DANIDA SECTOR POLICIES

WATER SUPPLY AND SANITATION

Danida
Ministry of Foreign Affairs

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for

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LIST OF ABBREVIATIONS

DAC	Development Assistance Committee
Danida	Danish International Development Assistance
DKK	Danish Kroner
ESA	External Support Agency
IDWSSD	International Drinking Water Supply and Sanitation Decade
Ipcd	litres per capital per day
NGO	Non-governmental Organization
OECD	Organization for Economic Cooperation for Development
PVC	Polyvinyl Chloride
R&D	Research and Development
TAG	Technological Advisory Group (under UNDP/ World Bank Programme)
UN	United Nations
VIP	Ventilated Improved Pit (Latrines)
VLOM	Village level operation and maintenance
WHO	World Health Organization

CONTENTS

1. INTRODUCTION

The Danish Government assigns a high priority to water supply and sanitation services as a way of contributing to lasting improvements in social conditions and of promoting better health for the poorest population groups in recipient countries. In recent years (1985-90) Denmark has contributed 3-400 million Danish Kroner (DKK) per year to this sector.

In this paper "Danida" means the Danish International Development Assistance of the Danish Ministry of Foreign Affairs. In Danida terminology, the water supply and sanitation sector includes:

* water supply, primarily for domestic use, in rural and urban areas
* sanitation and sewerage services
* health/hygiene promotion
* water resources assessment and protection.

Other water-related aspects such as irrigation, hydro.power and flood control are not considered part of this sector and so are not dealt with in this policy paper, though they do of course influence water resources management.

Danida's support to the water supply and sanitation sector extends back some 25 years. During this

period, on the basis of practice and experience, a number of policy guidelines have gradually been developed. Chapter 2 of this paper spells out the guidelines, which are used for identification, preparation and planning as well as implementation, operation and maintenance of Danida-supported water supply and sanitation projects. The reasoning behind the policy guidelines is presented in Chapters 3 to 6.

The guidelines are the result of many years of practical project work in 30-40 countries in the developing world, primarily in Africa and Asia. They are based on what have been found to be the basic requirements for sustainable projects. They may therefore be considered to be the basic principles on which the Danish Government seeks cooperation with other countries in the drinking water supply and sanitation sector.

It is intended that this paper will be used by recipient governments when preparing project proposals for Danish funding. The guidelines presented here should also be used by project planners when undertaking identification, project preparation and appraisals in the drinking water supply and sanitation sector.

2. SECTOR POLICIES FOR WATER SUPPLY AND SANITATION

The following sector policies will direct Danish development assistance to improvement of water supply and sanitation in developing countries. The sector policies adhere to the overall policies for Danish development aid as decided by the Danish Parliament.

They have been developed based on more than 25 years of experience and lessons learned from working with provision of drinking water and sanitation. They give due consideration to international resolutions, declarations and guidelines for water supply and sanitation and to other Danish sector policies of relevance for water supply and sanitation. The sector policies thus reflect "the current state of the art". They may have to be reviewed and modified as time goes on and new lessons are learned.

2.1 Overall Objectives

The overall objectives of Danish support to water supply and sanitation are:

* Provision of equal access for as many people as possible in poor areas to water supply and sanitation facilities, while safeguarding the environment for future generations.

* Improvement of the community's social and economic development, especially relieving women and children of the time- and energy-consuming burden of fetching water.

* Ensuring sustainable water supply and sanitation facilities which will be effectively used to bring optimum socio-economic benefits and promote behaviourial changes necessary to achieve health improvements.

2.2 General Guidelines

Danida shall:

1. Provide technical and financial assistance for water supply and sanitation improvements primarily in rural communities, inclusive of small towns and growth centres, and to the periurban (slum) areas of large towns, in a continued dialogue with the recipient country. Selection of areas most in need of improvements in drinking water supply and sanitation facilities will be based on need-related criteria.

2. Provide support to strengthen the capacity of sector organizations through project components for institutional and human resources development. Support the principle of community management,

whereby rural communities are empowered and equipped to own and control their own water supply and sanitation systems. This is to improve the reliability of maintaining installed facilities and increase the involvement of the private sector and non-governmental organizations.

3. Ensure that appropriate low-cost water supply and sanitation technologies are selected, offering good possibilities for community participation in decision making and in physical implementation, inclusive of operation and maintenance of the completed facilities.

4. Encourage women to play influential roles in design, construction, operation and maintenance, and water management, as well as in hygiene education (special provisions may be needed to train women) and ensure that they have equal employment opportunities at all levels of staff and management.

5. Ensure the sustainability of projects through cost recovery at a level where at least the cost of operation and maintenance is recovered from the users, and to the extent possible for replicability, that as much as possible of the capital costs are recovered.

6. Assure financial viability of public utilities when Danida provides technical and financial assistance to urban water and sanitation projects. The focus remains on assuring sustainable services for the poorest sections of the community. Tariff structures with cross subsidies where appropriate should ensure that services can be reliably maintained including public standposts or other facilities for the urban poor.

7. Promote coordination with other donors to obtain optimal impact of the investment in cooperation with the recipient country.

2.3 Water Resources and Environmental Aspects

Danida shall:

1. Promote sustainable growth in beneficiary countries, while safeguarding the environment. Integrated water resources management is increasingly needed, to ensure the long-term sustainability of water resources. In recognition of the need to integrate water and land resources management, this may involve additional activities to manage catchment areas and protect water sources.

2. Optimize water resource management at the local level with due consideration to other needs.

3. Select sources (surface or ground water) with due consideration to the implications for operating costs. Ground water will always be considered when a risk of contaminated surface water exists. However, ground water may have other problems like salinity, excess of iron, or fluoride.

4. Assess the conditions for and the impact of assistance to water supply, considering demographic, environmental and health aspects. This procedure will be carried out in order to select target areas for the assistance and may involve environmental impact assessment.

2.4 Technologies - Water Supply

Danida shall:

1. Make technology choice based upon technical, sociological and financial feasibility studies, including willingness and ability to pay studies. Choices of technology will then depend on availability of source type, population density, affordability, capital and recurrent costs; and maintainability. Only

well-known and tested technologies are applied.

2. Give preference to either standposts on a gravity fed piped scheme with appropriate protection of the catchment area, or to hand-augered wells or dugwells equipped with handpumps. In the latter case, preference will be given to standardized locally manufactured hand or foot operated pumps which have been field tested and accepted by the user population and can be maintained at the village level (rural water supply).

3. Normally only apply motor or engine driven pumps for water supply to urban areas and large townships where availability of regular power (fuel, electricity) and trained operation and maintenance staff is ensured.

4. Choose the level of service to be provided, taking into account walking distance, social barriers, and access to alternative water sources. In rural areas, water supply schemes will, in general, be designed to provide an average of 25-30 litres per capita per day from each public water point (standposts or hand pumps). For urban water supplies, design figures in excess of 60 to 80 lpcd from house connections are rarely considered justified for houses without waterborne sewerage.

WHO guidelines for drinking water quality will be used with due consideration to local conditions and water use habits.

2.5 Technologies - Sanitation, Sewerage and Drainage

Danida shall:

1. Assess the need for sanitation facilities and drainage of excess water in connection with provision of water supply and when found necessary provide such facilities. In choosing sanitation technology, emphasis will be put on acceptability (culturally and financially) by user communities. Preference will be given to low-cost on site disposal methods.

2. Install waterborne sewerage only in centrally and densely populated areas and/or areas with difficult soil conditions, and only if plot owners are motivated to connect to the system. Treatment by waste stabilization ponds will be preferred.

3. Introduce solid waste management and storm water drainage systems mainly in densely populated areas such as growth centres and periurban/slum areas.

2.6 Health and Hygiene

Danida shall:

1. Popularize information on the correlation between safe drinking water and a decrease in water-related diseases.

2. Emphasize the critical importance of linking low-cost sanitation with the provision of new water supplies, and accompanying both with appropriate health and hygiene education. Schools are seen as an important vehicle for disseminating the key health messages, and projects will, wherever appropriate, include construction of latrines in schools, and the provision of education aids and materials.

3. Ensure that health promotion, hygiene education and low-cost sanitation is provided in the context of improved environmental sanitation.

4. Ensure women's involvement in health promotion, recognizing their important role in the improved health of their families and in changing the behaviour of children.

2.7 Economic and Financial Aspects

Danida shall:

1. Normally not finance new installations where maintenance of similar installations in the same areas is neglected.

2. Normally finance urban water supplies through an onward-lending arrangement, following the rules and regulations governing such arrangements in the given recipient country.

3. Ensure that mechanisms exist so that tariffs (in utility-operated water supply systems) can be regulated concurrent with the rise in costs.

4. Promote social cross-subsidization through water tariffs, thereby ensuring a basic minimum consumption at reduced rates, and larger consumptions at increased rates, and discouraging wastage and excessive consumption.

5. Ensure that subsidies on low-cost latrines to the poorest communities are fixed at a level which ban encourage commercial latrine production.

6. Encourage contributions in cash or in kind for construction of rural water supply in

accordance with local traditions and/or Government policies.

2.8 Management and Institution Building

Danida shall:

1. Support and strengthen local organizations - government or non-government - and institutions, provided these enjoy general respect among the populations in the villages, or urban areas when urban projects are to be implemented.

2. To the extent possible, ensure implementation of water supply and sanitation project activities by personnel of the organization/institution of the recipient country and, if necessary, provide them with management tools and training.

3. Promote existing water departments, water utilities and other relevant organizations/institutions to be able to undertake the necessary "software activities" (sociological and financial studies; consumer oriented siting of schemes; design and conduct of promotional activities; initiation of local management and operation and maintenance) not traditionally found in engineering departments.

4. Promote and strengthen community management of utilization of water resources, of operation and maintenance of water and sanitation schemes, and of the hygiene of the environment.

5. Carry out sociological and anthropological studies, where these are considered necessary, to establish guidelines for motivating beneficiaries and implementing effective user involvement and community participation.

6. Promote animation campaigns for the establishment of water committees in the villages selected under a water and sanitation project.

