WHO/CWS/90.10
ORIGINAL: ENGLISH
DISTR: LIMITED

WATER SUPPLY AND SANITATION

HANDBOOK OF FINANCIAL PRINCIPLES AND METHODS

WORLD HEALTH ORGANIZATION
WORKING GROUP ON COST RECOVERY

IRC, INTERNATIONAL WATER AND SANITATION CENTRE, NETHERLANDS

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UNITED NATIONS DEVELOPMENT PROGRAMME • WORLD BANK

WORLD HEALTH ORGANIZATION, GENEVA, 1990

ACKNOWLEDGEMENTS

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* Each composite index contains either zero (O,o = all) or:

- Description of topic (P practical, T theoretical, E example)
- Target audience (m manager, g engineer, c accountant)
- Type of system (R rural, U urban).

DEFINITION OF TECHNICAL TERMS

ABBREVIATIONS

AIC	Average incremental cost	m	metre
CWS	Comm. Water Supply and San.	m3	cubic metre
GCWC	Grand City Water Corporation	MIS	Management infomation system
IRR	Internal rate of return	NRW	Non-revenue water
IT	Information Technology	O&M	Operation and maintenance
kg	kilogramme	Rs	Rupees
km	kilometre	UFW	Unaccounted-for water
kWh	kilo Watt hour	VIP	Ventilated improved pit
lcd	litres per capita per day	WSS	Water supply and sanitation

CEFIGRE	Centre de Formation Internationale à la Gestion des Ressources en Eau
CGE	Compagnie Générale des Eaux, France
DGIS	Directorate General for International Cooperation, The Netherlands
DHS	Distric Health Systems, WHO
GTZ	German Agency for Technical Cooperation
IRC	International Water and Sanitation Centre
NORAD	Ministry of Development Cooperation, Norway
NVE	Water Resources and Energy Administration, Norway
PWA	Provincial Water Authority, Thailand
TUT	Tampere University of Technology, Finland
WASH	Water and Sanitation for Health
WB	World Bank

FOREWORD

This handbook is intended to assist all those who are concerned with financing sustainable Water Supply and Sanitation (WSS) systems. The managerial principles and methods which have been selected to inform and assist practitioners and decision-makers are geared towards financial viability and sustainability, not as ends in themselves, but rather as means to ensure attainment of long-term public health and environmental goals.

In this context, a major question to be addressed is: "How to improve the effectiveness and efficiency of health development efforts in terms of their impact on the health of entire populations, with emphasis on the most needy?"

For the WSS sector, the most common answers available are based on cost containment in design and operation, cross-subsidization, and cost recovery. The purpose of these measures is to ensure overall sustainability, and in so doing avoid service disruptions or lack of WSS facilities, which in developing countries affect primarily the least privileged population groups.

These answers are not entirely satisfactory, as the issue of effectiveness of WSS services in terms of their health and environmental impact is not directly addressed, essentially because of insufficient awareness or concern, and lack of practical means to ascertain and measure these benefits. The purpose of the handbook is to facilitate financial management, in the hope that this will result in WSS service improvements and related benefits.

The handbook follows recommendations made by the WHO Working Group on Cost Recovery, which has more than eighty members, including senior government officials, representatives of bilateral and international technical and financial institutions, consulting firms, public and private water and sanitation agencies, and non-governmental organizations active in the field of environmental health.

The guidance material was elaborated gradually, during a series of consultations organized by the Community Water Supply and Sanitation (CWS) Unit of the Environmental Health Division of WHO, and the IRC International Water and Sanitation Center. It was subsequently tested and refined in field activities involving more than twenty countries; a final set of financial management principles evolved. A group of financing agencies then met with representatives of developing countries, WHO and IRC, and agreed that these principles should be compiled in the form of a handbook, which would provide a widely applicable methodology for implementation.

While primarily designed as a guide for operation and control, the content of the handbook provides sources and guidance which can also be utilized for training purposes and promoting and creating receptive situations for sound planning. It is addressed to a wide range of planners, project officers, and other professionals (managers, accountants, engineers, health officials, social scientists, etc.), policy makers, advisers, consultants and trainers, of national and external agencies.

As concluded by the WHO Working Group on Cost Recovery, sustainability is the most desirable development stage of any WSS system. Efficiency, effectiveness or self-sufficiency are less reliable indicators, which often deceive planners or discourage promoters, essentially because of their sensitivity to environmental and political change.

For WSS systems to be sustainable, all of their costs should be covered. In all countries, cost containment should be an important objective of public utilities, but this is crucial in developing countries, where too many people are still deprived of service. Risk-taking, deficit-spending measures, based on high technology and the assumption that at some future time consumers or government will pay, cannot be afforded and should generally be discouraged.

Subsidies, and technical measures to contain WSS costs, are generally country specific and follow multiple rules; they are not treated here in any detail. This handbook deals principally with methods to determine what the total cost is, and to improve cost recovery through user charges. It does not make any value judgement or recommendation with regard to cost containment measures, except where they are closely related to principles and methods to improve cost recovery.

Apart from cost recovery and cost containment, the two basic principles of sound financial management are those of resources coverage and liquidity maintenance. Resources coverage means that at any given time all needs should be covered. Liquidity maintenance means that at any given time all cash needs should be covered. While full resources coverage (including through cash-raising) should be pursued as a matter of principle, the methods to achieve this objective vary with circumstances: in most developing countries, liquidity maintenance is an essential condition to the attainment of permanent resources coverage, and sustainability.

Part I, PRINCIPLES, is the section of the handbook which provides a general conceptual framework, based on the objective of full resources coverage, and is concerned with the What? Why? and Who? for sustainable WSS development.

Part II, METHODS, deals with the practical aspects of implementation of sound financial principles. Sustainable systems require resources, many of which can be equated to cash. There is a need for arguments and tools to improve cash-raising and reduce demand on resources, and more generally to plan and implement economically sound and financially viable WSS systems.

Because of the experience of the last decades, it has become a truism that in WSS inadequate financial management invariably leads to service disruptions and environmental health deterioration. The need was not felt to emphasize throughout the handbook the linkage between public health goals, sustainability objectives, resources coverage, and detailed financial mechanisms such as cost recovery, cash raising and cost containment. The environmental effects of financial decisions and activities in the water supply and sanitation sector have been documented elsewhere by the WHO Working Group on Cost Recovery. The purpose of this handbook is to motivate the reader to adopt some principles, and follow some methods, designed to influence these effects.

PART I
PRINCIPLES

INTRODUCTION

Institutional and Financial Issues in WSS

Following several consultations on institutional development in WSS, the WHO Working Group on Cost Recovery formulated action lines to address those institutional and financial issues which are most commonly encountered in WSS.

WATER SUPPLY AND SANITATION
INSTITUTIONAL AND FINANCIAL ISSUES*

Sector Management Issues
Inter-ministerial coordination in planning
Institutional and human resources development
Agencies' autonomy (including over tariffs)
Agencies' regulations and monitoring
Activities that can be privatized
Activities that can be devolved on to communities
Funding for operation and expansion

Agency Management Issues
Financial planning and management information
Project preparation and appraisal
- .reduction of non-revenue water
- .efficient use of resources
- .preventive maintenance

Billing and collection
Other revenue sources
Consumers' willingness to pay (surveys)
Women's involvement in projects
Effective and efficient ways to serve the poor

Tariff Issues
Balance feasibility, efficiency, equity and expansion objectives against free services
Cover operating costs, and generally investment costs (charges to reflect value to the economy)
For the poor, willingness to pay may be high because the alternatives are unattractive
Stepped and differentiated tariffs
Metering
Cross-subsidization

* S. Ettinger and H. Garn
Senior Economists, World Bank.

These action lines are contained in the Report of the Fourth Consultation on Institutional Development (Geneva, 21-25 November 1988), in two volumes:

- Vol.I: "Managerial and Financial Principles for Water Supply and Sanitation Agencies" (WHO/CWS/89.5);
- Vol.II: "Principles and Models to Achieve Sustainable Community Water Supply and to Extend Household Sanitation" (WHO/CWS/89.6).

This handbook does not cover the whole range of issues identified by the Fourth Consultation but rather concentrates on financial management. The purpose of Part I is to explain the principles of sound financial management for sustainability, and to show the resources mobilization process which leads to the achievement of a number of objectives (desirable states) required to ensure the sustainability of WSS operation. This process is illustrated graphically on the facing page.

Kinds of Resources and Costs

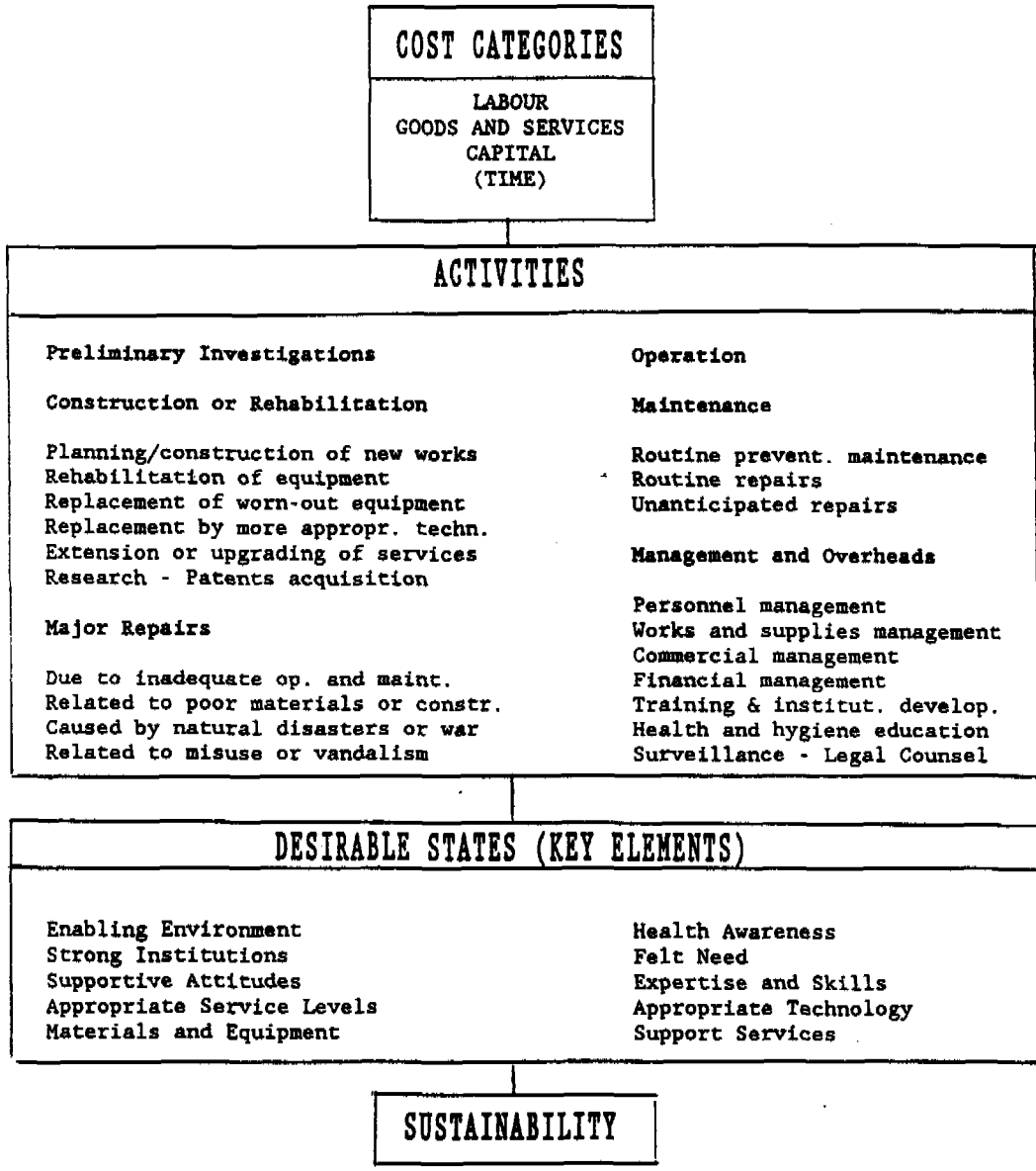
As in all fields, a set of terms - or jargon - has emerged. "Cost recovery", "cost containment" and "liquidity maintenance" are terms currently used by economists and financial analysts to describe what a public utility should practice if "viability" of its water supply or sanitation system is to be ensured. Other people involved in development work stress "appropriate technology", "community participation", "in kind contribution", "partnership", when talking of achieving "sustainable" community-based water supply and sanitation schemes.

The two groups look at and stress different things, which often leads to lively debate, but both have a common goal - a system that functions well, is utilized to the full with continuing health and socio-economic benefits, and operates efficiently on at least a break even, if not a surplus basis - in short, a sustainable system. What is required is that all costs and responsibilities associated with the system's planning and construction, operation and maintenance (O&M), and eventual replacement, having been clearly identified and allocated, should be adequately met.

The resources mobilization process on the facing page shows a breakdown of costs according to their nature: labour, goods and services , or capital. The time element is also to be considered.

The table also shows a breakdown of cost into activities, such as construction, maintenance, or rehabilitation.

RESOURCES MOBILIZATION FOR SUSTAINABILITY



The total cost of a WSS operation should always be calculated as:

- either the sum of labour, goods and services and capital resources mobilised as inputs to the WSS system,
- or the sum of costs of activities undertaken to plan, design, construct, operate, maintain and eventually extend and renew this system. The latter calculation requires rather sophisticated forms of cost accounting, which necessitate the breakdown of labour, goods and services and capital costs into various activities. It is generally not practiced in medium size or small WSS agencies.

There exist other categorizations and distinctions, like of fixed versus variable, or direct versus indirect costs. The purpose of enumerating these distinctions and the key elements of sustainability, is to make the handbook self-contained, thereby saving readers the trouble of seeking complementary knowledge in the literature.

The Nature of the Problem

The difficulty to recover cost is a major constraint to sound WSS financial management. The fulfilment of at least minimum WSS needs is an essential step towards the health improvement objectives of most governments, yet half the population of the developing world is still deprived of adequate services. Ensuring that all costs are covered through user charges alone is sometimes difficult, especially in urban poor and rural areas where cash is a minor aspect of the economy and is in short supply, while social and political considerations complicate the competition for and allocation of scarce development resources and operational subsidies.

There is a critical need for managerial and financial improvements to meet budgetary constraints and optimise water utilisation. It is necessary to improve the allocation, size and timing of application of investment funds, to contain all costs, and to diversify and increase the sources of recurrent income. Particularly in developing countries and especially in rural areas, there is an increasing need for communities to organize themselves to construct, operate and maintain WSS facilities, and to derive the maximum benefit from these facilities while ensuring that all costs are met.

A widespread idea is that water is free. However, payment of its cost is always required. Although sound tariff structures are beginning to be widely used, WSS services in many countries are provided at prices unrelated to either financial or economic costs. Besides, large consumers (including governments) sometimes do not pay their water bills; industries often enjoy the benefits of private supplies and discharge untreated effluents free of charge or penalty. At the same time, charges for those who do pay are high.

It is not uncommon that utilities have irregular incomes and trouble meeting fixed obligations such as debt-service and payrolls. Inadequate setting of charges is one reason for this state of affairs. But a number of "larger environment" problems, such as unwillingness to pay, perceptions that rates are too high in relation to quality of service, lack of qualified staff and lack of political will also influence the commitment to contain and recover costs.

Another constraint to efficient resources mobilization is that this is too often restricted to the WSS sector alone. The linkage with other sectors, especially public health, should be emphasized. The role of the health sector should be considered, as a resources provider for health education and WSS surveillance, in addition to promotion and organization of community involvement. In many countries, health agencies can also assist in planning, construction, operation, maintenance and repair of simple systems. In some instances, industry and rural development also have a role to play in helping the agencies of the WSS sector, and possibly subsidizing other consumer groups.

One last constraint to efficient financial management is the high cost of providing WSS services to very small communities in remote areas or areas where provision of safe water is difficult. In some countries, these communities represent more than half of the total population. Rigid policies setting fixed proportions of total cost to be met by the community can be unfair or unrealistic, and therefore no universal rule applies. Studies are required on a case by case basis, stressing appropriate technology, community participation, intersectoral action and cross-subsidization, bearing in mind, however, that in the end all sector costs must be covered.

Perception of the Problem

Engineers, financial analysts and economists have different perceptions of the problem, and the objectives which they pursue, as well as the languages which they use, differ widely, while corresponding to the same overall concept of sustainability. As Parts I and II of this handbook contain frequent indications on how objectives should be set and costs and benefits calculated, it is important to define precisely the perceptions which professionals of various disciplines have of their respective objectives with respect to cost recovery.

In a restrictive sense, the engineer is concerned with a project: WSS services cost tons of material, hours of labour, and capital resources such as pipes, reservoirs or pumps. The engineer's objective is that the project should represent the least cost solution to meet the demand (or to achieve any other type of benefit).

The financial analyst is concerned with an agency with one or several projects: WSS services cost money, corresponding to the market prices of material, labour and capital. The objective here is to ensure liquidity maintenance, as the agency must at all time have all the funds it needs to cover its costs.

