ECONOMICS AND FINANCING

Yasumoto Magara
Professor of Engineering, Hokkaido University, Sapporo, Japan

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Summary

Satisfying minimum water supply and sanitation system needs is an essential step towards health improvement objectives of most governments, yet half the population of the developing world is still deprived of adequate services.

Economic analysis is a means of evaluating the feasibility of development projects in terms of national economy. But benefits derived from water supply and sanitation often cannot be estimated from the current market. For those properties with no explicit market prices, indirect methods must be applied to know their benefits. Imaginary market method is free from the existing market. Contingent valuation method (CVM) is classified in this category. CVM is especially useful when measuring non-market value such as the value of ecosystems, amenity, etc.

Once technical options for water supply and sanitation have been decided, the best means of covering the necessary cost should be considered. Many schemes such as community fund raising, indirect taxes, tariff, etc. have been suggested for recovering the cost and each alternative has an extent of applicability.

Differences in development costs between areas are caused by the difference of natural conditions such as access to water sources or geographical features of the project areas, differences of the application technology of the system such as the type of water treatment process, and differences in social and economic conditions. When financial aid is provided to build waterworks facilities in "poorest countries", the subsequent project management will not be able to provide adequate maintenance for the facilities. In many waterworks projects in developing countries, the waterworks facilities and equipment are not repaired, resulting in system failure and water shortage.

Though the limits to the ability to pay and the percentage to be paid differ depending on time, place, and people, waterworks popularization must be developed promptly with a service appropriate for the regional circumstances so that water is available in good quality and quantity, for a relatively small financial burden.

1. Introduction

Sustainability is the most desirable characteristic of any water supply and sanitation system. For water supply and sanitation systems to be sustainable, all their cost should be covered. The difficulty of covering cost is a major obstacle to sound water supply and sanitation systems. Satisfying minimum water supply and sanitation needs is an essential step towards the health improvement objectives of most governments, yet half the population in the developing world is still deprived of adequate services.

Covering the costs through user charges alone is sometimes difficult, especially in poor urban and rural areas, where social and political considerations complicate the competition for, and allocation of, scarce resources and operational subsides. Water supply and sanitation agencies should be granted autonomy in order to provide an efficient and satisfactory service. While subject to public interest regulations, they should operate on a commercial basis.

The agency should provide a service for which the consumer is willing to pay. To achieve financial viability, the average tariff should be fixed at such a level that all cash needs are covered, including an adequate self-financing margin to fund extension. Therefore, ability to pay criteria, such as percentage of water and sanitation charges to household income, are only broad guidelines and represent an external assessment, whereas willingness to pay is more relevant.

2. Development cost of water supply and sanitation

The development cost of rural and urban water supply and sanitation are reported by the interim of the UN Water Decade program. The cost of developing rural water supply and sanitation facilities are shown in Tables 1 and 2, respectively. The differences between areas are caused by the difference of natural conditions such as access to water sources or geographical features of the project areas, the application technology of the system such as the type of water treatment process, or the social and economic conditions.

Regions	1980	1985	Increase Rate (%) (1985-1990)	1995 (Estimated Value*)
Africa	32	40	25	54
America	88	83	-6	112
Southeast Asia	18	14.5	-19	20
East Mediterranean	112	123	10	166
West Pacific	26	44	69	59
LDCs	29	36	24	49

*The average rate of the United States 1980-1993 GDP deflator (3.8%) was applied: 1985× 1.3477

Note: ‘America’ refers to the nations of the Americas except USA and Canada.
‘LDCs’ is the abbreviation of least developed countries.
The values of the price rates are medians.

