increasing the strength and energy of people can be considered as an investment in human capital. Studies comparing physical productivity of U.S. laborers vs. those in developing countries indicate that the health factor alone gives the U.S. worker a two-fold to three-fold advantage in pure physical productivity, negating to a great extent the differences in wage scales.[33]

Epidemiological surveys have yet to develop a measure of the boundary line between infection per se and economically critical disease. As with malaria, the major cost of hyperendemic disease to society is probably not the cost of medical treatment, funerals, or even time lost from work, but the 365 days spent each year in semi-productive work due to disease.

Some observers go so far as to interpret the relative economic development of the west vis-a-vis the tropical countries as due in large part to the twin specters of hunger and infectious disease that have long haunted the tropics.

Water supplies are highly effective as preventive health measures. On a cost basis a purely preventive program can be financed at a cost of about one-half of one percent of the national income, while a curative program will cost 10 times this amount.[34]

However certain arguments are valid without studies evaluating health benefits. First of all the real question at issue is not water or no water, but rather the level and cost of service. The number of deaths each year due to thirst is infinitesimal. Since water is a physiological need, all people are presently served. Existing services are, however, inadequate in quantity, quality, and reliability. Moreover they are not inexpensive; unit prices paid to water vendors, carrying filthy water on the backs of animals, are commonly five to fifty times those readily achievable by piped public water supply systems in urban areas. Costs for water transport are present whether the service is piped or not. The labor alone expended for carrying household water in many countries would be incomprehensible to the American housewife. Indeed, some anthropologists have contended that polygamy in some cultures was a product

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[33] Logan, John A. "The Quantitative Relationships Between Community Water Supplies and Economic Development," International Review of Tropical Medicine, Vol. 2, pp. 27-40, 1963. Also see Logan, John A. "The International Municipal Water Supply Program, A Health & Economic Appraisal," American Journal of Tropical Medicine and Hygiene, Vol. 9, No. 5, pp. 469-476, September 1960.

[34] Winslow, C. E. A. "The Cost of Sickness and Price of Health," World Health Organization Monograph Series, No. 7, 106 pp., 1951.

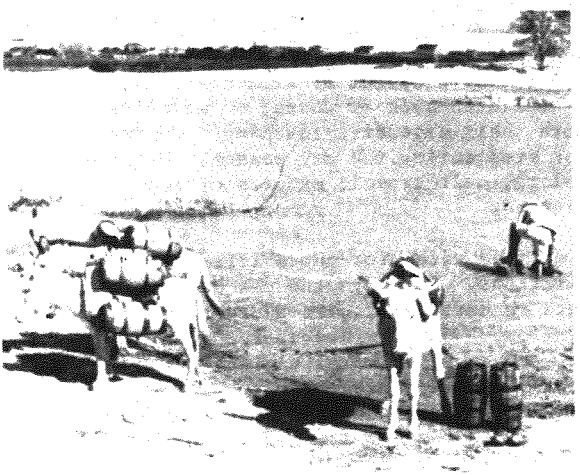


Figure 8: WATER VENDOR AT HIS "PLANT"
Untreated water is commonly sold by such vendors at 5 to 50 times the cost that would be required to maintain a public, piped, and treated water system.

Figure 9
WOMAN POWER
A common method of water transport in the developing countries.

of the need for woman power to find and transport water to her home and family. Paradoxically, on the basis of total cost to the community, provision of a centrally operated piped water supply may reduce the existing level of water supply expenditure.

The burden on a country of supporting large numbers of people blinded by trachoma or crippled by filariasis can be economically considerable. Children sick or absent on water carrying chores are unable to absorb their expensive teaching. Commerce, industry, and tourism slow or stop during the dry season. Water-borne epidemics, especially cholera, halt travel; exports of food and other commercial products are barred.

Just as water is vital for human life, it is also essential for industrial operations. Although the use and the amount required may vary, nearly all industries require a dependable source of water for efficient operation. Water is needed for cooling, processing, cleaning, transport, and as a raw material, depending on the nature of the industry. Water quality requirements of industry are widely variable but water suitable for drinking will meet the majority of needs.

Actually, the crux of the matter is the question of the quality of human life. Economic development is not a goal in itself, except as it improves human existence. Water supplies are clearly beneficial to all, meet a legitimate community need, are part of the infrastructure required for social and economic advancement, and are popular and wanted. Moreover, experience has demonstrated that they are feasible as self-sustaining, self-generating enterprises in urban areas of even the poorest countries.

Population Control

High fertility, high birth rate, and their accompanying demographic and disease patterns with accompanying high infant and preschool mortality form a circular, biologic system in the developing countries which, if unbroken, sustains the high birth rate (See Figure 11).[35] In many of these societies, the parents' only form of saving for the future, or social security for old age, is to have a few male children survive to adulthood. High fertility therefore is not perceived as disadvantageous where childhood mortality is high. We have then "the apparent paradox that a reduction in childhood mortality will reduce rather than raise the rate of our population growth."[36]

35 McDermott, Walsh. "Modern Medicine and the Demographic-Disease Pattern of Overly Traditional Societies: A Technologic Misfit," Journal of Medical Education, Vol. 41, No. 9, Pt. 2, pp. 137-162, September 1966.

36 President's Science Advisory Committee. The World Food Problem, Vol. 1, U. S. Government Printing Office, Washington, D. C., May 1967. p. 14. Also see Taylor, Carl E., and Hall, Marie-Francoise. "Health, Population, and Economic Development," Science, Vol. 157, pp. 651-657, 11 August 1967, and Viorst, Milton. "Too many born? Too many die. So says Roger Revelle," Horizon, Vol. 10, No. 3, pp. 33-37, Summer 1968.

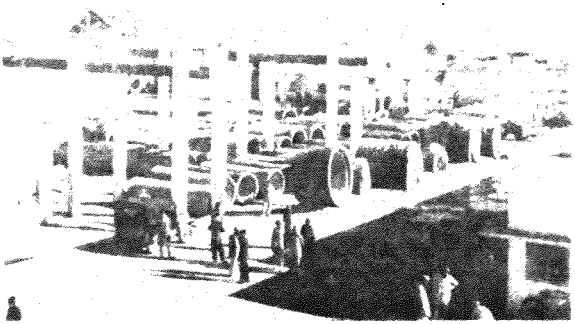
The infant who acquires a fatal diarrhea is not roaming the streets or fields; his world is the inside of his home and its immediate environs. To sanitize this environment without water is an impossible dream. Piped public water supply may very well be necessary to establish the preconditions for successfully lowering fertility. (Figure 4 showed a correlation between infant mortality and piped water supplies in Latin America.)

Political and Social Aspects[37]

Few public officials and administrators can long be oblivious to the public pulse. Water supply is without question high on the list of public needs and demands and therefore is politically appealing. In a world where officialdom can no longer turn its back on the people, the advantages of municipal water supplies are understandable by officials and leaders at all levels. These are projects which can be seen, they save the people time and effort so they can feel their value directly. They are conveniences which the public can immediately understand and readily accept while other values which require time to bear fruit have a chance to become effective. They are visible signs of progress - important to public morale and confidence in societies where economic development seems glacially slow to the man in the street. When the service is good and well administered, the fact that the public must pay for water still does not detract from its appeal.

[37]This section draws heavily from Wagner, E. G. "The ICA Community Water Supply Development Programme, Immediate and Long-Range Aspects," International Cooperation Administration, Washington, D. C., 12 pp., Mimeo., circa 1961.

Figure 10
PIPE FACTORY FOR GREATER KARACHI (PAKISTAN) WATER SUPPLY AND SEWAGE PROJECT
A secondary benefit.



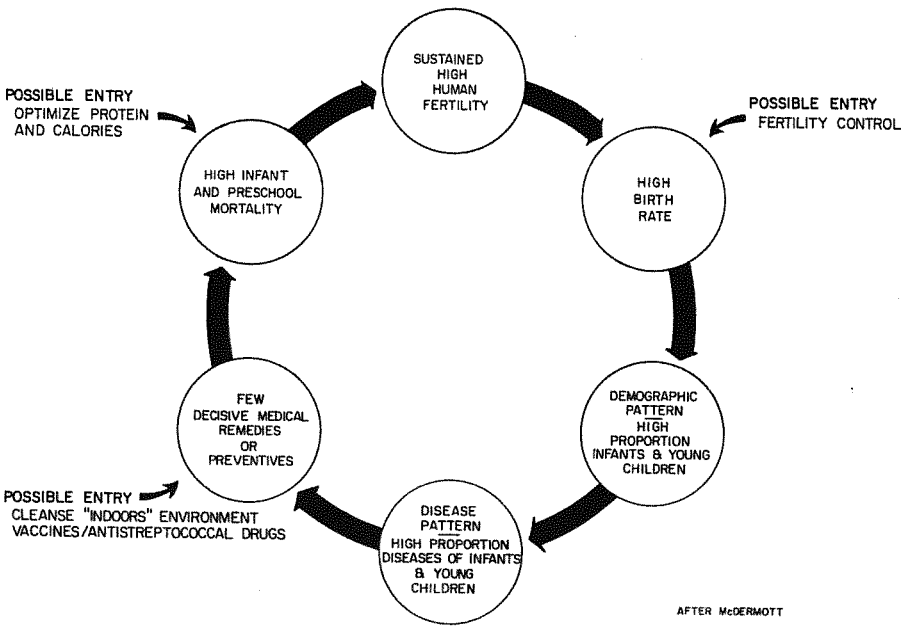


Figure 11: ENTRY POINTS TO BASIC CORE DEMOGRAPHIC-DISEASE PATTERN (INFANTS AND YOUNG CHILDREN) OF AN OVERLY TRADITIONAL SOCIETY

Another important factor is that programs can be started at both national and community level to fit the national and community situation. The programs can be tailored to the country or community. A small and modest country or community can have a small and modest program. A source, a storage tank, and a few pipes may be the beginning of a community water supply system. A small group of technicians can be the start of a water supply agency. Invariably these modest beginnings develop into important activities. Small water systems can be extended as demands build up and the water supply institutions will grow with them. History indicates clearly that the critical step is to get started, no matter on how modest a scale. Without exception systems grow and institutions develop to become powerful forces in developing water supplies.

Water supplies have great significance for improvement of municipal administration. Reform in water supply management offers a unique entree into the field of municipal government. This is, for the most part, an area which employs relatively few people so that mayors and city councils do not look upon the water department as a place to make large numbers of political appointments. At the same time it is obvious to the entire public when water is being supplied and when it is not, so that poor service is immediately apparent.[38] This is an area therefore in which most towns and cities are anxious to seek and willing to accept assistance and follow reform recommendations even to the point of giving up much of the control of the system. Improvement in the management of the water system therefore not only will directly benefit the public through improved water service but can be the springboard for general improvement in municipal administration. With the increased tempo in the growth of towns and cities this can be of major significance. Administration at the municipal level is intimately related to the development of democratic institutions.

One of the most important health aspects of social progress is that of security. Individual health is a matter of deep personal concern to all peoples everywhere. Depending on the part of the world in which one lives the dangers to health come from different sources. In the underdeveloped areas the greatest danger is the very environment in which the people live, and water, which should be one of the most beneficial factors in this environment is, by its absence or condition, one of the lethal and insidious factors. Since water is a prime necessity for biological life people must have it every day, all their lives. Lacking a better source they willingly accept and consume whatever is available, in whatever condition it is found, completely innocent of its lethal qualities. In the older age groups biological survival and partial immunity serve to reduce the ill effects but in the young the toll is

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[38] A desirable characteristic of public services in developing countries for example, compare the quality of maintenance of national airlines to that of national highways.

enormous. A safe and abundant water supply therefore is a long and sure stride toward security.

Summary: Water Supply and Community Development

As a high-priority measure for community development, water supplies have certain favorable characteristics:

(1) improvement in the quality of human life,
(2) widely spread and readily visible benefits, perceptible to and desired by the average citizen,
(3) assured public acceptance,
(4) needed and self-sustaining element of social development,
(5) assured high cost-effectiveness as a health measure,
(6) assured high probability of success as a financially self supporting public investment,
(7) reduced aggregate current costs of water supply through economies of scale, and the
(8) required technology is already available.

II

DEVELOPMENT OF FOREIGN ASSISTANCE PROGRAMS

Historical Development

Although large-scale foreign aid programs are an outgrowth of World War II, Congressional support dates back as early as 1794 when $15,000 was authorized for a relief program to help French refugees who fled to Baltimore from Santo Domingo. United States foreign aid efforts in the nineteenth century were primarily for disaster relief. Examples include destructive earthquakes in Latin America, Italy, and Japan; famine in Ireland, China, Russia, Morocco, and India; floods in China; volcanic eruption in Japan; and war relief in France, Germany, and Cuba. In addition to disaster relief activities, the U.S. Government provided a limited number of technical services to other countries, at their request, in agriculture, public health, education, public works, and other fields.

Private citizens in the United States became involved in programs of international health early in the nineteenth century. The first American medical missionary efforts began about 1836 and continue to this day. The number of wells drilled by these groups is unknown but is well into the thousands.

The Rockefeller Foundation was the first major non-sectarian organization to provide significant technical and financial assistance to the developing countries in medicine and public health, beginning about 1913. The Foundation's famed hookworm eradication program in the southern United States was extended to Central and South America, the West Indies, Egypt, and Asia. An amazingly successful yellow fever eradication program for the Americas was begun in 1916. The Foundation did not limit its activities to control and eradication of specific diseases, but also promoted local health services, professional training, and health education of the public.

The work of the Rockefeller Foundation had important effects on the establishment in 1940 of the first formal U.S. Government Agency for overseas technical assistance, the Office for Coordination of Commercial and Cultural Relations Between the American Republics. The influence of the Rockefeller Foundation was exercised not only by demonstration and example but through the person of Nelson A. Rockefeller whose 1940 memorandum to Harry Hopkins, then working closely with President Roosevelt, on "Hemispheric Economic Policy" was the catalyst leading to formation of the office. Mr. Rockefeller was appointed as the first Coordinator.[39]

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[39] Rowland, Donald W. History of the Office of the Coordinator of Inter-American Affairs, U.S. Government Printing Office, Washington, D.C., 1947. Chpt. 1.

The organization then launched continued until May 1946, undergoing several name changes without real alteration of structure or function. For most of its life it was known as the Office of the Coordinator of Inter-American Affairs (CIAA).

One of the purposes in establishment of the Office was to insure continued production of materials, such as natural rubber, considered essential to the United States in event of war. The protection of the health of local population, the workers, and U.S. personnel assigned to the areas was vital to the success of the project. Safe water supply was a primary consideration as enteric diseases were prevalent in the areas where material resources were available and being developed.

The importance of health and sanitation was also recognized by the Latin Americans. Twenty-one ministers of foreign affairs from Latin American republics gathered in Rio de Janeiro in January 1942 and formulated agreements establishing bilateral health programs. As a consequence, the United States in 1942 established within CIAA a government corporation to coordinate and administer the new bilateral health programs. The organization had two major facets, a coordinating office known as the Institute of Inter-American Affairs (IIAA) and a cooperative unit, usually called a servicio, operated in the host country by the United States and the host government.

This period marked the beginning recognition of the vital relationship between health and effective productivity for any nation. It also set the stage for the worldwide programs, which, unfolding throughout the postwar years, are now accepted as an essential part of the foreign policy of the United States.

Programs of comparable scope and significance in other parts of the world did not develop until after the War. A few small programs were carried out such as the U.S. Public Health Service mission to the Philippines in 1946 whose program included provision of safe water supplies.