7. Promote training of the beneficiaries who will generally be expected to participate in the choice of water and sanitation technologies, the siting of water points, construction activities when relevant, and in the daily running and maintenance of the scheme.

8. Support women's involvement in design, construction, operation and maintenance, and management of improved water supply and sanitation facilities. The key criterion is that women and men should have equal opportunity to participate fully in all aspects of community management.

2.9 Operation and Maintenance

Danida shall:

1. Ensure that no new installations are established without at the same time establishing or strengthening the system of operation and maintenance.

2. Favour the establishment of village water supply and sanitation committees to organize rural system maintenance.

3. Build on existing patterns of social organization, but also encourage, to the extent possible, representation of all village social groupings. Women shall be encouraged to play an important role.

4. Ensure that community-based operation and maintenance be supported by an organized availability of spare parts, if not readily available in the market, and access to reliable technical support for major breakdowns.

5. Promote information to consumers about operation and maintenance and who to contact in case of a break-down.

6. Set up where necessary a minimum of financial and administrative system for urban schemes to deal with billing and collection of water rates.

2.10 Sustainability

Danida shall:

1. Make sustainability a prime objective of Danida financed water and sanitation projects. Sustainability depends on several matters, e.g. development of institutional capacity, a stable sector policy, and efficient administrative systems in the recipient country. There must be a reasonable expectation that new installations will function for at least ten years, and preferably for their economic lifetime. This objective involves the financial viability of the water organization as a whole, as well as that of the individual project. Projects will be formulated on the basis of a complete financial package, involving contributions from the recipient government, the users, and donors.

2. Promote the institutional capacity to implement, operate, and maintain donor-supported installations and to plan and develop the sector ultimately to sustain without foreign assistance.

3. Promote, when feasible, that a water and sanitation project will be used as an entry point for a number of related activities which will enhance its sustainability (for

instance integrated water and land management of catchment areas).

3. BACKGROUND

3.1 Water Supply and Sanitation in Development

A popular saying in the Sahel zone of Africa is "l'eau, c'est la vie" - water is life. Yet today an estimated 1,250 million people in developing countries have no access to safe drinking water within a reasonable distance. Nearly half of the population in these countries is without proper sanitation facilities. Millions of women spend many hours every day collecting water from distant - often polluted - sources, and a considerable part of the pitiful death toll among their children is caused by water-related diseases.

Improved water and sanitation services have major social, economic, health and environmental impacts on community life. Some of the benefits that result from water supply and sanitation significantly enhance the impact of investments in other sectors, such as education and industry, and the effect is mutual.

Social and economic benefits

Water supply and sanitation projects contribute substantially to a community's social and economic development. A reliable water supply relieves women and children of the time-consuming burden of fetching water. In rural areas and villages without regular water supply, women and children may devote 15-25% of their time in obtaining water. Access to water near or on the house plot frees women to attend to more rewarding tasks, like child care, food preparation and agricultural production.

The convenience and privacy provided by a household latrine is also a very real improvement in the quality of life for many people whose alternative is defecation in public places, urban or rural.

School attendance and farm labour production are reduced by waterborne worm infections and other diseases. The indirect benefits of improved water supply and sanitation may be even greater than the direct benefits. For example, it is known that school drop-out rates of girls are directly linked to the time spent on water collection and other household chores. Girls' school attendance is important, not only for them but for their families, since family size, child health

and child schooling are all strongly related to the mother's education.

Water supply development may contribute to opening up areas for agricultural development or livestock grazing, where dry season water shortages previously inhibited such developments. Provided that the environmental/ecological consequences of such development are properly assessed and costs properly calculated, there may be both social and economic benefits.

By contributing to improved living conditions in small urban centres, water supply and sanitation can help to shift development from major cities to secondary towns, with considerable benefit in reducing the burgeoning growth of megacities.

Although the water supply and sanitation sector has these important economic benefits, it is still considered by most decision makers to be a "social" rather than an economically productive sector. As such, it often receives a comparatively low priority in national planning and budgeting, particularly in times of economic pressure.

Health impacts

It is estimated that 80% of disease episodes in developing countries are due to water- or excreta-related diseases. A World Health Organization review demonstrates that improvements in water supply and sanitation have a direct and significant payoff in reducing diarrhoeal morbidity: When both water quality and water quantity are improved, diarrhoeal morbidity rates can be reduced by as much as 37 per cent. When health education and sanitation components are added to water supply, breaking the disease-causing link between water and human faeces, the reduction in diarrhoeal diseases is still more dramatic, as much as 50% and higher.

Improved water supply and sanitation will also have a marked impact on water hygiene diseases (typically various eye and skin infections) and water-based diseases caused by parasitic worms.

Environmental concerns

As population growth and urban migration put increasing pressure on city infrastructure, more and more of the world's poorest people are living in cramped and squalid conditions. Human waste poses a serious health threat and is a

major contributor to degradation of the living environment in human settlements. Water sources are increasingly polluted, with the effect that rural inhabitants must walk further to find water fit for human consumption, while in urban areas treatment costs (chemicals and electricity) multiply. Clean water and proper sanitation contribute enormously to the creation of a health-promoting and pleasant environment, and can provide the spur for self-help efforts to bring further environmental improvements.

3.2 Competition for Water Resources

Population growth, industrialisation and general socioeconomic development continually increase the demand for finite water resources. Drinking water has to compete with other - generally much greater - demands for agriculture, industry and power generation. Despite the crucial importance of drinking water for human health and wellbeing, the larger consumers often receive greater consideration in the framework of water resources planning and management. At the same time, pollution and over-exploitation make it harder and harder to find water resources which meet the high quality standards necessary for domestic supplies.

Exploitation of water resources must be sustainable in the long term. However, water resources are increasingly threatened by human activities, which will lead to increased water scarcity in the 1990s and beyond. Uncontrolled extraction of groundwater for irrigation or consumption in large industrial cities with rapid population growth may result in a general lowering of the water table. This will have severe consequences for the population who are dependent on this water resource. In large areas of Bangladesh, for example, it means that water for drinking purposes can no longer be provided with existing low-cost technology such as suction handpumps. In coastal areas, it may disturb the delicate interface between salt and fresh water, leading to saline intrusion, as is already happening in Bangladesh and Orissa State in India.

The quantities of water used for drinking water purposes in rural areas and small towns are small in comparison with the amounts used for agriculture and industry. From a water resource point of view, rural and small town drinking water supply projects have negligible environmental impacts. But drinking water supply is highly dependent on the local environment. Its sustainability may be threatened because of environmental deg-

radation. Particular attention needs to be given to the interaction between water and land resources management. Deforestation, uncontrolled grazing and other human activities in the catchment areas lead to soil erosion, water quality degradation and other adverse environmental effects. Tree planting, on the other hand, may cause increased water losses to evapotranspiration and result in reduced dry season runoff. These factors need to be studied and considered as part of integrated water resources management.

During the last ten years, awareness has grown that provision of water for domestic purposes and the eventual disposal of excreta cannot be treated in isolation. They must be considered in the context of water resources management, including pollution control, water quality management and the classification of sources according to their planned uses.

3.3 International Drinking Water Supply and Sanitation Decade (IDWSSD)

In November 1980 the UN General Assembly proclaimed the period from 1981 to 1990 as the **International Drinking Water Supply and Sanitation Decade**. Governments were urged to set targets to provide all their people with a minimum quantity of safe drinking water

by 1990 and at the same time to improve sanitary conditions by implementing measures for disposal of liquid waste and excreta.

The task to be tackled was - and is - enormous. In 1980 WHO estimated that about 1,825 million people in Africa, Asia and Latin America were without access to a safe water supply, and roughly the same number lacked adequate sanitation. Global coverage stood at about 44% for water supply and 46% for sanitation. Coverage was lower in rural and urban fringe areas than in urban areas and for low-income groups, wherever they lived.

At the end of the Decade, the statistics suggest that much has been accomplished, especially in rural water supply, yet much remains to be done. And we have still to see to what extent water supplies and sanitation facilities remain sustainable.

An assessment of the present situation concerning levels of service coverage was presented in a Report of the Secretary-General to the 45th Session of the UN General Assembly in October 1990. It is based on information provided by Governments to WHO.

* Since the start of the Decade, it is estimated that an additional 368

million urban residents in the world's developing countries have gained access to an adequate and safe water supply. This leaves an estimated 244 million still without such services. The level of service coverage, however, only rose from 77% to 82% because of the rapid rate of urban population increase - almost 70% in Africa and about 37% in the Americas and South-East Asia.

	Year	*Population*	*Number served*	*Number unserved*	*% coverage*
URBAN WATER SUPPLY	1980	933.47	720.77	212.70	77
	1990	1332.22	1088.52	243.70	82
RURAL WATER SUPPLY	1980	2302.99	690.25	1612.74	30
	1990	2658.51	1669.79	988.72	63
TOTAL WATER SUPPLY	1980	3236.46	1411.02	1825.44	44
	1990	3990.73	2758.31	1232.42	69
URBAN SANITATION	1980	933.47	641.39	292.08	69
	1990	1332.22	955.22	377.00	72
RURAL SANITATION	1980	2302.99	860.64	1442.35	37
	1990	2658.51	1294.72	1363.79	49
TOTAL SANITATION	1980	3236.46	1502.03	1734.43	46
	1990	3990.73	2249.94	1740.79	56

Table 1 Water supply and sanitation coverage in developing countries in 1980 and 1990 (World Health Organization statistics, figures in millions)

* During the period 1981-1990 it is estimated that an additional 314 million urban residents have attained access to appropriate means of excreta disposal. However, because of lower initial levels of service coverage than for water supply, this still leaves around 377 million without such services. Despite the rapid urban population growth, percentage coverage has risen from 69% in 1980 to 72%. This represents a doubling of the rate of implementation of programmes since the start of the Decade.

* For rural residents it is estimated that an additional 980 million now benefit from an adequate and safe water supply. This still leaves approximately 990 million unserved; for every person gaining a safe supply since the start of the Decade, there remains one without. Nevertheless there is a dramatic rise in the overall level of service coverage, from 30% to 63%; and the disparity between urban and rural levels has been reduced.