The economist is concerned with a country with several agencies: WSS services cost the money and time which are spent on them while they could be employed in other sectors. The objective is to ensure that the return on these resources is at least that which could be attained on average in other sectors where they could be rationally employed. Health and environmental benefits are included in the objective to the extent that they can be appraised.

One of the aims of the handbook is to broaden these individual concerns.

THE COST SHARING APPROACH

The Partnership Model

The provision and continuing operation of any WSS facility involves costs and responsibilities, which are usually shared between the Agency and the Community (or the User).

"Agency" is defined as the implementing or initiating authority, and "Community/User" is defined broadly as the end user (either an individual or a collective group of any size, but whose members have common water supply or sanitation service interests).

At the community end of a community/user-agency scale of responsibilities are the examples of:

Case A-1: Farmer Smith buys a handpump, pays a contractor to dig a well and install the pump, then maintains the pump himself (this assumes that free abstraction of water is allowed).

Case A-2: Farmer Smith constructs a ventilated pit latrine for family use, paying for all materials and providing the labour himself.

At the agency end of the scale, the community/user has little responsibility and costs; for example:

Case B-1: During the project's development phase, the Grand City Water Corporation (GCWC) plans, designs and supervises construction of a new piped water system. Construction is carried out both by direct labour and by contract. Capital investment is 40 percent financed by an international low-interest loan and 30 percent grant-funded by a bilateral donor; the balance of funds is provided from national sources within the infrastructure development budget.

These are the extreme cases; the following are typical situations of cost and responsibility sharing:

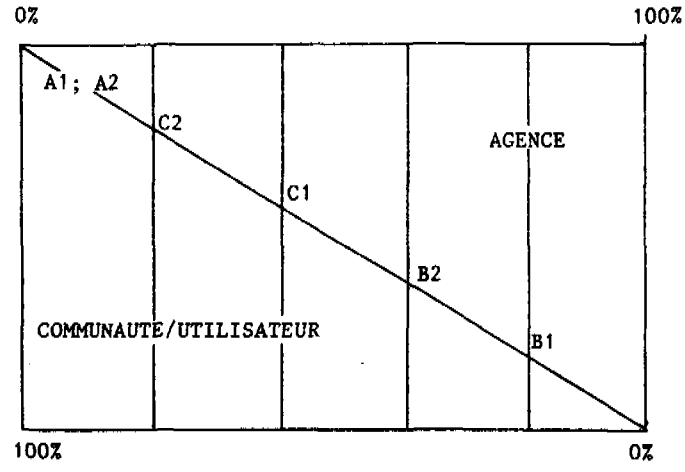
Case B-2: After having commissioned the facilities, GCWC operates and maintains them with its own staff. GCWC's recurrent budget (including debt service) has as its only source of funds user charges based on metered consumption.

Case C-1: For the construction of a piped water supply scheme in the rural village of Small (population 3000), the community is organized to dig trenches and lay pipelines as its in-kind contribution to help offset initial costs. Materials, transport and supervision are provided by the Ministry of Water. When completed, the system is "handed-over" to the community.

Case C-2: During the operation, the community is responsible for daily operation and routine maintenance of facilities. A local mechanic has been trained as a pump mechanic. Villagers contribute funds at the end of each harvesting season. A two-tier maintenance system has been developed, which means that Small's Water and Health Committee can call in a mobile regional maintenance unit to perform major repairs at an agreed-upon rate which is partly subsidized from general agency funds.

On this sliding scale, it is possible to represent the "partnership" of agency-community/user responsibility sharing by a point on the diagonal line.

The case examples given above are plotted here, with distances above and below the diagonal line reflecting the relative responsibilities to be assumed by each party.



The relationship is rarely static, so over the life of the project the point of placement on the diagonal line may be different, depending on how responsibilities are divided at that particular time. The gradual takeover of operation and maintenance responsibilities by a community will thus be illustrated by an upward move from right to left on the diagonal line.

Gaps and Overlaps in Responsibility Sharing

Except in the case of an individual doing everything on his own, the provision and operation of WSS facilities imply a two-way partnership between project executors and project beneficiaries. However, the intended partnership and division of responsibilities are not always achieved.

In such situations:

- where it is found that neither party wants, or is able to fulfil its commitment, actions should be taken to ensure each partner's ability to meet its obligations, and/or a different level of technology should be chosen so that the gap can be eliminated;
- where one party is doing more than it should while the other is doing less, action should be taken to ensure that both partners understand, accept and execute their responsibilities. The corrective actions identified in the previous situation may also apply;
- where both partners are doing more than they should and there is overlap and confusion, action should be taken to clarify the respective responsibilities.

What is important is that the right balance of responsibility sharing should be struck.

THE SUSTAINABILITY OBJECTIVE

Key Elements

* Enabling Environment	* Expertise and Skills
* Health Awareness	* Appropriate Service Level
* Strong Institutions	* Appropriate Technology
. Community	* Materials and Equipment
. Agency	* Support Services
. Special interest groups	. Customer relations
* Felt Need	. Community support
* Supportive Attitudes	. O&M support

These elements relate to the creation and maintenance of conditions that ensure technical, social and financial project success, subject to availability of resources and adequate sharing of responsibilities between the community and the agency.

Enabling Environment

This element is largely a responsibility of Government. It consists of legal provisions, informal regulations, education, information and other incentives which influence the behaviour of both the community/user and the agency. Developing country politicians and policy-makers should provide an Enabling Environment which involves:

* the promotion and commitment to the provision of WSS services for improvement in health and quality of life of the whole population.
* political will for a genuine commitment to sustainability, which includes the existence of a clear and consistent policy and legal framework, as examplified by the creation of autonomous organizations clearly committed and allowed to improve organizational efficiency, financial viability, reliability of services, and to provide services tailored to the consumers' needs and willingness to pay.
* clearly formulated objectives and standards for construction, operation and use of facilities.
* creation and maintenance of a positive and supportive environment to ensure that new or old WSS facilities continue to function well, giving maximum benefit to the users.
* monitoring and regulation of WSS agencies to ensure that they provide an appropriate service to the public.

An Enabling Environment is not consistent with a "Free Water" policy, for it emphatically requires a commitment to a partnership approach (agency vis a vis the community/user) in the provision and meeting of costs of water and sanitation services.

Health Awareness

For the community /user, Health Awareness implies awareness of:

* the health benefit of improved water and sanitation services, to the extent that the user refuses to use alternative facilities of easier access or lower cost.
* the seriousness of diseases due to lack of adequate water and sanitation, and the effect on personal health of unhygienic practices; this knowledge is particularly important among women, since they have a major influence on the health of children; it should be based on local concepts of water use, hygiene and disease, and the understanding of how specific local conditions and practices can affect health.

For the agency, Health Awareness implies:

* a working knowledge and acceptance of the complementarity of water, sanitation and health;
* a commitment to bring about improvements in health through health education and other promotional activities;
* a continuous cooperation with agencies of the health sector, with mutual transfers of resources.

In addition, on the part of the community/household or user, it means an acceptance of personal responsibility, and willingness to pay or contribute otherwise towards efforts and activities to improve personal and community health.

Strong Institutions

This element covers agency and community-based institutions for the management of water and sanitation services.

For the agency, Strong Institutions mean:

* organizations with clearly defined responsibilities, a sound legal basis, and autonomous control of finances and human resources;
* institutions with adequate financial resources to carry out their mandated responsibilities during the development and the operational phases of any project.

For the community, Strong Institutions mean:

* they have a formal, legitimate and permanent status;
* they are characterised by strong leadership and solid backing by the constituency (especially women);
* they represent all user groups, including women and poor households;
* they have an ability to organize and carry out a planned and agreed programme of activities.

Felt Need

This element is characterised by the existence of a genuine individual/household or community need for improved WSS services, and means:

* an awareness and expressed need of the health, economic and social advantages of improved WSS services;
* a desire to have WSS services that are convenient and time-saving, which also implies the existence of productive pursuits for the time saved.

Felt Need also implies a willingness to contribute to the development, operation and maintenance of WSS facilities.

On the part of the agency it means:

* a willingness and capacity to consult men and women of various socio-economic and cultural sections of the community on their felt needs and priorities;
* a willingness to encourage communities to make improvements in WSS facilities for health, economic and socio-cultural reasons.

While a general Felt Need may be (or is often thought to be) self-evident, needs for a particular level of service may have to be nurtured through health promotion, literacy programmes and general economic activities.

Supportive Attitudes

For the agency, Supportive Attitudes mean commitment to:

* a partnership process for implementation of WSS facilities;
* a genuine desire to work with communities to assist them in finding solutions to their WSS problems;
* policies and institutions which motivate agency staff.

For the community it means:

* the acceptance of responsibilities and a willingness to assume ownership, pay for services and contribute towards the provision of WSS.

These supportive attitudes should be created and maintained among the formal and informal leaders of the community, and the agency. Such attitudes are reinforced by examples of successful WSS projects or of projects observed in other areas. Therefore, the resources mobilisation plan for monitoring performance and progress and allowing timely corrective action should also provide for continuous exchange of experiences.

Expertise and Skills

This element is characterised by the existence of levels of skills required for the development, construction, operation and management of WSS facilities.

At the community level it means:

* technical skills for carrying out minor repairs and routine maintenance;
* skills for organizing cash-raising and managing financial resources;
* organizational skills for mobilising community inputs, identifying community preferences and consulting with agency staff.

The agency should possess not only the necessary technical, administrative and management skills, but also have (or be able to draw upon) resources persons with appropriate skills in social organization, extension work, communications, training, monitoring, follow-up, and review/evaluation. The agency should also have skills to effectively involve women in these activities.

Expertise and Skills also require the existence of training programmes and activities targeted at agency staff and at the community.

Appropriate Service Levels

Appropriate Service Levels should be jointly agreed between the users or beneficiaries and the implementing agency, and reflect appropriateness in the socio-economic and technical context of the project. The concept therefore applies to small communities, but is also useful for larger systems. This element is characterised by the acceptance of responsibilities for development and operational phases inputs. The Appropriate Service Level for a particular situation ideally allows the community to upgrade later to a higher service level, thus encouraging maintenance of the facility until it can be improved.

In reaching appropriate service levels resources are required for:

* comprehensive analysis of alternative service levels;
* consumer surveys;
* communications with communities/users to explain the implications of each alternative;
* paying the extra cost of service levels appropriate to specific situations, which require more than the type of WSS adopted in national policies and plans.

Appropriate Technology

The chosen service level should reflect technology that is practical, economically viable, satisfies the needs of the users and is socially acceptable.

Thus the Appropriate Technology element for WSS is characterised by:

* socio-cultural appropriateness;
* affordability;
* ease of maintenance with the skills available in the agency or community;
* maximum use of locally available materials or spare parts;
* easily understood attributes;
* technical efficiency.

Choice of appropriate technology is thus determined by an array of technical and non-technical factors which should be analyzed, discussed and finally agreed upon by the agency and the community/user.

Materials and Equipment

For the agreed service level and technology choice, there should be adequate resources, jointly provided by the agency and the community, to cover all the required development and operational phase inputs.

The key characteristic of the Materials & Equipment element is the timely availability of necessary inputs.

It implies:

* availability of materials and equipment for new schemes, for rehabilitation and for operation and maintenance;
* close coordination with communities/users so as to guarantee the availability of their in kind contributions.

Support Services

This element covers O&M support systems, extension services and customer relations. Although this element is primarily provided by the agency during the development phase, some inputs should be identified and jointly agreed to come from the community and should increasingly shift towards the community/user at the operational phase.

The O&M support system is characterised by the regular availability of funds, equipment, spare parts and staff to carry out operations of the system.

At the agency level it requires:

* establishment of maintenance teams, leak-detection teams, and technical teams to provide back-up support for community-based water/health committees;
* the existence of monitoring systems and a preventive maintenance programme;
* an O&M training programme for agency staff as well as for community-based operators.

At the community level O&M support requires:

* supervision and payment of local O&M tasks;
* assigned responsibilities for community-based operators;
* monitoring, and reporting on resource coverage.

Community extension services should also be readily available and properly equipped and trained to provide for technical support, training and supervision, as well as promotional work in hygiene and health education.

Extension services would also require:

* multi-disciplinary teams with social, as well as organizational and technical skills;
* a customer-relations service, especially in largely agency-managed systems. This service should provide for fault-reporting, public relations and user education (health, water conservation, security, etc.).

The Resources Coverage Process

Each element of sustainability has responsibilities and costs attached to it. In order to ensure that the elements are in place certain resources have to be provided by one of the main parties in the WSS development process - the development authorities (agencies) or the beneficiaries (community and/or users). A broad range of resources is necessary and they include cash; equipment, materials and supplies; expertise and skills; and time and labour.

The level of resources required and the corresponding responsibilities will vary from one project to another and be determined by the situation anticipated at each phase of the project cycle.

It may be found that the elements of sustainability are not available to some degree. In such cases, resources may be needed to strengthen national institutional capacities in order to develop the elements, for example:

- to establish community institutions for maintaining a rural water supply facility;
- to provide for training in the required skills for operating the facility.

With respect to agency-managed systems, resources may be needed:

- to establish more efficient organizational structures;
- to carry out a comprehensive institutional reorganization of the sector;
- to strengthen or enhance existing systems for delivery of the required elements of sustainability.

Sometimes it will only be necessary to provide resources to maintain the delivery systems for anyone of the elements.

It is important, however, that all necessary responsibilities and resources should be identified, quantified, allocated, shared and agreed by all parties.

This process, called "Resources Coverage" can only be carried out effectively in an atmosphere of confidence and trust between the development authorities and the beneficiaries. It requires a partnership approach.

The Partnership Process

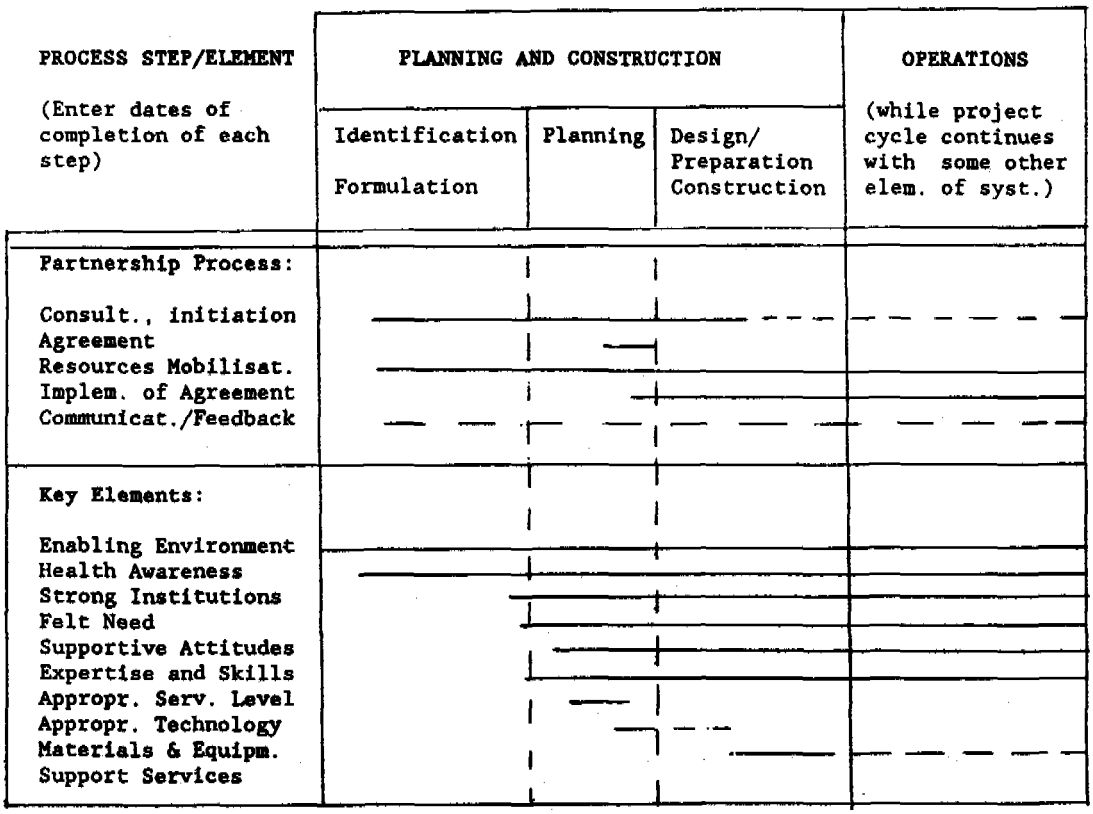
Basically, the partnership process is a two-way communication and joint decision-making process comprising consultation, reaching of agreement, mobilisation of resources, implementation of points agreed upon and feedback between the agency and the community/user. The step by step approach is discussed in detail later.

The partnership process requires adequate resources (too often neglected) in terms of time and skills for communication and gradual patient exchange between the partners in the development of water supply and sanitation.

A very important point is that the key elements, as well as the partnership process itself, affect time, money, materials and skills requirements.

Timing

The relative timing of all inputs to the development process is important to the success of any WSS project. The timing of the process and the input of the resources (key elements) extend over the duration of the project. The implications are that there are certain critical periods when the elements of sustainability must be in place (the desired state must have been reached). Before these critical periods are reached, resources will be needed to build up the elements to an appropriate level.