In 1947 programs of military, economic, and technical assistance were initiated in Greece and Turkey at the request of those governments. In Greece the operations were undertaken by the Greek government with Greek funds meeting all internal (local) costs. Foreign exchange requirements were met with dollars provided by the United States. Among the health and sanitation activities was the improvement of 375 community water supplies.[40]

The Economic Cooperation Administration (ECA) was established

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[40] Department of Health, Education, and Welfare and Agency for International Development. "International Cooperation in Health and Sanitation Programs," mimeo., Washington, D.C., November 8, 1965. p. 19.

in 1948 to administer the European Recovery Program ("Marshall Plan"). The program in Europe required little technical assistance. Aid for China was also authorized and in 1949 the programs were extended to the Far East where technical assistance in public health was a prominent activity.

In his inaugural address of January 20, 1949, President Truman called for "a bold new program for making the benefits of our scientific advances and industrial progress available for the improvement and growth of underdeveloped areas." This concept was embodied in Title IV of the Foreign Economic Assistance Act of 1950 and resulted in creation of the Technical Cooperation Administration (TCA).

Although TCA operated at this time concurrently with ECA, there was little overlapping of activities. TCA established new missions in southern Asia, the Near East, and Africa which complemented ECA's programs in Europe and the Far East. In Latin America, IIAA was brought into the State Department as part of TCA, although it retained its corporate structure and continued to administer technical programs in that area.

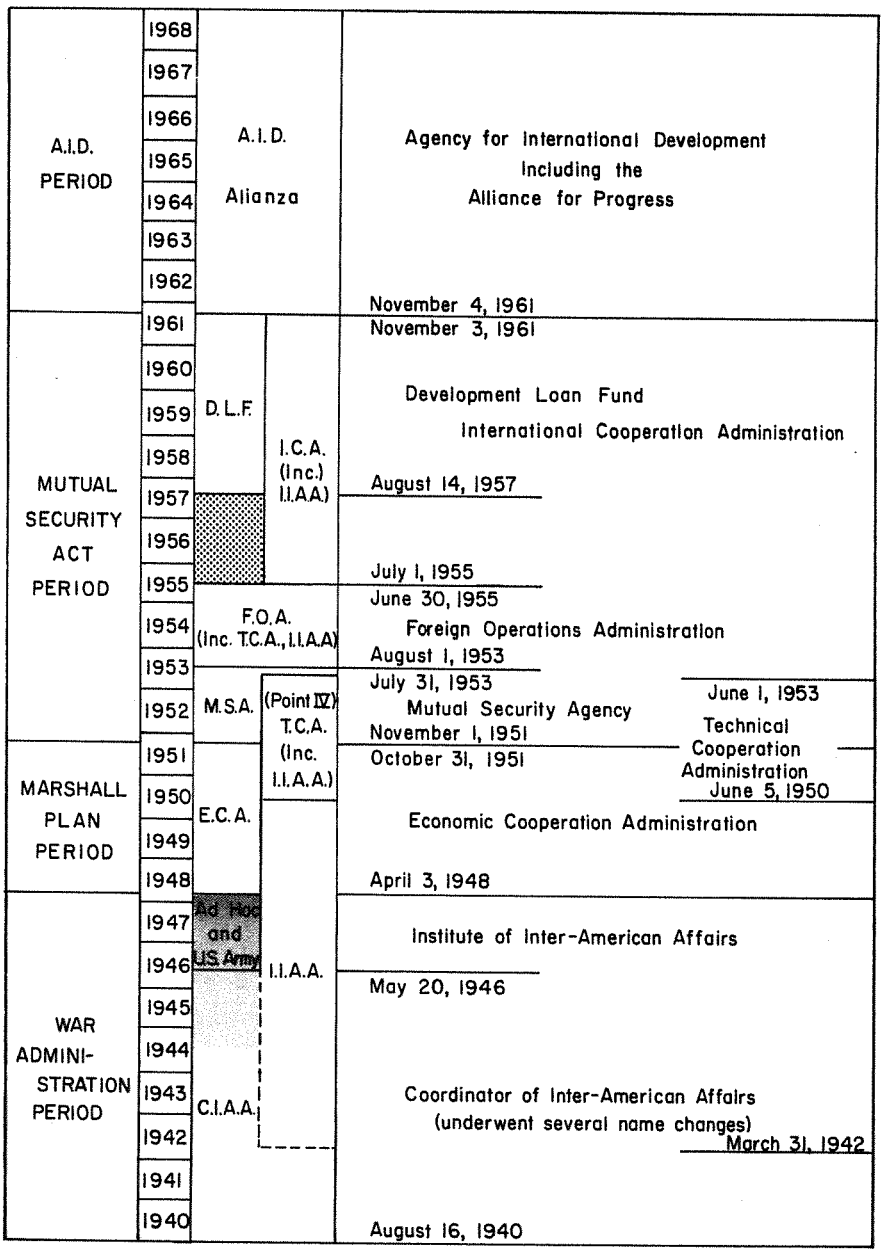
ECA was succeeded by the Mutual Security Agency (MSA) in 1951. The Foreign Operations Administration (FOA) was established August 1, 1953, and absorbed the functions of MSA, TCA, and IIAA until succeeded by the International Cooperation Administration (ICA) within the Department of State in 1955. In turn ICA was succeeded by the Agency for International Development (AID) on November 3, 1961.

The flux of agencies is admittedly confusing. Furthermore several existed simultaneously. Their chronology is outlined in Figure 12.

Most of the initial countries receiving postwar technical assistance had agricultural economies and early emphasis was placed on technical assistance to agriculture in order to increase production and quality of agricultural products. Public health programs were initiated to control disease and education was a third major technical assistance program.

Improved water supplies to control enteric diseases became a part of public health programs. Together with the provision of adequate potable water, training programs for engineers and sanitarians were inaugurated. Such training included fellowships to send engineers and technicians to the United States for post-graduate instruction and special training in the design, operation, and management of water works. Well over a thousand foreign nationals have received such training within the United States. Uncounted thousands, particularly technicians, have received U.S.-assisted training within their own or third countries.

In recent years, emphasis on technical assistance has declined and been replaced by economic aid and capital assistance. Development



U.S. PROGRAMS OF BILATERAL TECHNICAL AND ECONOMIC ASSISTANCE

Figure 12

Loan Funds at low rates of interest were made available and countries were encouraged to borrow from these funds for larger capital projects, in lieu of development grants. With the increase in economic aid and capital assistance, country programs less frequently included technical assistance in public health projects and associated environmental sanitation activities and water supply projects. This has resulted in a lessening of advisory and consultant services in water supply activities to the host countries, which frequently have not developed adequate local technical capability. Some of the slack has been taken up by increased assistance from the World Health Organization, Pan American Health Organization, and other multilateral agencies but not enough to overcome the weakness of inadequate local technical capability. Contracts with U.S. engineering firms that include some limited technical assistance are on the increase, financed by U.S. loans, international bank loans, and local currency as well as host country funds.[41] Technical capability is being provided in this manner in lieu of the technical assistance so productive in the earlier years.[42]

Global Community Water Supply Development Program (CWSP)

International agencies, whether bilateral or multilateral, that attempt to provide technical assistance to all countries, or even only the developing countries, must choose their priorities of services and programs carefully; with vast geographic domains, such numerous clientele, and necessarily limited budgets, international organizations must limit their programs to those activities which are largely stimulative, demonstrative, and self-generative in nature. They cannot solve individual health problems. To be effective they must act essentially as catalysts--stimulating and intensifying the actions of others. They cannot undertake projects which are the normal obligations of governments. Whatever contribution they make should produce concepts and practices that will be accepted and continued by others and propagated in ever-widening spheres of influence.

Identification of the Global Community Water Supply Program as such, grew generally out of reviews and evaluations of technical assistance in environmental sanitation in the first 12 to 15 years following World War II. In an effort to provide complete programs to serve their diverse clientele, the international agencies had undertaken numerous and widespread activities with their limited resources. However,

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[41] A recent survey indicates that U.S. consultants are involved in overseas water and sewerage projects with an estimated construction cost of over $1.3 billion. See "Financing Overseas Engineering," Consulting Engineer, Vol. 31, pp. 208-218, September 1968.

[42] Much of the technical assistance continues to be financed by the United States inasmuch as the U.S. is the major contributor to the multilateral agencies and banks.

in the areas in which some concentration had been attempted, the hoped-for waves of sanitary improvements spreading from the foresight of assisted projects had not been realized.[43] Both the International Cooperation Administration (ICA), a predecessor of AID, and the World Health Organization (WHO) concluded in the late 1950's that a massive spearhead attack on one phase of environmental sanitation was needed[44,45]--some challenging activity of great proportions that could catch the imagination of the leaders of the people, and something that the people themselves understood, needed, and wanted. The example of the malaria eradication program was undoubtedly influential: This spearhead function was to be chosen so as to satisfy as many as possible, preferably all, of these criteria:

(1) Satisfy a human yearning.
(2) Offer a reasonable expectation of expeditious execution.
(3) Require minimum time and energy for promotion.
(4) Yield the greatest health, comfort and economic returns.
(5) Affect the greatest number of people.
(6) Rest largely upon the resources of the people.
(7) Require minimal preparation of the masses.
(8) Rest upon a secure and scientifically accepted technological base.
(9) Require little or no additional research for initiation.

The functions of sanitation that most adequately meet these criteria are community piped water supply and community sewerage systems. To initiate both in a single program at that time seemed self-defeating. Besides, the lesson of experience has been that once public water supply is installed, sewerage will not be far behind.

Inasmuch as some 80 percent of the population in developing countries live in rural rather than urban areas, the question might be asked, why the concentration on urban areas? The answer is simple. In the first 15 years of international assistance following World War II, major attention went to the rural areas without measurable impact. WHO and ICA concluded, that for them, putting water supplies

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[43] World Health Organization. "The Work and Achievements of WHO in Environmental Sanitation and Proposals for a Future Program." Report of the Director-General, WHO Doc. A12/P & B16, 21 April 1959.

[44] Twelfth World Health Assembly. "Resolution WHA1248," Official Records of the World Health Organization, No. 95, p. 42, 1959.

[45] Campbell, Eugene P. "Statement on Community Water Supply Program," in "Hearings on Mutual Security Act of 1959," Committee on Foreign Relations, U.S. Senate, 86th Congr., 1st Sess., pp. 754-761, May 18, 1959. The program was first proposed to Congress by President Eisenhower in his message on the Mutual Security Program, March 13, 1959.

in rural areas first is a burden somewhat like the mythological burden of Sisyphus, toiling uphill incessantly with the huge stone that ever rolled back upon him. In the villages, the necessary institutional structure to administer, maintain, and finance a water supply was largely non-existent.[46] In urban areas embryonic or better administrative institutions already exist, economies of scale can be realized with resulting cheaper unit costs per person served,[47] the need for a community effort is greater, and establishment of self-supporting systems is a reasonable hope. Development of professional competence and confidence within the cities will hopefully spread and influence smaller systems.

The Global Community Water Supply Program involves not one but several international bilateral and multilateral organizations, including the U.S. Agency for International Development (AID), the World Health Organization (WHO), the Pan American Health Organization (PAHO), and the international lending agencies, as well as national and local agencies of numerous developing countries.

Through its Health Service, Office of War on Hunger,[48] AID coordinates its water supply technical assistance with other agencies including WHO, PAHO, the Inter-American Development Bank, the International Development Association, the World Bank, and U.S. government agencies, particularly the Public Health Service. Within AID, the Health Service has technical support responsibility, primarily with the Regional Bureaus, and secondarily, though importantly, with staff offices such as the Office of Engineering, which monitors capital assistance projects.

AID activities within the Global Community Water Supply Program began in 1960 and include technical consultation and support, professional development, and institution-building.

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[46] Even installations as simple as village wells cannot be operated successfully without institutional support. A 1956 survey of 131 wells constructed in 1949-1950 in a Rockefeller Foundation project in Egypt found that only 37 were still operative. The reason given was that necessary spare parts were not available. There were no local committees for collecting money for repairs although the villagers wanted the wells fixed. See Shipman, Harold, Agamieh, Mohammed, Ibrahim, M. Roushdy, and Abdel Mawla, Abdel Mawla M. "Report on a Survey of Water-supplies and Latrines in Certain Egyptian Villages," Bulletin World Health Organization, Vol. 18, No. 3, pp. 477-479, 1958.

[47] Thus serving a larger population with a given expenditure.

[48] This office currently oversees central staff functions related to the Community Water Supply Program (CWSP). Although the CWSP has continued through several administrative reorganizations and name changes, it has generally been an arm of health-related technical assistance.

Technical consultation and support includes advisory services, feasibility studies, technical design studies, and socioeconomic studies. Professional development is concerned primarily with training of foreign nationals, both in the U.S. and overseas, and with development of technical and managerial leadership. By institution-building is meant the development, strengthening, and encouragement within developing countries of both local and national water supply programs and agencies.

A brief description of some specific programs currently underway may be informative. A manual on criteria and guidelines for community water supply programs in developing countries is being developed for use by AID, lending agencies, host country personnel, engineering consultants, and others. As part of this effort, on-site evaluation studies of both successful and less successful aspects of community water supply activities in selected developing countries have been completed.

Special training programs in groundwater development, water works management, and sanitary engineering design for engineers from developing countries are supported at the Universities of Minnesota, Akron, and North Carolina, respectively. These courses have been presented overseas as well as on campus. AID has supported development of graduate sanitary engineering education abroad, e.g., the Regional School of Sanitary Engineering at the University of San Carlos in Guatemala. There the University of North Carolina, under an AID contract, is assisting in establishment of a graduate program to serve all of Central America.

Development of a simple, durable, and inexpensive well-mounted hand pump, suitable for local manufacture and readily maintained under adverse conditions, is underway through a contract with the Battelle Memorial Institute.

AID coordinates and cooperates with the Community Water Supply Programs of WHO and PAHO. In addition to the normal subscription to these agencies, the United States has contributed $875,000 to WHO's Special Account for Community Water Supply and $1,540,000 to PAHO's Special Fund for Community Water Supply Development.

AID Capital Assistance

The United States is the principal contributor to all multi-governmental development programs described herein. Direct (bilateral) U.S. assistance is extended by AID and is developed under the concept of integrated country programming. This concept requires that no element of AID assistance may be considered without reference to the total use of internal and external resources available to the country. Thus AID programming takes into account both what the country is doing with resources it controls and also the foreign assistance

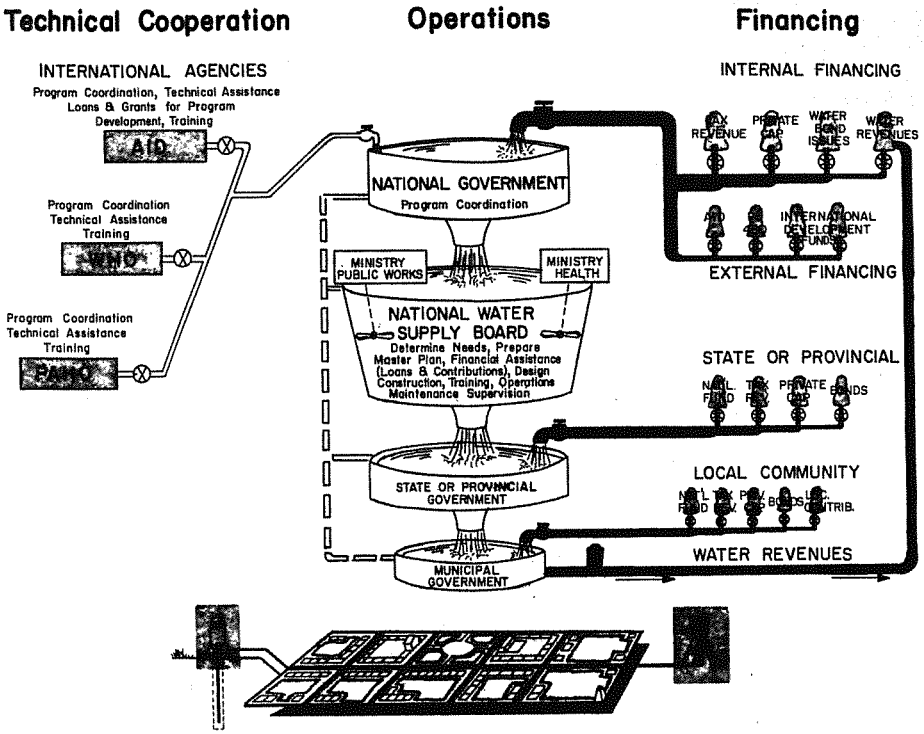

Figure 13

available from other sources.[49] In some cases, only a small amount of AID seed capital is able to catalyze a chain reaction of economic development.