* During the period 1981-1990, 434 million rural residents gained

access to appropriate means of excreta disposal, and at the end of 1990 it was estimated that there were still 1360 million people in the rural areas of the world's developing countries without access to such a facility. This corresponds to a rise in the level of service coverage from 37% to 49%.

3.4 The International Donor Community

During the IDWSSD the role of the international donor community has been to support recipient governments' efforts with financial resources and technical know-how and through better co-ordination of their respective support programmes.

When the IDWSSD was launched, it was expected that both the recipient countries and the international donor community would substantially increase the funding for water supply and sanitation projects. With conventional technology, which at least in the cities would mean piped water systems, waterborne sewerage and sewage treatment, the estimated costs to achieve universal coverage were about US$ 600 billion over the ten years. With the anticipated development and use of lower cost technologies, experts suggested that

costs might be halved to US$ 30 billion per year - still three or four times the actual investment level in the sector in 1980. Even if these enormous increases in resources had been achieved, annual recurrent costs for operating the new facilities would in most recipient countries have required as much as a ten-fold increase in their previous annual recurrent budgets for water supplies and sanitation.

Due to the world recession and the need for most recipient governments to channel a larger part of their investment resources into productive sectors such as agriculture, combined with the effects of structural adjustment programmes bringing reductions in social sectors, only a fraction of the expected funds for the IDWSSD has actually materialized. Some bilateral donors, including Danida, have been able to increase funding to the water supply and sanitation sector in some recipient countries due to the greater priority given to the sector by these governments. But these are exceptions to the general picture.

A significant achievement during the Decade has been the development, promotion and acceptance of low-cost water supply and sanitation technologies such as handpumps and on-site sanitation disposal methods, both resulting from

substantial global and interregional applied research programmes initiated by the United Nations Development Programme and the World Bank. This has reduced both investment costs and recurrent costs for these technologies to a level which is affordable by most users. Danida, along with other bilateral donors, has provided continuous support for the UNDP/ World Bank Water and Sanitation Programme.

Another important achievement has been the general acceptance of community participation in all aspects of water supply and sanitation projects from decision-making, through physical implementation to operation and maintenance of completed facilities. Community management of installed facilities is now becoming widely accepted, and is seen as the key to achieving sustainable and effectively used water and sanitation facilities in the 1990s.

Donor cooperation is important if optimum use is to be made of all available resources for water supply and sanitation development in individual countries. Since the start of the IDWSSD, the Nordic bilateral agencies have held informal yearly meetings with representatives of the World Bank and WHO to exchange experiences and information and to discuss approaches.

The Organization of Economic Cooperation for Development's Development Assistance Committee (OECD/DAC) has played an important role by preparing a guideline for donor coordination in the sector, and WHO supported by UNDP, has initiated a number of regional consultations as well as in-country coordination meetings among donor agencies and recipient government agencies dealing with water supply and sanitation projects.

In November 1988 at the International Drinking Water Supply and Sanitation Consultation held in The Hague, Netherlands, attended by the major multilateral and bilateral agencies and several non-government organizations and representatives from developing country governments, it was decided to create a Collaborative Council of External Support Agencies (ESAs), to continue the momentum of the IDWSSD beyond 1990 and through to the year 2000. Future activities, in addition to water supply, sanitation and hygiene education, also include other environmental issues such as waste water reuse, solid waste management, drainage and hazardous waste management.

The aim is to assist developing countries in preparing sector strategies and

programmes that co-ordinate the activities in the individual country and utilize the experience, research and development from the Water and Sanitation Decade, in order to reach still unserved populations with sustainable water supply and sanitation services. The focus of these activities is to promote action to increase both the quality and the quantity of investments in water supply and sanitation programmes at the country level. This expanded programme is a natural complement to the WHO call for Health for All by the Year 2000.

At the Global Consultation on Safe Water and Sanitation for the 1990s, held in New Delhi, India, in September 1990, the ESA Collaborative Council decided to expand its membership, to include sector professionals from developing country water and sanitation agencies as equal partners. In this way, donor agencies, non-governmental organizations and international professional associations are endeavouring to develop and adopt common policies which respond to the strategies and needs of developing countries.

- So as not to overload weak local sector institutions, donor agencies try as far as possible to co-ordinate and standardize their approaches and procedures for

preparation and appraisal of sector projects in co-operation with local sector institutions. Danida actively supports efforts which aim at strengthening donor coordination at the country level. In this connection, Danida fully supports the concept of in-country coordination meetings, preferably chaired by the sector responsible agency. Danida has participated in such meetings in major cooperation countries so far (e.g. Tanzania, Bangladesh) and also in Burkina Faso. Regrettably, donor coordination still leaves much to be desired in some of the major recipient countries of Danida assistance. This lack of co-ordination is especially felt when the country concerned has not yet established a policy for the sector.

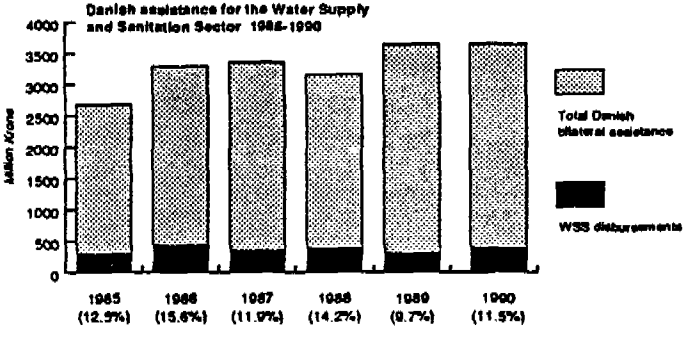
3.5 Danida's Involvement in the Water Supply and Sanitation Sector

During 1990 Danida was involved in 62 drinking water supply and sanitation projects in 30 countries. A descriptive list of these projects is prepared and updated from time to time. The majority of these projects, 39 altogether, are situated in 20 countries in Africa. With the exception of one single project in a Latin American country, the remaining projects are situated in nine countries in Asia.

Total Danish disbursements to water supply and sanitation projects during 1990 amounted to DKK 391 million, equivalent to about US$ 65 million. This includes payments to consultants of all kinds, for feasibility studies, detailed design, contract management, supervision, training, etc, and payments to suppliers and contractors. It also covers payment for relevant local costs and funds channelled through non-government organizations.

During the latter part of the Water Supply and Sanitation Decade, Danish investments in drinking water supplies and sanitation have been between 10 and 15% of total Danish bilateral assistance, or DKK 300-450 million per year (see Figure 3.1).

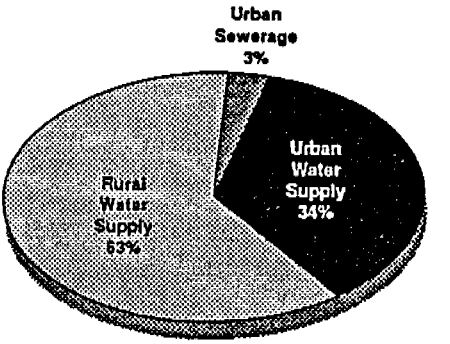
Figure 3.1



Just before the Decade, at the end of the 1970s, average investments were 7-8% of the then smaller Danish bilateral assistance, or on average just under DKK 100 million per year.

The distribution between rural water supply, urban water supply and urban sewerage varies from year to year. The average distribution for the last four years is shown in Figure 3.2. Rural water supply is the main sub-sector.

Figure 3.2



Average distribution of assistance 1987-90

(It should be added that a minor allocation for rural sanitation is included in this figure). Urban water supply is also a large

sub-sector, while the investment in urban sewerage has been very limited.

As from 1 January 1989 all Danish bilateral assistance is provided in the form of grant aid. Development loans are no longer provided. At the same time, the administrative distinction between untied assistance and assistance tied to procurement in Denmark has been dropped. Danida will, however, continue to see that half of bilateral assistance is spent on procurement in Denmark of goods or services. This new procedure will give more flexibility in the preparation of individual projects.

Even though only grant assistance will be provided in the future, disbursement will continue in respect of loans authorized before 1 January 1989. Tied grant assistance projects will also be completed in accordance with the agreements covering such projects. For a number of years, appraisal of tied and untied assistance projects has been carried out to meet the same standards. The main difference has, however, been that certain components such as low-cost sanitation were unsuitable for tied Danish assistance. Practically all costs for this component are of local nature, and as such did not qualify for Danish assistance.

In Danida's Plan of Action published in 1988, the number of cooperation countries will gradually be reduced from about 70 to 20-25 over a five-year period. This is going to affect Danish support to the water supply and sanitation sector, where assistance to a number of the present 30 recipient countries in this sector will gradually have to be phased out.

3.6 Sector Characteristics and Major Constraints

Drinking water supply and sanitation projects include some or all of the following components

* water supply facilities
* low-cost sanitation and sewerage services
* health hygiene promotion (including health information and general communication support)
* water resources assessment and protection.

An achievement during the course of the IDWSSD is that health/hygiene promotion and communication have come to be considered an essential integrated part of a water supply and sanitation project.

Although projects in the sector generally are limited to provision of water supply and sanitation installations, certain related activities are often considered to be an important supplement to a water project. In rural water projects a demand for supplementary water for small-scale kitchen garden irrigation and livestock watering may arise. Protection of catchment areas, supplementary health care activities and functional literacy are other examples of potentially related activities which are receiving increased consideration.

Storm water drainage and solid waste disposal management may have to be addressed in order to achieve optimum benefits from an urban water supply and sanitation project.

Replicability and sustainability are key concepts in Danida's policy for development assistance in general. These aspects are also often the most problematic to achieve, and the water supply and sanitation sector is no exception to this rule.

Widespread experience has shown that water supply and sanitation services operate best when they are designed to be appropriate to the local situation. This calls for participation of target

communities in the project cycle. Involvement of women is especially important during the planning phase and in preventive maintenance activities once installations have been completed. Governmental institutions have, however, in most cases, limited experiences with community involvement in planning, implementation, operation and maintenance of water and sanitation projects.