Assessment of Elements of Sustainability

It is important to make a complete assessment of the elements to ensure sustainability. For each element the key questions will include:

- is the element in place?
- what resources are needed?
- are the responsibilities for resources provision properly allocated?

It has been emphasised throughout that a systematic process of identification, quantification, provision and timing of inputs and responsibilities is crucial to ensure sustainable WSS development. The following are examples of worksheets to help obtain the overviews, assessments and establishment of responsibilities for the required inputs.

Resources Coverage Worksheets

PLANNING/CONSTRUCTION PHASE INPUTS			OPERATIONAL PHASE INPUTS	
Agency's Allocation	Community's Allocation	KEY ELEMENT	Agency's Allocation	Community's Allocation

Assessment of Inputs Required at Development or Operational Phase

RESOURCES REQUIRED FROM THE AGENCY					RESOURCES REQUIRED FROM THE COMMUNITY			
Cash	Time	Labour	Matls.	KEY ELEMENT	Cash	Time	Labour	Matls.

NOTES

1. "Time" means all time not otherwise included under "labour" -- time for communications, organization, planning, implementation, supervision, education, follow-up, accounts management, reporting, etc.
   Together, "Time" + "Labour" = 100% of all time required.
2. "Matls" means supplies, equipment, materials, parts, transport, fuel, etc.
3. "Cash" should be broken down into local and foreign currency components as appropriate.
4. On the Agency side, there are cost and budgetary implications associated with "Time", "Labour" and "Matls" inputs, as well as "Cash". The Agency's budgetary requirements can be determined by translating inputs into cost.

Examples of Completed Worksheets

Overview of Inputs Required for Community Water Supply Project

PLANNING/CONSTRUCT. PHASE INPUTS		KEY ELEMENT	OPERATIONAL PHASE INPUTS	
Agency	Community		Agency	Community
* * *	*	Enabling Environment	* *	* *
* *	*	Health Awareness	*	*
* * *	* *	Strong Institution	*	* *
* *	*	Felt Need	-	*
* * *	* *	Supportive Attitudes	-	*
* * *	*	Expertise and Skills	*	* *
* *	* *	Appro. Service Level	-	-
* *	* *	Appropriate Technology	-	-
* * *	*	Materials & Equipment	*	* * *
* *	-	Support Services	*	* *

Overview of Inputs Required for Peri-urban Sanitation Project

PLANNING/CONSTRUCT. PHASE INPUTS		KEY ELEMENT	OPERATIONAL PHASE INPUTS	
Agency	Community		Agency	Community
* * *	*	Enabling Environment	* *	* *
* *	*	Health Awareness	*	* *
* * *	* *	Strong Institution	*	* *
* *	* *	Felt Need	*	* *
* *	*	Supportive Attitudes	-	*
* *	* *	Expertise and Skills	-	*
*	* *	Appro. Service Level	-	-
* * *	*	Appropriate Technology	*	*
* *	* * *	Materials & Equipment	*	* *
* *		Support Services	*	*

Rating Scale Used

** = Upper end of scale -- relatively important input required
** = Value toward upper end of scale
* = Value toward lower end of scale
- = Lower end of scale -- relatively little/no input required

(for illustrative purposes only)

THE GENERAL MODEL

For a WSS project to be sustainable, good financial and institutional management and effective use of the available cash resources are required. Besides resources coverage, two basic operating principles are:

** **Cost Containment**: Every effort should be made to reduce wastage, cut costs and improve cost-effectiveness. For a typical piped water system, for example, such measures as minimizing non-revenue water (which includes unaccounted for water and all other water which is not paid for) and maximizing efficiency of billing and collection can often significantly reduce cost or produce gains in revenue.

** **Liquidity Maintenance**: At any given time, all cash needs should be covered. For a public utility this means having always enough cash on hand to meet expenses for construction, debt service and O&M.

The model on the facing page is applicable generally, although, in some cases some boxes may not be relevant and emphasis on specific key elements can vary. Following the lines of cash flow, it can be seen that:

* All agency inputs (expertise, manpower, materials, equipment, transport, etc.) are budgeted for.

* There are four sources of funds for the agency:

  (1) user charges or water or sanitation taxes;

  (2) grants from external and local funding institutions;

  (3) loans;

  (4) funds made available by the Government from taxation.

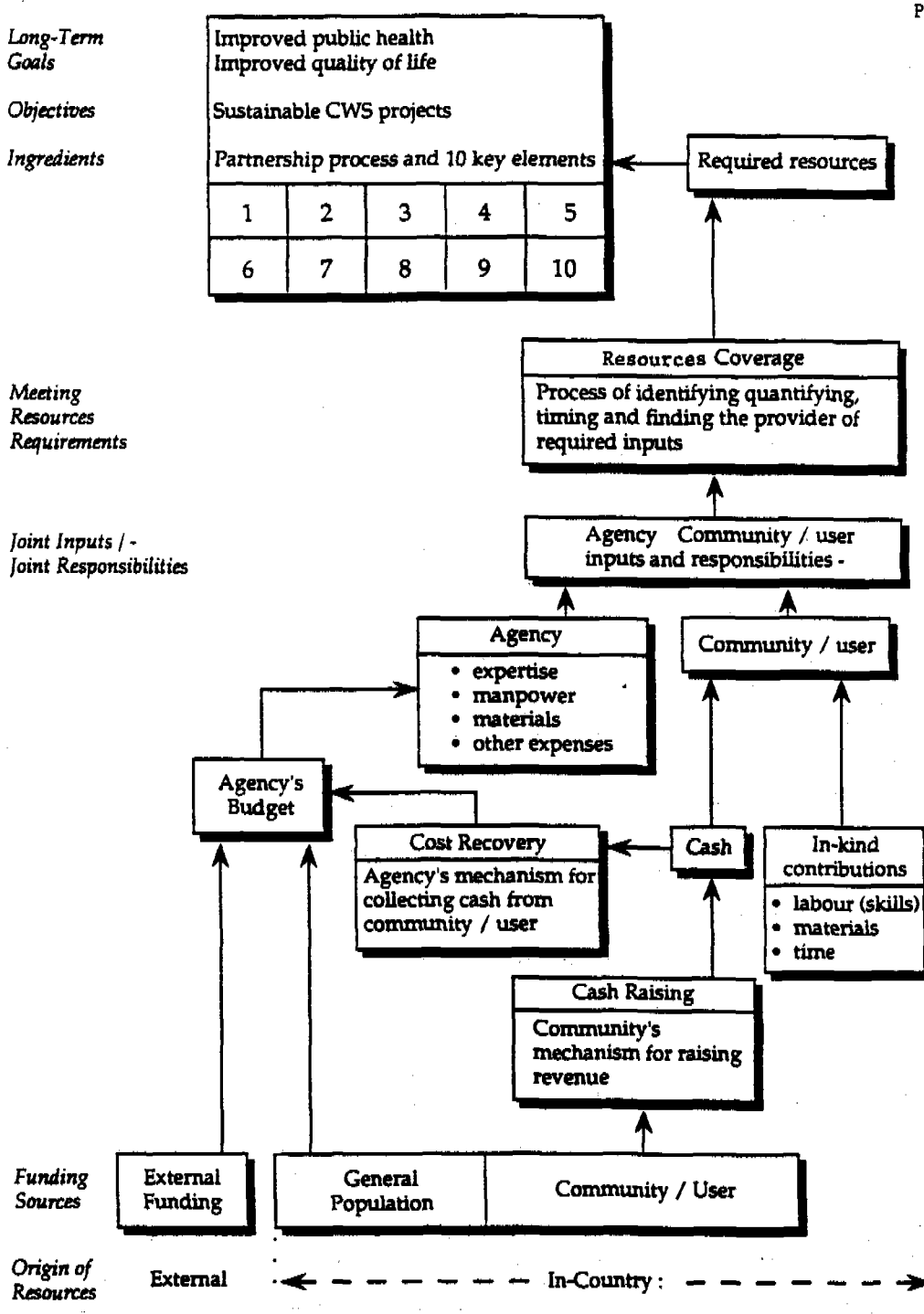
* Except for direct grants from external agencies, all investment and operational costs are met from in-country resources. In one form or another, the citizens bear the substantial part of, if not all, incurred costs.

* Cost recovery mechanisms are means used by the agency to collect funds from the service population (in the form of charges, fees or taxes).

* Cash-raising is what the community/user does as a collective/ individual activity to raise necessary funds to meet cash needs.

  (Various financing options available to the community are discussed later.)

* The community/user's cash contributions can be in the form of fees paid to the agency or of direct inputs to the project.



GENERAL MODEL FOR ACHIEVING AND FINANCING SUSTAINABLE WSS

ILLUSTRATIVE EXAMPLES

A number of typical examples are presented here as an illustration of the preceding principles.

Each example describes a fully balanced positive situation where resources coverage and partnership, intended to achieve long term sustainability, have been carefully calculated and then adequately provided and applied. However, the examples are fictitious and simplified so that many secondary considerations have been left out.

The examples are designed to show:

- the wide range of application of the resources coverage and partnership approach;
- the application of and the demand for resources of many of the key elements of sustainability;
- how real-life case studies might be developed.

On **Resources Coverage**, the examples illustrate some of the resource needs associated with sustainable water and sanitation interventions and give emphasis to the principle that all resources have to be provided, managed, and paid for by someone.

Relating to the principle that (whether planning a new scheme, a rehabilitation or upgrading intervention, or a combination of these), the management, provision and funding of resources always requires a balanced **Partnership** between agency and community (comprising different interest groups), the examples show:

- how allocation of different degrees of responsibility to agency and community/user is possible;
- the two levels of the partnership approach to resources coverage, as illustrated in the preceding figure:
  (i) partnership in managing the schemes and in providing and applying resources (cash, materials, labour and skills);
  (ii) partnership in accepting the end responsibility for providing the funds that purchase many of these resources.

Reference is made frequently to the "sliding scale" of sharing responsibilities and typical positions on the scale are illustrated. It will be seen that at each level, and at each phase of the lifetime of the project (development, operation, replacement/extension etc.), the balance of agency/community partnership may well be different and can be expected to change.

The essential point being made is that although flexible, at any time the division of responsibility should be agreed upon and all the needs should be covered:

There should be clear agreement and joint acceptance of shared responsibilities between agency and users. This agreement should cover funding, provision and management of resources at each stage of project development and implementation. Only then can sustainable functioning, use and impact be assured.

EXAMPLE 1. URBAN WSS: A MAJOR INVESTMENT PROJECT

Project Setting

Banjar Ketap is to become the new provincial capital in a rapidly growing region of a major South-East Asian country. It already serves as district capital and has a population of around 200,000 inhabitants, which in the next 15 years is expected to grow to over 300,000. Assisted by international financing institutions, the Government is embarking on a major water and sewerage investment programme. Plans are made to set up an autonomous Banjar Ketap Water and Sewerage Authority. This Authority will have a mandate to recover its operational costs including depreciation allowances, and interest.

Selected Solution

Flexible mixed-service-level systems are decided upon, to best respond to the rapid expansion and changing economic mix of Banjar Ketap's future population. A separate sewerage system with oxidation pond treatment is the mainstay of the sanitation provisions, with some allowance for construction of septic tanks in low-density areas. A looped network piped water supply will offer a mixture of service levels, including house, yard and neighbourhood connections, and some public taps.

Agreements on Resource Coverage

Many of Banjar Ketap's planned population have yet to settle in the city. Nonetheless as much key data as is necessary is gathered about their likely requirements and economic capacity to contribute to the costs of the services to be provided. Interviews are held with male and female representatives of the various socio-economic groups. Publicity campaigns are launched to raise the awareness of the population on the major developments being planned.

Based on this data the Authority is able to develop a detailed policy, showing the level of service options to be offered to each area and associated charges to be levied. A complete tariff structure is developed whereby the Authority is confident that for various mixes of service provided and populations served, it can meet its financial targets and maintain a positive cash position.

Further public relations activities continue to inform the users of the coming improvements, and of the vital role of all beneficiaries in paying promptly and using the services to good effect. At the same time, briefing programmes for the new residents build their awareness that improved infrastructure costs money and that they have an obligation to look after it, use it properly and make sufficient financial contributions.

Highlights

* Banjar Ketap will be an almost fully agency-managed system, at the agency end of the "sliding scale";
* the role of the users is to help decide on the most appropriate levels of service and of payment of the resources necessary to sustain them - an example of the partnership approach;
* through careful investigation, flexible choice of service levels, public awareness activities and proper forward projection and tariff setting, the agency is ensuring long term sustainability through resources coverage.

EXAMPLE 2. PERI-URBAN WATER SUPPLY: AN EXTENSION PROJECT

Project Setting

Miluni is a medium-size town in Southern Africa. It has a population of around 130,000 and is growing fast, mainly outside the official boundaries, where there are few planning restrictions. Government policy is that the cost of water supply to each district town and its satellites should be covered by users. Other than this there are few restrictions on level of service and charging. Miluni is fortunate in having external grant financing available to cover the investment cost (but not the recurrent costs) of any extension of service. Currently, and for some years to come, there will be surplus treatment and supply capacity.

Selected Solution

Because the new peri-urban settlements are largely unplanned, house connections, as already provided in the official sections of the town, would be difficult to introduce. In any case the peri-urban communities would not be able to afford the costs of such a level of service. An alternative acceptable to all is agreed upon: each cluster of dwellings will be served with a shared standpost or "neighbourhood tap".

Agreements on Resources Coverage

The agreements on resources coverage are crucial to the long-term sustainability of the schemes and are discussed and agreed upon by the communities and the Water Ministry well in advance of construction. In essence all construction costs are to be covered by the external donor. The donor will also support the initial "software" costs of discussing and reaching agreement with the communities, and carrying out a long-term participatory hygiene education programme. The key agreements therefore relate to how the recurrent costs of the service are to be funded.

Because the water supplied is pumped and treated, the new user groups will have to cover the corresponding costs, with support by some small cross-subsidy from the house-connection water rates in the town. A system is developed whereby each neighbourhood tap is metered, but where the cost of the water supplied is shared between different individual users in ratios determined by the user group itself, through its users' committee, comprising both women and men representatives. Neighbourhood groups also contribute to reducing agency's maintenance costs by carrying out on their own basic maintenance and repair to the standpost and drainage areas. The agency gives training for this purpose to community-selected caretakers, and establishes a system for monitoring and if necessary improving local performance.

Highlights

* the major responsibility for supplying the resources during both development and operational phases falls largely on the agency. This is dictated by the level of service and by the fact that the new schemes form part of a more complex system that is already agency-managed. Nonetheless from the beginning the community is made well aware that it has the end responsibility for providing the cash necessary to mobilize most of the resources that the agency will need in order to provide the service.
* the scheme is largely agency-managed and falls towards the agency end of the "sliding scale";
* a partnership approach has been applied during the development phase, in agreeing on levels of service and mechanisms required for generating the necessary cash to support operation of the system, and in setting up local institutions;
* the main origin of the necessary resources is the user community itself, with some small cross subsidy from the town's general population and inputs during the development phase from an external support agency.

EXAMPLE 3. RURAL WATER SUPPLY: A NEW SCHEME

Project Setting

Paichuri is a small and remote rural village in the Indian sub-continent. Around 1500 people live here, supporting themselves largely through subsistence farming. Most families, however, have some regular cash income from village menfolk living away and working in the industries of the State capital. The nearest town to Paichuri, where Government services are available, is more than one day's journey away by bullock cart, over poor roads. The community meet their water needs from unprotected traditional wells, which frequently collapse. State policy is that although communities should be assisted by grants in improving their water and sanitation facilities, at least 30% of construction inputs and 50% of the costs of providing all support services during the operational phases should be provided by the community itself.

Selected Solution

Building on the effects of a long-term hygiene education programme that was initiated in support of a project in the neighbouring district two years before, discussion between the agency and the community leads to agreement to jointly develop new community water supply facilities in Paichuri. Because of the limited financial resources of the community, the lowest level of service capable of providing safe water is jointly selected: protected wells with buckets and windlasses.

Agreements on Resources Coverage

In order to meet the State requirement that the community contribute at least 30% of the investment costs and, equally important, to root the project firmly in the community, maximum community inputs are sought. Contributions of skill, labour and local materials (as well as some cash) are agreed upon with the community. External inputs to the operational phase are minimized by using simplified technology and training local community members in repair and maintenance work. For tasks outside the capability of the community (such as major repairs to the windlass), a "User Support Unit" is set up at the Ministry of Water yard in the district town. This will provide occasional support to the community, on request and at cost. The community is helped to set up a Water Committee to manage the wells, and cash raising and accounting mechanisms to help pay for occasional external support. Measures have been taken to help women take part in consultations, and in the management of the wells.

Highlights

In contrast to Example 1, the responsibility for applying the necessary resources is more evenly shared between agency and community. However, although the agency provides many of the inputs needed for the development phase, the balance for resource provision swings strongly back to the community during the operational life of the facilities. Because of the remoteness of Paichuri (one of many hundreds of similar villages in the District), agency responsibility for providing the necessary resources for routine repairs would prove exorbitantly costly.