In carrying out its loan assistance program, AID makes extensive use of private institutions, business firms, consulting engineers, universities, service organizations, and other U.S. government agencies to provide planning, feasibility studies, supervision of construction,

[49] For some countries, e.g., India, consortia or consultive groups of donor countries and multilateral agencies have been formed to review and coordinate external economic assistance. These are generally organized and chaired by a multilateral agency.

technical advice, and other professional services. The results of this policy of using specialized knowledge and skills from a wide spectrum of groups and individuals are brought to bear directly upon the problems of U.S. foreign assistance. Financing of these activities by U.S. citizens is done both under direct contract with AID and indirectly through loans or grants to foreign agencies which in turn utilize U.S. talent and equipment.

Water supply projects have been assisted in such cities as Saigon, Rangoon, Karachi, Teheran, Monrovia, Ibadan, Khartoum, Dar es Salaam, Fort Archambault, Tunis, Sfax, Nairobi, Taiz, San Jose, Panama City, Bogota, Rio de Janeiro, Sao Paulo, Lima, Seoul, Taegu, and Inchon. Through 1968, AID and its predecessors have made direct grants and loans totaling some $330 million for water supply projects and programs. An additional $200 million has been indirectly provided through local currency and commodity assistance loans and grants.

Other United States Foreign Assistance

The Export-Import Bank of Washington, organized in 1934, has made many loans for water resources development. Its policy is not to compete with private capital and to make loans that are repayable only in dollars. During the period 1958-1966 inclusive, the Export-Import Bank loaned $54 million for water supply projects.

The Social Progress Trust Fund, first funded in 1961, is a $525,000,000 contribution by the United States that is administered by the Inter-American Development Bank (IDB). All its resources have been committed to loans and technical assistance designed to encourage progress in the member countries in land settlement, housing, education, and community water supply and sanitation. Trust Fund water supply and sewerage loans through 1968 totaled $160 million. The total cost of projects involved is estimated at $300 million. Their implementation will benefit over 22 million people. This financial assistance made possible the completion of 1,542 water supply and 99 sewerage systems through 1968.[50]

Although a realistic estimate of the amount of local funds spent for water supplies in developing countries is unavailable, these expenditures even now exceed external funds and will eventually repay external loans. In latin America where such data are more available than in Asia or Africa, during the period 1961-1967 inclusive, international loans totaling some $535 million were extended for the construction of water supply and sewerage systems. National matching funds and other national funds spent or allocated during the same period totaled some $725 million.[51]

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[50]Inter-American Development Bank. "Socio-Economic Progress in Latin America," Social Progress Trust Fund Eighth Annual Report, 1968, Washington, D.C., 1969.

[51]Estimate by Pan American Health Organization.

Other Capital Assistance

International Bank for Reconstruction and Development (IBRD), commonly known as the World Bank, and its affiliate, The International Development Association, provide loans to finance economically productive projects of high priority in member countries. The World Bank organized in late 1945, concentrates on so-called "hard loans" with generally higher interest rates and shorter repayment periods; the International Development Association, formed in 1960, makes relatively "soft loans" with lower rates and longer terms. Their funds are derived from both public and private sources. Through June 30, 1968, the World Bank had loaned $74.2 million on water supply projects and the International Development Association $34 million.[52]

The Inter-American Development Bank (IDB) makes development loans within the Americas. Through 1968, it loaned $421 million (including loans for Social Progress Trust Fund) for water supply and sewerage projects.[53]

Summary

Through 1968, the United States has expended through technical assistance, capital assistance, and support of multilateral agencies almost one billion dollars for development of public water supplies in the developing countries.

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[52] International Bank for Reconstruction and Development and International Development Association. "Annual Report 1968," Washington, D.C., 1968. Appendix 1, p. 94.

[53] Inter-American Development Bank. "Ninth Annual Report 1968," Washington, D.C.

FIGURE 14. AID-ASSISTED TRAINING

Practical training is an important phase of technical assistance. Clockwise, these photos show (1) a Pakistani gaining experience at the Durham, N.C. water works, (2) Central American students in a water testing laboratory at the University of San Carlos, Guatemala, (3) a Nigerian gaining engineering design experience and management exposure at Gilbert Associates, Reading, Pa., and (4) international participants gaining field experience in well-drilling at the University of Minnesota.

III

SOME HIGHLIGHTS OF U.S. ASSISTANCE

The number and variety of U.S. assisted water supply projects in developing countries is too great for individual review. A few current projects have been selected as illustrative of several types of technical and capital assistance.

Education: Escuela Regional Ingenieria Sanitaria

One of the more successful areas of international cooperation is in Central America where the six small countries of Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama have established a common market and are working earnestly to coordinate their efforts in a number of activities essential to needed economic development.

Despite some of the world's highest infant mortality rates, the world's highest rate of population increase, and staggering backlogs of needed water and sewerage works,[54] there are only about 140 qualified sanitary engineers employed in Central America, one per 110,000 population.[55] The Superior Council of the Universities of Central America (CSUCA) in 1964 designated the University of San Carlos in Guatemala City to develop a graduate sanitary engineering program to serve all Central America, not only by educating engineers but by undertaking needed research apropos to Central American sanitary problems. The Regional School of Sanitary Engineering thus founded is a post-graduate school in which the highest cultural centers of six countries have joined together for realistic approaches and solutions to a fundamental human problem.

Recognizing both the need and the difficulty, AID through its Regional Office for Central America and Panama (ROCAP) has assisted in establishment of the School, primarily through a contract with the University of North Carolina (UNC) to provide consultation and other assistance to the faculty at San Carlos, including development of curriculum and applied research programs, assignment of UNC faculty, post-graduate programs for Central American faculty, and design and equipping of libraries and laboratories.

The School awarded graduate degrees to the nine sanitary engineers (from four countries) of its first class on November 28, 1966. These were the first graduate engineering degrees ever awarded in Central America. To date 45 Central American engineers have completed the academic program - an increase in Central American sanitary engineering manpower of over 40 percent in three years. The School has

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[54] Only 45 percent of the population has house connections or easy access to water supply, 15 percent for sewers.

[55] Versus U.S. ratio of approximately one per 20,000 population.

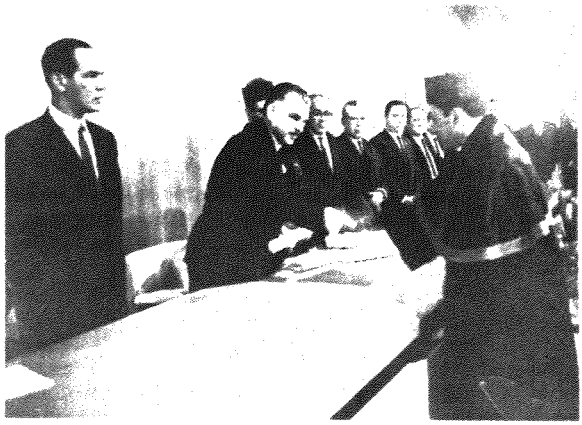

Figure 15

REGIONAL SCHOOL OF SANITARY ENGINEERING
FOR CENTRAL AMERICA (ERIS)
President Julio Cesar Mendez Montenegro of Guatemala presents a diploma to Ing. Ottoniel Samoyoa, a member of the School's first graduating class, as rectors of six Central American Universities look on. The School receives partial financial support from AID's Regional Office for Central America and Panama (ROCAP) and technical assistance from the University of North Carolina, Chapel Hill, N.C.

became a focal point and a stimulus for sanitary engineering in Central America adding conferences, short courses, and continuing education to its degree program and research activities.

Development of a National Water Program: Brazil

In 1942 the Institute of Inter-American Affairs (IIAA) joined with the Ministry of Health of Brazil to create the Special Services of Public Health (SESP).[56] This pioneering cooperative effort initiated a variety of health services in the Amazon and Rio Doce Valleys. In the formative years of SESP, the various health programs were directed by United States specialists, working with a staff of Brazilians. As the Brazilian personnel gained experience, the more promising were given scholarships for graduate study in the United States and in Brazil.

Sanitary engineers were prominent among those trained, and assumed positions of increasing responsibility until, in 1953, Brazilian

[56] Servicio Especial de Saude Publica.

engineers assumed full direction of the sanitary engineering programs, which now have extended into more than half the states of Brazil. United States engineers continued to serve as advisors to SESP until the joint Brazil-United States agreement was terminated at the request of the United States in 1960. The transition was accompanied by the Government of Brazil's action to convert SESP to a Special Foundation (FSESP)[57] in the Ministry of Health, with its responsibilities, functions, and Brazilian staff remaining intact. It is significant that direct U.S. financial support throughout this period of joint operation of SESP was very limited, emphasis being given to training and technical assistance. Assistance in this form has continued in water supply development, but is confined to specific projects, largely in the area of local training.

The SESP program has accorded high priority to the development of potable water supplies in small communities, starting in the Amazon and Rio Doce Valleys. Since the Second World War, the SESP water supply program has been extended to other geographic areas in the North, Northeast, and Central States. By 1960, SESP engineers had designed and constructed 131 public water systems serving more than 500,000 people, and had completed designs of 374 additional systems. SESP had also prepared a model law for the creation of local autonomous water and sewerage authorities, and had contracted with a number of such authorities for the management, operation, and maintenance of municipal water and sewer systems.

Throughout this period, U.S. technical assistance was stressed through the assignment of U.S. sanitary engineers (from a high of 15 in 1943 to a low of 3 in 1960) who served in operating positions for the first few years but converted to advisory roles shortly after World War II. United States consultants on special problems were utilized freely to supplement the resident staff. High priority was allocated to the training of Brazilian engineers, on-the-job, through seminars and short courses, academic study fellowships in Brazilian schools, and fellowships for graduate study in the United States (118 during this period). U.S.-trained sanitary engineers now occupy many important positions in Brazilian government agencies, universities, and consulting engineering firms.

Technical assistance was also directed toward institution building, first within SESP itself. Other institution-building achievements included the municipal water and sewer authorities (now numbering about 500) and the management-operating program within SESP.

It was recognized early in the program that the needs for training could not be met by the existing institutions and by foreign study fellowships. Programs were initiated about 1950, providing technical assistance and limited financial support to engineering schools for the strengthening of sanitary engineering courses, and for development

[57] Fundacao Servicio Especial de Saude Publica.

of local training programs for sub-professional personnel. The program of assistance to engineering schools led to formation of an association of professors of sanitary engineering, which continues to meet and to sponsor seminars. There are now about 150 in this activity.

Since 1960, AID assistance to water supply development in Brazil has been directed primarily to the building of viable institutions, national, state, and local. Such institutions share responsibilities for planning, financing, designing, constructing, managing, and operating municipal water supply systems. The planning and implementation of local training programs have been supported by U.S. technical assistance, by small grants of local currency funds, and by WHO and PAHO. U.S. advisors have also been assigned to national, regional, and state organizations engaged in the planning and establishment of water supply institutions and loan funding programs. Training of Brazilian water supply specialists in the United States has continued to receive support from the Government of Brazil and AID.

Brazilian National Water Supply and Sewerage Loan Fund:

The history of financing water supplies in Brazil, as in many other countries, has been one of gifts and grants by the central government, usually spread too thinly to permit satisfactory completion of any individual project. Grants were made without comprehensive planning and with little regard to sound project planning, feasibility, or assurance of future maintenance and operation. Layer on layer of organization was created in various Ministries to administer water supply grant activities. With the acceleration of urban growth, each year produced a greater demand for facilities. In general, municipal water and sewerage systems in Brazil are operated as municipal departments under the control of the mayor and council. Water and sewerage rates have been too low, resulting in inadequate revenues for proper operation and maintenance. Lack of competent management by municipal authorities has also been a contributing factor to poor quality water and sewerage services.

The signing of the agreement by Brazil and USAID in April 1965, establishing the National Loan Fund, constituted a landmark in the history of water supply development in Brazil. In addition to its obvious capital input, the Loan Fund has been a progressive influence on fiscal and business management of the municipal systems. It also serves as a precedent for other developing countries. There is little question that the achievement of this milestone in Brazil can be credited in no small measure to the long-term program of technical assistance and training supported by the United States Government over the past twenty-five years.

The initial capital available to the National Loan Fund of 37 million new cruzeiros (approximately U.S. $10 million) has been obligated for loans to 19 municipalities and one state loan fund. The U.S. contribution to the original fund included NCr $8 million from P.L. 480 funds and NCr $16 million in counterpart funds. In September 1967, the National Loan Fund was transferred to the National Housing Bank (BNH), Ministry

of Interior, where it is administered by the Superintendency of the Sanitation Finance System (FISANE). FISANE-BNH has made commitments to date to 503 municipalities[58] towards support of projects costing NCr $658 million over a 3-year period, supposedly to be entirely supported through BNH funds.

Presently, except for Sao Paulo, Rio de Janeiro, and Brazilia, only 40 percent of the urban population is served by water supplies and 17 percent by sewerage. The present program may raise these to 60 and 20 percent, respectively, by 1972.

Progress thus far in the operation of the National Loan Fund has justified the emphasis on local participation and development of municipal responsibility for self-sustaining operations. Acceptance of the obligation to pay a fair rate for adequate water services has been well demonstrated throughout Brazil, not only in the larger municipalities but also in the smaller systems operated by FSESP. The success of the National Loan Fund in meeting the demands of medium sized cities will depend primarily upon the availability of capital funds made available during the pre-revolving stage of the program.[59]

Institution Building: East Pakistan

Loans to build structures are common. Loans to build institutions are not. However most authorities agree that institutions are often the limiting factor in fostering development. A notable loan for institution building is that made by AID to the government of East Pakistan for general advisory services to strengthen its Directorate of Public Health Engineering (DPHE).

East Pakistan, a province of Pakistan, is about the size of the state of Illinois. Its population currently exceeds 70,000,000 and is growing rapidly. Its gross provincial product per capita is less than U.S. $100. Except for a few large cities, most of the populace live in villages under crowded conditions and, until recently, without sanitary facilities. Half the children die by 16.4 years of age, two of every three deaths from diarrheal disease and cholera.