Optimum benefits from water supply and sanitation development depend on a timely coordination of the population receiving suitable access to reliable water installations and the promotion of health activities including installation of low-cost sanitation facilities.

In most recipient countries, political and administrative responsibility for water supply and sanitation is divided among a number of ministries, national and regional institutions and local authorities, each with its own mandate. This institutional fragmentation and general lack of coordination among involved parties usually results in an over-emphasis on water development and an insufficient allocation of resources to institutions responsible for health promotion activities such as sanitation, and health and hygiene education.

A reliable water supply is only possible with a firmly established maintenance system. Most countries receiving Danida assistance are characterized by shortages of funds and inadequately experienced maintenance staff. Establishment of recovery systems for operation and maintenance costs is an important component in project design. Cost recovery strategies often include community contributions. Sustainability of completed installations is more likely when communities take responsibility for recurrent costs.

Excessive exploitation of groundwater resources for agricultural purposes and removal of vegetation cover leading to a reduced infiltration capability to recharge the groundwater aquifer are in some places a serious threat to an uninterrupted water supply.

Despite some encouraging progress during the last decade, the water supply and sanitation sector is still in many recipient countries characterized by one or more of the following main constraints:

* inefficient and financially weak institutions,

* insufficient recovery of costs,

* insufficient attention to operation and maintenance,

* imbalance between provision of water supply and sanitation facilities,

* inadequate efforts in community participation, health promotion and communication support,

* institutional fragmentation and inadequate coordination among sector institutions and donor agencies,

* unrealistic assumptions regarding capability and willingness to pay for maintenance costs.

4. TECHNOLOGY OPTIONS

4.1 Levels of Service for Water Supply

Both the level and the reliability of water supply services available to urban and rural populations of developing countries vary enormously from country to country and within countries. For some, obtaining supplies for the family still involves a tiring trek for women and children to a distant, often polluted stream or pond. At the other extreme, some more favoured urban residents may enjoy dependable and plentiful supplies from a household tap.

For the scattered populations in rural areas, water supply improvements generally involve public point sources. These may be handpumps on dug wells or boreholes, or standposts on a gravity-fed piped system. In urban areas, a mix of service levels is commonly provided, ranging from public standposts through semiprivate yardtaps to private house connections.

Danida has supported projects covering a wide range of service levels. In each case, the choice of appropriate service level depends on a range of factors. The most important of these are: availability of water sources, population density,

affordability (capital and recurrent costs), and maintainability. Choice may also be influenced by the type and convenience of traditional water sources.

Rural water supplies

Local hydrogeological conditions are a prime factor in determining rural water supply service levels and technology choice. In projects in many areas of South India and West Africa, for instance, handpumps on deep mechanically drilled boreholes or deep hand-dug wells are the only options. Because of the very high costs of drilling or excavating, commonly 200-300 users must share the same water point.

In more favourable geological areas, shallow dug wells or hand-drilled boreholes provide safe water at much lower costs. In Bangladesh, for example, where tubewells can be sunk by hand in a few hours, user groups average less than 100. Similarly, inexpensive shallow dug wells with handpumps supply 60-100 users each in parts of Zimbabwe.

User group size is important, as, in combination with pump capacity, it determines the amount of queuing necessary at water points. Another key parameter in determining service level is

the walking distance for consumers. Greater distance does not only affect the amount of water each family can collect - though that is an important health-related factor. It may also encourage users to return to more convenient but less safe traditional sources for at least part of the year.

Ideally, no user should have to walk more than a few hundred metres (max. 400 m) to the nearest water point. Unfortunately, this ideal is often unachievable, because of high costs and/or difficult hydrogeology. Some villagers in Niger and other West African countries, for instance, must still walk several kilometres to the nearest water point, simply because no closer source reliable all year round could be found. The new source is still an improvement, as the alternative was to walk up to 10 km for water during the dry season.

Urban water supplies

Danida has supported urban water supply projects in small to medium size towns in a large number of countries from the Philippines in the East to Guinea (Conakry) in the West. In densely populated areas, water supply from handpumps is not always feasible, because of the large number of handpumps

required, especially when drilling costs are high. The potential pollution of groundwater also has to be taken into account when choosing between handpumps and a piped supply in a densely populated area. In these situations, only pumped piped water supplies are appropriate. In Danida-supported urban water supplies, it is a condition that the population in urban fringe areas should be given access to public standposts within a reasonable walking distance. Normally, higher levels of service in the form of yardtaps and private house connections are included to establish financial viability of such schemes.

4.2 Water Quantity

Water demand, normally measured as the quantity of water used per person and expressed in litres per capita per day (lpcd), is a key parameter in the design of any water supply scheme. It also tends to be controversial, in the sense that projected water demands almost always exceed water actually consumed, so that the water project is over-designed and hence more costly than necessary. As a rule of thumb, water use of at least 20 lpcd is regarded as a minimum health requirement, and most projects are designed to provide 25-30 lpcd from point sources.

Studies of completed point source supplies (standposts or handpumps) show that walking distance and availability of alternative water sources are key determinants of water use. Experience from Danida-supported projects in Africa and Asia reveals that actual water use generally averages only 10-15 lpcd. This does not imply that the design criteria should be changed. What it does suggest is that more effort is needed to design projects and motivate users to use enough water for all appropriate purposes.

Minimizing walking distances and providing appropriate platforms and washing facilities at the water points are among the structural measures which can encourage more effective use of water. They need to be complemented with health promotion and information/ communication support activities.

Water usage in the immediate vicinity of yardtaps generally ranges from 40 to 50 lpcd. For private house connections, water use is strongly correlated to the standard of housing. Although Danida is often presented in the planning stages with higher proposed design figures, consumptions in excess of 60-80 lpcd are rarely considered justified for houses without waterborne sewerage.

In siting handpumps or public standposts, ethical, religious, cultural and social aspects all have to be taken into consideration. Location of the water point will influence the actual water use (religious taboos, caste system etc).

The above consumption figures do not include system losses, which have to be added for design purposes. For well designed and supervised schemes, unaccounted - for water should not exceed 25%. If it does, no further new investment should be contemplated until the option of reducing unaccounted - for water has been investigated.

4.3 Water Quality

There are just two criteria for judging the acceptability of a raw water source for potable supplies:

* Is it a health risk ?

* Is it unacceptable to the users (bad taste, colour, odour, turbidity, etc) ?

If the answer to both these questions is "No", the water may be regarded as a suitable source without treatment. Steps to improve the quality generally only add to

operation and maintenance problems and diminish reliability.

Water use habits and tolerance levels vary widely. WHO Guidelines for Drinking Water Quality provide useful indicators for eliminating poor water resources, but they must be used with due consideration of local conditions. If no alternative is available, for example, the local population and the local authority may well accept a higher level of, say, fluoride or iron than the guidelines suggest.

Danida's experience over many years leads to the conclusion that there is still no such thing as a simple and reliable treatment process for safeguarding the bacterial quality of potable water supplies in developing countries. It follows that safety overrides convenience in the selection of appropriate water sources. A distant surface source will often be preferred to a nearby one if the quality is more dependable and the additional costs are not excessive. Whenever there is a risk that surface water is (or may become) bacteriologically contaminated, groundwater sources will be preferred.

The most frequent problems with groundwater quality in Danida-supported schemes have been high levels of iron (Bangladesh and India), chloride

(Bangladesh and India), and fluoride (Sri Lanka and Malawi). In some areas, the groundwater has a high carbon dioxide content, leading to corrosion of iron or steel pump parts and consequent taste and colour problems in the water supplied (Sri Lanka, Liberia, Mali).

In some areas of Bangladesh, Sri Lanka and India, simple iron removal devices and sand filters are being used in combination with handpumps to improve groundwater supplies. By and large, these plants have proved to be maintainable by the users themselves. Also in Bangladesh and India, measures are being taken to avoid the use of high-chloride groundwater. In affected coastal areas, intensive hydrogeological and hydro chemical investigations determine suitable positions for the filter intake in the freshwater aquifer, avoiding layers subject to saline intrusion.

Where groundwater is found to be aggressive, through low pH values or high carbon dioxide content, corrodible pump parts, including rising mains, need to be replaced with alternatives made from non-corrodible materials, such as polyvinyl chloride (PVC), stainless steel, or brass.

An acceptable quality of water at the point of collection does not guarantee that it

will remain uncontaminated at the point of use. Transportation, storage and handling frequently lead to contamination. Health and hygiene education messages must include advice on safe handling and household protection of water.

4.4 Water Resources and the Environment

The quantity of water used for domestic supplies in rural areas and small towns is very small in comparison with the amount used for agricultural or industrial purposes. From the water resources viewpoint, therefore, drinking water supply projects generally have negligible environmental impact in terms of drawdown of groundwater levels or reduction in stream flows.

Unfortunately, the reverse is not true. Drinking water supplies are highly dependent on their surrounding environment, and face continual threat from the impact on water resources of other uses and from environmental degradation in general. Danida has published a policy paper Environmental Issues in Water Resources Management, which deals with this subject at length.

Gravity-fed piped water schemes depend on perennial supplies of clean water, often from small streams originating in forested

hills. Protection of such supplies calls for measures to manage human activities in the catchment areas, with due regard to their effects on the quantity and quality of the water resources. Uncontrolled development caused by the need for firewood, farm land and pasture to support increasing populations have led to soil erosion and water quality degradation in many African and Asian countries (as e.g.the communal lands of Zimbabwe).

The hydrological effects of forest management are, however, subject to some uncertainty. Evidence from many locations around the world suggests that tree planting can lead to reduced dry season run-off, while the opposite effect often is postulated, but rarely scientifically documented. Monitoring of water quantity and quality should be included in water projects where effects of upstream land use management may be a factor to consider.

Forest protection and afforestation components are increasingly being included in drinking water supply projects (e.g. Sri Lanka, Tanzania, Niger, and Karnataka and Tamil Nadu in India). Linkages always need to be considered between water supply projects and community forestry or other environmental protection measures.