* the scheme is largely community managed (with women taking an active role), particularly during the operational phase, and falls towards the community end of the "sliding scale".
* the scheme represents a partnership approach, particularly during operation, with the community taking the main responsibility for the facilities and the agency offering continuing support at cost.
* the scheme involves "hidden costs" which must nevertheless be carefully allowed for. The community provides only 30% of the investment costs. In addition, although it pays for specific external maintenance support during the operational phase, the agency will still incur the costs of extension services (hygiene education, community support, problem-solving, re-training) during the life of the scheme.

  "All costs must be covered by someone": they have been carefully calculated, and provided for, and external support has been identified before implementation.

EXAMPLE 4. SEPTIC TANK-BASED SANITATION: A REHABILITATION PROJECT

Project Setting

Santa Martha is a provincial inland town in one of the larger countries of Latin America. Rapid expansion during the oil boom of the 1960s has led to a series of infrastructure improvements, including sewerage in some sections of the town. Where ground levels or scattered housing made sewerage impossible, systems based on individual septic tanks were often constructed by the municipality. The responsibility for maintenance was ill-defined. Cover slabs have become broken, the tanks are overloaded and are never desludged. Accumulated solids flow into the soakaway pits, causing them to block. This has led to a deteriorating public health situation. Community opinion is strongly in support of action.

Selected Solution

The municipality initiates discussions with the neighbourhoods concerned. People are willing to pay towards an improvement in the situation, providing there is a clear division of responsibilities in the future. Following detailed agreements, a rehabilitation programme is started in conjunction with some new construction. Householders are trained in the proper operation and maintenance of their septic tank systems. A small company is set up jointly by the municipality and a local organization. This will offer at-cost support services (such as repairs and regular desludging of septic tanks), as well as maintenance services for other aspects of the local infrastructure.

Agreements on Resources Coverage

All the costs of the rehabilitation programme and the support service are carefully worked out. It is agreed that the costs of the long-term rehabilitation work will be shared equally between the municipality (funded from general taxation) and a new community-based fund. Fees that the new company will have to charge to at least break even are worked out and agreed to by the user households. The municipality guarantees continuity of service by the company or a successor. A bilateral agency agrees to cover project costs of promotion, negotiation, training and essential monitoring.

Highlights

This example falls towards the "agency" end of the sliding scale in terms of providing and managing the necessary resources, whether by the municipality or the company. However, the community accepts the major responsibility for eventually paying for these resources, through the community fund and (more widely) general taxation for implementation of the improvements, and then through at-cost fees paid to the company for the support services required.

* clear agreements between agency and community on responsibilities, resource inputs and monitoring are essential if a rehabilitated system is not to revert to an unsatisfactory condition.
* the idea of "agency" can be broad. In this case it is all external bodies, outside of the user households, which apply or provide resources. It includes both the municipality and the company.
* the less visible costs related to promoting, negotiating, training and monitoring in such a project need to be fully taken into account, as well as the costs of setting up both the community funds and the enterprise services company. In this case, these costs are covered, for a certain period at least, by contributions from an external support agency, but in the long term they will usually have to be internally provided.
* ensuring resources coverage is just as critical during the operational phase of a project as during the previous phases. Particularly in rehabilitation interventions, unless new operational mechanisms are set up, the rehabilitation effort may be wasted.

EXAMPLE 5. HOUSEHOLD SANITATION: AN UPGRADING PROJECT

Project Setting

Kusunga is a small village of some 500 people in East Africa. Because it has fertile land, it has prospered as a source of vegetables for the nearby district centre, Abanja. Most households of Kusunga therefore have some cash income. Existing sanitation facilities are basic. About 70% of all households have a simple pit latrine with earth floor. However, increasing contact with the district centre and its services is leading to a demand, particularly from women, for an improved latrine for each household. Government policy supports sanitation upgrading, but only when implemented as an integral part of a hygiene education programme and where the households can cover the full construction costs of the improvements.

Selected Solution

In discussions with householders, Ministry of Health representatives confirm that there is a strong felt need for improving existing latrines and constructing new ones.

Accordingly a programme for the upgrading of existing latrines, which are deep and stable, to ventilated improved pit (VIP) standard is jointly developed, together with the construction of new facilities. Key agreements relate to who is to do and pay for the work. At the same time the agency steps up its programme of hygiene education support, involving local women as village hygiene assistants.

Agreements on Resources Coverage

A maximized self-help programme is jointly planned. The community and individual householders carry out most of the construction activities, contribute local materials and pay in full for the additional materials needed, such as cement and reinforcement. Householders will also carry out any necessary maintenance on their latrine slabs and superstructure. The agency provides all necessary outside materials at cost, but does not attempt to recover the costs of training the community in construction and maintenance skills, monitoring, or the costs of its hygiene education activities, which it will fund from an externally-funded institutional development project.

Highlights

* This is a good example of a community/household-managed system, falling well towards the "community" end of the sliding scale. Householders, with support from the broader community, take full responsibility for mobilizing resources for the construction and upkeep of the improvements. There are also considerable resources from the agency, particularly during the development phase, in providing extension, training, supervision, and hygiene education. This is to be provided here from general taxation and overall external support to the health sector.
* Although users can be seen as providers of many of the resources necessary for improvements, there will always be some materials to be purchased from outside. Unless this is to be an agency contribution, households will need sources of cash and ways of collecting and managing this.
* In such programmes, the costs of construction and maintenance might be low when compared with the true long-term costs of associated hygiene education, promotion, advice, training and monitoring services provided by the agency. On first sight this seems an almost fully "self help" project, but the substantial additional resource requirements of the support services should be calculated and also adequately provided.

BEYOND THE GENERAL MODEL

The five examples of the general model illustrate variations in partnership, agreements on resource coverage, and other elements of a system which has its own sustainability as prime objective. Beyond this system, as previously explained (page 7), different perceptions may prevail, in the broader framework of water resources protection and conservation, and generally of environmental management.

At any time the policy of the WSS sector should be both feasible and open to development, and therefore it should reflect on the one hand, the cost of operating and maintaining the existing facilities and, on the other hand, the growing scarcity, distance and pollution of water resources.

If for instance a system utilizing groundwater is faced with an unexpected increase in water demand, which requires water abstraction, treatment and transportation from a distant stream, consumption can be expected to increase to a level where sewerage would become the appropriate technology, for wastewater disposal as well as to prevent the contamination of groundwater.

In this case, sustainability has a broader meaning than in the previous examples. Two very costly improvements are required: extension of the water supply, and construction of waterborne sewage collection and disposal facilities. These costly developments are motivated by public health and environmental objectives which are external to the financial model. Part II of the handbook, which deals with methods, therefore includes two types of accounts for costing and pricing purposes:

- the community and agency accounts, or financial accounts, which reflect the cost of WSS to those who supply or use these services;
- the sector accounts, which reflect the value of water and sanitation, as well as all other resources and services, to the national economy.

The results of these two different accounting systems can generally be reconciled. In the example above, if there is a possibility to treat municipal sewage (and a market to sell and reuse the effluent) the benefit of the wastewater use scheme could be calculated in two ways:

- in economic terms, as the sum of public health and environmental benefits of having sewerage, plus the saving which may result from postponing the water supply extension investment if wastewater can be reused as a substitute for water from the present system;
- in financial terms, as the sum of the market prices of all items entering the calculation of economic value, except some public health and environmental benefits which cannot be quantified.

PART II
METHODS

INTRODUCTION

Background

Part I has given some of the underlying principles for ascertaining that all resources required for water and sanitation services are identified, provided and paid for, with the aim of ensuring sustainable services which meet the users' (termed the community) needs. A key method by which this is achieved, is the use of the partnership between the user group and the agency in the determination of resource requirements and in the planning, construction and operation of WSS services, and in their management.

This section of the handbook is intended to provide a practical guide to dealing with cost recovery issues in setting up and maintaining community water supply and sanitation services. The handbook shows the use of the consultation between suppliers and users and should be useful to both groups. The actions required are presented in a sequential order which follows the stages of planning, construction and operation. In using this sequence, the user of this handbook can see at which stage various important cost recovery activities occur.

Cost recovery issues are not always financial in nature. Successful cost recovery requires not only appropriate financial policies, and processes to put them into effect, but also an appropriate organisational framework, and arrangements for effective community participation. Equally important are activities to enhance public awareness, combined with health education programmes which demonstrate the importance of safe water supply and sanitation. The handbook therefore makes many references to non-financial issues such as these deliberately. Cost recovery requires changes in the behaviour and attitudes of all those who are involved in the provision, management and receipt of water and sanitation services. The actions described in this handbook should be viewed against this background.

Not all the issues raised will be relevant for the whole community water supply and sanitation sector, because of the great variation in the size, nature and financing requirements, of water supply and sanitation schemes, in urban and rural areas. The handbook is designed to identify all the issues which may affect any water or sanitation project, but some issues will not be relevant for larger systems while others may not be appropriate for smaller ones. Different solutions are therefore provided at each end of the scale, for water supply and sanitation respectively. In rural areas, reliable income data are often difficult to obtain, and can often be replaced by more general indications on the sustainability of certain technologies and the willingness to contribute of various user groups.

Sources

The consultations on cost recovery have used as a basic document: "What Price Water?" - User Participation in Paying for Community-Based Water Supply, by Christine van Wijk-Sijbesma, IRC, The Hague, 1987. The cash-raising options presented in this document have therefore been used extensively in the following sections.

Good financial management, both of WSS services already in operation and of those moving from construction into operation, is essential to ensure sustainability. The intention is to help the user of the handbook avoid, by using appropriate procedures and good financial management, many of the pitfalls which can develop and which jeopardise sustainability of WSS services. Some common errors have been identified and are listed below, on the basis of documentation produced by Coopers & Lybrand Deloitte, United Kingdom, under the general title: "Practical Financial Management".

FINANCIAL AND MANAGEMENT ACCOUNTING

Pitfalls:
- no clear accounting policies in place;
- backlog of accounts and regular reports allowed to build up;
- poor budgeting and budgetary control;
- lack of qualified staff;
- poor communication within the organisation.

Effects:
- consolidation of information from different regions/offices is impossible;
- too little/inaccurate/late information is available to managers, who are then unable to make decisions based on correct information
- wrong decisions may be made;
- the effectiveness of use of resources cannot be assessed.

CASH MANAGEMENT

Pitfalls:
- inadequate management information or financial planning will lead to inadequate information on short and long term cash needs;
- inadequate links between cash flow systems and budgeting systems does not enable cash requirements to be anticipated and provided for.

Effects:
- Either:
  - shortage of funds to make scheduled payments e.g. to suppliers, or repayments of debt;
  - requirement to cover short term deficits through expensive short term borrowing;
  - poor relationship with bankers;
- or:
  - excessive surplus cash holdings, suggesting inadequate procedures on investment, and absence of financial planning.

TARIFF AND CHARGING POLICIES

Pitfalls:
- failure to understand the cost structure of the service provided;
- failure to understand the different types of consumers and their service requirements;
- failure to understand the behaviour of consumers in response to changes in prices;
- failure to undertake financial planning.

Effects:
- revenues not covering costs, leading to liquidity problems - operating cost, debt service payments or working capital requirements cannot be covered;
- the social objectives of the service may not be fulfilled.

BILLING AND COLLECTION

Pitfalls:
- inflexible and inappropriate payment arrangements for customers;
- inadequate management information does not identify debtor accounts;
- failure to take account of customer complaints;
- failure to take action on overdue accounts;
- late billing and ineffective revenue collection arrangements;
- inadequate accounting for bad debts.

Effects:
- poor and ineffective billing and collection leads to high levels of accounts receivable, and too much money being spent on the procedures themselves - using up scarce resources and threatening the liquidity of the service.

ASSET MANAGEMENT

Pitfalls:
- inadequate/inappropriate asset records;
- failure to address efficient utilisation of assets;
- failure to optimise life of assets through consideration of costs of maintenance and replacement;
- failure to adequately maintain assets.

Effects:
- financial statements may not reflect the true value of the assets to the service;
- wrong decisions may be made concerning the need for asset replacement;
- the depreciation allowance may be wrong, leading to longer term problems of adequacy of revenues to cover costs and provide for service extension.

INFORMATION TECHNOLOGY

Pitfalls:
- failure to address proper role of IT;
- failure to include in IT budgets sufficient allocation for support and training.

Effects:
- over-investment or under-investment in an IT system, its support and training requirement;
- selection of an IT system which does not improve customer service in a cost effective manner.

PROCUREMENT AND INVENTORY MANAGEMENT

Pitfalls:
- no clear strategy for procurement is in place;
- inadequate storage capacity;
- economies of scale in procurement are not used;
- purchase lead times not taken into account;
- inappropriate stores valuation procedures followed.

Effects:
- inappropriate levels of stock - too high levels lead to wastage of money, in particular scarce foreign exchange, and perhaps pilferage and wastage of stock - too low levels hamper other parts of the operation of the service - e.g. maintenance.

CAPITAL STRUCTURE

Pitfalls:
- failure to determine all sources of finance and their terms;
- failure to take a longer term view of the implications of different types of financing;
- failure to address appropriate mix of debt and equity.

Effects:
- failure to meet debt service payments, or to be able to sustain working capital requirements;
- failure to make sufficient return on capital.

ORGANISATION OF THE FINANCE FUNCTION

Pitfalls:
- failure to ensure that the organisation structure of the finance section is compatible with the aims of the finance function - e.g. with regard to reporting arrangements, information flows, manpower and skill levels;

Effects:
- all other areas of financial management are hindered by an inappropriate organisation - through inadequate information, reporting, manpower and skills, or possibly excessive costs incurred in the finance function.

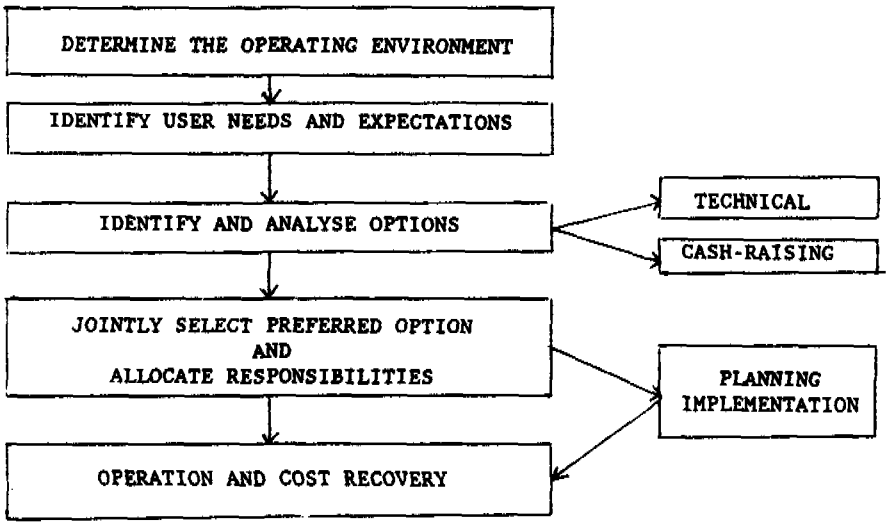
The last source of information which is extensively used in this part of the handbook is the report of the fourth consultation of the WHO Working Group on Cost Recovery, which provides the following general guiding principles.

PRINCIPLES

* Water and sewerage agencies should be granted AUTONOMY in order to provide an efficient and satisfactory service. While subject to public interest regulations, they should operate on a commercial basis.
* The agency's management should be such as to ensure overall EFFICIENCY (technical, commercial, financial, etc.), rather than high-level performance in any given field.
* The agency should focus on COST CONTROL: on the investment side by avoiding premature investment or investment on too large a scale and by selecting appropriate technology, and on the recurrent side by an OPTIMUM UTILIZATION of FACILITIES, which should be achieved by minimizing the amount of non-revenue water, maximizing the efficiency of billing and collection and implementing adequate preventive maintenance measures.
* The service provided by the agency should be tailored to the consumers' needs, which requires in particular a good CONSULTATION with the consumers, market studies and good public relations.
* "Ability to pay" criteria can at their very best be broad guidelines and represent an external assessment, whereas "WILLINGNESS to pay" is far more relevant.
* The agencies should provide a service for which the consumer is willing to pay. To achieve financial viability, the average tariff should be fixed at such a level that all cash needs (except sudden emergency needs which would cause intolerable tariff fluctuations) are covered, including where possible an adequate self-financing margin to fund extensions (LIQUIDITY MAINTENANCE).
* Increased efforts should be made by the donor community to help water supply and sanitation agencies to reach a SOUND FINANCIAL POSITION; projects which may undermine the financial viability of the sector should not be undertaken.
* The agency should KNOW (through internal information systems, accounts, meters, etc.) how much it finances, how much water it produces, and where the water goes.
* Subject to average tariffs being sufficient to cover liquidity needs, the following selected principles should be followed for specific consumers:
  - the public standpost service should be financially autonomous, with an average tariff to the retailers (entrepreneurs/community organizations/other agencies) equivalent to the variable costs of supplying these connections; the rates should be such that under normal supply conditions the financial situation of the agency cannot improve by closing these facilities;
  - pricing should be consistent with economic costs;
  - where the capacity of the natural drainage system is - or is expected to become - insufficient, the costs of a sewerage/drainage system (existing or future) should be gradually covered by a charge, for instance a levy on water use, except for water used to cover minimum human needs; a similar charge should also be applied in the case of private abstraction of water.