Table 1. Unit costs of rural water supply

Regions	1980	1985	Increase Rate (%) (1985-1990)	1995 (Estimated Value*)
Africa	15	25	67	33
America	30	40	33	54
Southeast Asia	9	15	61	20

East Mediterranean	100	70	- 30	101
West Pacific	5	12	140	16
LDCs	18	25	39	33

*The average rate of the United States 1980-1993 GDP deflator (3.8%) was applied: 1985× 1.3477
Note: 'America' refers to the nations of the Americas except USA and Canada.
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Table 2. Unit costs of rural sanitation

According to the UN interim report mentioned above, there are regional differences in investment costs for facilities for urban water supply and sanitation in developing countries, as shown in Table 3 and 4. In water supply, for instance, the investment in Southeast Asia is relatively low ($55 to 60 per capita); much higher investment ($100 to 290 per capita, two to four times that of Southeast Asia) is needed in Central and South America or Mediterranean areas. The primary reasons for such differences are considered to be as follows.

- Labor charges for construction work, such as earthworks, are different.
- Primary fundamental machinery, pipes for waterworks, steel, water-treatment devices, and construction machinery have to be imported, raising construction expenses.
- Since the funds are insufficient in many cases, they have to provide construction expenses through loan facilities, with higher interest rate.
- Larger scale facilities are needed for urban waterworks, so they need to supply large quantities of water of good quality. The latest technology is therefore needed, and relatively expensive facilities and systems are built.
- The residents' affordability for expenses (waterworks fee) is different.
- The investment rates of political subsidy are different.

Regions	**Individual water supply**				**Public Water Supply**			
	1980	**1985**	**Increase Rate (%)**	**1995 (Estimated Value*)**	**1980**	**1985**	**Increase Rate (%)**	**1995 (Estimated Value*)**
Africa	100	106	6	143	46	55	20	74
America	125	160	28	216	62	81	31	109
Southeast Asia	55	60	9	81	-	35	-	47
East Mediterranean	250	290	16	391	102	75	-26	101

West Pacific	80	96	20	129	20	42	110	57
LDCs	100	121	21	163	40	60	50	81

*The average rate of the United States 1980-1993 GDP deflator (3.8%) was applied: 1985× 1.3477

Note: ‘America’ refers to the nations of the Americas except the US and Canada.
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The values of the price rates are medians.

Table 3. Unit costs of urban water supply

Regions	**1980**	**1985**	**Increase Rate (%)**	**1995 (Estimated Value*)**
Africa	53	116	119	160
America	62	80	29	107
Southeast Asia	15	20	33	27
East Mediterranean	365	345	-5	43
West Pacific	50	73	46	98
LDCs	52	120	131	161

*The average rate of the United States 1980-1993 GDP deflator (3.8%) was applied: 1985× 1.3477

Note: ‘America’ refers to the nations of the Americas except the US and Canada.
‘LDCs’ is the abbreviation of least developed countries.
The values of the price rates are medians.

Table 4. Unit costs of urban sanitation through individual household systems

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Biographical Sketch

Yasumoto Magara is Professor of Engineering at Hokkaido University, where he has been on faculty since 1997. He was admitted to Hokkaido University in 1960 and received the degree of Bachelor of Engineering in Sanitary Engineering in 1964 and Master of Engineering in 1966. After working for the same university for 4 years, he moved to the National Institute of Public Health in 1970. He has served as a Director of the Institute, since 1984 for Department of Sanitary Engineering, then Department of Water Supply Engineering. He also obtained a Ph.D. in Engineering from Hokkaido University in 1979 and was conferred an Honorary Doctoral Degree in Engineering from Chiangmai University in 1994. Since 1964, his research subjects have been in environmental engineering and have included advanced water purification for drinking water, control of hazardous chemicals in drinking water, planning and treatment of domestic waste including human excreta, management of ambient water quality, and mechanisms of biological wastewater treatment system performance. He has also been a member of governmental deliberation councils of several ministries and agencies including Ministry of Health and Welfare, Ministry of Education, Environmental Agency, and National Land Agency. Meanwhile he performs international activities with JICA (Japan International Cooperation Agency) and World Health Organization. As for academic fields, he plays a pivotal role in many associations and societies, and has been Chairman of the Japan Society for the Water Environment.
Professor Magara has written and edited books on analysis and assessment of drinking water. He has been the author or co-author of more than 100 research articles.