Another example of adverse environmental impact on drinking water projects is the general decline in groundwater levels in Bangladesh due to excessive rates of pumping for dry-season irrigation. Many thousands of suction handpumps have gone dry (their maximum pumping depth is 7 m), and are having to be replaced with direct action handpumps.

It is important to realise that, while water supply and sanitation are synergistic in terms of health benefits, there are also potential hazards. In areas with high water tables, pit latrines must be kept well clear of shallow drinking water wells, to prevent contamination of the potable supplies.

4.5 Design and Choice of Technology

Simplicity, durability and sustainability are the key principles in the design of water supply and sanitation projects. Designers are expected to choose technologies which can be operated and maintained locally and which are affordable by the intended users.

Wells and boreholes equipped with handpumps

A simple, economic and sustainable form of community water supply is provided by

handpumps on shallow hand-drilled boreholes or protected dug wells. This type of scheme provides ample opportunity for labour-intensive participation.

In many areas though, there is no alternative to mechanically drilled medium-deep or deep boreholes in rock formations.

In every case, preference is given to standardised locally-manufactured handpumps which have been field-tested and which are accepted by the local population (examples include Mali, Malawi, Bangladesh and Zimbabwe). Local production helps to ensure that spare parts will be available when needed in the future. Pump standardisation reduces procurement costs and eases future maintenance problems. Simple reliable handpumps which can be largely maintained by village level mechanics are commonly described as VLOM-type handpumps (VLOM = village level operation and maintenance).

Handpump surrounds need to be properly drained, to avoid stagnant pools of water which could be breeding grounds for mosquitos, or contribute to contamination of the water source (this same requirement

is applied to the surrounds of standposts on piped supplies).

Piped water supply schemes

Gravity schemes fed by unpolluted springs or streams offer the best possible choice for community water supplies. Avoiding dependence on unreliable fuel or power supplies, they can generally be designed at affordable costs, with good possibilities for labour intensive community participation. Public standposts and yardtaps provide an economic range of service levels and are comparatively straightforward to operate and maintain.

Danida has financed a number of gravity schemes, in Tanzania, Malawi, Sri Lanka and Nepal. Unfortunately, suitable sources are becoming more and more difficult to locate, and most communities have to find acceptable alternatives. When a good source has been found, the catchment area must subsequently be protected against pollution.

In appropriate conditions, hydraulic ram pumps (hydrams) may offer a low-maintenance option capable of lifting relatively small volumes of water to quite considerable heights without the need for external power sources.

If groundwater is to be used as a source for a piped water scheme, solar pumps merit consideration. Field testing in villages with 2-3000 population in Mali, Niger, Burkina Faso and Liberia gives some reason for confidence that the technology can be suitable where the pumping lift (between the water level in the borehole and the highest point to be supplied) is less than about 40 m. Because of current limitations on capacity, solar pumping is presently only thought suitable for supplying a few standposts.

Danida does not normally support the use of deep boreholes or river sources supplying motor pumps for rural water supplies. Such schemes are only considered appropriate for use in urban or semi-urban water supplies, where a regular supply of fuel or electricity can be assured, and skilled personnel are continuously available.

Similar logic means that surface water sources which require treatment are usually avoided for rural water supplies. Selecting the best available source and protecting it is a preferable option. If treatment cannot be avoided, simple slow sand filters and roughing filters may be considered.

On piped schemes, standardization of pipes and fittings is of prime importance for future repairs. The number of pipe pressure classes is kept to a minimum, to avoid possible future replacement of a high pressure pipe with a lower class pipe.

Normally transmission mains are designed for the anticipated flow in a 15-20 year planning horizon. This avoids the cost of having to lay a parallel main later. The difference in pipe costs will be marginal and laying costs virtually the same. When it comes to distribution pipes, the situation is somewhat different, as it is often quite difficult to forecast where the future population will settle.

4.6 Water Supply Costs

Data on the costs of community water supplies are notoriously difficult to compare. Different definitions and assumptions, differing currency fluctuations and rapid cost variations cloud comparisons. Nevertheless, some guidance is needed on the relative costs of different technology options and service levels, so that sensible economic and financial comparisons can be made in planning new projects. The aim should always be to use limited available funds so as to supply as many people as possible with basic services rather than a few people with

elaborate facilities. This principle is often expressed as "Some for all, rather than all for some".

With this in mind, and re-emphasizing the need for maximum caution in transferring absolute figures from one country or region to another, Danida has endeavoured to compile data on investment and running costs for various types of schemes. Investment costs are taken to include costs of initial studies, design, construction (including supervision), and equipment, but do not include Danida's own expenses. Generally, recurrent costs cover operation and maintenance and include energy, chemicals, spare parts and salaries of maintenance staff.

For handpump supplies on wells or boreholes, investment costs range from DKK 175 to DKK 495 per capita. Rural gravity piped schemes range from DKK 300 to DKK 700 per capita. For urban schemes involving pumped piped supplies with a mix of public standposts and individual house connections, the range is from DKK 250 to DKK 1500. All prices have been converted to 1991 price equivalents.

Few reliable figures are available for recurrent costs. For handpump schemes,

the range is from DKK 3 to DKK 10 per capita per year. On rural gravity piped schemes recurrent costs vary from DKK 4 to DKK 8, while for urban piped schemes, the range is from DKK 20 to DKK 50 per capita per year (1991 price equivalents).

In making cost comparisons, it may sometimes be appropriate to consider technologies involving higher initial capital costs (mainly financed by a donor agency), which lead to lower operation and maintenance costs (payable by users or governments). This will be especially important if the extra initial investment also results in greater reliability. This type of reasoning may, for example lead to the choice of solar pumps; it will certainly increase the likelihood of choosing a distant gravity source rather than a closer surface water source requiring pumping. In some circumstances, it may be used to justify inclusion of a hydropower component in a water supply scheme, so as to ensure dependable power supplies.

4.7 Sanitation

Recent changes in Danida's administrative distinction between tied and untied assistance make it easier for sanitation components to be included with water supply, and future projects in both the

urban and rural sector will attempt to integrate water supply and sanitation. In the past, some rural water supply projects have included a low-cost sanitation component, but few urban schemes have done so, sometimes due to fragmented institutional arrangements, whereby sanitary improvements are outside the responsibility of the water authority.

Experience in rural areas indicates that socio-cultural attitudes have more influence than technological considerations on the perceived need for, and use of, sanitation facilities. The approach to sanitation promotion therefore concentrates initially on socio- economic studies to identify approaches which will improve sanitation acceptability.

Pilot projects seek to determine the type of sanitary latrine which will be acceptable, and which can be made locally by individual households. The aim is not to develop yet another type of low-cost latrine, but to establish a delivery approach linked to the community's own felt needs. The approach is not easy; latrines are generally low on the priority list of decision makers in rural communities.

Where latrine development is undertaken as part of the pilot approach, it frequently

leads to variations on the standard latrine designs developed by the UNDP/ World Bank Technological Advisory Group (TAG), for which Danida has provided regular support. In Zimbabwe, for instance, ventilated improved pit (VIP) latrines are promoted. In Sri Lanka, India and Bangladesh, pour-flush latrines are the favoured solution for household facilities, while offset double pit latrines are built at institutions on some projects in Sri Lanka and India.

In several recipient countries, most of the population use locally made latrines (e.g. Tanzania). In these circumstances, no special promotion is needed at household level, but projects may include a component to promote the construction of latrines at institutions such as schools and health clinics.

Depending on the type and quality, low-cost latrines range from DKK 300 to DKK 900 per unit (1991 price levels). Commonly, 50-75% of the costs may be subsidized, but that still leaves a considerable cash or labour contribution to be made by benefiting families. That is why Danida sees promotion as a key area to be supported.

4.8 Sewerage

Danida's focus on supporting schemes which favour the poorest sections of the population means that few projects include waterborne sewerage. Schemes involving a network of sewer pipes, sewage treatment and discharges to a watercourse or the sea are costly and depend on the availability of reliable power, chemicals and skilled manpower. They also require a reliable water supply of at least 60 lpcd. More economical and more readily sustainable options are normally available.

There are some exceptions. In India, government policy is that waterborne sanitation will be considered, but only for central densely populated areas in cities with more than 100,000 inhabitants. In Kenya, the government encourages waterborne sewerage for towns and urban centres with high population densities and difficult soil conditions. Danida has supported such systems under grants in four provincial towns in Kenya. Sewerage systems are also backed by tied grants in Bhutan and Yemen (PDR).

Simple treatment can be provided by oxidation ponds, sometimes in combination with septic tanks. Such projects generally involve high costs and long implementation periods. Persuading

plot owners to connect to a sewer system is a particular problem, even if a legal system of sewerage byelaws does exist.

4.9 Solid Waste Management and Stormwater Drainage

Danida has to date had only limited involvement in solid waste management and stormwater drainage, as components of water supply and sanitation projects. It is likely that this involvement will increase significantly in the future.

Failure to make proper provision for the disposal of stormwater and solid wastes can lead to serious environmental and health hazards. Lack of stormwater drainage may cause flooding or create stagnant pools, while if solid waste is not collected or disposed of in an acceptable way, it may well be thrown into drains or sewer manholes, clogging pipes or open drains and creating breeding grounds for rats and other vermin.

Providing satisfactory stormwater drainage can be relatively inexpensive, and is generally an activity involving a high proportion of local labour. The usual system involves open ditches and lined canals combined with culverts.

In most developing countries, solid waste quantities are quite modest, but accumulation of waste in places such as markets is a considerable health hazard. Solid waste management involves collecting the waste and transporting it to a dumping site or a composting or incineration plant. Depending on local conditions, simple transportation methods such as rickshaws, donkey carts, or tractor-drawn carriages are usually sufficient in some cases, the waste may sorted and usable items recycled (e.g. metals, glass, plastics and paper).

4.10 Research and Development

Assistance for water supply and sanitation development need to do more than enable a defined group of people to obtain improved facilities. An equally important objective is to support and strengthen responsible sector agencies, technically and administratively.