Contents

The handbook follows step by step the financial management and related activities required to improve WSS services and to achieve cost recovery. These activities are undertaken in relation to the environment (e.g. legislation), the users' group (e.g. tariff-setting), the agency (e.g. management improvements), and the system itself (e.g. metering).



DETERMINATION OF THE OPERATING ENVIRONMENT
(wider environment, community data)

Understanding the wider framework within which a project operates, will enable early appreciation of practical limitations or of factors which may encourage project sustainability. Too often schemes are initiated which, on proper analysis, never had much of a chance of succeeding.

IDENTIFICATION OF USERS' NEEDS AND EXPECTATIONS
(basic needs, other demand, level of service, outlined options)

Unless the user needs and expectations are taken into account, what appears to be a model solution to the agency may be inappropriate. User expectations may exceed what is possible, or the felt need may be less than the actual need. Recognising these differences at this stage will alert both the agency and the community to the need for their resolution, and should result in a better planned water or sanitation service.

IDENTIFICATION OF TECHNICAL OPTIONS
(WSS services, supply, demand, water losses, technically feasible options)

Irrespective of financial or economic considerations, it should be ascertained that the technical options retained will be appropriate in view of the need.

IDENTIFICATION WITH THE COMMUNITY OF CASH RAISING OPTIONS
(community fund raising, indirect taxes, water vending, regular user charges)

Irrespective of technical considerations, it should be ascertained that the community is willing to contribute cash, and that appropriate collection methods will be adopted.

ANALYSIS OF TECHNICAL OPTIONS
(construction, and operation and maintenance costs for each option)

Detailed data is required for comparative purposes.

SELECTION OF THE PREFERRED OPTION AND AGREEMENT WITH THE COMMUNITY
(comparison, selection, allocation of responsibilities).

An alternative should be chosen that meets users' needs at affordable cost and utilises effectively the resources made available by the community and the agency. Full cost recovery should be reflected in this option. It should also show the allocation of responsibilities not only between the agency and user group, but also to different groups within the main user group. The requirements for training and institutional development should be identified in the agreement.

FINALISATION OF THE PREFERRED SCHEME AND DETAILED PLANNING
(cash flows, tariff requirements, other community contributions)

Complete financial projections should be prepared

CONSTRUCTION AND OPERATION
(Financial planning, reporting systems)

Systems to monitor efficient use should be installed and operated.

OPERATING ENVIRONMENT

Introduction

In order to design and administer water supply and sanitation facilities, it is important to understand in detail both the community to be served, and the wider environment within which the systems will be developed and will operate. With regard to understanding all features of the community, there are large amounts of data to be collected. With regard to the wider environment, there is research to be done on factors which affect the type of project which should be developed, and on the possibility for local or national government to facilitate the recovery of CWS costs. This section is therefore divided into two subsections - wider environment, and community data.

Wider Environment

Firstly, it is important to understand how the project under consideration fits into the wider framework of Government initiatives on water and sanitation facilities. Secondly, it should be possible to determine what assistance may be available from Government: there may be grants for project development, or subsidies available for particular regions recognised by Government as deserving special assistance. Thirdly, there may be requirements placed on the technical design and on water quality by organisations outside the immediate community or agency environment. Finally, specific laws may affect options which could be developed, rights of the community to water supplies from particular sources, or rights of the agency with regard to the collection of dues from the community. The information collected will affect both the design of the technical schemes, the initial financing of the schemes and perhaps the way in which costs can be recovered. It should be recognised that it takes time and effort to define the project environment, and that costs will be incurred.

Important issues are:

- legislation on water rights, abstraction and use
- water quality and effluent standards
- legislation on health and environmental protection
- legislation on water and sanitation sector institutions
- national water and sanitation development plans
- availability of finance from Government and other sources
- availability of foreign exchange
- legal redress for non-payment of dues
- institutional capacity

Institutional capacity is addressed in this handbook only to the extent that it relates to the other issues.

Legislation and Standards

The community or agency may not have the right of use of the preferred water source. It is important to review legislation relating to water rights, abstraction and use. Changes may be required to existing legislation or to accepted practice, in which case options for making such changes, and the cost of so doing, should be established. Legislative changes usually are time-consuming, and require ministerial or parliamentary sponsorship. Mechanisms for achieving this or, if possible, avoiding the requirement, should be evaluated.

National water quality standards will affect the technical specifications of water supply and sanitation systems, and hence costs. Enquire about standards for treated water and standards for effluent discharged into the environment. Try to determine if the standards will evolve over the life of the project, as this could affect the need for treatment costs. In addition to any mandatory standards, particular quality standards may be applicable because of the requirements of the community to be served, or of individual consumers (such as industrial users) within the community. Determine if there are any requirements which will change in future, and identify any special consumers or requirements within the community.

The national institutional framework of water supply and sanitation development agencies should be reviewed to ensure that the best use is made of existing institutions and their resources. Exceptionally, a proposed project may involve the establishment of a new agency. If this is done ensure that its activities are coordinated with those of the existing institutions.

In order to achieve sustainability, the water/sanitation agency (or the community if it has executive responsibility) should have financial and administrative autonomy. If autonomy is not established, external influences on the agency can have the effect of undermining financial viability, for example by postponing tariff adjustments, or by diverting revenue in order to satisfy the needs of other sectors.

The preceding paragraphs illustrate some of the features of the regulatory framework of the sector. At operational level, preference should be given to strategies which do not require time-consuming changes in legislation. At national level, the following issues have been identified and are currently being studied:

- regulations are needed to ensure public health protection in WSS and, in particular, allocation to this sector of the most favourable share of the resource;
- regulations are required in the field of wastewater use, especially for use of municipal effluent in agriculture, to ensure health and environmental protection;

- new types of water resources and uses should be subjected to legal provisions to ensure adequate conservation and equitable and rational allocation, and provide the framework required for health and environmental protection;
- there is a need for fundamental legislation and regulations to ensure that community water supply and sanitation costs are recovered from all water users, whether they are connected to the public system or not; the charges should include any surplus which may result from the fact that better sources have already been mobilized and are not any more available to the public system;
- there is need for institutional structures and mechanisms to enforce legislation related to the four previously mentioned issues.

National Water and Sanitation Development Plans

Coordination between the sponsors of a project and other organisations active in sector and community planning should ease the development of WSS plans. Identify national and local agencies, ministries and donor agencies involved in water supply and sanitation, and review:

- national water development plans;
- health care initiatives and their implications for water supply and sanitation planning;
- development plans for related sectors;
- industrial development and associated water demand;
- agricultural extension and associated water demand;

Information gained through this review may draw attention to potential conflicts between development schemes. It could also draw attention to alternative sources of project financing. WSS schemes are more likely to be sustainable if they complement efforts of other agencies, rather than being in conflict with them. It will be useful to collect information on similar projects in other areas of the country. Determine what cost recovery mechanisms have been used in these cases, and their track record. This could high-light some problems with respect to particular cost recovery mechanisms or reveal some new method of cost recovery which has not been recognised. Other issues relating to the wider environment of Government legislation may be identified, or some aspect of the effectiveness of different types of community organisations may be revealed.

Availability of Finance from Government and Other Sources

Policies may have been established by Government to assist water supply and sanitation schemes. These may be advantageous to some schemes as the terms on which finance is supplied may be softer than those available from the private sector.

Government financial assistance may be in the form of loans or grants. Determine the availability of project finance from Government. Determine the procedures for obtaining grants from Government, and the availability of low interest loans, or loans with longer grace periods than those offered by commercial banks.

As well as central government financing, the possibility of regional or municipal assistance should be explored. In addition, there may be scope for collaboration with public or private sector development or commercial banks, or cooperative unions, and this should be explored. In some cases, integrated agricultural or industrial development projects have infrastructure components which may be used to foster WSS development.

Availability of Foreign Exchange

Foreign exchange may be required if items of equipment or spare parts are to be imported. Scarcity of foreign exchange can often delay the implementation of a project or of urgent repairs. Foreign exchange is unlikely to be available in the community or even within the agency, but there should be an allocation to the water and sanitation sector by Government. Establish what procedures are required to obtain earmarking of foreign exchange, and whether part of the amount reserved will be made available to the activity under consideration. Try to determine how long the release of foreign currency may take so that the procurement process may take any likely delays into account. In order to ensure sustainability , it is important for WSS agencies and for communities to ascertain well in advance that foreign exchange will be made available as needed throughout the life of the project.

Non-Payment of Dues

In many countries, government, municipalities, industry and other large consumers do not pay for WSS services. It is important to establish at the beginning of a project the powers of the agency or water committee to recover such dues. Determine what legal action can be taken against non-payment of dues for water or sanitation services. For example, determine if the agency has powers to disconnect users from water supply. This is very difficult in special cases (schools, hospitals, influential customers): check the possibility of earmarking in advance a proportion of these customers' budgets to be used for the payment of WSS services.

Community Data

Data Collection

Much of the information may already be available from community records, or from local Government records. If the data appears difficult to obtain, see if it is possible to collect it from similar communities - With care, it may be possible to apply data from another community similar to the community in question. Schedule A on the facing page gives a list of the type of data that will be needed to define the needs of the community adequately and therefore to specify the services required to meet the community's needs. Any community development plan should be reviewed in detail to ensure that the development of a WSS project complements the community's plan.

Community Institutions

It is important to understand community organisations, and the extent to which existing villages can support the construction, operation, maintenance and surveillance of the facilities. This is crucial for rural schemes, where the community is more likely to assume responsibility. Determine therefore what organisations exist, their responsibilites, and how they are funded. An urban WSS scheme with predominately agency management will usually rely less on community organisations.

Estimation of Willingness to Pay

The estimation of the willingness to pay is based on what is paid at the moment, or the consumers'perception of the value of the effort they presently make to collect water. If presently water is of lower quality than that contemplated for the future, their perception of the value of an increase in water quality will affect their willingness to pay. Willingness to pay for clean water collected and carried over a long distance will probably be much lower than for clean water collected from a standpipe close by. This will in turn be much less than the amount a person might pay for water delivered through a house connection. For sewerage, similar concepts apply, though much more weight is probably given to the perception by the user of an improved level of service.

If, in the view of the community, the scheme does not properly address the needs felt by the members, they are unlikely to contribute in cash or in kind to the costs of construction or operation. A distinction should be made between affordability, which is an outside judgement, based for instance on some percentage of income which could be spent on WSS, and willingness, which reflects the value which the consumer places on the service.

Willingness to pay is a useful yardstick for assessing project feasibility. If a rough measure of project costs exceeds the average willingness to pay of the community members, it is unlikely that revenues would match costs, through whatever cost recovery mechanism. Willingness to pay is also useful, therefore, in setting tariffs.

Information concerning the community to be served **Schedule A**

People

number of households in the target community
average size of household - no of adults, no of children
average number of wage-earners per household
number of households with full plumbing
number of households with yard-taps
number of households without own supply
projected population growth in each year
projected household size in each year
lcd (liters per capita per day) for houses with full plumbing
lcd for people in houses with yard taps
lcd for people in houses without own supply
other demand for water supply:
- industrial users
- irrigation
- livestock

average household income
average household expenditure on food and other necessities
sources of funds within the community
seasonal variations in incomes of different groups within the community
identify specific local health issues
identify awareness within the community of these local health issues
determine the impact of improved WSS services on these issues
determine literacy rates and the availability within the community of skills which would enhance project participation
determine demographic and geographic factors such as population growth and distance from major urban growth areas

Present Supply

determine the views of consumers on:
- present water quality, quantity and reliability (including sources used although unsafe)
- ease of collection
- cost

sources of present supply, including any which are unsafe
quality and seasonality of water sources
distance of consumers from water sources
present cash expenditure on WSS services
method of delivery of present water supply (piped supply, collection from standpipe or tanker)
present level of sanitation service
distance water is carried
cost recovery on other projects in same community

The community's willingness to pay can be calculated from information as listed in Schedule A. Possibly, further surveys will need to be carried out. Determine if possible the willingness to pay of key sections of the community, in units of local currency per litre or per cubic metre. Willingness to pay will vary between different members of the same community and between urban and rural areas. It also varies between the types of installations which users have. It will be difficult, for instance, to convince the head of a household which has its own septic tank to pay for connecting to the public sewers.

Although the evaluation of any type of transactions can be useful in assessing affordability and willingness to pay, comparisons between the selling-prices of water from the public network (sold by cubic metre) and from vendors (sold by buckets or drums) should be avoided. The customers' appreciation of these services is related to the vital need of at least small quantities for survival in one case, and the convenience of large quantities readily available in the other; water in both cases is the same commodity, but used for different purposes which have too little in common to allow any valid price comparison.

ESTIMATION OF WILLINGNESS TO PAY

Construct a list of the broad categories of people in the community. Against each, set out the present source of water, the present payment for water, and a measure of the quality of water obtained. If for example, members of the community collect water and take some time in doing this, there may be a way of valuing this time. The simplest way is to ask the people involved what they would be prepared to pay to receive the same quantity of water without the effort involved. The Table below should help in the analysis.

family type	water source (s)	quantity	payment		perceived quality
			in cash	in kind	
labourer	collection from source 2 km dist.	50 lcd*	-	2 hours per day	good
landlord	payment to vendor	80 lcd*	Rs* 10	-	good
other	collection from stream 1.5 km distant	40 lcd*	-	4 hours per day	dirty

* lcd = litres per capita per day; Rs = Rupees

This will reveal information on how much is paid in cash and in kind by different groups within the community. Different groups are likely to pay different amounts.

USERS' NEEDS AND EXPECTATIONS

Introduction

The process of consultation between the agency and the community should be planned and undertaken by both parties as equal partners. The community should have a sense of ownership of the water supply or sanitation project. This will help to ensure that the consultation process produces acceptable and workable solutions. Consultation should be a continuous process.

The consultation should be carried out through an appropriate community organisation. In some cases, this may be a water committee. The important requirement is that community representatives should fully represent the views and needs of all consumers and special groups. In many cases, women have the greater share of responsibility for water collection, and for budgeting household expenditure on water supplies: ensure that women are adequately represented.

At this stage of the investigation, the objectives of the community consultation are to:

- determine the community's perceived water supply and sanitation requirements;
- review with the community the alternative technical options for meeting these requirements.

These issues should be covered in an introductory fashion. In later consultations, options of different schemes with different levels of service and cost implications will be presented to the community. At that stage, further methods of cash raising can be discussed, and subsequent consultations will be used to jointly select a preferred project. At the present stage, the aim is only to alert the community to the likely outline of the schemes, to assess the probable level of commitment to be expected from the community and to learn of any factors which may have an important effect on the design of the scheme, and any physical attributes of the water supply or sanitation environment of which the agency/planner may be unaware.

These initial consultations may also form a test of the effectiveness of the methods in place. A procedure should be agreed for future consultations. The key issue here is to ensure that the views of the community as a whole are represented, without adversely affecting the traditional pattern of community organisation and representation.

Community's Perceived Requirements

The data collected in the previous section will have given a picture of the way in which the community's needs for water supply and sanitation are presently served. It is now appropriate to discuss with the community how the present level of service compares to their needs in terms of volume provided, price paid, quality and accessibility.

Determine with the community their view of basic needs of water for drinking, food preparation, cooking, washing, bathing and other essential uses, and the needs of used water disposal and other elements of basic sanitation. This will be useful later on in the determination of the price to be paid for lifeline use.

Discuss with the community other demand for water in cattle-farming, irrigation, agro-processing and other industries, municipal use, and any other employment generating activities. Also identify any water loss, including unauthorized use.

The different levels of service needed by each type of user and the health implications of each should be discussed. After identifying the known sources of loss and their order of magnitude, prepare in consultation with the community an initial rough projection of the total demand to be served each year for the next 2 to 3 years for a village, or 5 to 10 years for larger agglomerations.

Outline of Solutions

Discuss with the community the main options for improving water supply and sanitation facilities. Ask whether there are schemes they would recommend. Certain aspects of the project's technical specifications will be determined regardless of the community's aspirations, by such elements as the availability of water sources (which should be checked first), but other elements of design should be agreed upon with the community.

Discuss whether there are options of providing different service levels. Ensure that there is a general appreciation of the difference in costs, and consequently user charges, for different service levels. A single service level may not be appropriate for the community as a whole, and the technical options developed should encompass the different types required. Discuss the different options which may be available:

for water supply, for example:

- 24 hour piped supply with household connections
- 24 hour piped supply with household connections and standpipes in some areas
- use of yard taps and group connections

for sanitation, for example:

- full plumbing in each household
- public latrines

At the end of the consultation with the community, there should be a good understanding by the agency of the perceived needs of the community and the demand to be served. Details of present supply and broad options for improvements should be known. On the part of the community, there should be an appreciation of the convenience, health and other benefits, and broad cost implications of different levels of service.