The government of East Pakistan has contracted with Camp, Dresser, and McKee, a Boston consulting engineering firm, for general advisory services intended to (1) develop the Directorate of Public Health Engineering into an efficient and independent body, and (2) to improve sanitary services in East Pakistan.[60] The scope of contracted services

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[58] Rio de Janiero and Sao Paulo are excluded from the Fund.

[59] For further information on Brazil, see Board, Leonard M., Harris, Robert R., and Hubbs, G. Lamar. "Evaluation of Community Water Supply Programs and Capabilities in Brazil," 115 pp., Mimeo., U.S. Public Health Service, Washington, D.C., 1968.

[60] This project excludes Dacca and Chittagong.

goes beyond the ordinary and is, hopefully, a harbinger of trends for future engineering contracts. In addition to the conventional comprehensive survey and plan, the project calls for development of standard specifications for water and sewer works materials and equipment, directed towards local manufacture; development of basic data for local commodity manufacture including costs, raw materials, marketing, foreign licensing, and feasibility of local manufacture; conduct of research and pilot projects for developing and improving design criteria; organization of training programs at all levels; establishment of laboratories and water quality control programs; development of construction practices; and development and recommendation of improvements in management, organization, and legislation.

Because this is not a design and construction contract, progress is difficult to evaluate and describe. Indeed measurement of progress in terms of money spent was a major Pakistani error prior to the time the project began in 1965. Pipelines were laid in some cases without joints or specials (e.g., at Jessore); in other cases elevated tanks, deep-wells, pumphouses and distribution lines were constructed without any connection between them. There were municipalities where over three miles of pipeline, tubewells, pumphouses, and elevated tanks were all constructed and where further construction was planned, without any customers being served by these systems and without money being allocated for making house connections.

A public water supply available only 3 or 4 hours a day and that in the street at hydrants 200 yards apart was the most common type of public water supply in the experience of the public. Where three quarters of the water pumped is immediately wasted through leaks and open taps, provincial and municipal governments are reluctant to provide 24-hour service.

The consultants therefore have given instruction not only in engineering and management but in the mechanic arts, plumbing, pipe fitting, engine and pump installation, operation and maintenance, etc. They have had to start at the bottom in these and also in other basic skills such as surveying and drafting.

In all their activities the engineers attempt to promote development of the skills of DPHE personnel through joint participation in the tasks. Over 50 professional water works personnel have been given extensive formal training by the consultants. Eight Pakistani engineers have received postgraduate training in the United States, coupled with practical training in the home office of the consultants.

The training emphasizes practicality. For example, pressure testing demonstrations have helped improve the quality of pipeline construction to the extent that pressure tests on new distribution systems can now be carried out successfully for the first time in many years.

Much effort has been expending in developing the DPHE Engineers' Notebook, prepared in an effort to standardize methods and procedures

and to educate DPHE engineers in practical and efficient methods of investigation, design, and construction. All the material is prepared especially for conditions in East Pakistan.

In addition to a "Comprehensive Survey Report for Water and Sewage Works in East Pakistan," a plan of action for the period 1965-1985, a number of other reports have been completed.

These include a report entitled "Analysis of Production Potentials of Water and Sewage Commodities in East Pakistan." Based on itemized projections of commodities required in public health engineering for the next 5 years, the Small Industries Advisory Service (Pak.) has published investment brochures. In many cases, it is being discovered that local industries have the ability to manufacture commodities formerly regarded as strictly import items.

Spadework by DPHE and the consultants led to central government establishment of detailed requirements for operation and maintenance of municipal water systems, including uniform rules and regulations, uniform methods of collection of water fees, depreciation funds, capital improvement funds, etc. Central government grants now require proof of capability to operate and maintain water systems.

Research and development activities have included development of iron removal plants for well water, new pipe joints for asbestos-cement pipe, portable stills, plastic well pipe and screens, and self-closing water faucets. Studies for development of a Public Health Engineering Institute are in progress. A UN Special Fund Grant is being sought. Laboratories have been established in Dacca and Chittagong.

The broad, basic approach taken by this project saw the construction of new pipelines in 1967 equal to 60 percent of all the pipe laid previously by DPHE. The number of well pump installations in 1967 exceeded the number installed during the previous three years. The number of people served with piped water increased an estimated 50 percent during 1968. The quality and reliability of existing services have been significantly improved.

Technological Development: Handpump for Wells

Probably the most ubiquitous single item of waterworks equipment is the hand-operated pump for taking water from wells. Yet there has been little improvement or research in handpump design in a generation or more. AID recently commissioned Batelle Memorial Institute to determine the requirements imposed on hand-operated water pumps for various environments and to develop detailed requirements for design and manufacture of a pump suitable for use in developing countries.

The major problem with handpumps in developing countries is poor maintenance due to lack of skills and lack of replacement parts. The problem is compounded by heavy usage-single pumps to serve over 300 people (plus livestock) are common; poor manufacturing quality typified

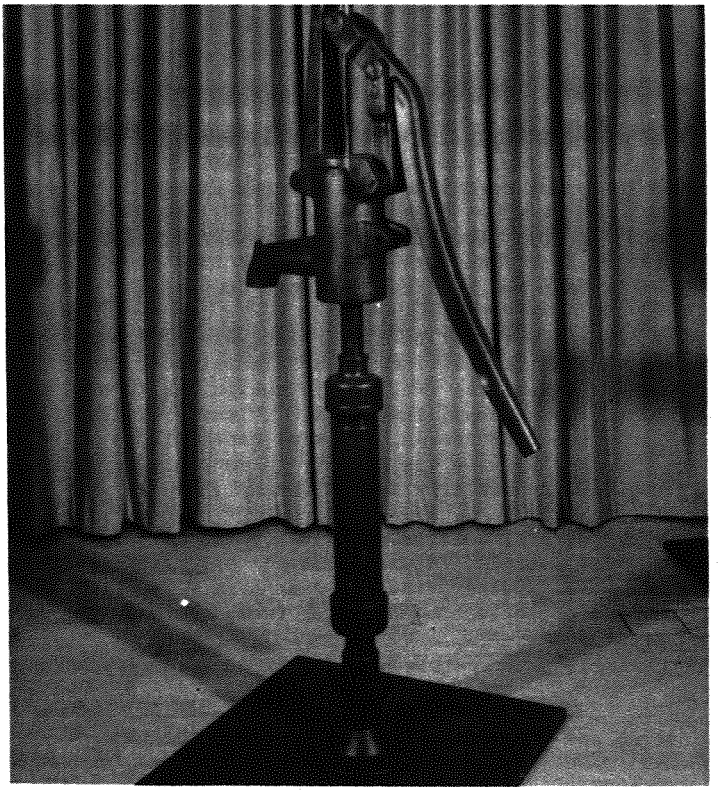


Figure 16: HAND PUMP FOR DEVELOPING COUNTRIES

by loose-fitting threaded connections; poor metallurgical quality, particularly brittle, high-phosphorous content iron; rough-walled cylinders; short-lived cups and valves; failure to protect critical parts from the weather, especially during storage; and, most importantly inadequate institutional support.

Both field observation and laboratory tests indicated that the most frequent cause of pump failure is short cup life. Testing indicated further that the most important single variable controlling cup wear is cylinder bore smoothness, with iron and steel cylinders the worst offenders. This problem can be eliminated by using brass cylinders. The expense, however, is prohibitive for many areas. In further tests, coating plain-steel cylinder walls with an inexpensive epoxyphenolic resin virtually eliminated wear.

Other innovations include development of neoprene-impregnated flapper valves with longer life than leather, reduction in the number of threaded connections, strengthening of all critical cross-sections subject to stress, and rubber-cushioned poppet valves. A pump was developed with the following characteristics:

(1) low production cost,
(2) long life under severe conditions,
(3) easily maintained with simple tools and unskilled labor,

(4) suitable for shallow or deep-well installation with only minor changes (cylinder location),
(5) capable of being manufactured in developing countries with a minimum of investment,
(6) easily operated by small people, including women and children, and
(7) designed to discourage pilfering and vandalism.

Planning is now underway for field tests of the new pump.

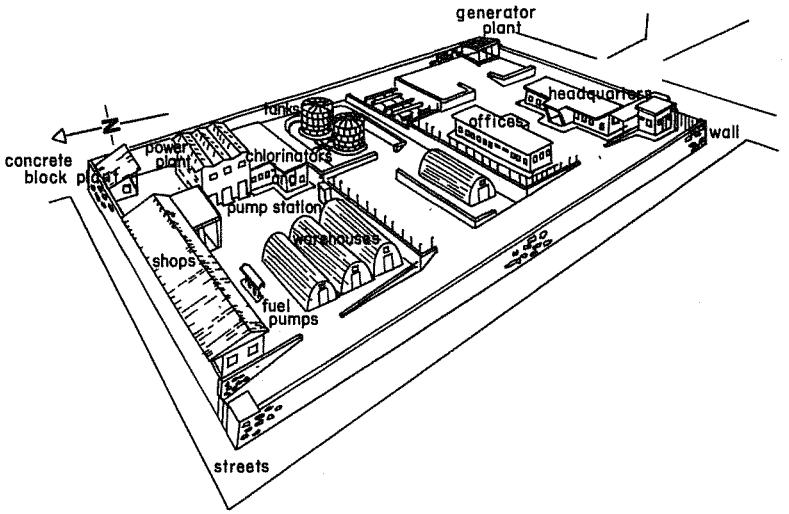
Capital Assistance: Water Supply for Taiz

One of the more interesting water supply projects undertaken with AID support is the John F. Kennedy Memorial Water Supply System of Taiz, the second capital of Yemen. Yemen, until recently, existed in self-imposed isolation with virtually no industry. Some consider it one of the most underdeveloped countries in the world. Prior to 1961, there existed no institution to oversee a safe public water supply system; for that matter there was no safe public water supply in the country. A deep-seated belief firmly maintained by the Yemeni throughout history was that a person was not supposed to pay for water consumed for household purposes.

In 1960, the Yemeni government requested assistance from AID in solving the critical water problems in Taiz. At that time, Taiz received its water supply from mountain springs through a network of open channels to mosques and small water tanks in various sections of the city. The people secured their daily supply of water, estimated at that time to be 2 gallons per capita per day (gpcd) from the tanks or directly from the aqueducts by dipping and filling tin cans or buckets.

AID agreed to assist in establishing a National Department of Public Water Supply and Sanitation and a water supply system for the city of Taiz. Under this project, a plan was devised through which the project provided training and demonstrations that helped Yemeni personnel assume full responsibility for continued permanent operation after AID phased out. This included development of technical and administrative organizations to provide services such as engineering, laboratory analyses and control, management, operation, and maintainance.

The construction of the facilities served as a training ground for contractors and employees who have learned new methods and skills previously unknown to them. The lack of contractors in Yemen capable of performing construction works according to standard engineering practices or even with ability to read and understand construction drawings necessitated that steps be taken to train local contractors. Candidates were actually sought out and transported to the AID office. At the beginning of the program, construction skills beyond stone masonry were virtually unknown. To cope with this situation, an ambitious on-the-job training program was undertaken to provide training in design, drafting, surveying, accounting, personnel, bacteriology,



CENTRAL PLANT

JOHN F. KENNEDY MEMORIAL WATER SYSTEM FOR TAIZ, YEMEN

Figure 17

and warehousing, and many Yemeni were trained as laboratory technicians, well drillers, clerks, mechanics, electricians, and welders. Also by advertising employment opportunities in Arabian newspapers, several educated or skilled Yemeni were enticed to return to their country from the oilfields of Saudi Arabia and Aden. Some 200 men received formal training during the project; 19, who became proficient in English, were sent to the United States for accelerated 4-month training in water systems management, ground water development, power plant equipment installation, community leadership training, chemical and bacteriological analysis, and property and supply management. Another 15 men attended a 4-month course in mechanics, electricity, and sanitation in Lebanon.

In addition to Taiz, over 50 other communities have now initiated self-help projects. Some of the communities requesting assistance for water supply are isolated and can only be reached by burro, mule, or camel - these requiring several hours. In such cases, the Department of Water Supply encourages the communities to undertake the improvement of the existing access trails by providing supervision plus hand tools and skilled labor required for construction. The communities supply the unskilled labor. Subsequently as a byproduct of requests for potable water systems, several villages can now be reached by motor vehicle.

Water in excess of the communities' needs is now being used for irrigation, thereby increasing agricultural output. Prior to construction of the water supplies, women and children had to walk for

several hours to carry water to their homes.

The government of Yemen renamed the Taiz water system the John F. Kennedy Memorial Water Supply System for Taiz on December 1, 1963.[61]

Rural Water Supply: Thailand

AID has provided assistance for the drilling of thousands of village wells all over the world. One of the most concentrated programs for village water supplies is that currently underway in Thailand to provide potable water to 600 villages in water-scarce, poverty-ridden, and security-sensitive areas in the northern and northeastern regions along the Laotian border. This program will ultimately serve about two million persons. The AID contribution will be about $4.5 million.

The general health of the people of Thailand has improved markedly in recent years due to control of malaria, better sanitation, and better medical care. Some 85 percent of the population live in rural villages where statistics of the Royal Thai Department of Health indicate that 90 percent of the population are infected with water-borne intestinal parasites. Approximately 60 percent of the morbidity and 40 percent of the mortality of the country are attributable to enteric diseases.

Thousands of village wells have been drilled or dug since 1952 in official Thai programs including over 7000 shallow wells in a village health program innaugurated in 1960 with U.S. assistance. However it has been observed that great numbers of those supposedly "served" by the wells are not using them during seasons when a nearby pond, canal, or backyard dug well has plenty of water at shorter carrying distance, or are not using the well water at all because of taste or high iron content, or prefer a traditional family source. Breakdown of the hand pumps too often renders the wells useless. In the words of one local observer of long experience: "the maintainance of hand pumps has so far proved to be an insurmountable problem."

With this sobering experience, emphasis has shifted to piped potable water systems. The task ahead is enormous. There are some 45,000 villages in Thailand of over 500 population. The concepts and experiences gained in the northeast projects can be put to good use in the continuing long-term National Rural Community Water Project. Already the Thai engineers have demonstrated their ability to plan, design, and construct. The most important function now is whether they can also manage and motivate local manpower and resources consistently and successfully to operate and maintain these water systems. Thailand has an opportunity to avoid the tragedy of rural water supply

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[61] For further information, see Ruiz, Adelmo. "Efforts of U.S. Agency for International Development to Supply Water to People of Yemen," Journal American Water Works Association, Vol. 58, pp. 1247-1259, October 1966.

Figure 18: THAILAND'S POTABLE WATER PROJECT
Youngsters in Thailand enjoy clean water, one of the prime needs of the developing world.

programs in virtually every other developing country: a construction effort which has left behind it primarily a trail of crippled or totally defunct facilities simply for lack of maintenance. Thus far, results are highly promising.

The Thais have retained an American consultant, Tippetts, Abbett, McCarthy, and Stratton (TAMS) of New York to furnish technical and advisory service in the planning, design, award and administration of contracts, supervision of construction, and operation of the potable water projects in the northeast.

This joint effort is being used as a vehicle for further training of Thai engineers, technicians, administrators, and managerial personnel. Approximately 150 Thais are receiving or will receive in-service training and 10 engineers will receive academic training in the United States during the life of the project. The strengthened institution and competent staff resulting from this project will continue to benefit Thailand long after termination of AID assistance.

IV

AFRICA

Summary

U.S. foreign aid to Africa began under the Mutual Security Agency in the free nations requesting that aid.[62] These were along the Mediterranean coast, and Ethiopia, Sudan, and Liberia. Later, as many of the newer African countries secured their independence during the 1960's, they also requested and received U.S. assistance.