With this objective in mind, research and development activities are considered in connection with many Danida-supported projects in the sector, if there is a need for such research and development. Examples include: development and testing of iron-removal units for handpumps in India (Orissa), Sri Lanka and Bangladesh; rainwater harvesting in

Uganda, Kenya and India; testing of solar pumps for water supply in the Sahel; development of improved hand-drilling technology, including techniques for sealing off saline layers in Orissa; handpump testing in Malawi; development of appropriate communication messages; procedures for village participation; and cost recovery systems.

Under the heading of R&D, Danida includes experimentation with various organizational structures. Support has been provided in the past for innovative approaches to community participation, operation and maintenance, health education, and sanitation.

On the other hand, Danida takes the view that testing and development of new technologies is a commercial activity, for which development funds are not generally considered appropriate. It is seen as the responsibility of the inventor/manufacturer to demonstrate through laboratory and field tests that his product is appropriate for use in recipient countries, before large-scale implementation with Danida support can be considered.

5. ORGANIZATION AND COMMUNITY PARTICIPATION

5.1 Organizational Aspects of Water Supply and Sanitation

The 1980s have seen a trend towards increasingly more complex projects. A typical project may now include water supply, sanitation, health education, environmental protection, communication, human resource development and research. Integrating all these components is a considerable challenge.

As a general rule in developing countries, water supply, sanitation and health education are the responsibilities of at least two different ministries. Different agencies are also often responsible for rural and urban water supply and sometimes there are more divisions for deep boreholes, deep hand-dug wells and shallow wells. Similarly, construction may be assigned to one ministry or agency and subsequent maintenance to another, with little incentive to cooperate and coordinate.

Water and sanitation agencies are generally technique and supply ("hardware") oriented, and staffed accordingly. They assign low priority to

sanitation, health promotion, communication, community participation ("software" components) and are short of professional staff to cover these components.

Discrepancy between policies, strategies and objectives and the organizational framework within which the policies are to be carried out creates problems.

Things have been improving in recent years. The current trend towards decentralization in both African and Asian countries holds promise for cooperation and integration at lower levels of water supply and sanitation development. Planning and development functions in particular can be strengthened by being taken closer to the people concerned. The upazila administration in Bangladesh, the panchayat laws in India and the decentralization to district level in Tanzania, Kenya and Zimbabwe are examples.

- To help solve the problem of "hardware" orientation, lack of coordination and integration and the shortage of professional "software" oriented staff in the relevant ministries and agencies, Danida, along with other donors, provides technical assistance and sometimes establishes special cells or units within

ministries/agencies, or in parallel with them, in connection with project implementation. In several countries, among them Kenya and India (Kerala, Orissa), Danida-supported projects have established socio-economic units responsible for community and health promotion activities and experimenting with village-based maintenance.

Training cells are formed in projects in India (Orissa, Tamil Nadu, Karnataka), Kenya and Liberia. Water resource development is being strengthened in a project in India through the establishment of a water resource cell.

Such cells or units are most often given responsibility for developing and carrying out software components and activities of different ministries/agencies, in many cases on a experimental basis or as pilot projects. Compared with the "mother" ministry/agency, their working conditions are usually more favourable. There are shorter decision-making lines, more mobility, additional budgets, and different recruitment procedures. These conditions are provided to enable staff of the cells/units to show results during the relatively short time span of the project. However, in practice it is difficult to transfer experience gained, methods used,

etc, from these cells to the "mother" ministry once donor support is phased out.

Apart from these cells/units, which are temporary organizational innovations, the 1980s have witnessed efforts to tackle the problem of organizing operation and maintenance. Two-tier and three-tier organizational systems have been established. There are experiments with mobile and fixed-point maintenance and with public and private maintenance. In most cases there is scope for further improvement and inputs leading to sustainable maintenance organizations.

Also, a number of Danida-supported water and sanitation projects are being implemented by Danish firms, who establish their own organizational set-up parallel to that of the ministry/agency.

For the future, when new projects are being prepared, the organizational framework will have to be carefully analyzed, to propose inputs which will provide organizational suitability and sustainability. Good arguments should be presented for suggestions to establish coordination cells/units and the recipient should agree to these cells/units being established. For projects already under implementation by Danish firms or special cells, plans will have to be prepared for

the integration of staff and activities of these cells into the "mother" ministries/agencies, or for phasing them out.

5.2 Integrated Development

Health education and environmental improvement

In Danida-supported water supply and sanitation projects, health education includes a combination of activities designed to encourage or facilitate new behaviour patterns which will improve health. Activities may include hygiene education, development communication support, and demonstration latrines with the emphasis on social acceptability and means of delivery.

These interventions need careful preparation, including locally adapted methods of communication.

In several projects (e.g. India, Sri Lanka, Zimbabwe, Niger), health promotion and hygiene education activities are designed to encourage villagers to undertake their own environmental sanitation improvements, like drainage facilities, refuse pits and other solid waste disposal activities.

The division of governmental responsibility for water and for sanitation/health promotion is a constraint. Too little attention has so far been given to the need for separate budget lines for water supply and health education in government agreements, as no ministry is inclined to transfer part of its allocation to a competing ministry. This may ensure that the right proportion of funds reach the ministry responsible for each activity.

Health and hygiene education is being provided effectively in combination with water supply and sanitation facilities at primary schools and clinics, and this is seen as a very useful way of spreading messages to families. In several projects, NGOs have been given the responsibility of planning and executing health promotion and sanitation.

In Sri Lanka and Uganda, cores of teachers are trained as trainers in relevant subjects, so that they can train teachers in project areas how to use the new facilities, and as an entry point for hygiene promotion.

Though experience with integration of water supply, low-cost sanitation and health promotion is rather limited, encouraging cases justify continued emphasis on an integrated approach.

Water as a source of development

Water projects serve increasingly as entry points for further development activities. Improved water supply is usually a strong felt need, and the presence of a development-oriented project organization often provides a valuable opportunity to respond to other needs as well. This has been the case on several Danida-supported projects around the world, when Danish assistance is channelled through NGOs whose activities develop spontaneously in response to the needs of their target groups.

As a simple example, tree planting occurs spontaneously around wells on numerous projects. In Niger, this has resulted in more systematic activities for controlling desertification by sand-dune fixation. Functional literacy programmes have been prepared for groups of women involved in water projects in Nepal and Niger.

In principle, the spreading effect into other development sectors is welcome, but caution should be exercised. Experience shows though that there are constraints. Embarking on related activities such as small-scale irrigation, for example, may raise expectations and put responsibilities on the project which it is not equipped to handle. Irrigation water is only one aspect

of agricultural development. Technical assistance, fertilisers, extension services, marketing opportunities are all needed, or the irrigation may turn out to be a failure. The expectations of the beneficiaries cannot then be met and eventually the new activity may have done more harm than good.

Institutional limitations may also be a problem. The successful water agency may not be able to obtain the necessary cooperation from ministries able to support related activities, whether they be in agriculture, health, education, or other sectors.

Generally, divergency into other development sectors has therefore to be carefully considered and planned.

5.3 Organization for Operation and Maintenance

Rural schemes

It is now generally recognized that operation and maintenance of village water supplies must be organized, to the maximum extent possible, at village level by the users themselves. Maintenance of remote handpumps by motorized units based at district or central level creates

serious administrative and financial problems.

However, even with trained caretakers, VLOM-type handpumps and local generation of maintenance funds, some maintenance back-up and support at higher levels is required, to handle repairs beyond the capability of village pump caretakers. The maintenance system must be designed to ensure efficient flow of information from village level upwards, and immediate response in terms of spare parts and required services flowing downwards, so that the reported breakdown of a handpump is attended to without delay.

Many handpump maintenance systems function in this manner. Examples from India include the so-called 3-tier system, with a village-level caretaker, a block mechanic responsible for some 50 handpumps and a district-based motorized team for major repairs. This has potential for establishing a sustainable maintenance system in some states (e.g. Tamil Nadu), while in others various forms of 2-tier systems are found to be more appropriate (e.g. a system based on self-employed local mechanics, blacksmiths or similar in Orissa). Similar systems operate in Africa, e.g. in Niger (based on "reparateurs des zones"), Mali (based on "forgerons

reparateurs" each covering a number of villages) and Zimbabwe (based on caretakers, pump minders and district level back-up).

In rural piped water projects in Malawi and Tanzania, local village committees and scheme caretakers have technical back-up at district level from their respective water agencies.

Urban schemes

While a user-based maintenance system is possible for rural water supplies, traditional urban water supply systems are generally operated and maintained by a water utility, with no direct involvement of users. Since they are generally more complicated to organize, skilled staff are required for system operation and maintenance, billing, and collection of charges from public standposts and individual connections.

In most West African countries (e.g. Niger, Burkina Faso and Mali), authorized standpost operators buy water from the agency and sell it to consumers at a fixed rate which will provide a modest income for the operator. Where operation and revenue collection at standpost level is not organized, experiences from both Asian and African countries show that there is a

considerable risk of deterioration and eventual shutdown. This is most unfortunate as public standposts are intended for those who cannot afford individual connections or shared yardtaps.

In many countries, operation and maintenance of urban water supply are administered by a concessionary company having its own accounts. It is therefore easy to know whether the company operates with a surplus or a deficit. Management improves the financial situation by seeking to increase the rates, cutting off bad payers or cutting down on administrative costs. The disadvantage is a tendency to ignore the social aspects of a safe water supply and to neglect the poorer parts of the population. Furthermore, such companies are not generally free to set tariffs based on economic calculations. Tariffs are subject to political interference and it kept too low leave the company with a deficit in operating smaller urban schemes.

5.4 Human Resources Development

To strengthen and reorientate staff of the various ministries/agencies responsible for water supply and sanitation, Danida provides training for different categories of staff in a range of project-relevant topics. Support is given for the production

of training manuals and teaching aids, including audio-visual aids.

Training of staff involved in project planning and implementation is aimed at awareness creation and improving understanding of project components and sector activities. Scholarships may be offered, or participation in seminars, workshops and study tours.

Organizational changes and changes in orientation and emphasis within the sector are likely to put new demands on manpower planning and regular re-training of staff. Training will also have to be extended to staff of non-governmental organizations, local consultancy firms and local contractors.