IDENTIFICATION OF TECHNICAL OPTIONS

Introduction

By now, the water supply and sanitation needs of the community should be known, as well as the sources of water, their quality and the possible rates of abstraction, and the depth of fresh groundwater. The technical options to supply adequate volumes from the sources can now be developed, as well as the methods to dispose of used water. The identification of technical options will lead to a description of each potential scheme, identifying all the resource requirements in the construction and operational phases, including requirements for manpower, training and other resources, activities and decisions. The capability of the community to support each option will be different. The technical options should be appraised and, in consultation with the community, a suitable scheme can be selected and developed.

This process of identification and formulation of technical plans itself takes time and effort and the costs incurred in kind or in cash should be recorded for future recovery.

Collection of information

The information collected should encompass all areas where costs will arise, so that all costs are identified. Consider therefore the cost of all activities from abstraction, treatment and distribution of water, to wastewater collection, treatment and disposal, plus other environmental sanitation costs, including in each case operation and maintenance costs. Identify the following for each WSS option:

- demand projections for all types of users and uses (domestic, industry, agriculture, etc - common to all options);
- losses due to leakage and other causes;
- unaccounted for use (illegal connections, etc.);
- source capacity and rate of abstraction;
- quality of source, treatment requirements;
- seasonality in supply and demand;
- use of standpipes;
- role of water vendors in distribution;
- individual or shared house connections;
- communal washing and bathing facilities;
- drainage facilities;
- requirements for wastewater collection and treatment.

Besides, for sanitation projects, identify:

- population to be served;
- levels of service;
- disposal methods;
- methods of sewage treatment, reuse if applicable, and disposal;
- use of house connections and other sanitation facilities, individual or shared.

The estimate of expected growth in demand for water is based on the detailed knowledge of the system environment and, in particular, on expected population growth, increase in per capita consumption, and on development plans which may affect agricultural and industrial demand. The implementation of a water supply or sanitation project could change factors in the community: availability of water could thus encourage new workshops or small industries to be set up. The technical design of the project should endeavour to take such changes into account.

As with other infrastructural improvements, the availability of safe water will tend to increase the growth rates of both the community itself and the agricultural and industrial activities undertaken. In estimating the demand growth, changes in community's expectations and perceived needs can be anticipated. These changes will tend to be in the direction of enhanced water quality and availability, and ease of collection. Project design should be sufficiently flexible to permit such developments without upsetting the operation of the existing project.

Prepare a schedule to describe the required amount of water to be delivered to users' premises; take care to include realistic assumptions of water losses within the consumers premises. Then add to the total user requirement a realistic assumption of distribution losses. This yields the total annual volume of water to be supplied to the distribution system. Schedule B on the facing page shows an example of such a projection. Sometimes, where water mains are older, distribution losses are higher, and it would be misleading to apply the same figure of losses for the whole system. In preparing Schedule B, it may be necessary to divide the community into different sections. Separate projections of water requirements can be added together to arrive at a more realistic projection of the total water requirement.

In the design of the scheme, there will usually be a choice concerning the extent to which future growth in demand should be provided for. In terms of economies of scale, there are obvious advantages in making substantial allowances for growth in demand. However, take care not to provide for too much growth in demand as this would result in a large scheme with high capital costs and low utilisation in the early years of use. This would put a very large burden on the initial users of the scheme, as the full costs would have to be met. It may be better to go for a phased approach, although this could be more expensive in total capital costs. If appropriate, identify different options so that these can be discussed with the community.

At the design stage, adequate attention should be given to the ease and economy with which facilities can be operated and maintained. Aspects such as required skills, availability of a qualified workforce and, consequently, training needs should be considered.

The design of water supply and used water disposal systems should consider the degree of variation in requirements on a daily, monthly or seasonal basis. In an optimum situation, the system should be able to deliver the required amount of water at the times when demand is at its peak. The capacity of the system, in terms of pipe diameters, pump sizes, etc. may have to be significantly greater than based on average daily demand. This can have a significant impact on costs.

WATER SUPPLY AND DEMAND

	Note	1991	1992	1993	1996
Pop. to be served (growth 2% per y.)		15 000	15 300	15 606	16 561
Target number of connections	1	-	-	2 006	2 129
Actual number of connections	2	0	0	500	2 129
Population served by connections		0	0	3 500	14 903
Cons. through connections (m3/year)	3	0	0	76 650	326 376
Population served by standpipes		0	0	1 561	1 656
Cons. through standpipes (m3/year)		0	0	25 639	27 200
Population served by vendors	4	15 000	15 300	10 545	(0)
Cons. through vendors (m3/year)		82 125	83 768	57 734	(0)
Total domestic demand (m3/year)		82 125	83 768	160 023	353 576
Actual and pot. ind. cons. (m3/year)	5	0	0	56 962	60 448
Actual and pot. agri. cons. (m3/year)	6	0	0	85 443	90 673
TOTAL CONSUMPTION (m3/year)	7	82 125	83 768	302 428	504 696
of which: sales		0	0	272 185	454 226
unauthorized use	8	0	0	30 243	50 470
Distr. and other losses	9	-	-	30%	24%
Production required (m3/year)	10	-	-	432 040	664 074

Notes: Supply of the community is to be taken over by an agency. Service begins in 1993. Prior to 1993 all consumption is from vendors.

1 90% of total population, 7 persons per household.

2 500 the first year, 1500 the second year, target level the 3rd year.

3 60 lcd for connections, 15 lcd through vendors and 45 lcd through standpipes.

4 Waiting for a household connection, not served by standpipes.

5 Equivalent to 10 litres per day per head of the population. Potential connections are assumed to be met.

6 For illustrative purposes, 150% of industrial consumption.

7 Through connections, standpipes and vendors, includes unauthorised use.

8 Illegal connections (new settlements in poorer districts) = 10%.

9 Assumed to reduce from 30% to 20% over 5 years, and stay constant thereafter.

10 Total consumption/(1-losses).

Continuous supply of water and, consequently, pressure in the distribution network, are highly desirable. Intermittent systems are hazardous to health because pressure losses lead to risks of contamination of water in the pipes. However continuous supplies are far from the rule in developing countries, often because of serious economic and technical constraints.

By the end of this stage, for each technical supply option, there should be be details of:

- number of consumers to be served in each year;
- type of service (connections, standpipes, etc);
- level of service (number of hours);
- capacity of the system (m3/hour);
- annual production (m3) in each year;
- capital cost and phasing of:
  - source development;
  - pumping works;
  - treatment works;
  - storage and distribution;
  - drainage;
- quantities of chemicals needed for treatment;
- manpower requirements for operation and maintenance;
- training needs, at all stages of the project.

Similar categories of information are required for sanitation service developments.

For each of the options, the technical information collected should be compared with general data requirements for financial planning.

REQUIREMENTS FOR FINANCIAL PLANNING

- reliable and up-to-date information on: mapping of systems; number and location of connections; quantities and costs of water produced; billing, cash collection and consumption by consumers' category (available through meter and accounting records and/or regular consumer surveys) and other indicators;
- proper commercial accounting audited internally and externally with results available within six months of the end of each financial year;
- realistic annual budgeting;
- preparation of roll-over five-year financial plans in order to determine the tariff levels required in relation to a pre-defined maintenance and investment programme; such plans should be conceived as dynamic and not static, with annual monitoring and updating;
- in financial planning, the maintenance of cash liquidity should be the prime objective: a positive balance should be maintained between sources and applications of funds, to cover direct operating expenses, debt-service obligations and a contribution to future capital requirements.

Source - WHO Working Group on Cost Recovery - Document WHO/CWS/89.5

CASH-RAISING OPTIONS

Introduction

Now that technical options have been developed, more is known about the cost of development and the cost of operation. Prior to a full analysis of each scheme, there should be a further consultation with the community on the best way to raise cash to cover construction and operational costs. Data collected on the community will have revealed some information about its financial resources and the skills and labour available within the community. It is now appropriate to set out the broad financial implications of the potential schemes and to discuss the alternative methods of cost recovery. It is not yet intended that final agreement should be reached, nor that the level of community contributions or charges should be set - this should await a fuller analysis of the supply options. But at this stage, it is useful to explore cost recovery options with the community.

Many schemes for cash raising and for recovering the cost of WSS services have been developed. There are five main types:

- community fund raising;
- indirect taxes;
- regular user charges;
- water vending;
- contribution in kind.

Each is discussed below and should be discussed with the community. There may already be some of these schemes operating for other commodities in the community. At the end of this stage of the consultation, there should be a clear understanding by the community and by the agency of the ways in which the community could contribute to costs, and the likely level of in-kind contributions. The agency will use this knowledge in analysing which technical options could be financed and those which could not. After a detailed analysis of feasible options, the actual costs to be recovered will be better known. At that point, further consultations with the community will enable development of these options and selection of one which suits the community best.

Community Fund Raising

Under community fund raising, the users of services do not pay a charge based on volume of water supplied, but finance WSS projects, at least in part, through contributions to various community funds, or by payment of taxes.

Community fund raising is usually appropriate in cases where users benefit equally from the provision of the service, for instance for water supply where users obtain supplies from standposts, or for sanitation where all households will usually have identical facilities. Where users have private water supply connections, or different service levels, user charges which reflect these differences in service are usually more appropriate.

Community fund raising can be used to finance both construction and operation costs. However, if operational costs include regular payments, such as salaries for maintenance staff, regular charges are more likely to be appropriate. Community fund raising can take the following forms:

- ad hoc contributions;
- revolving funds;
- communal revenue levies;
- cooperative unions.

Ad Hoc Contributions

The use of ad hoc contributions is appropriate in communities with a tradition of this kind of fund raising. For success, it is required that the community should have a good knowledge of household budgets. This is often the case when household incomes exhibit a high degree of seasonality. Ad hoc contributions can be used to solicit financial contributions for project construction, and at regular intervals thereafter to finance the operation and maintenance of simple systems, for example systems with public water points only.

Fund raising by ad hoc contributions can be organised by the traditional community leadership, or by a voluntary organisation such as a women's group or a water committee. The process involves the periodic setting of targets, and the soliciting of contributions, either in advance or when required, and this can be done through public meetings, lotteries, festivals and house-to-house collections.

Revolving Funds

A more sophisticated form of fund raising involves the creation of a community revolving fund. A revolving fund is a credit facility which is earmarked for a specific purpose. Initial capital may be supplied by government, the water agency or through the sale of shares in the project to members of the community. The capital of the fund, and any interest earned, would be invested in the construction of a project: this investment may be supplemented by loans or some other method of financing. For sanitation, the fund could provide loans to householders for latrine construction or repair. The principle throughout is that the fund is earmarked for WSS services and any money invested, once recovered, should be reinvested in WSS services, at least until all members of the community are served.

Such a revolving fund should be managed by a specially constituted body. In addition to promoting cost recovery for water and sanitation, the revolving fund can be used as a community savings fund. Interest would be paid on any deposits and charges made on any loans. Such general purpose loans would be made only after all members of the community had WSS services.

Communal Revenue Levies

Communal revenue levies are often appropriate for communities which share public water supply facilities and where there is a source of community income, such as sales of crops from community fields and livestock, and of products from community flour mills or other agro-processing and small-scale community industry. Such communal levies would be imposed by local government or by a community water committee with formally defined powers.

Cooperative Unions

Water supply projects can also be financed by local co-operative unions. These can deal with production, agricultural marketing or savings. The contribution of the co-operative union to water supply and sanitation cost recovery would be managed by the cooperative's executive committee, or perhaps by a specially set up water sub-committee, which would reserve funds on the basis of the cooperative's expected net income and the estimated project costs. Non-members of the cooperative who benefit from the water supply project should contribute separately.

Indirect Taxes

Indirect taxes are another way to contribute to cost recovery, either for construction or for operation. This may prove appropriate for communities with an adequate taxation base and effective tax collection. The transfer of sufficient funds from the taxation agency to the relevant water agency should be assured. It is also important that the level of taxation should be related, even if indirectly, to water use. To relate the taxation to water use there are two main options:

- water rates can be charged on houses and other forms of property; for instance, higher rates for larger houses;
- a community charge can be adopted; it is generally based on a per capita flat rate tax, which effectively assumes even per capita use of water in a given group; a household of five people would pay five times the consumption of a single occupant.

Billing and collection of indirect taxes are usually best managed by the relevant municipality or some other local government institution, because administration costs can be saved by combining water taxes with charges for other services such as electricity or housing.

The main disadvantage of such systems of indirect taxation is that the institution responsible for water supply and sanitation is distinct from the institution responsible for revenue raising. The agency has no guarantee that it will receive the user charges recovered by the municipality or other agencies; if it does not, service levels may deteriorate, although users are paying the full cost. This will tend to reduce the willingness to pay. Also, because users do not have the information about actual water supply costs, they are not able to participate effectively in decision making. And as there is no indication in the price paid that each unit of water provided costs money, there is little incentive to use water wisely and to reduce wastage.

Regular User Charges

Regular user charges for water supply and sanitation are charges made for supply once the system is operational. They can be:

- fixed charges per connection per month;
- charges based on metered use, where the total payment depends on the recorded consumption of water.

Sometimes such charges include instalments on a connection charge. Procedures for setting the level of WSS charges are presented in later sections, and briefly outlined below.

Connection Charges

Connection charges should in principle be set to recover costs - though for administrative simplicity standard charges are set if the point of connection is within a certain distance from the main distribution system. The impact of connection charges can be reduced by making loans available specifically for this cost and recovering loan repayments on the same bill as the regular charge. However, as this cost may still be too high for many low income consumers, the design of the project often includes standposts to serve some poorer members of the community and separate household connections for those who can afford the connection charge.

An alternative is to make group connections available. Here, a connection is made to a single point from which several households take their supplies. The charge which they pay is usually lower than in the case of a private household connection, and the total cost of making the connection and supplying the water can be recovered.

If standpipes are included, there is a choice open to the community and the agency of whether the standpipe supplies should be free. Where public standpipe supplies are free, the lowest income groups are subsidised by the higher income groups, which may accord with national or regional social policies. This may be suitable for communities with large differences in payment capacity and water consumption, particularly if the high-income and low-income households are separately situated.

A system of free standpost supplies has a number of potential drawbacks which should be fully discussed with the community. The provision of free water to a part of the community weakens the concept of project sustainability, and may significantly decrease the willingness to pay of households with a direct connection. There is the possibility that wealthier households will not accept a paid connection because of the availability of free public standpipes - reducing revenues as well as other potential benefits of the project. In addition, some poorer households in wealthier areas may not have easy access to the public supply points.

Fixed Charges

In the case of fixed charges, each household pays the same rate and consumption is not metered. This system may be suitable for households with private taps, or which share taps with a well-defined and homogeneous social group, where incomes are reasonably reliable over time and where all benefits from the project are shared more or less equally. The advantage of fixed charges is that they are simple to administer. A major disadvantage is however that fixed charges do not encourage care in use of water, as the user pays the same whatever amount of water is used. Another disadvantage is that all users, whatever their income, pay the same amount. Members of the community will usually agree that this is unfair. Therefore metered charges are often preferred where metering is feasible.

A variant of the above is a system in which various fixed charges are applied to different types of users. Such a system is appropriate for a community in which there are differences in household income or appreciable variations in water usage between households. However, for such a system to work, there should be a sufficiently developed community spirit.

Criteria for allocating different fixed charges to households will include:

- number of people in the household;
- whether water consumption is for household uses only or for other purposes as well;
- whether the household is directly connected to the system or uses a public water standpost;
- distance of the household from the nearest public water pipe.

In addition, water consumption by a household will be dependent on factors such as household income and the nature of household amenities such as bathrooms. However, it is more difficult to take these factors into account. Therefore, the more easily measurable criteria specified above are usually more practical to use in a graded tariff system.

A system of fixed water charges could be administered by the community water committee, local government institutions, or the relevant water agency. In order to reach and maintain a high degree of willingness to pay throughout the community, specialist advice from a water agency will be required in setting tariffs for different classes of users. The setting of rates is discussed further in following sections.

Charges for Metered Use

The use of water metering enables charges to be based on the volume of water actually used. This clearly has advantages because the charge can relate to cost, and there are incentives to avoid wastage of water. But the capital costs of water supply are significantly increased. Metering is especially useful in communities with limited water resources.

Within the metering option, two basic charging systems can be used:

- a fixed rate per unit supplied;
- different rates for different levels of consumption and/or for different types of users; in many cases, the amount of water used for basic needs is subsidised by subsequent amounts of water consumed for household amenities or other uses.

The metering option requires efficient administrative procedures for regular meter reading, billing, and revenue collection. At the same time, tampering with meters and other forms of fraud should be minimised. Maintenance procedures have to be sophisticated to avoid technical problems with the meters. Therefore, a metering system usually implies efficient water agency management.

The capital, maintenance and administrative costs of metered systems can be reduced by using metered group connections, although the necessary payments are more easily obtained from private connections than from public outlets. The households which constitute a group would form a tap committee responsible for paying the metered charges, and recovering these from individual households through flat or scale rates. Meters are generally preferred to coin operated taps which are administratively simple but prone to breakdowns and interference.

PROS AND CONS OF METERING

* pros: increase in revenue - equity - reduction of misuse and wastage - conservation of the resource - more accurate economic costing and pricing providing signals to increase or decrease consumption - use of a single parameter (volume) - differential tariff structures according to volume consumed - possibility to calculate meaningful lifeline rates, to predict average revenue and growth in demand - improvement of the commercial and accounting organization, management and control of a public utility - better technical control of water supply systems (subject to adequate master metering).