Water supplies were invariably included as much of northern Africa is arid with inadequate rainfall for agriculture and domestic water supply. In other areas, rainfall was plentiful but seasonal, providing an abundance of water during the rainy season and little or none from surface sources during the dry season. Surface and shallow well supplies were often polluted. Stockwatering ponds and small impoundments inadvertently added to problems of disease.

The scarcity of surface water, giving urgency to groundwater development, lack of information on groundwater resources, and a rural population (over 80 percent) have led to many projects to study, evaluate and develop underground water supplies. AID assistance in Africa has been oriented towards groundwater development and training with a few notable exceptions, to wit, water supplies for the cities of Fort Archambault (Chad), Nairobi (Kenya), Monrovia (Liberia), Ibadan and Lagos (Nigeria), Kigali (Rwanda), Mogadishu (Somali Republic), Tunis and Sfax (Tunisia), and Dar es Salaam (Tanzania).

Direct U.S. financial contributions to development of domestic water supplies in Africa are summarized in Table 1. These figures are exclusive of indirect technical assistance (e.g., over 150 man-years), training of Africans within the U.S. (over 80), AID funds (small) allocated for discretionary use by the ambassador, agricultural commodities (food for work projects), and loans and grants for multipurpose projects which may include a water supply component, e.g., hydrographic surveys.

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[62] With the exception of Liberia which has received sporadic assistance since the American Colonization Society was chartered in 1816 to encourage free American Negroes to emigrate to Africa. See Bixler, Raymond W. The Foreign Policy of the United States in Liberia, New York, 1957.

AFRICA

DIRECT U.S. AID FOR DOMESTIC WATER SUPPLIES (Shaded countries)

① Groundwater development: exploration, mapping, equipment, training, and/or drilling of wells

② Development loans for water works construction

③ Professional services: advisory services, management studies, engineering reports, and/or feasibility studies

④ Rural and village water supply systems

⑤ City water supply systems

⑥ Institutional support

⑦ Peace Corps well-drilling programs

⑧ Participant training within U.S.

Figure 19

Table 1

AFRICA

Direct U.S. Capital Assistance for Development of Domestic Water Supplies

Country	Years	Loans	Grants	Totals
		(In Thousands of U.S. Dollars)		
Africa - Regional	1962		40	40
Cameroon	1963-66		62	62
Chad	1962-65		735	735
Dahomey	1964-68	850*	37	887
Ethiopia	1951-64		1,638	1,638
Ghana	1958-68		296	296
Kenya	1963-68	2,550	25	2,575
Liberia	1963-68	7,000	133	7,133
Libya	1955-62		975	975
Malagasy	1962-68		1,155	1,155
Niger			89	89
Nigeria	1962-68	16,700	5,120	21,820
Rwanda	1964-68		510	510
Sierra Leone	1962-67		167	167
Somali Republic	1958-68	8,500	2,723	11,223
Sudan	1958-64	2,700*	2,173	4,873
Tanzania	1954-68	3,100	526	3,626
Tunisia	1958-68	1,400	2,558	3,958
Upper Volta	1963-68		382	382
TOTALS		42,800	19,344	62,144

*Authorized

Estimates of availability of water service in Africa are highly approximate. Reliable statistics are lacking in many areas. Estimates prepared by the Department of Commerce for the Water for Peace Program are shown in Table 2.

Table 2

AFRICA

Estimated Availability of Water Service in 1964

1964 Populations*	North Africa Number	North Africa Percent		South Africa Number	South Africa Percent	
Total Population (T)	58.5	100.0		234.5	100.0	
Urban Population (U)	19.1	32.7	(U/T)	27.4	11.7	(U/T)
Urban Served	14.7	77.0		14.0	51.0	
House Connections	10.9	57.0		3.6	13.0	
Public Outlets	3.8	20.0		10.4	38.0	
Urban Not Served	4.4	23.0		13.4	49.0	
Rural Population (R)	39.4	67.3	(R/T)	207.1	88.3	(R/T)
Rural Served	11.8	30.0		55.9	26.9	
House Connections	3.9	10.0		4.1	2.0	
Public Outlets	7.9	20.0		51.8	25.0	
Rural Not Served	27.6	70.0		151.2	73.0	
Total Population Served	26.5	45.3		69.9	29.8	
Total Population Not Served	32.0	54.7		164.6	70.2	

*All population number figures in millions.

Alarming as these deficiencies are, the real crisis is skilled manpower. Some African countries do not have a single native-born, educationally qualified sanitary engineer. Few African countries have educational institutions for sanitary engineers or sanitarians. Administrative organization is in its infancy in some areas.

The water supply problems yet facing Africans are awesome. However their relatively low population density, natural resources, ambition, drive for social justice, and willingness to seek and accept change give hope for the future.

The following are thumbnail sketches of U.S.-assisted activities in each country.

Cameroon

Cameroon achieved independence in 1960. AID provided water supply advisory service to the Directorate of Public Works from 1963 to 1966. Improvements in data collection, planning, design management, operation and maintenance were implemented during this period. In addition to a resident AID sanitary engineer, this project received considerable assistance from the African Regional Water Supply Advisor, a position since abolished - presumably for budgetary reasons.

Chad

Chad, almost completely rural, is a former French Overseas Territory that also proclaimed independence in 1960. AID has provided U.S. equipment for the rural well drilling programs of the Chadian Bureau des Recherches Geologiques et Minieres which has drilled over 600 wells since 1953. A project to provide Fort Archambault with an adequate water supply was begun in 1963 and is now completed. Peace Corps Volunteers have initiated self-help well-drilling programs in rural areas on the thin edge of the desert.

Ethiopia

The program started late in 1951 with assignment of a sanitary engineer to the U.S. Mission. Actual field activities did not begin until 1953 when a Water Resources Joint Fund project was started, continuing until 1960. Well-drilling was a major activity, not only to produce adequate potable water supplies for villages and towns but to train Ethiopians in the techniques of drilling and development of community water supplies. Water supply systems were provided for several small towns and agricultural centers. Water supply development was a continuing activity until 1964. Small water supply systems were also a part of several public health projects.

Ghana

The former British Gold Coast colony, Ghana became an independent republic in 1957. Ghana is rich in mineral wealth and is the world's leading cocoa producer. The huge Akosombo hydroelectric project on the Volta River, partly financed by the U.S., was completed in 1965 and began serving Ghana's first giant industry, a U.S. built and owned aluminum reduction plant near the port of Tema.

AID has assisted in a number of water supply studies. U.S. technicians have assisted rural public works programs in several regions.

The principal AID water supply activity has been assistance in establishment of the State Water and Sewerage Technical School. The first class of 20, who will complete the three-year course during 1968 will be technically competent to operate any water or sewerage plant in Ghana, regardless of size or complexity. Over 30 Ghanians have received training in the United States, one of whom is now director of the Technical School.

Ivory Coast

A former French Overseas Territory, the Republic of the Ivory Coast has been independent since 1960. AID assistance was requested for a groundwater survey in 1962. The work included a two-man team of engineers, plus related equipment, for four months.

Kenya

A former British Colony and Protectorate, Kenya has been independent since 1963. The northern three-fifths is arid. Community water supply activity has included feasibility surveys, a review of rural water supplies, and a 1963 loan for the Nairobi water supply.

Liberia

U.S.-assisted water supply activity began during World War II, primarily in relation to the development of Roberts Field and the provision of safe and adequate water supplies for U.S. personnel. Assistance to the Government of Liberia followed, mainly in general sanitation and malaria control. Community water supply activity began in 1963 with a WHO study of Monrovia's water supply followed by an AID loan. Another contract provided managerial, operational, and training services for the development of public utilities, including water.

Libya

Libya, first country to receive independence fully under United Nations auspices, initiated a program for the development of domestic water supplies in 1955. Through 1962, the U.S. provided technical assistance for rural water supplies, groundwater studies, and rehabilitation of urban water systems.

Malagasy Republic

Formerly the French Overseas Territory of Madagascar, the Malagasy Republic gained independence in 1960. AID has assisted in development of groundwater for village water supplies.

Niger

Niger gained independence in 1960. Because scarcity of water is the country's primary problem, Niger devotes about 40 percent of its development budget to exploration and exploitation of water resources. Niger has received assistance from the U.S., France, West Germany, the European Economic Community, and Israel in its programs for groundwater development.

Nigeria

Nigeria, Africa's most populous country, became independent in 1960. U.S. assistance for groundwater investigations began in 1962. Other assistance has been provided through loans for feasibility studies and water supply system construction for the cities of Ibadan, Lagos, and Illourin and for several townships.

Rwanda

Rwanda, part of the former Belgian UN Trusteeship of Rwanda-

Urundi, became independent in 1962. Acitivity has been limited to financing engineering studies and design of the Kigali water supply project. The World Bank has since loaned money for construction of the project.

Senegal

Formerly under French control, Senegal became independent in 1960. Activity has been limited to a groundwater resources survey of water for human and animal needs.

Sierra Leone

Sierra Leone, a former British Colony, became independent in 1961. AID supported groundwater development and training of well drillers during the period 1962-1965.

Figure 20

NEW WATER SERVICE IN NIGERIA
This young man would agree with the ancient Greek poet Pindar that "Water is the best of all things."

Somali Republic

Although the present Republic has existed only since 1960, U.S. aid to water resources development, primarily well drilling, began in 1954. For ten years this assistance was primarily the provision of equipment, training, and advisory services. Since 1963, an AID-USPHS project has assisted in establishment of a self-sustaining water supply improvement program in the Ministry of Public Works. Assistance was given, beginning in 1962, for provision of a potable water supply for Mogadishu, the capital city.

Sudan

Water supply assistance began in 1958 with preparation of an engineering report on "Potable Water Supply in the Republic of the Sudan." This report was the basis for a U.S.-assisted five-year rural development project that began in 1959. Over 70 Sudanese received training (19 in the U.S.) and Sudanese water system construction capacity was doubled during the project.

Tanzania

Tanzania, formerly Tanganyika and Zanzibar, has been independent since 1961. Loans have been made for improvement of Dar es Salaam and 75 smaller water supplies. Engineering and economic surveys and advisory services have been provided for the Ministry of Communications, Power, and Works.

Togo

Togo became independent in 1960. There is no U.S.-supported community water supply program. U.S. assistance has been limited to support of a Rural Development Service Center in northwestern Togo which has trained community sanitation agents. Using voluntary local participation, Peace Corps personnel have drilled and dug wells in southern Togo.

Tunisia

U.S. aid to Tunisian water supply programs began in 1958 with a project to explore and prove underground water resources, both for domestic use and agriculture. Since then there have been a number of projects designed to expand and improve water supplies, mainly from underground sources. These projects have been expanded to include provision of urban supplies for Monastir, Sfax, Tunis, and smaller communities as well as rural developments. Several development loans have been made for these projects.

Upper Volta

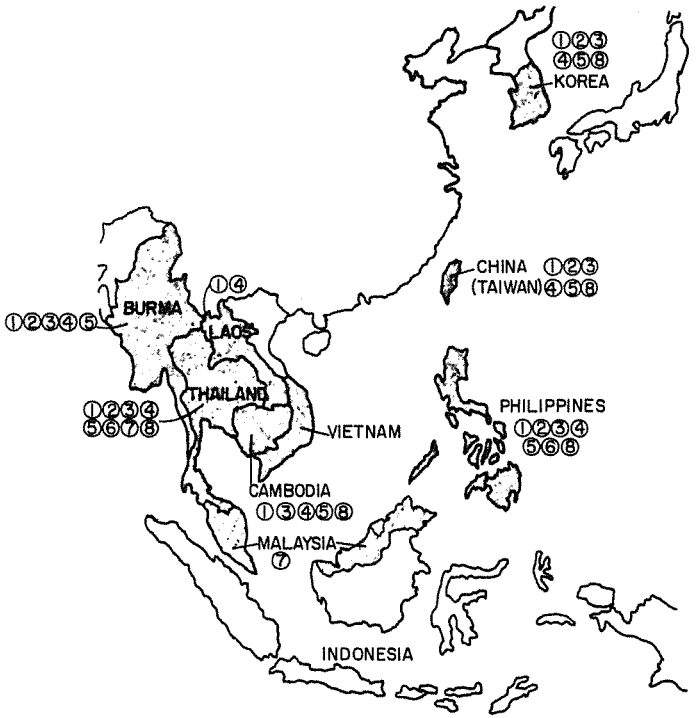
Upper Volta became independent in 1960. More than 90 percent of its people are subsistence farmers. There has been a single

AID-assisted program for rural water resources development to provide water for domestic and agricultural purposes. Peace Corps Volunteers have been active in well-digging in southeastern Upper Volta.

Figure 21

CENTRAL AFRICAN WATER STORAGE TANK
In many African villages the trunks of baobab and tebeldi trees are hollowed out for storing water during the dry season.

EAST ASIA AND VIETNAM



DIRECT U.S. AID FOR DOMESTIC WATER SUPPLIES (Shaded countries)

① Groundwater development: exploration, mapping, equipment, training, and/or drilling of wells
② Development loans or grants for water works construction
③ Professional services: advisory services, management studies, engineering reports, and/or feasibility studies
④ Rural and village water supply systems
⑤ City water supply systems
⑥ Institutional support
⑦ Peace Corps environmental sanitation programs
⑧ Participant training within U.S.

Figure 22

V

EAST ASIA AND VIETNAM

Summary

Community water supply programs were initiated in the far east under the Mutual Security Agency and its successor agencies. In general, this area, with the exception of Korea, has a tropical climate with heavy rainfall during the rainy seasons and with rivers, lakes, streams and canals that supply abundant water, albeit often polluted. Dysentery and enteric diseases are rampant. In the delta areas ground water is abundant but not always potable. In the higher elevations ground water is not so abundant due to the types of soil, often thin, and underlying rock formations. Water development for agricultural uses is of great importance.

There has been considerable war damage to existing supplies. First considerations were repairs to these systems and then expansion of sources and systems to meet the inadequacies of growing populations in the cities. Korea and Vietnam in particular have been faced with tremendous problems of providing shelter and other facilities for refugees.

Direct U.S. financial contributions to development of domestic water supplies in these countries are summarized in Table 3. These figures are exclusive of indirect technical assistance (e.g., over 200 professional man-years), U.S. and third country training of local nationals (over 250), agricultural commodities and local currency loans, and loans and grants for multipurpose projects,e.g., for overall development of the Mekong River.