5.5 Community Participation

Since the beginning of the Water and Sanitation Decade, planners of Danida-supported water and sanitation projects in main recipient countries have assigned a crucial role to user communities in planning, implementation, operation and maintenance of water supply and sanitation development.

Experience gained in a number of projects (e.g. Tanzania, Kenya, Zimbabwe, Malawi, Niger, Bangladesh, Sri Lanka)

shows that community participation is unlikely to emerge spontaneously. It needs careful planning and detailed definition of tasks to be undertaken by the involved parties, viz. community, government and project staff.

When projects have paid insufficient attention to the mobilization of local communities and have underestimated the need for resources (staff, communication materials, etc.) the result has often been frequent breakdowns of completed installations, inappropriate siting of standposts/handpumps and inadequate usage of water supply and sanitation facilities. Project preparation has to include detailed studies of social, cultural and economic aspects of the target communities (e.g. Tanzania, Kenya, Niger, India and Sri Lanka).

- In a number of Danida-supported projects, a plan of operation for project implementation includes step-by-step guidelines on when and how to involve the communities. Such guidelines are specific for each country, since they consider actual needs of the communities and availability of people (avoiding overlapping with other activities, in the planting season, for example). In a Danida-supported water project in

Tanzania, a Village Participation Handbook has been developed.

In some countries, community participation has underlined the need for cooperation with personnel who are not traditionally involved in the sector but drawn from other institutions, such as social science institutes at the universities, (e.g. Tanzania, Niger). Sometimes the project employs community organizers and people with good knowledge of the local community to form a special unit with responsibility for mobilization of communities. In Sri Lanka the responsible sector institution has established a section for community support and sanitation.

In Tanzania, Kenya, India (Orissa), Mali, Liberia and Zimbabwe, formal agreements have been made between the community and the project with regard to division of responsibilities, obligations and benefits and for activities during implementation.

The benefits of community participation are particularly apparent in the formation of a reliable operation and maintenance system. Community participation is of special significance in selection of sites for stand-posts and handpumps and selection of village care-takers for preventive maintenance of handpumps and village water supplies.

The link between the public administration system and informal village organizations is crucial. The trend towards decentralizing the administrative system is welcomed by Danida, if it brings decisions closer to the people concerned. In some countries (e.g. Kenya, Tanzania, Uganda) the public administration system extends to village level. In Tanzania water and sanitation committees are formed as standing committees under the village government, supplemented with 2-3 women chosen among and by the villagers. This gives an official status to the water and sanitation committee. Ward Water Committees have been formed in Kerala, India.

During project preparation socio-economic analyses indicate the range of contributions possible by various groups of the community, in kind and cash during the different stages of project implementation and in operation and maintenance.

Experience in Zimbabwe has shown that active involvement of the communities, especially of women, in construction of demonstration latrines can be a useful method of spreading the sanitation concept. Villagers are here involved in selection of local materials for

construction of latrines as well as in the actual construction process.

The need for community participation in development of improved water supplies and sanitary latrines requires that the choice of technology is given proper consideration during the project preparation phase.

5.6 Women's role in Water and Sanitation Projects

Women are the main beneficiaries of water projects, because in almost all societies they are responsible for collecting and handling water for domestic purposes. Long distances to water sources increase the workload and the length of the working day of women. Dirty water, resulting in family members suffering from water-related diseases, increases the load of daily care that lies upon women's shoulders.

Thus, women are the first to benefit from the water being brought closer to the homes, being available in sufficient quantity all year around, and being of good quality. Although clean and plentiful water nearby is not enough to eliminate all health problems in the community, it certainly brings a considerable improvement in the quality of life of the

women, and is a pre-condition for improved health of their families.

The extent of women's participation in Danida-supported projects varies. Involvement depends, among other things, on the decision-making power and influence of women within the family and in the society concerned, on the specific type of water project, and on the extent to which project management has pursued the issue.

- In many Danida-supported projects, the involvement of women in planning, implementation, operation and maintenance of the installations, has been given increasing importance. Often it has been made a rule that women should occupy a certain number of seats in water committees (Kenya, Tanzania and Kerala, India), and in some places emphasis has been put on motivating and enabling the women to take leading positions within the committees. Women are often seen as particularly suitable for the post of treasurer.

  As members of water committees, women have been actively involved in siting public water points, deciding on the design and placement of washing facilities, organizing voluntary community labour, organizing collection of water

fees, motivating communities not to misuse water and explaining to them how to get the full benefits.

In rural water schemes, local participation of beneficiaries has very often had to rely on women for voluntary labour contributions. In marginal semi-arid areas of rural Africa, this pattern has been reinforced by the high rate of male migration, often leaving more than half the households without men. While water projects in those areas will eventually ease women's burden in water collection, implementation has often laid an extra heavy work load on the same overburdened women.

Involvement of women in physical implementation of water projects gives them a knowledge of the technology used. Where the project needs local caretakers to look after daily maintenance and smaller repairs, it is logical to involve women in these tasks. This has been successfully done in Tanzania, Kenya, Liberia, Sri Lanka, and India, to quote a few examples.

It has been the policy in Danida-supported projects, not only to encourage women to undertake caretaker tasks, but also, where acceptable to the local community, to train them as mechanics in a three-tier system.

In projects where sanitation and health education play an important role, selected village women have often been trained as agents in public health. In Sri Lanka such voluntary female health promoters were very successful in mobilising the communities for latrine construction, reaching a coverage of 80%, the highest in any Danida-supported project so far.

Some communities, because of their cultural traditions, resist women's involvement in public life aspects previously reserved for men. Even if the communities accept women's new roles, still in practice the work might be affected by traditional attitudes of the communities and of the women themselves, weakening the effectiveness of the established organizational and practical arrangements.

Another important constraint for women's full involvement in water projects, particularly in rural areas, is the general situation of rural women, already overburdened with domestic and productive work. However, asking women to take responsibility for yet another community task, is to put in their hands more control over something that is an absolute imperative in their daily life - secure access to water.

Pressure to involve women in activities outside their traditional domain, has often come most vehemently from female professionals in the sector. Danida is actively promoting recruitment and further training of more women staff at all levels in sector responsible institutions. In many projects where units have been established to supervise work with communities, the majority of professional staff in at least some of these units are women (e.g. Kerala, Tanzania).

6. FINANCE AND COST RECOVERY

6.1 General

Water and sanitation projects supported by donors also involve contributions from the recipient government and from users. Involvement of all three parties is important in establishing joint responsibility.

The contributions from each party are agreed in advance and need to be adhered to if the project is to be a success. At times, government financial inputs come late and are less than the agreed amount. This leads to unfortunate delays, but there is no easy way out by reducing the agreed contributions from government.

In the construction phase, most of the finance generally comes from the donor, but user contributions may be substantial. In piped water projects, communities provide labour for digging pipe trenches; and in sanitation schemes, such as the Danida-supported projects in Zimbabwe and Sri Lanka, the capitalized value of pit and superstructure construction by users is a significant part of the total cost. As well as helping to reduce overall costs, the user contribution to construction instills a sense of ownership and commitment which is

vitally important in assuring the sustainability of water and sanitation facilities.

In the **operation and maintenance** phase of Danida-supported projects, the aim is gradually to reduce Danida's involvement, as all operation and maintenance costs should be taken over by the local agency and the users. Technical assistance is usually included in this phase.

The financial viability and performance of the agency responsible for the project, whether this is a public utility or a government entity, is one of the critical factors influencing long-term sustainability. In appraising projects for potential support, Danida therefore seeks to assess the organization of the sector as a whole, and may seek organizational changes, so as to foster the financial efficiency of the intended project management agency. Three main organizational forms do exist:

* rural water supply under the auspices of a ministry;

* a public utility - in principle self-financing, but in quite a few cases needing a public subsidy element for a transition period; and

* a public utility self-financing from the start.

6.2 Why Cost Recovery ?

In countries where water traditionally has been regarded as a free good, costs of providing and maintaining services have become a heavy burden on central and local government budgets. They become subject to budget cuts in times of financial stringency, with the result that the water schemes become unreliable. Both the availability and the quality of water suffer; poor maintenance leads to steady deterioration: there are no incentives for users to avoid waste; few of the anticipated benefits are achieved; and schemes cannot be replicated because funds dry up. There is overwhelming evidence that costs of water supply services must, in one way or another, be borne by consumers, so as to ensure adequate operation and maintenance and to provide finance for future expansion. For all these reasons, cost recovery is essential for sustainable water supply services.

6.3 Cost Components

Through tariffs or other means of collecting funds, water consumers contribute in varying degrees to different elements of water project costs. The level

of cost recovery demanded by Danida varies, depending on both the type of user group and the organizational form. The main elements to be covered by user contributions are:

1. **operation** - staff salaries and expenses, fuel for vehicles and machinery, electricity, chemicals,....

2. **maintenance** - spare parts, hire of mechanics, and other recurrent expenses in connection with regular preventive maintenance and repair

3. **replacement** of worn out equipment and civil structures, plus major rehabilitation/overhauls

4. **instalments** on loans or depreciation allowances

5. **interest** on loans or equity.

The pace at which full cost recovery can be achieved depends on the economic circumstances of the country and differs between urban and rural areas. As a minimum, operation and maintenance costs should be recovered from the start.

That means that there must be political authority for a user payment system.

Danida seeks to ensure that revenue from water supply tariffs or charges stays in the sector. In countries where water revenue is simply passed to the Treasury, there is no incentive to pursue cost recovery, and operation and maintenance funds are usually insufficient.

6.4 Cost Recovery in Rural Water Supply

The basic principle of operation and maintenance of rural water supply systems is that users should be able to do as much as possible for themselves, and should have control over any outside assistance which is needed.

Design and technology choice should have ensured that the system is both affordable and sustainable, with contributions from all consumer income groups. It is important that agreement on cost sharing is reached between the consumers and the rural water authorities before any new project is initiated.

Ability and willingness to pay tend to be good in arid areas (e.g. Sahelian countries), but less so in areas where traditionally sources are convenient and plentiful and where consumers do not

recognize health risks. Expected benefits must be explained through specially prepared communication programmes.