* cons: cost (acquisition in foreign currency, installation, preventive maintenance, inspection, repairs) - consumers' reactions (vandalism, non-payment) - irregular income (as opposed to flat rates) - high levels of under-registration and other technical problems (adaptation to local conditions) - logistic and other difficulties related to inspection and reading (on which billing and collection depend) - high level of accuracy required prior to computerization - billing system purely volumetric and impersonal perhaps not adapted to equity objectives - poor reliability of supply may be an obstacle to consumers' willingness to pay for metered consumption.

Source - WHO Working Group on Cost Recovery- Document WHO/CWS/89.5

Water Vending

Because of the difficulties associated with cost recovery for piped water supplies with public outlets, water vending systems, even though they are often illegal, have been formalised to supplement or replace piped distribution systems. This option is suitable for communities where a socially beneficial vending system already exists and can be improved, and where other options are technically, economically, or otherwise unsuitable. Water vending may also be appropriate in communities where other cost recovery options have failed to operate satisfactorily.

At water kiosks, water can be sold by the litre or by type of container by water agency employees or licenced holders of a metered connection. Wastage and vandalism may be minimised, and user payment can be assured. Concessionary sales are possible, from kiosks or otherwise (for instance trucked water to temporary settlements) when owners of a private house connection have the right to sell water to other households which do not have a connection. The concession holders can be selected according to socio-economic policy criteria; women heads of households, who are likely to need the additional income, could be chosen.

Water vending has a number of potential drawbacks which should be considered by the community as part of the evaluation of different cost recovery options. Firstly, users will face higher costs than under alternative options because the salary or profit of the vendor should be covered as well as the cost of the water. Secondly, vending points should be limited in number and dispersed to ensure sufficient earnings at each point, which can result in long waiting times and the continued use of contaminated alternative sources. Thirdly, users may also be inconvenienced when taps are locked at night, or when the concession holder is otherwise absent. Users are also vulnerable to exploitation in times of water shortage, but are less dependent on neighbours and others.

The institutionalisation of water vendors is currently envisaged or already achieved in many large cities of developing countries, where the growth of urban poor districts has been such that most infrastructure sectors lag behind. Water vending accustoms users to paying for the service, and thus piped connections which offer a better service for a lower price will be more attractive when they are available . In the meantime, there is in many cases no alternative to purchasing water from vendors, whether this is legal or not.

Contributions In Kind

Contributions in kind can be used for latrine construction, or work on wells, water distribution networks, and so on. It is rarely feasible to assign an equivalent cash value to contributions in kind, which are supplied on a non-market basis, and therefore it is difficult to decide on a fair method of charging those who do, and those who do not, contribute in kind. It is often most appropriate to consider contributions in kind as a supplement to voluntary fund raising for projects which are based on public water points.

ANALYSIS OF TECHNICAL OPTIONS

Introduction

By this stage, a number of technical solutions should have been identified. They may differ, in cost, technology, service, and in participation required from the local community. The objective of this section is to assess the total cost of the scheme and to prepare the information in a form which will enable the agency and community jointly to decide which project should be preferred.

In the process of comparing alternatives and determining whether any particular option is likely to be sustainable, the following steps are required:

- determination of the level of service to be provided by a given scheme, and whether it would be appropriate;
- determination of the cost of the project;
- assessment of whether the technology can be supported by the community;
- determination of the scope for participation in kind from the community, both in construction and operation.

Having determined these factors, the schemes and their costs can be compared to the willingness of the community to pay. If the comparison is favourable, it is appropriate to investigate different cost recovery mechanisms in more detail and to assess which of various methods of fund raising is likely to be appropriate in the community to be served.

The analysis of alternative schemes is critical to ensuring sustainability. Because of the amount of work involved, the number of alternative options should be limited. When an initial review has eliminated some schemes, the community should be fully informed of the results. The procedures of this review are outlined below and may appear lengthy, but the appraisal may in practice be quite short. Whatever the case, it is essential to go through the process, in order to anticipate all expenditures and so that all concerned realise the size of the cost to be recovered.

Each step of the review is listed below. This list will be used to build up the cash flow projection of the project (Schedule C). This will include all cash flows corresponding to expenditures during the construction and operation of the project, and their timing. In kind contributions to construction and operation will also be shown.

Steps in Analysing Technical Options

Identify Construction Costs (local and foreing currency):
- capital, engineering contingencies;
- labour (skilled and unskilled);
- working capital (inventories, payables) increments.

Determine phasing of Construction Costs.
Identify potential loan sources, and terms:
- interest;
- repayment period;
- grace period.

Identify sources of grants.
Determine operation and maintenance costs:
- capital;
- labour (skilled and unskilled);
- materials.

Calculate cash flow profile for project cash expenses, net of in kind contributions (Schedule C).
Calculate water produced in each year.
Calculate annual cost per unit of water produced.
Estimate and project unaccounted-for water.
Calculate annual cost per unit of water sold.
Compare annual cost per unit of water sold to consumer's willingness to pay.
Retain for further analysis or discard.

Construction Costs

Capital costs should be divided into foreign and local costs.

Estimate as carefully as possible the foreign exchange that will be required by each component of the project, and when. Enter the information on Schedule C.

Local capital costs should be divided into those which should be incurred in cash, and those which can be in kind. Any duties or taxes paid on imported equipment should be included in local costs.

Separate local costs into capital, material and labour costs. Can labour costs be provided by the community? In earlier sections, data was collected on community skills. Can these be matched to the requirements during construction of the scheme? If not, include, as a local cost, the provision of training to establish adequate skills, or of outside labour to provide the skills. Enter this information on Schedule C.

After some years of operation, there may be a need for replacement of some of the equipment installed, or at least some refurbishment may be required. Include the foreign and local costs of these activities in the cash flow. Although they occur some years after the project has gone into operation, they are still considered as capital costs.

Operation and maintenance costs

Consider the operational phase of the scheme; estimate for a typical year:

- water produced (refer to projection of demand, Schedule B);
- purchase cost of water (if applicable);
- purchase of materials, spare parts, chemicals, fuel and electricity;
- agency input required to carry out O&M, or to liaise with community members and representatives in their responsibility for O&M;
- the degree to which community members can carry out O&M;
- the present level of skills in the community and the need for training to enhance or develop the required skills.

As with the capital cost estimation, it is important to segregate O&M costs incurred in foreign and local currency. Also determine what level of support can be given by in kind contributions.

As before, enter the data on schedule C - both the total costs and the in kind contributions (these should be netted off to obtain the annual cash requirement). Remember to include those costs which may not occur annually, but perhaps every other year or even less frequently.

Calculation of Total Annual Financial Cost

It is now possible to use the information collected to aim at a rough measure of the cost of the project in each year, and to compare this to the community's willingness to pay. If the comparison is favourable, further analysis can be done.

Determine the contributions that can be made to capital cost through:

- Government grants;
- foreign loans;
- local bank loans.

Enter this information on Schedule C and calculate the cash expenditures arising from these sources, including interest payments plus repayment of principal (debt service). Calculate the residual annual amount, in units of local currency, to be recovered from the community. From technical data of the project, enter the amount of water to be made available in each year. Calculate the residual amount to be collected per litre of water produced. This yields a cost per litre produced, which will be used in comparing technical options.

Estimate the amount of water which is likely to be unaccounted-for. In the absence of precise indications, use a target figure which to be realistic should not be less than 25% of total water produced. Calculate the cost X per unit (m3 or liter) of water sold (accounted-for).

The cost X may have been incurred by the agency, or perhaps by the water committee of the community. However, it is now the users of water who should respond with cash contributions. We need to know if X is too high and, if it is not, how it can be collected.

PROJECT CASH FLOW

31 Dec. Cur. pric.- Inf. 6%	Note	1991	1992	1993	1996
foreign exchange (60%)		2 400 000	3 816 000	0	0
local component		1 600 000	2 544 000	0	0
Total construction cost	1	4 000 000	6 360 000	0	0
Replacement costs	2	0	0	0	1 386 402
foreign loan		2 400 000	3 816 000	0	0
local loan (from govern.)		1 050 000	1 994 000	0	0
government grant		500 000	500 000	0	0
in kind cont. = com. fund		50 000	50 000	0	0
Total financing	3	4 000 000	6 360 000	0	0
foreign loan: interest		0	0	0	472,416
repayments		0	0	0	310 800
local loan: interest		0	0	456 600	319 620
repayments		0	0	304 400	304 400
Debt serv. and replacement	4	0	0	761 000	2 793 638
wages: skilled lab.		0	50 880	161 798	278 351
unsk. lab.		0	30 528	97 079	167 011
water treatment		0	0	102 559	135 092
other		0	0	202 020	213 515
O&M	5	0	81 408	563 456	793 969
total cash requirement		0	81 408	1 324 456	3 587 607
Average cost/m3 produced				3.07	5.40
Average cost/m3 sold				4.87	7.90

Notes: In this Schedule, the costs are calculated in financial terms (local currency). Assumptions are given below. Refer also to Schedule B.

1 10 million local currency units at 1991 prices.

2 Replacement of equipment 4 years after operation begins.

3 The cost of construction is partly off-set by labour provided by the population.

4 Interest on foreign loans is charged at 8% per year. Repayment is made in 20 equal annual installments. Both interest and repayments do not commence until expiry of a 2 year grace period, running from the beginning of operation. Interest on local loans is charged at 15% per year. Repayment is made in 10 equal annual installments. No grace period.

5 Manpower requirement is calculated on the basis of 12 employees/1000 connections. Total costs are 20 000 per employee for skilled work, and 8 000 per employee for unskilled work. Of the total number of employees, 40% are skilled and 60% unskilled. Water treatment costs are 0.16 per m3 produced at 1993 prices. Other O&M costs include materials for maintenance, and are calculated at 2% of the net book value of assets in operation.

Compare X to the willingness to pay established in the preceding section. If X is too high, the project should not proceed. Another alternative should be found with lower cost, or the design should be changed to lower the cost. If X is not too high the project can be retained for a further analysis and discussion with the community.

Care should be taken in this screening process to take into account the different levels of willingness to pay of different sections of the community. If X falls within the range of willingness to pay of the majority of the community, then it is worth proceeding to discuss the option with the community.

It is important to be realistic about the levels of losses and non-payment of dues. The chosen option should be designed to cover these secondary costs as well. A clear distinction should be made between:

- unaccounted-for water (UFW) = leakage in network + reservoir losses + firefighting and unauthorized use + meter under registration + operational use;
- non-revenue water (NRW) = UFW + all other unpaid water. UFW has been used to calculate X. NRW will be used as a monitoring indicator during the operation of the system.

Refer again to Schedule C. You should have, for each option, a completed analysis of project costs, financing charges, contributions in kind, and the net cost to be recovered from the community in the way of tariffs, indirect taxes and so on. The options and their financial aspects can now be discussed with the community to reach a preferred scheme.

SELECTION OF THE PREFERRED OPTION

The previous section finished with a completed schedule for each option identifying its total cost and the annual amount of cash to be recovered. In consultation with the community, it should now be possible to determine those projects which are clearly not viable, for example those which perhaps do not meet level of service requirements, or those which meet level of service requirements but are too costly. There may be a project which matches the community's ability to participate in kind and its willingness to pay in cash terms. The selected project should ensure that service levels meet the needs of the community, and that the cost recovery approach is achievable and consistent with willingness to pay.

There may be no immediate option available which balances the community's willingness to pay with the financial contribution required from the community. This will become apparent during the consultation process, as well as during the detailed project appraisal. Such a problem can be addressed by:

- redesigning the technical specifications of the water supply project;
- developing willingness to pay through a public awareness campaign on health and other benefits; such campaigns however are time-consuming and should have taken place before the beginning of the planning process.

If this stage of the consultation is complete, there should be agreement on the project to be undertaken, its technical characteristics, and the responsibilities of agency and community in supplying inputs to construction and making annual payments for the WSS services.

The allocation of responsibilities should be agreed upon, and formally set down in a written document. If appropriate, this can take the form of a contract between the community and the agency. It is vital to ensure that there is no misunderstanding of respective responsibilities at this stage.

CHOSEN OPTION - ALLOCATION OF RESPONSIBILITIES

	Agency	Community	Government
Construction Phase			
Foreign Cost	X		X
Local Cost			
- in cash	X	X	
- in kind		X	
Operational Phase			
- materials	X	X	
- labour - in cash	X	X	
- in kind		X	
Payment			
- subsidies			X
- taxes	X	X	
- community contributions		X	
- water charges	X	X	
- sanitation charges	X	X	

DETAILED PLANNING FOR THE SELECTED OPTION

At this stage, there is an initial agreement between the agency and the community on responsibilities for financing construction and annual operating costs, the community's contribution in kind, and other mechanisms through which costs will be recovered. The initial agreement establishes not only where the responsibilities for either the community or the agency lie, but also when activities should occur. Detailed planning should ensure that each of the agreed actions takes place. In this section, rates are set for the chosen mechanisms of cost recovery.

The detailed planning of cost recovery takes place in the context of continuing community consultation. As planning proceeds, it may appear that additional responsibilities have to be taken on by the agency or the community. As with earlier stages of the consultation, it is important to ensure that the views of all sections of the community are taken into account as much as possible and that all agreements are fully documented.

Detailed planning of the project involves the following key actions:

* Check that there is full understanding of roles and responsibilities:
  - on the part of the community, for:
    - inputs to project construction (in cash and in kind);
    - operation and maintenance;
    - revenue collection;
  - on the part of the water agency, for:
    - funding of capital requirements not covered by community,
    - negociation of loans;
    - procurement of equipment;
    - project construction;
    - implementation and management.

* Determine the amounts to be raised through each method of cash raising.

* Determine the required user charges through discussion with the community of the most adequate rate structure.

* Recalculate the cash flow projection taking account of cash raising options, and ensuring that revenue will be adequate.

* Assess training needs.

Calculation of User Charges

Whatever the allocation of responsibility for setting user charges, it is important that the community should be involved in the determination of the type and level of charges to be implemented. This strategy should enhance willingness to pay by fostering an understanding of the issues involved. The responsibility for setting charges, and for designing and implementing relevant financial systems, should usually be allocated to the agency, except in smaller systems.

Three criteria should be considered in setting charges for water supply and wastewater disposal services:

- a public health criterion: each person should have the benefit of adequate quantity and quality of water, and sanitation services as required to ensure hygiene and comfort;

  T1 = acceptable service level
  T1 = f(income) = social tariff (for low-income-groups)
  T1 = (comfort) = f (volumes) (for higher-income groups)

- a financial criterion: the water and sanitation agency should maintain permanently its financial equilibrium and its liquidity; for this, the average tariff should cover all purchases of goods and services, and all capital and personnel expenditures;

  C = Capital expenditures
  M = Goods and services
  P = Personnel
  X = volumes sold
  $T2 = \frac{C + M + P}{X}$ (market prices)
  $X.T2 = C + M + P$

- an economic criterion: the tariffs should lead to the best possible utilization of water and all other resources (production factors). For this, the user who can pay and whose consumption may lead to a costly increase of production capacity should be charged a price which allows him to choose between increasing his consumption if the benefits are higher than the costs, or reduce it (or use wastewater) if the cost becomes prohibitive.

  T3 = f(utilisation of resources)
  T3 = C + M + P
  T3 = production factors (opportunity costs)

These three criteria are often in conflict. For example, the economic cost of water may be above the willingness to pay of many poorer consumers, even though the benefits through improvements in health may be high. In this case, charging according to economic cost would not fulfill the public health criterion, unless willingness to pay could be increased. As previously explained (Part I, page 7) the economist's perception of the problem differs from those of engineers and financial analysts.

In many cases, it is possible to reach a compromise, and to meet all the criteria to an acceptable extent. The approach is usually to ensure that the basic needs of all consumers are provided for by supplying the corresponding amounts of water at a low price reflecting their willingness to pay, and then by adjusting the price of all other supplies to cover financial requirements. In this way, there is some cross-subsidy from the wealthier consumers who pay higher charges than the financial criterion would impose, while poorer consumers pay "lifeline rates" corresponding to the satisfaction of basic needs.

In previous sections, several types of charges were discussed with the community members. In this section, guidance is given in determining charge levels for the preferred method of cost recovery, using the cost calculations of the selected scheme. Each type of charge is briefly discussed below, as well as how the charges are determined. Depending on the combination of cost recovery options that has been chosen, some sections will not be relevant.

Before setting any of these charges, or any combination of them, it is important to know both the annual cash requirement (to meet the financial criterion above) and the economic cost. Knowing these, appropriate rates can be designed which adequately meet the previously mentioned criteria.

In Schedule C, the cash flow and the annual cash requirements of the project were calculated for each year. Care should be taken to include in the cash flow projection all charges arising from loans drawn, or any other financing mechanism chosen. It may be necessary to recalculate the cash flow projection following consultations with the community. For example, there may be more or less participation in construction by the community than was originally envisaged. This has an effect on the financing and consequently on the charges. After recalculating the cash flow, the annual cash requirement should be clear. Unless there are Government operating subsidies available, this is the annual amount which should be recovered from the users.