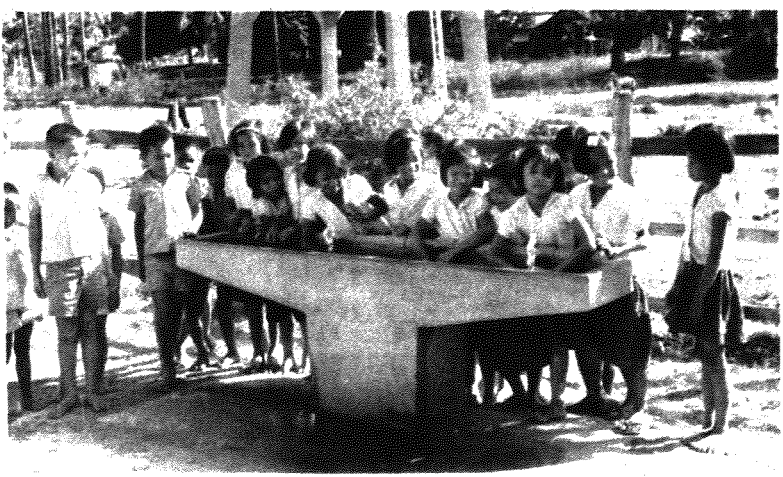


Figure 23: STUDENTS FROM SCHOOL IN NORTHEASTERN THAILAND

Table 3

EAST ASIA AND VIETNAM

Direct U.S. Capital Assistance for Development of Domestic Water Supplies

Country	Years	Loans	Grants	Totals
		(In Thousands of U.S. Dollars)		
Burma	1951-68	1,596	500	2,096
Cambodia	1951-63		2,369	2,369
China (Taipei)	1951-63		946	946
Korea (Seoul)	1956-66	7,460	9,467	16,927
Laos	1963-65		897	897
Philippines	1952-63		5,355	5,355
Thailand	1951-68		6,402	6,402
Vietnam (Saigon)	1951-68	17,457	16,717	34,174
TOTALS		26,513	42,653	69,166

Estimates by the World Health Organization of the 1962 availability of urban water service in these countries, are shown in Table 4.

Table 4

Estimated Availability of Water Service in 1962*

1962 Populations**	Number	Percent
Total Population (T)	243.4	100
Urban Population (U)	56.2	23 (U/T)
Urban Served	24.3	43
House Connections	8.9	16
Public Outlets	15.3	27
Total Served	24.3	43
Urban Not Served	31.9	57
Rural Population (R)	187.1	77 (R/T)
Rural Served	---	25?
Rural Not Served	---	75?
Total Population Served	70?	30?
Total Population Not Served	170?	70?

*Includes those countries in previous table plus Indonesia and Federation of Malaya.

**All population number figures in millions.

The following are thumbnail sketches of U.S.-assisted water supply-related activities in each country.

Burma

American aid to Burma began in 1950. Public health programs were an important component of early aid activities and by 1952 these included training of rural health workers, establishment of environmental sanitation programs, design of several municipal water supply systems, and construction of low-cost housing projects. The U.S. also made available to the Burmese Government dollar funds needed to engage three U.S. consulting firms to conduct a country-wide economic survey with plans for development and rehabilitation. Included were plans for water supply systems.

Also during this period, a Bureau of Environmental Sanitation was established within the Directorate of Health and Medical Services. The National Rural Sanitation and Water Supply Board was also formed and an extensive well-drilling program initiated.

At the request of the Burmese Government, there was no U.S. aid program from March 1953 to April 1958. In 1958 an expanded village water supply program was begun, drilling over a thousand wells annually for five years. Rangoon water supply (and sewerage) improvements were partially financed with U.S. loans from 1958 to 1969. Two U.S. engineering firms participated in this work.

Cambodia

Aid to Cambodia began in 1951 as part of an overall Indo-China program headquartered in Saigon. After the Geneva accords of August 1954, a separate mission was established in Phnom Penh and rural sanitation and well-drilling projects started. Three urban supplies were completed with two others partially completed. The U.S. also funded a detailed feasibility and engineering survey, by two U.S. firms, of plans for construction of a water supply system and hydroelectric plant for the port city of Sihanoukville (ne Kompong Som), Cambodia's only deep water seaport.

Aid to Cambodia was terminated, at Cambodian request, in 1963.

China (Taipei)

U.S. aid to the Republic of China began in 1951 and terminated in 1965. National economic development there has progressed to a level where China itself now provides technical assistance to some 30 developing countries.

Water supply related activity began in 1952 with a project designed to improve sanitation and public water supplies, including rehabilitation of war-damaged installations. The work done in prior and concurrent years by the Sino-American Joint Commission on Rural

Reconstruction and the Institute for Environmental Sanitation was supplemented by U.S. assistance. A water resources survey was undertaken to provide information for domestic water supply among other proposed uses. Financial assistance was provided to the Taipei Regional Water Supply Improvement Project and the Taichung Municipal Water Supply. The U.S. also made available approximately 30 million dollars for construction of the Shihmen Multipurpose Dam, a source of public water supply for an ultimate urban population of 340,000.

Korea (Seoul)

Early aid to the Republic of Korea (ROK) after the armistice of 1953 was largely devoted to rehabilitation of almost a hundred war-damaged waterworks. U.S. assistance to an environmental sanitation program has led to rehabilitation and construction of over 15,000 wells and several thousand public baths and toilets.

AID has made development loans and grants for community water supply and sewerage projects in Seoul, Taegu, and Inchon.

Laos

The first U.S. sanitary engineer assigned to Laos, formerly part of Indo-China, arrived in late 1956. Well-drilling programs for irrigation, rural health, and rural self-help have been the major AID-assisted activities resulting in public water supplies. Approximately 4,000 wells have been provided, a Well Drilling Center established in Vientiane, and several hundred well-drillers and sanitarians trained, including 12 in the U.S.

Philippines

A small U.S. Public Health Service mission in the Philippines from 1946 to 1950 included the provision of safe water supplies in urban and rural areas among its several tasks. The major U.S.-assistance thereafter has been advisory services, including a comprehensive national water resources survey and training of Philippine nationals; provision of equipment and material; and financing of imported commodities.

Filipino technical capacity is now well established and many Filipino engineers are currently employed in third countries. The World Bank has loaned over $20 million dollars to the National Water Waterworks and Sewerage Authority (NAWASA) for new construction.

Thailand

The people of Thailand live primarily within rural villages (88 percent). Several major programs to provide village water supplies have been undertaken. One, the water supply component of the accelerated rural development (ARD) program in critical border

provinces in the Northeast, has already been described in the section, "Some Highlights of U.S. Assistance." An earlier rural program began in 1951 when an MSA-supported project provided ground water supplies that benefitted over 50,000 Thais. A Health Demonstration and Training Center was organized in Cholburi Province which has trained several thousand health workers. Actual field demonstrations are conducted at the village level, showing advantages derived from a safe water supply. These ideas have spread to some 15 provinces. Utilizing principles learned from the earlier efforts, a new nationwide program to improve village environmental sanitation was begun in 1960. By 1964, programs were underway in over 4,000 villages; 108,000 sanitary privies and 4,720 sanitary wells had been constructed; 1,729 health, community development, and land resettlement workers had received training in 71 provinces; and 21 sanitarians had received training in the U.S.

An emergency water project for cholera control in Bangkok was supported in 1958. A 30-year municipal development plan was prepared for Bangkok in 1957, by a U.S. contractor, with U.S. financial assistance.

Vietnam (Saigon)

U.S. assistance to the Republic of Vietnam began in 1951, with little support for water supply activity until 1957, when an active well-drilling program began which with its successors (including Military Civic Action) had drilled 1,496 producing village wells through June 1964.

Following several years of study, a development loan to cover the foreign exchange costs ($17.5 million) of a $26.5 million project to meet the water supply needs of the metropolitan Saigon/Cholon area was approved in 1959. This project, U.S. engineered, is now completed. Provision of water supplies in a number of other Vietnamese cities has been assisted by commodity support, technician funding, and provision of contract services by U.S. engineers.

Regional

The Asian Institute of Technology (AIT), a regional educational institution serving SEATO member countries and other countries in Southeast Asia, offers several graduate engineering degrees, including the Master of Public Health Engineering. AIT receives financial assistance from AID, primarily through an AID contract with Colorado State University for technical assistance to its sister institution.

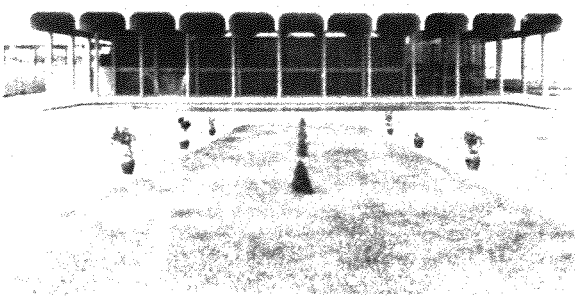


Figure 24

SAIGON WATER TREATMENT PLANT
An attractive facade is one of the modern aspects of a water treatment plant designed to serve Saigon and Cholon, South Vietnam. The plant was designed by Hydrotechnic Corporation of New York and partially financed by the Agency for International Development (AID).

VI

LATIN AMERICA

Introduction

The inauguration in 1942 of the bilateral health programs of the Institute of Inter-American Affairs planted the seed that ultimately led to the concept of a Global Community Water Supply Program some 15 years later. The early start in Latin America, the development of institutions and professional manpower, and the generation of local support do much to explain the favorable water supply picture in Latin America vis-a-vis the remainder of the developing world. This example and the experience gained by IIAA personnel[63] and others were influential factors in forming the new global program.

Water supply activities during the life of IIAA were part of its health and sanitation program. Field operations were conducted by a cooperative unit in one of the ministries, e.g., Public Health, of the host government, generally called the Servicio. The Spanish word Servicio means service. It is also a synonym for government bureaus in the United States. Although a Servicio was part of a ministry, it had considerable autonomy. It generally had a U.S. director and a national co-director, employed its own personnel, set its own salary scales, and used U.S., national, and local funds. As local counterparts acquired sufficient skills and experience, U.S. personnel stepped aside and became consultants. The Servicios were characterized by flexibility and a minimum of paperwork. As a device for getting things done in a critical period and under adverse conditions, the Servicios were effective. None exist today in their original form, most having been absorbed by national health ministries, and retaining varying degrees of autonomy.[64]

Through 1951, total U.S. financial assistance to the Servicios was $30,403,104 for 661 sanitation projects, approximately 30 percent of the total Servicio funds expended for sanitation.

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[63] For example, all five sanitary engineers who have directed the AID Global Water Supply Program, Leonard M. Board, Edmund G. Wagner, Charles S. Pineo, James D. Caldwell, and Arthur H. Holloway (listed chronologically) once served in IIAA as did Dr. Eugene P. Campbell and Dr. Herman G. Baity, who were respectively Chief, Health Division, ICA, and Director, Division of Environmental Health, WHO, at the time the Global Water Supply Program was initiated. Dr. M. G. Candau, Director-General, WHO, was formerly Superintendent of SESP, the Brazilian Servicio.

[64] For an evaluation of the Servicios, see U.S. Public Health Service. "10 Years of Cooperative Health Programs in Latin America," Department of Health, Education, and Welfare, Washington, D.C., 1963. Chpts. 3 and 5.

LATIN AMERICA

DIRECT U.S. AID FOR DOMESTIC WATER SUPPLIES (Shaded countries)

① Groundwater development: exploration, mapping, equipment, training, and/or drilling of wells

② Development loans or grants for water works construction

③ Professional services: advisory services, management studies, engineering reports, and/or feasibility studies

④ Rural and village water supply systems

⑤ City water supply systems

⑥ Institutional support

⑦ Peace Corps environmental sanitation programs

⑧ Participant training within U.S.

Figure 25

The Alliance for Progress Decade (1961-1971) has seen renewed emphasis on provision of public water supplies. One goal of the Charter of Punta del Este is "To provide adequate potable water supply and sewage disposal to not less than 70% of the urban and 50% of the rural population during the present decade... ."[65] The water supply objective will probably be met for the urban population, but not for the rural. In seven years the Alliance has seen new or improved service provided for 60 million Latin Americans.

Summary

Direct U.S. financial contributions to development of domestic water supplies in Latin America are summarized in Table 5. These figures are incomplete for assistance prior to 1952, and exclude indirect technical assistance (e.g., over 275 professional man-years), training programs for Latin Americans (over 300 trained in the U.S.), program assistance (purchase of commodities), Export-Import Bank loans, and loans and grants for multipurpose water resources projects which may have a water supply component.

Also excluded are water supply and sewage loans made from the Social Progress Trust Fund, U.S. financed, but administered by the Inter-American Development Bank. Through 1968, these total $160 million.

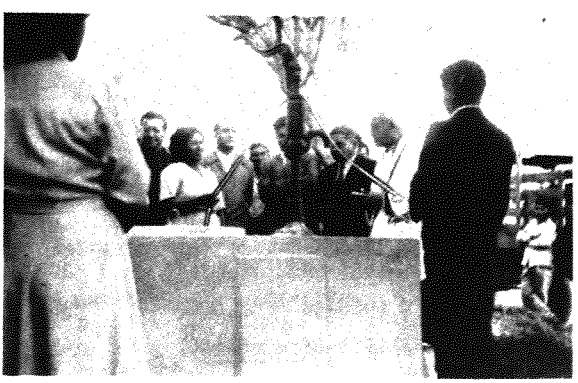

Figure 26

DEDICATION OF A WELL AND HANDPUMP IN PERU
The inauguration of a water supply in Latin America is often a holiday, a festival that may last a week, solemn with its religious dedication and stirring speeches, spectacular with its parades, bands, and dances.

[65] Pan American Union. "Alliance for Progress," OAS Official Records, OEA/Ser. H/XII.1 (English), General Secretariat, Organization of American States, Washington, D.C., 1961. p. 11.

Table 5

LATIN AMERICA

Direct U.S. Capital Assistance for Development of Domestic Water Supplies

Country	Years	Loans	Grants	Totals
		(In Thousands of U.S. Dollars)		
Latin America - Regional	1960-65		1,543	1,543
Bolivia	1955-68		1,625	1,625
Brazil***	1957-68	20,500*	4,478	24,978
Chile	1952-68	4,697		
Colombia	1949-68	4,000	393	4,393
Costa Rica	1956-68	4,900	412	5,312
Dominican Republic	1964-68	1,890	3,005	4,895
Ecuador	1949-65	50	684	734
El Salvador	1959-62		86	86
Guatemala	1955-67	1,745	2,731	4,476
Guyana	1968	2,600		2,600
Haiti	1957-62		623	623
Honduras	1957-68	2,300	389	2,689
Jamaica	1955-68	4,232	504	4,736
Mexico	1943-58		1,766	1,766
Nicaraugua	1951-65	585	537	1,122
Panama	1951-68	28,038**	308	28,346
Paraguay	1958-68	1,000	388	1,388
Peru	1953-68	8,600	417	9,017
Surinam	1955-64		650	650
Trinidad	1961-65		600	600
Venezuela	1944-59		287	287
TOTALS		85,137	21,426	106,563

*$15,400,000 authorized but unsigned as of June 30, 1968.
**Includes $15,000,000 authorized but unsigned as of June 30, 1968.
***Brazil, in particular, has received much assistance in the form of P.L.480 and local currency loans and grants. These are not included herein. See discussion of these forms of assistance in the epilogue.

Estimates by the Pan American Health Organization (PAHO) of availability of water services in Latin America in 1967 are shown in Table 6.

Table 6

LATIN AMERICA

Estimated Availability of Water Service in 1967

1967 Populations*	Number	Percent
Total Population (T)	254.3	100
Urban Population (U)	135.8	53 (U/T)
Urban Served	95.3	70
House Connections	77.8	57
Easy Access	17.5	13
Urban Not Served	40.5	30
Rural Population (R)	118.5	47 (R/T)
Rural Served	19.1	16
House Connections	7.5	39
Easy Access	11.6	61
Rural Not Served	99.4	84
Total Population Served	114.4	45
Total Population Not Served	139.9	55

*All population number figures in millions.

The water supply situation in Latin America is promising. Established administrative and educational institutions, experienced professional manpower, strong programs of bilateral and multilateral technical and capital assistance; these are the legacy of over a quarter-century of U.S. support. The following are brief reviews of U.S.-assisted water supply activities.