It is rare to find that villagers alone can, from the start, finance the complete maintenance system for their new water supplies,including salaries of involved government staff, operation of vehicles, etc. They must however be committed to make some contribution. In Mali and Niger, for instance, no handpump is installed until the water committee has raised a certain sum for maintenance.

In Bangladesh, handpumps and spare parts are sold on the village market. These are simple suction or direct action handpumps, where maintenance has moved from the public to the private sector. The more complicated India Mark II handpump, which is extensively used in India and many other countries, normally requires public back-up support.

Danida wants to be reasonably sure that installations being financed can function for at least 10 years and preferably for their economic lifetime. New installations cannot be financed while similar nearby installations are being inadequately maintained.

Danida's policy is that users should cover as a minimum the costs of spare parts and replacement of handpumps (not the borehole), taps or broken pipes when necessary. It is also up to the local community to pay the pump attendant or scheme attendant, in cash or kind.

6.5 Cost Recovery in Urban Water Supply

Unlike rural water supply, urban systems are normally organized through a self-supporting utility or a parastatal company. Users pay directly for water and related services, rather than via the public budget.

Self-financing public utilities

Organized along similar lines to a private firm, the self-financing public water utility is run by a board of directors or equivalent. It will normally be licensed by government to develop resources, and distribute and sell water in specified areas. The company may be owned by the government, perhaps through a water ministry, but its budget and accounts will normally be kept entirely separate from other government departments.

Its self-financing status is important. The company must be able to obtain capital for new investment, for rehabilitating worn out installations, and for operation and

maintenance. Such capital may come from loans, grants from donors, and working profits. In other words, the utility must not be a burden on the public purse. In some instances it may even have to pay company tax.

The utility's tariffs will commonly have to be approved by the government, and pay scales, operating standards, and other administrative norms may well be set nationally.

The bulk of the supplies will usually be via private connections to householders, businesses or publicinstitutions. Poorer community groups may be supplied via public standposts, paying for their water either directly or through charges made by the local authority which will then pay the utility for providing the service.

Often water tariffs are set nationally and take no account of the widely differing costs of providing and distributing water in large and small towns. In such cases, the water utility needs the right balance of larger towns with financially viable operations to support smaller towns with more expensive operations.

In setting tariffs, governments can help to subsidize basic consumption through public standposts by using progressive

tariffs (rising steeply with increasing consumption) for individual connections. Large industrial and commercial consumers should pay charges which at least reflect the full costs of making such services available.

In appraising potential new projects, Danida analyses the whole utility's long-term financial viability, including its power to revise water tariffs expeditiously, as costs rise. Danida favours the principle of a utility working towards a positive rate of return, even in cases where no interest is to be paid or there is grant financing. This approach provides a prudent safety margin to cope with increasing O&M costs, unchanged tariffs, less water sold, and so on.

From Danida's point of view, it is also reasonable to expect a utility to achieve profits which can be used to finance new installations. This is particularly true where profits from the better-off sections of the community can be used to finance basic services for poorer communities (Danida target groups), as long as the reason for increased water charges is not due to inefficient management.

Some examples of water utilities functioning in the manner described above are:

* Société Beninoise d'Electricité et d'Eau, Benin

* Société Nationale des Eaux, Central African Republic

* Water Conservation and Pipeline Board, Kenya

* District Water Supply Fund, Malawi.

The last example, though not a utility, is a fund operated on commercial terms and administered by the Ministry of Water. The Local Water Utilities Administration (LWUA) in the Philippines operates on the same principle, by issuing loans to autonomous, self-reliant Water District.

Parastal companies

A parastatal differs from a 100% self-financing public company in that central or local government may contribute a public subsidy for a transition period, or finance a deficit for a number of years. Otherwise, the parastatal operates in similar ways to the utility company, with its own separate budget and accounts.

For Danida, the subsidy itself is not a problem. Danida does however need to take into account for how long the

government can bear the burden of subsidizing deficits on an increasing number of water supply systems. Difficulties may be intensified at times of structural adjustment, when budgetary savings are normally being sought. If a parastatal is assured that its deficit will be covered at the end of the year, there is no incentive to improve efficiency or to raise tariffs.

Some typical parastatals are: Kerala Water Authority (and similar authorities in other Indian States); and Energie de Mali. In Guinea (Conakry) an autonomous state society, SONEG, is responsible for planning, financing and installation of water supply systems. SONEG owns the systems, but assigns the operation on 10-year concession contracts to a parastatal, SEEG, in which two French companies own 51% and the Guinea State 49% of the shares.

In appraising potential projects to be administered by parastatals, Danida needs to assess whether government has both the political will and the financial strength to guarantee deficit financing for some years. Alternatively, it may be a condition of Danish support that water tariffs will be gradually increased, to make the parastatal viable.

Public enterprise

The third option for urban systems involves a central authority financing and constructing a city water supply, then handing over responsibility for running it to a local authority, which may in turn operate the system via a water company.

The aim is that the local authority should operate the supply on a commercial basis and create profits for use on other activities. New investments are also assumed to come from within the local authority.

Though similar to the utility approach, this option has the disadvantage that revenue does not remain in the water company, or necessarily in the sector. The company is thus continually drained of liquidity.

The District Water Enterprises (PDAM) in Indonesia are examples of parastatals, operating under the direction of the Ministry of Public Works.

Danida's tests of suitability of potential water projects with this type of administration are similar to those applied to proposed rural water supply projects. Tariffs should at least cover basic operation and maintenance costs, and

there should be reasonable assurance that financial arrangements are stable for a minimum of ten years.

6.6 Water Tariffs

It is important that the water utility should provide a reliable service in a cost-efficient manner, and that water tariffs should be fixed at realistic affordable levels. An inefficient water utility should not simply increase water tariffs for the profitable water systems and neglect less profitable services in periurban areas or minor towns. Water tariffs for urban piped water supplies are normally progressive. This means that big water users pay proportionately higher costs and the extra profits can be used to subsidize basic services for the poor. It also discourages wasteful use of water and so defers the need to seek more expensive sources.

In a few places, flat-rate connections are used and accompanied with measures to restrict consumption, such as flow restrictors of intermittent services. These solutions cannot be recommended.

Application of progressive water tariffs involves installing individual meters, and requires regular meter reading, billing and collection. It brings the extra advantage

that widespread metering makes it easier to trace unaccounted - for water, either through leaks or illicit connections.

Regrettably, tariffs have a tendency to fall behind general inflation, because of the feared political implications of raising them. If the water company has no regulations on how to alter tariffs concurrently with rising costs, Danida will make introduction of such regulations a condition of financial support.

In rural areas, metering is difficult to manage and generally other measures are used to regulate water use. In Tanzania, for instance, each village connected to a particular scheme has its own storage tank connected to a transmission system. A carefully calibrated connection delivers the design flow over 24 hours. Social pressure from neighbours then becomes the control over individual misuse. In the high potential Aguthi area in Kenya, metering has proved to be a successful solution for a large rural scheme with 6,000 individual connections.

There is an unfortunate economic factor at play in the provision of water from periurban standposts. If the water is sold by a standpost operator, it will normally cost more per unit than the tariff for an

individual connection. Yet it is the poorest people who depend on standpost supplies.

Socially undesirable as this situation may be, unless the standpost operator can be guaranteed a reasonable income, it is unlikely that the supply will remain operational for long. In exceptional cases, locally collected taxes have paid for neighbourhood taps serving a small area where everybody is known to each other and the level of social conscience is high (e.g. Guinea).

6.7 Financial Administration and Management

Wherever there is a need to collect payments from water users, a local administration and management system will be needed.

Individual consumers and water kiosks have to be recorded, meters have to be read, billing and collection have to be organized, and accounting systems have to be set up. To avoid demoralizing regular payers, cut-off notices have to be issued and enforced on non-payers.

It is unfortunately true that large consumers (government institutions, parastatals and industries) are often the worst offenders in terms of non-payment.

Danida policy is that collection efficiency must be reasonably high. It cannot be accepted that large consumers do not pay. Where this is the existing situation, payment conditions must be imposed before Danida will consider further investment.

6.8 Two-Step Financing

Danida support comes in the form of grants, not loans, and is made available directly to governments. However, Danida believes that urban water utilities should be subject to the discipline imposed by loans. The idea is to discourage selection of expensive high-technology options and to provide incentives for better efficiency.

With two-step financing, Danida provides a grant to the government (the finance ministry), and the government extends a loan to the water utility. Details of each individual financing arrangement should be discussed by the government, the water utility and Danida. The repayment period and interest rate are adjusted to suit conditions in the country concerned, with a general rule that sound financial principles must be applied.

To encourage certain "software" activities, like the organization of community participation and health education, Danida

is willing to see such activities financed by grants to the water utility. The same may sometimes apply to design and supervision, and to feasibility studies and other project preparatory activities which few water agencies are willing to have financed with loans.

6.9 Sanitation

Danida-supported rural sanitation programmes in Sri Lanka, Bangladesh, India (Kerala) and Zimbabwe have been very successful in terms of demand from users. In each case, materials for household latrines are given to consumers or sold at subsidized rates, while the digging of the pit and construction of the superstructure are the responsibility of the users. In Sri Lanka and Zimbabwe, all strata of the communities benefit from the programmes, but in Bangladesh, even with the subsidies, the poorest families do not find it within their financial means to buy latrines.

Because of the potential impact of improved sanitation on health, the clear popularity of the programmes and the relatively low investment per capita compared with water supply, Danida has accepted that the present subsidy practice should continue, as a way of spreading the concept of sanitation rapidly in rural

communities. It is important however that subsidy policies in Danida-supported projects are in line with national subsidy policies.

It has to be recognized that subsidizing latrine components to ensure that the poorest people are reached may have an adverse impact on private sector latrine production. In the long term it is the private sector which must be able to supply the majority of the population with latrines. Danida therefore seeks to ensure that subsidies and demand are carefully monitored, and that the subsidies are administered in such a way that private latrine production is encouraged rather than inhibited.