Regional

The AID contribution ($1,543,000 since 1960) to the Pan American Health Organization (PAHO) Special Fund for Community Water Supply Development helps support the principal source of international technical assistance to water supply development in Latin America. PAHO has supported advisors and consultants, sponsored university fellowships, short courses, and seminars, and undertaken special studies and investigations all over Latin America. PAHO also works closely with the Inter-American Development Bank (IDB), the World Bank, United Nations Development Program (UNDP), UNICEF, the Organization of American States (OAS), and its Washington headquarters is the WHO Regional Office for the Americas. A substantial part of the necessary technical assistance is being provided by PAHO with financing from its

own funds (the U.S. is also a contributor to the regular PAHO budget).

Assistance to the Regional School of Sanitary Engineering, University of San Carlos, Guatemala, was described earlier in the "Highlights" section. U.S. support of the Social Progress Trust Fund has also been previously mentioned. At one time AID maintained a Regional Sanitary Engineer in Latin America who undertook many studies and investigations and was available to both Latin agencies and AID missions for counselling on an ad hoc basis.

Bolivia

Assistance was provided to several small water systems during the 1950's. During this decade, assistance has been provided for drilling wells, training sanitarians, engineering advisory services, and survey and design of numerous small community water supplies. Over 20 systems were constructed. Forty-five Bolivians were sent to other countries for training, nine in the U.S.

Brazil

U.S.-assisted water supply activities began in 1942 in the Amazon and Rio Doce Valleys with cooperative efforts undertaken by the newly formed Servicio Especial de Saude Publica (SESP). The development of this program has been described in the "Highlights" section.

Programs were initiated about 1950, providing technical assistance and limited financial support to engineering schools for strengthening sanitary engineering courses and programs.

Since 1960, U.S. aid to water supply development in Brazil has been directed primarily to building viable institutions - national, state, and local. Since 1964, 249 individuals have attended AID-funded professional training courses and 1,646 individuals have received AID-funded medium-level training. Since 1962 AID has made available to engineering schools and water authorities more than 37,000 technical books, manuals, pamphlets, and journals, the majority translated from U.S. publications and published in Portuguese.

New construction and expansion of 74 water supply systems in the Northeast Region have been assisted by AID dollar and cruzeiro grants. A comprehensive water and sewerage plan for Sao Paulo was aided by similar grants. The National Loan Fund was described previously in the "Highlights" section.

Chile

The Health Servicio in Chile was active from 1943 to 1953. Among the 61 completed projects were two water supply systems. As part of an earthquake reconstruction loan, projects have been supported

providing drinking water systems in 30 communities.

Colombia

U.S. assistance has been directed primarily to strengthening the capability and capacity of the Ministry of Public Health in developing programs of water supply, sewerage, and environmental sanitation, including advisory services and sponsorship of professional training; loans for feasibility studies; and loans for water works construction to the Empresas Publicas de Barranquilla and to the National Municipal Development Institute (INSFOPAL) for financing systems in smaller towns.

The AID-supported training programs for ground water development and water works management, offered in the U.S. at the Universities of Minnesota and Akron respectively, have been "exported" to Bogota where they are periodically taught in Spanish.

Costa Rica

The wartime health and sanitation program was reestablished in Costa Rica in 1950. Construction of water supplies and sewage disposal systems was done on a demonstration and training basis. By 1959, 85 wells serving 82,000 people had been completed. Advisory services were also provided leading ultimately to establishment of a national water and sewerage authority (SNAA).[66]

In 1961, AID and the Export-Import Bank approved loans of $3.5 million and $4.5 million, respectively, for the San Jose waterworks. AID has made an additional $1.4 million loan to finance repairs of damage by volcano Irazu.

Dominican Republic

Emergency disaster relief grant funds were provided in 1965 to improve water supply and distribution in Santo Domingo. In 1966 loans were approved for extension of the Santo Domingo distribution system and for rural water supplies, including three towns with approximately 26,000 population.

Ecuador

Postwar U.S. assistance related to water supply has been principally through several environmental sanitation projects. These have strengthened national sanitary engineering capability, both institutionally and manpower-wise, and directly and indirectly assisted 50 municipal and 250 rural village water supply projects. Export-Import Bank loans for water system improvements have been made for projects in Quito (2 loans), Guayaquil, and Latacunga. The

[66] Servicio Nacional de Acueductos y Alcantarillado.

first two of these loans were authorized in 1942.

El Salvador

A Servicio (SCISP)[67] was established in 1942 and, with U.S. financial assistance, constructed numerous small water supply systems. Advisory services were provided in establishment of the National Water and Sewer Authority (ANDA)[68] in 1962.

Guatemala

A Servicio (SCISP) was established in 1942 and through 1948 constructed 5 public water and sewer systems. An environmental sanitation program established in 1956 by 1963 had provided potable water to 72 communities with total population of 160,000. A concurrent self-help rural housing and water supply project completed 450 wells. An additional 74 wells have since been drilled as part of a civic action project. The Regional School of Sanitary Engineering has been previously described.

Haiti

About 20 small water supply projects were constructed by the Haitian Servicio (SCISP) between 1942 and 1958. One-year U.S. training programs were completed by 17 Haitian sanitary engineers. An AID-sponsored engineering study of the Port-Au-Prince water supply led to authorization of an Inter-American Development Bank loan in 1964. The AID water program in Haiti was discontinued after FY 1962.

Honduras

The Honduran Servicio (SCISP) constructed 105 water systems serving 165,000 people, at an approximate cost of $3.5 million dollars between 1942 and 1960. An additional 78 systems were constructed with 1957 and 1963 development loans. Advisory services have been provided to the Tegucigalpa Water System and the national water agency (SANAA)[69] established in 1961.

Jamaica

U.S. assistance to Jamaica began in 1955 and has consisted primarily of advisory services, an intensive in-country training program, sponsorship of overseas training, engineering feasibility studies, and a $3.7 million loan for construction of five water supply systems serving 18 communities with a total population of 174,000.

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[67] Servicio Cooperativo Interamericana de Salud Publica.

[68] Administracion Nacional de Acueductos y Alcantarillados.

[69] Servicio Autonomo Nacional de Acueductos y Alcantarillados.

Mexico

U.S. sanitary engineers were assigned to the Mexican Servicio (DCISP)[70] from 1943 to 1956. Over 60 water supply systems were constructed during this period. In addition to technical assistance, IIAA made a direct financial contribution of $880,000. IIAA engineering staff also assisted in establishing a sanitary engineering program at the National University of Mexico. U.S. funding for health programs ceased in 1958.

Nicaraugua

The Nicarauguan Servicio, established in 1942, improved and constructed numerous water systems before transfer of this function to the Ministry of Public Works in 1955. A new Servicio formed in 1959 undertook, with U.S. assistance, rural sanitation programs which included water supply construction and training. In 1959 a P.L. 480 loan for water supply construction was made to Matagalpa.

Panama

Potable water was of paramount importance in construction of the Panama Canal. In accordance with the Treaty of 1903 (Article 7), the United States was charged with responsibility for the water supply needs of the Canal area and also the needs of the cities of Panama and Colon. Ownership of works supplying Panama City and Colon was transfered to the Government of Panama in 1945.

A twelve year project to strengthen the Sanitary Engineering Division of the Ministry of Health was initiated in 1951. The number of sanitary engineers in the ministry was increased from one in 1951 to 19 in 1961, 14 of whom received U.S. or third country training.

In 1958 and 1963, loans of $2.0 million and $6.0 million, respectively, were extended for Panama City water and sewer construction. A 1961 grant supported a study for a national water program which has since been funded by the Inter-American Development Bank. Rural demonstration projects have also been supported. Several large new loans are currently being negotiated.

Paraguay

Assistance began in 1942 with a Servicio (SCISP) water supply study for Asuncion. Subsequent assistance to Asuncion, the capital, has totaled almost $10 million in Export-Import Bank loans, ICA development loans, and P.L. 480 funds. The major construction work was carried out during the late 1950's.

Technical assistance for environmental sanitation has been

[70] Direccion Cooperativo Interamericana de Salud Publica.

provided through AID-assisted health programs. The first potable water system outside Asuncion was installed in Encarnacion during 1962. AID has assisted in the organization and initial operations of the new (1962) National Water Supply Commission (SANOS).

Peru

Water supply activity began in 1942 with construction by the Servicio (SCISP) of a water supply system for Chimbote, a coastal town of then 9,800 population that had been selected by the Government of Peru as a site for development of heavy industry. Water supply system construction has since been supported, on a small scale, at numerous other communities, including Chiclayo, Cuzco, and Iquitos.

In 1963 AID and Export-Import loans totaling $15.1 million were authorized for improvements to Lima water and sewerage systems. Peru has also borrowed $25 million from the Inter-American Development Bank to finance environmental sanitation programs. The technical ability to assimilate such large infusions of capital is due in no small measure to the sanitary engineering program developed at the National Engineering University (UNI), with 1954-58 and 1965-67 assistance from ICA, AID, and the University of North Carolina.[71] UNI has graduated over 250 sanitary engineers and maintains an active research program.

Surinam

U.S. assistance began in 1955 with advisory services on small well development, part of a public health project. Funding ceased in 1963.

Trinidad and Tobago

One water supply project has been assisted, the 1961 construction of wells and transmission lines in the Tucker Valley of Trinidad.

Uruguay

Seven sanitary engineers have received training in the United States.

Venezuela

A rural water supply program was initiated in 1944 by the Servicio (OCISP).[72] Over 100 systems were constructed, serving about 107,000 people, at a total cost of about $4.4 million. Nearly the entire cost was borne by Venezuela. This program has been expanded and continued by the Ministry of Health with some U.S. technical assistance and several IDB loans.

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[71] See Okun, Daniel A. "Sanitary Engineering Education in Peru," University of North Carolina, 51 pp., Chapel Hill N.C., 1958, and Brown, James C. "Recent Developments at the Center for Applied Research of the Faculty of Sanitary Engineering, National Engineering University of Peru," University of North Carolina, 13 pp., Chapel Hill, N.C., 1969.

[72] Oficina Cooperativa Interamericana de Salud Publica.

VII

NEAR EAST AND SOUTH ASIA

Summary

Over three-quarters of a billion people live in these countries in a land area roughly the size of the United States, bounded by inhospitable deserts and mountains, with an average GNP[73] per capita under $200, and amid the endemic foci of such water-borne diseases as cholera. Water supply problems are tremendously varied, from those of the sparsely populated Arabian desert to those of the densely populated delta of the Ganges.

U.S. assistance with these problems began in the early 1950's with programs administered by the Technical Cooperation Administration and the Mutual Security Agency. Direct U.S. financial contributions are summarized in Table 7. These totals are exclusive of indirect

Table 7

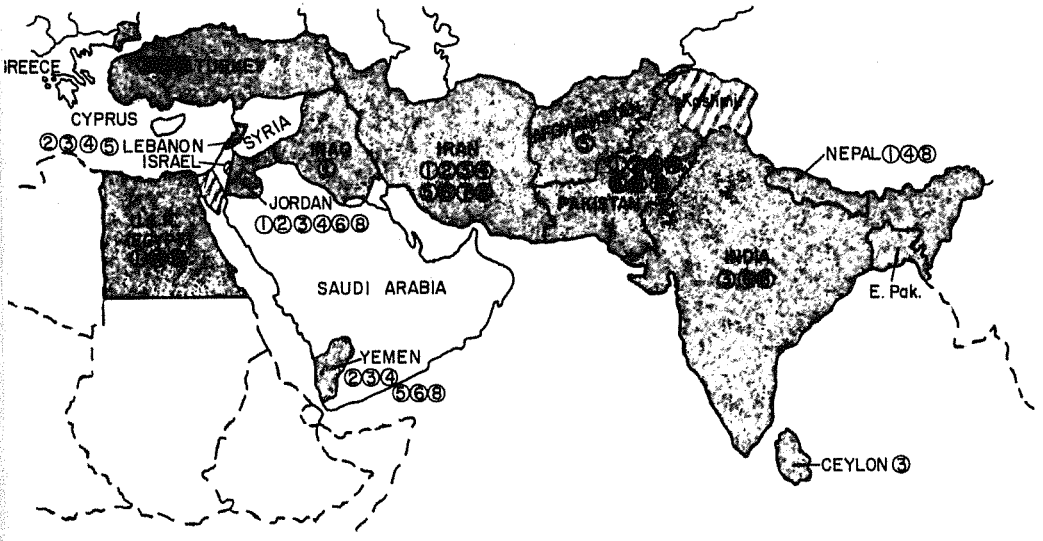
NEAR EAST AND SOUTH ASIA

Direct U.S. Capital Assistance for Development
Of Domestic Water Supplies

Country	Years	Loans	Grants	Totals
		(In Thousands of U.S. Dollars)		
Ceylon	1956-61		56	56
India	1953-61		6,448	6,448
Iran	1951-66		2,776	2,776
Iraq	1953-58		30	30
Israel	1958-60	2,131		2,131
Jordan	1952-65		13,431	13,431
Lebanon	1953-63		6,495	6,495
Nepal	1960-63		93	93
Pakistan	1953-68	9,841	7,718	17,559
Turkey	1962-65		69	69
United Arab Republic	1953-60		6,476	6,476
Yemen	1961-68		4,263	4,263
TOTALS		11,972	47,855	59,827

[73]Gross National Product, the total market value of all final goods and services produced by a nation's economy before deductions for depreciation and consumption of durable capital goods. Sometimes called Gross National Expenditure.

NEAR EAST AND SOUTH ASIA



DIRECT U.S. AID FOR DOMESTIC WATER SUPPLIES (Shaded countries)

① Groundwater development: exploration, mapping, equipment, training, and/or drilling of wells

② Development loans or grants for water works construction

③ Professional services: advisory services, management studies, engineering reports, and/or feasibility studies

④ Rural and village water supply systems

⑤ City water supply systems

⑥ Institutional support

⑦ Peace Corps public works programs

⑧ Participant training within U.S.

Figure 27

technical assistance (e.g., over 150 man-years), foreign training of local nationals (about 200), program assistance for commodity purchases, Export-Import Bank loans, and support of multipurpose water resources or health projects which may include potable water supply activities.

The availability of water service in urban areas as estimated by WHO in 1962 is shown in Table 8.

Table 8

NEAR EAST AND SOUTH ASIA

Estimated Availability of Water Service in 1962

1962 Populations*	Number	Percent
Total Population (T)	687.3	100
Urban Population (U)	131.5	19 (U/T)
Urban Served	61.4	47
House Connections	31.5	24
Easy Access	29.9	23
Urban Not Served	70.1	53
Rural Population (R)	555.8	81 (R/T)
Rural Served	50 (?)	less than 10 (?)
Rural Not Served	500 (?)	more than 90 (?)
Total Population Served	120 (?)	less than 20 (?)
Total Population Not Served	560 (?)	more than 80 (?)

*All population number figures are in millions.

Closely related to the problems of water supply are the low levels of public sanitation and personal hygiene, particularly in southern Asia.[74] Poor sanitation, extreme poverty, inadequate nutrition, and population pressures make water supply improvements in South Asia a formidable task. Progress is being made, albeit slowly. For example, preparations for India's Fourth 5-Year Plan indicate that water supply and sanitation schemes will receive a larger financial allotment than in the three previous plans combined. The share of such schemes in total public development spending will rise from about 1.5 percent to 2.6 percent, and their share in all spending for health purposes, from one-third to two-fifths.

The following are thumbnail sketches of U.S.-assisted water supply activities in each country.

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74 These are ably summarized by Myrdal, Gunnar. Asian Drama, Pantheon Books, New York, 1968. Vol. I, Chpt. 12, and Vol. III, Chpt. 30.

Afganistan

There has been no direct assistance to potable water supply projects in Afganistan. Technical assistance has been provided for hydrologic investigations and for public health programs.

Ceylon

Advisory services were provided from 1956 to 1961 to Ceylonese government agencies active in rural water supply. Subsequent advisory services have been provided on an ad hoc basis.

India

The National Water Supply and Sanitation Program of India was initiated on an organized basis in 1954 as part of the First 5-Year Plan (1951-56). It has been continued with increased levels of support in succeeding Second and Third 5-Year Plans. In the projected Fourth Plan (1966-71) the level of support proposed represents more than a three-fold increase to a level of Rs 373 crores (about $500 million).[75]

Direct U.S. aid efforts for Indian water supply have been in the form of technical and commodity assistance provided to the National Program. These have included 24 man-years of advisory services by U.S. engineers (from 1953 to 1957, a U.S. Public Health Service officer[76] served as Chief Engineer of the new Central Public Health Engineering Organization - CPHEO); institutional development and support, particularly to CPHEO; support of training, including support of graduate public health engineering courses in India and training of 22 key officials of CPHEO and state organizations in the United States; and provision of commodities such as laboratory equipment, drilling rigs, pipe and fittings, pumps, and windmills.

Iran

U.S. assistance began under TCA in 1951. Iranian/United States accomplishments through health and sanitation programs[77] during the subsequent 15 years included construction of 84 deep wells, 4,630 shallow wells, and 35 water distribution systems; training of 20 engineers (15 in the U.S.) and 514 sanitarians; and establishment of a General Department of Sanitary Engineering within the Ministry

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[75] U.S. Public Health Service Advisory Team. "Review of the National Water Supply Program of India " Washington, D.C., April 1967. p. 7.

[76] Callis H. Atkins, now Director, Division of Environmental Health, WHO.

[77] From 1953-56, the work was carried out by a joint Public Health Cooperative (PHCO), not unlike the early Servicios in Latin America.

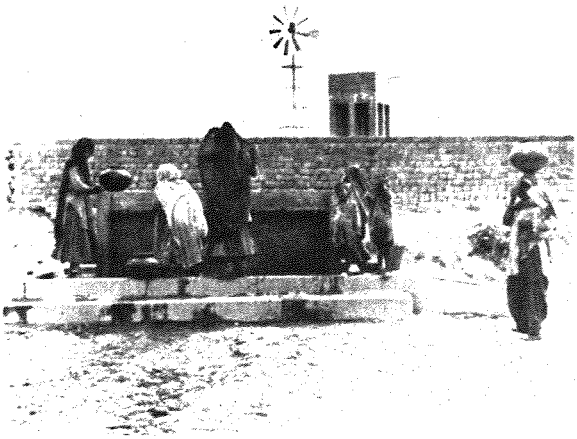

Figure 28

RURAL WATER SUPPLY IN INDIA
This installation (tubewell, windmill, tank, and public faucets) replaced an unprotected dug well. According to an attached plaque, it was completed in 1954 with the cooperation of the U.S. Technical Cooperation Mission.

of Health.

Development support ($2.045 million) was provided for construction of the Teheran Water Treatment Plant, completed in 1956. With AID support, sanitary engineering courses were added to the civil engineering curriculum at Pahlevi University. By 1967, Iran had progressed to the point where external aid is no longer required for further development.

Iraq

Direct assistance has been provided for only one project, a groundwater survey by a U.S. consulting firm. Several Iraqi professionals have participated in training programs within the U.S.

Israel

No assistance has been provided for community water supplies. An AID loan for agricultural development has been used to finance commodity imports for an "integrated water system." A one-million gallon per day desalination-power plant at Eilat recieved a develop-

ment loan.

Jordan

Development of water supplies for domestic, agricultural, and industrial uses has been a major component of U.S. aid to Jordan. Accomplishments include development of a Central Water Authority, strengthening of the Environmental Sanitation Divison of the Ministry of Health and the Amman Sanitation Training Center, development of laboratories, establishment of loan funds for village and municipal development, construction and rehabilitation of hundreds of wells, springs, and cisterns, and assistance to over 20 community water supplies.

Lebanon

At Lebanese request, the U.S. financed complete reconnaissance surveys, including domestic water supply, on nine river basins during the 1950's. The Litani River investigation was expanded to include studies and designs for village water supply districts. Construction of the Kasmie Village water supply area was totally financed by the U.S. as a demonstration. Further funds made available by the Governments of Lebanon and the United States brought water to approximately 300,000 people in 400 villages. Assistance has been provided to American University (Beirut) for training of sanitary engineers and sanitarians from other countries.

Nepal

The U.S. provided advisory services in environmental sanitation from 1955 to 1963. A 1960 to 1963 well drilling and pipeline laying program financed by U.S. owned local currency, P.L. 480 funds, and an AID development grant, in the Kathmandu and Rapti Valleys provided new or improved water supplies to about 300,000 people. The Indian Aid Mission is assisting installation of a city-wide water distribution system in the capital, Kathmandu.

Pakistan

U.S. aid to Pakistan for health and sanitation activities began in 1953. Public health teams, including sanitary engineers and sanitarians, were stationed in the federal and provincial capitals. They acted primarily as advisors, consultants, and teachers.

Construction of the water treatment plant for Karachi, completed in 1962, and 160 miles of related canals, tunnels, and trunk mains, was partially financed by the United States. The U.S. also sponsored engineering studies and designs for water supply facilities for Dacca and Chittagong. Construction of these facilities was partially financed by a large World Bank loan.

The general advisory services in public health engineering to the

province of East Pakistan have been discussed in the "Highlights" section. Similar services also have been supported in West Pakistan.

Turkey

Water-related assistance to Turkey began in 1954 with a continuing project aimed at institutional development of the General Directorate of State Hydraulic Works (DSI). A specific public water supply program, aimed at development of village water supplies, was started in 1962. A feasibility study for Ankara is U.S. sponsored. Training has been the principal U.S. supported activity. Over 400 personnel have received training, 88 of them in the United States. A ground water course has been established at Middle East Technical University at Ankara with assistance from the University of Minnesota.

United Arab Republic

Point IV assistance to Egypt began in 1951. Included was an environmental sanitation program that included U.S. training for Egyptian sanitary engineers and sanitarians, construction of water supplies (generally wells) and latrines in villages, and a regional distribution system in the delta. These programs were terminated in 1956. A program of ground water investigations in the western desert was supported from 1959 to 1967.

Yemen

U.S. water supply activities in Yemen have been extensively described in a previous section, "Some Highlights of U.S. Assistance."

No man is an Iland, intire of it selfe;
every man is a peece of the Continent,
a part of the maine; if a Clod bee
washed away by the Sea, Europe is the
lesse, as well as if a Promontorie were,
as well as if a Mannor of thy friends
or of thine owne were; Any mans
death diminishes me, because I am
involved in Mankinde . . . .

John Donne
17. Meditation

VIII

EPILOGUE

Any attempt to objectively summarize or evaluate the overall water-related foreign aid activities of the United States meets with several difficulties.

One obvious form of assessment is quantitative, i.e., how much money has been spent, how many people have been served? Even these questions are difficult, if not impossible to answer. The reasons are several. First, complete data are simply not available; partly because of missing and retired program reports,[78] but more importantly, because much water supply activity has been so intertwined with other public works, public health, and engineering activities that water supply activity costs have frequently been unreported or unidentified as separate entries in the records. The AID reporting system for local currency loans and commodity assistance does not centrally compile water supply-related assistance. Some supporting assistance[79] has also probably been used for water supply development.

Likewise technical man-years can only be estimated on the basis of projects or programs in which U.S. professionals were involved full-time.

Further, water supply projects and programs have nearly always been self-help activities with considerable host-country input, much of which has been unmeasured or unreported.

Another important factor is that much U.S. financial assistance has been provided indirectly through support of the International Bank for Reconstruction and Development (World Bank), the International Development Association, the Inter-American Development Bank, the Social Progress Trust Fund, and the United Nations Development Programme. Technical

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[78] For example, some older reports, particularly those of the IIAA, have been retired to archives. IIAA reports alone cover over 600 sanitation projects to which the U.S. contributed about $30 million. Detailed analyses of these reports were not feasible within the time available.

[79] Supporting assistance is provided primarily to build the defensive strength of less developed nations threatened by communist expansion and to avert dangerous economic and political instability in sensitive areas. Supporting assistance funds are used primarily for purchase through commercial channels of essential imports which the recipient country is unable to finance from its own foreign exchange earnings. The private exporter (usually in the United States) provides the commodities and is paid in dollars. The local importer pays full value in local currency to his government, which then uses the funds to finance defense or other programs of mutual benefit to the recipient country and to the United States.

assistance by the World Health Organization, and its American Regional Office, the Pan American Health Organization, has been materially supported both by the regular U.S. subscriptions and by contributions to their special funds for the community water program.

Nevertheless, Figure 29 is an attempt to summarize by regions the total direct U.S. assistance in loans and grants for water supply. Over the past 25 years, this direct financial assistance to all countries by AID and its predecessors has totaled about $300 million. Export-Import Bank loans have exceeded $50 million. Early IIAA expenditures exceeded $30 million. Local currency loans and commodity assistance are conservatively estimated at an additional $200 million. Indirect assistance provided through U.S. support of multilateral agencies totals perhaps an additional $400 million.[80] Totaling close to one billion dollars, this is probably over 75 to 80 percent of all external public assistance for water supply activities in foreign countries. Local capital investment in water supply facilities is perhaps one to two times greater than external loans and grants.[81] The average annual capital investment in water supplies in developing countries during this decade has been about $125 million and is increasing. About 50 to 60 percent of the funds originated in the United States.

What has this investment bought? How many people have ready access to potable water, adequate in quality and quantity. Figure 29 sums up the picture by regions. World wide only some 55 percent of the urban and less than 25 percent of the total population of developing countries are now served, many of these inadequately.

To completely serve only the urban population will require prodigious effort and expenditure. Per capita costs vary tremendously of course, not only geographically but with level of service, population density, per capita demand, and general economic development. Using an average per capita cost of $40,[82] and the population estimates previously given, a present value capital investment of $6.4 billion would be required to provide water at minimal levels of service to the now unserved urban population of the countries reported herein.

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80 These funds, with a few exceptions (e.g., the Social Progress Trust Fund administered by the Inter-American Development Bank), cannot be directly estimated inasmuch as the multilateral agencies have several sources and categories of funds, with varying U.S. participation; make loans and grants under varying conditions; and often support projects in which the water supply component is combined with other elements, e.g., housing, sewers, et al. United States participation ranges from 30 percent and upward of capital resources and special funds. The United States is also the leading purchaser of bonds and securities issued by the International banks.

81 Extrapolated from Latin American experience. The data available for other regions are insufficient for direct calculation.

82 Based on a considerable number of sources available to the author. These costs range from $2 to $200 per capita.

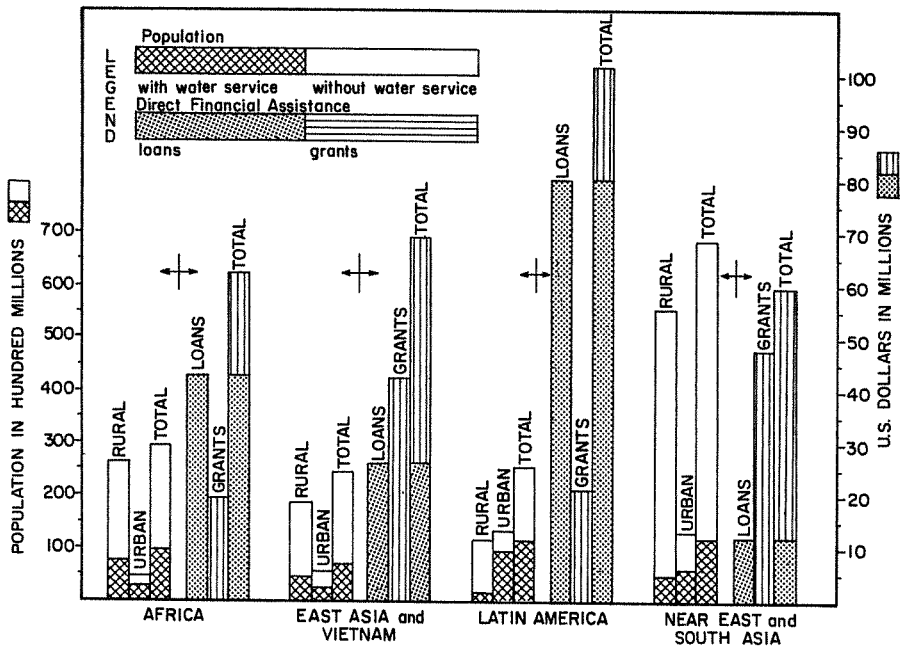

Figure 29

DIRECT U.S. FINANCIAL ASSISTANCE BY REGIONS*

*since World War II by AID and its predecessors; excludes Export-Import Bank loans, P.L. 480 funds, supporting assistance, and support of multilateral agencies.

The major accomplishment of the programs described herein has been their role in assisting countries to develop or strengthen business-type, self-sustaining, national and local institutions which are planning, constructing, operating, managing, and financing water supply systems at the community level. Although material support has been provided to good effect, the enduring and growing benefits have been the strengthening of human resources. Several examples, from the many, have been described in detail. For most of the development emphasis countries, an institutional environment has been created that will generate continuous and progressive solution of water problems by the host country itself.

The United States has been a major sponsor of water supply programs in the developing countries. U. S. interest continues in these programs, not merely an interest in safeguarding a billion dollar investment, but an interest in their ultimate success and the welfare of their users.

On the basis of experience to date, several conclusions seem important:

(1) Community water supplies in developing countries are still inadequate, many grossly so, despite great progress since World War II. Future progress is imperiled by natural population increase and urban migration.

(2) Community water supplies are essential investments for community development and for sustained economic growth. They encourage progressive forces, emphasize human progress, and stimulate self-help concepts.

(3) A self-liquidating water supply system is a feasible goal for urban communities of even the poorest countries.

(4) Well-conceived, well-engineered water supply projects can attract international financing.

(5) Preventive health programs that ignore water supply are invariably failures.

(6) Deficiencies in personnel and in institutions are currently the critical factors in development of community water supplies, not technology and probably not capital. Any realistic program for improvement will require attention to institution building and personnel training.

(7) The major accomplishment of the Community Water Supply Program is not hardware but the progress to date in establishment or strengthening of water supply institutions. However technical assistance must be continued until these have ripened to full maturity.

The attentive reader must undoubtedly realize by now how strong the U. S. influence has been in the Global Community Water Supply Program, a noble task in which all Americans - indeed all mankind - can take pride. In some future millenia, more humanitarian than our own, this author sometimes likes to think that the twentieth century will be chiefly remembered not as an age of political conflict or technical invention but as an age in which human society first dared to think of the welfare of the whole human race as a practical objective.

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Postnote

A companion document to this report, "Manual on Guidelines and Criteria for International Assistance to Community Water Supply Activities," Agency for International Development, Washington, D. C., 1969 (in press) reviews technological and managerial aspects of water supplies in some detail. For a critique of AID's internal policies and management in this regard, see Okun, Daniel A. "The Community Water Supply Program of the Agency for International Development," Department of State, Washington, D. C., February 1965.

PHOTO CREDITS

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