Cost to the Economy

The economic cost is a measure of the cost to the country of consumption of WSS services. It attempts to value the true cost of using resources in providing WSS services. These resources consist of units of foreign exchange, local currency, labour, materials and other inputs including time. As shown in more detail below, the economic cost of a commodity is different from its financial cost, because it describes the cost to a country of making available a unit of the commodity, whereas the financial cost reflects only the utilization of resources acquired, at their market prices. For instance, duties and taxes are not costs to the country, because a tax paid by one person is a revenue to another: a tax is a transfer within the economy. While duties and taxes overvalue the cost of a commodity, in other cases this cost is undervalued. For example, in many countries foreign exchange is in short supply and is given a price, in local currency terms, which does not reflect its real value. A premium is usually applied (roughly equal to the difference between the official and the black market rate) to foreign project costs to reflect this distortion in economic tariff-setting.

Probably the best illustration of how economic costs differ from market prices is provided by the case of unskilled labour, which is counted at market price in financial cost calculations; the financial cost will usually be much higher than the economic cost in countries where unemployment prevails.

Cost Elements of a Typical WSS System

A municipal water system is characterized by its capacity, its production, the demand and consumption of the population served, and the capacity of used water collection and disposal. Thus an agglomeration of 10 000 inhabitants consuming 75 litres per capita per day can be served by water supply facilities producing 1000 cubic metres per day, 25% of which is unaccounted for. An installed capacity of 1500 cubic metres per day is enough to ensure the supply of this agglomeration. In this fictitious case, it is assumed that the rate of pollution is low, and used water collection and disposal is by sewerage without treatment. Besides, peak-demand factors are assumed low and are not considered.

This WSS system, in its present state, can function independently from the other sectors of the national economy, as long as its financial revenues cover its costs at market prices.

The installation of a factory with a high water consumption and dangerously polluting effluents changes the equilibrium conditions previously described. This firm will need 300 persons or 7% of the active population, half of which is presently unemployed. The factory will consume 900 cubic metres per day, which will require a water production increase of 1200 cubic metres per day; the installed capacity will become insufficient. A new catchment, a new main, and the enlargement of the water treatment works become necessary. Besides, the effluent from the factory should be treated prior to its disposal in the environment.

The transition of the system from its present to its future stage requires the mobilization of new economic resources.

At any time, the policy of a municipal water supply and sewerage agency should be both feasible and open to development, and therefore it should reflect on the one hand, the cost of operating and maintaining the existing facilities, and on the other hand the growing scarcity, distance and pollution of water, as well as the scarcity and cost of all other resources.

Financial Costs

Financial costs correspond to the utilization of resources acquired at market prices:

(i) purchase of water (from other municipalities or agencies);

(ii) purchase of materials, consumables, spare parts, miscellaneous supplies;

(iii) purchase of services;

(i) + (ii) + (iii) + decrease in inventory
= consumption of goods and services = M;

(iv) overhead expenditures;

(v) personnel expenditures;

(i) + (ii) + (iii) + (iv) + (v)
= consumption of goods and services + personnel expenditures = M + P;

Total cost = cost (materials + personnel + capital);

$$T = M + P + C$$

Capital costs (C) include

(vi) interest

(vii) depreciation (which reflects the fact that the installations in service lose value as a result of being used, being outdated or becoming incompatible with more modern equipment with which they should be integrated).

$$C = \text{Interest} + \text{Depreciation}$$

Interest and yearly allowances for depreciation are projected as percentages of average (mid-year) values. Interest is a percentage of the average value of loans outstanding; depreciation is a percentage of the average value of gross fixed assets in operation. Land and works in process are not depreciated.

$$\text{Debt Service} = \text{Interest} + \text{Amortization}$$

Capital costs are not equal to debt service. Debt service equals interest + amortization of principal (reimbursement of fractions of the capital borrowed). If the amortization of principal is larger than the allowance for depreciation, with the result that the resources available from tariffs (based on average financial costs) are insufficient to repay the debt, there can be two reasons:

- loan negotiations have resulted in an agreement on a repayment period which is less than the life expectancy of some costly assets;
- the operation has poor financial performance in terms of cost recovery, with the result that it does not generate the financial resources required for the future replacement of the assets.

These situations do not correspond to any additional cost to the operation; rather, they reflect losses resulting from poor performance. Tariffs should reflect costs, not losses.

Economic Costs

The objective of this section is to explain some of the terms and methods used in economic pricing, which as mentioned in Part I (page 7) differ from financial concepts (financially viable solutions may not be retained for economic reasons, and vice versa).

The cost of water and sanitation services to the economy reflects the actual utilization of resources, with or without financial counterpart, in real value rather than at market prices (as explained below). Thus, in a situation of general under-employment of national resources, part of the cost of a project represents benefits for the economy as a whole, as this project mobilizes labour and materials which otherwise would remain idle (unemployed labour or useless materials which are however acquired at a price).

The financial cost of the project is expressed in salaries, paid at the authorized minimum rate, and materials at their "catalogue" price. By contrast, the economic cost contains only those elements which could have been utilized, if the project had not taken place.

The economic cost is comprised of the following:

- cost of capital: it will be used as discount rate to reflect the value of time in the calculation of the economic cost. The cost of capital is the rate at which money could be invested in other projects in CWS or in other sectors. It should not be confused with the internal rate of return, (the discount rate at which the present values of expected benefits and costs of a project are equal);

- costs of construction, operation and maintenance, in equipment, personnel, goods and services, evaluated in economic terms, reflecting the actual use of resources, as previously indicated;

- value of time: the time between the decision to execute a project and its implementation has a value, represented by a discount rate (cost of capital). If expenditures are postponed, the present cost of the project will be reduced. If the benefits of the projects are advanced in time their present value increases with the result that the internal rate of return also increases. The forecasting of costs and benefits over time will be done without inflation, as this is not required to compare between several projects, or to determine the value of one isolated project.

Within the capacity of an existing system, the economic value (marginal cost) corresponds to the cost of supplying one additional unit of water (e.g. 1/m3); this cost includes all relevant operation and maintenance expenditures. Beyond capacity, new investment is required, and the economic value (long-run marginal cost) includes construction, operation and maintenance expenditures. It is reflected by the average incremental cost, which is the additional investment and operational cost divided by the additional volumes of water sold.

The financial allowance for depreciation of a piece of equipment should not be affected by the conditions of acquisition; even if it was given free, it would have to be replaced at a cost.

The economic value of water (just like the financial allowance for depreciation of assets) is independent of the prior conditions of acquisiton and operation, or from the ownership of the installation. The economic value should reflect the value of production factors and of volumes which can be sold.

In order to calculate this economic value, all investment and operation costs which will be incurred in the future should be considered, year by year, and their present values should be calculated; the sum of these present values should then be divided by the discounted number of cubic metres which will be sold during the life of the assets.

The present values of future costs are increased by a yearly allowance for the renewal of the facilities, and slightly diminished by the residual value resulting from this provision, after it has been discounted over the entire life-expectancy of the assets.

$$V = \frac{\text{money}}{\text{volume}} = \frac{I - R + (O\&M)}{Q}$$

V represents the economic value; the numerator represents the sum of the costs of the programme, discounted year by year (investment I minus residual value R plus operation and maintenance costs O&M) and Q represents the discounted quantities sold, which are the products of the programme.

The Discounting Process

The discount rate reflects the preference of water producers and users for goods or services which are available now, as opposed to the same goods and services which would become available at a later date.

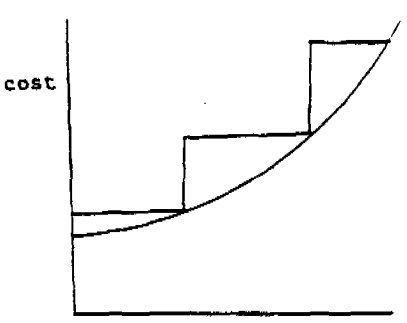
In calculating the economic cost of water, the numerator is entirely valued in cash and therefore the determination of a discount rate is not particularly difficult: the discount rate is the preference that one has for the availability today (instead of at a later date) of resources for investment, operation and maintenance. It therefore should correspond to the interest rate which could be obtained from other investments, for instance in other infrastructure works.

The denominator is valued entirely in volumes since the tariff is not known. It indicates the rate of preference given to having water today (rather than at a later date) as compared to other goods and services.

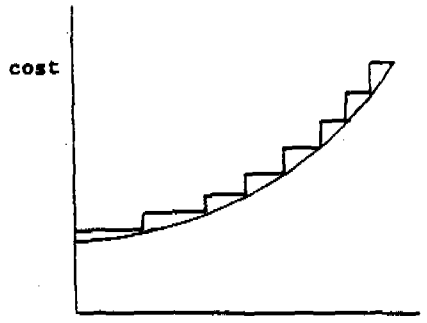
This preference rate cannot be determined, as one would have to ask all potential users for their opinion. For purposes of simplification, the discount rate used in the denominator is the same as that of the numerator, which amounts to equating the time preference for water to that which applies to money. This hypothesis is valid for medium and high consumptions only; it is erroneous in the case of essential needs; it should be noted that tariff policies based on cost alone (be it economic or financial) generally do not apply well to the case of essential needs.

Limitations and Implications of Economic Pricing

Investment for the mobilization, treatment and distribution of surface water usually follows a step curve similar to that which applies to the investment for the collection, treatment and disposal of used water. It is therefore desirable to maintain the consumption within the limits of any given step. Beyond this step, important investments are required, which will be operated below full capacity. Most facilities will be constructed for 10 to 20 years and capacity saturation will occur gradually. However, where ground water resources are available in sufficient quantity and are of adequate quality, the step curve can be replaced by a gradual adjustment of production to demand, and the approach of maintaining cost within the same step becomes useless. Pricing based on long-run marginal cost is therefore much less effective in this situation.



step curve
(surface water treatment)



soft adjustment curve
(groundwater abstraction)

The individual reaction of consumers to price changes (elasticity of demand) is weak in this sector. It is very low by definition for essential needs; it is undefined, but probably very low for industries.

There exists a higher elasticity of collective demand in reaction to consumers' income variations (if these are contrary to price changes); this can result in a "zero growth" response to tariffs based on the cost of all goods at their economic values. The problem is compounded in the frequent case of simultaneous increase of other goods and services. As large cities grow, the population of low-income districts increases much faster than the number of consumers who are likely to pay the full cost of water and subsidize others: these are the largest contributors to the income of a utility, and they constantly diminish in relative terms.

Generally, the reaction of consumers to price changes is difficult to predict in this sector. However, subject to variations between regions (in % and lcd), the structure of consumption is usually such that:

(i) a large number of consumers (often 60% to 80% of the population) accounts for a small share of total water consumption (often less than 30%, corresponding to 10 to 60 lcd); the effect on utility income of granting subsidized tariffs in this consumption bracket is limited;

(ii) average consumers (60 lcd to 200 lcd and more) usually represent 20% to 40% of the population and of the total water consumption; tariff increases in this consumption bracket have a major effect on utility income;

(iii) the high consumption category usually includes a few hundred (in some cases a few thousand) private connections; elasticity is low (lack of subtitute sources), total income is highly sensitive to price changes in this consumption bracket;

(iv) cross-subsidization becomes less effective (or high consumption tariffs become excessively high), as the population in (i) increases by millions, why (ii) increases by thousands, and (iii) remains virtually stagnant. This is unfortunately the case of many urban areas in developing countries.

Treatment of Inflation

Inflation has important implications on financial management. The WSS sector has special characteristics which require from managers that they pursue a policy of liquidity maintenance in all circumstances:

- income is often variable, even over the year, while most of the costs are fixed;
- the budgetary allocations from government to the sector are difficult to predict;
- the market of capital, goods and services has few suppliers and few buyers; prices are subject to high inflation rates;
- the breakdowns of equipment are frequent, of various origins, and generally unforeseen;
- the loan repayment periods are often shorter than the life of the assets;
- the extension needs are constantly increasing;
- there is very little time available to repair deficient equipment; besides, because of high cost spare parts, inventories should be reduced (in so far as procurement leadtime permits), while the lack of standardization is a major constraint to rational stock-keeping.

Implications

The depreciation allowance on fixed assets in operation should be based on their replacement value, rather than on accounting records which show their "historical" accounting value.

Depreciation allowances are required for all assets in operation, whether or not they operate beyond their normal life expectancy.

Subject to the maintenance of an appropriate liquidity level, any financial surplus should be immediately utilized in order to produce more water or water of better quality:

- in investment to extend the coverage of needs;
- in rehabilitation;
- in preventive maintenance;
- in leak detection and repair.

As water is a sector of high health importance and in some cases attractive financial yield, all of these activities are usually more easily justified than most other financial investment.

It will not be necessary to devise complex formulas for indexing the selling prices on the basis of inflation. Each major element of cost and tariff should be calculated at constant prices, and thereafter adjusted for inflation.

Tariff adjustments for inflation should be frequent, except in the case of social tariffs; they should be foreseen in advance and automatically made as a result of the permanent provisions of the tariff legislation. They can be based on simple formulas, provided recalculation can be ensured at longer intervals.

The social cost of WSS corresponds to the subsidy required in order to provide services for those who must have water and sanitation at low cost. Their total consumption is generally less than the order of magnitude which would require capacity increases. In order to meet the health and equity objectives of the WSS sector:

- water should not be free, or service would always be provided to the same people, and those who do not have water would never have water;
- in most countries, the operation and maintenance costs of water and sanitation should be covered without exceeding a small percentage of the income of the poorest;
- water should not be wasted;
- the water and sanitation agency should not try to compensate for structural or tariff deficits through bank overdrafts or short-term borrowings.

AIC and IRR

The average incremental cost (AIC) is a useful indicator for tariff-setting purposes, because it provides the consumer with the price signal needed to optimize consumption. Similarly, the internal rate of return (IRR) of a project is an indicator used in comparing the proposed activity or programme with a number of alternatives.

Besides their roles as indicators resulting from comparisons of cash flows over time, AIC and IRR provide a dynamic picture of the economic profile of a utility, and the influence which a project has on its structural characteristics.

AVERAGE INCREMENTAL COST

Million Rupees and m3
Constant 1990 prices

	INCREASE IN ECONOMIC COST			INCREASE IN VOLUME	DISCOUNT COST	DISCOUNT SALES
YEAR	INVEST.	REPLAC.	O&M	SOLD	INCREASES	INCREASES
1990	X_0				x_0	
1	X_1				x_1	
i		y_i	z_i	q_i	c_i	v_i
2014						

The AIC table shows graphically how construction, operation and maintenance activities evolve overtime. The result (AIC) is calculated from the two right-hand columns of the table; however the left-hand columns are just as useful in giving an image of the development of the utility.

By giving hypothetical values (tariffs) to additional units of volume sold, the future amounts of yearly income can be obtained; right-hand columns are then expressed in cash terms (sales were in volumes only for AIC calculations). The IRR is the discount rate which equates the sums of cost increases and sales increases.

Because they have been shown to be highly sensitive to changes in volumes sold, AIC and IRR calculations require metering. The sensitivity of AIC to changes in the discount rate (opportunity cost of capital) is high and warrants attention. For tariff-setting purposes, the variation of AIC should be checked under several assumptions of demand growth.

Schedule D on the facing page shows an example of calculation of AIC, based on the figures given in Schedules B and C.

AVERAGE INCREMENTAL COST (AIC)

Constant prices	Note	1991	1992	1993	1996
Constr. costs (financial)	1	4 000 000	6 000 000	0	0
foreign currency (60%)		2 400 000	3 600 000	0	0
for. cost adjusted (25%)		3 000 000	4 500 000	0	0
local cost		1 600 000	2 400 000	0	0
Total constr. cost (eco.)		4 600 000	6 900 000	0	0
Replacem. costs (financial)	1	0	0	0	1 036 000
foreign currency (60%)		0	0	0	621 600
for. cost adjust. (25%)		0	0	0	777 000
local cost		0	0	0	414 400
Total repl. costs (eco.)		0	0	0	1 191 400
O&M cost (financial)	2	0	76 000	501 474	593 300
skill lab. at market cost		0	48 000	144 000	208 000
unsk. lab. at market cost		0	28 800	86 400	124 800
skilled lab. at eco. cost		0	62 400	187 200	270 400
unsk. lab. at eco. cost		0	17 280	51 840	74 880
water treatment		0	0	91 277	100 949
other		0	0	179 797	159 551
Total O&M costs (eco.)		0	79 680	510 114	605 780
Total undiscounted costs		4 600 000	6 979 680	510 114	1 797 180
disc. factor (rate 10%)		1	0.91	0.83	0.62
disc. capital costs		4 600 000	6 272 727	0	0
disc. replacement costs		0	0	0	739 766
disc. O&M costs		0	72 436	421 582	376 141
Total discounted costs		4 600 000	6 345 164	421 582	1 115 907
Product. (m3) - Schedule B		0	0	432 040	664 074
Discount. production (m3)		0	0	356 865	412 377
Sales (m3)		0	0	272 185	454 226
Discounted sales (m3)		0	0	224 825	282 066

sum of discounted costs	(1991 - 2008)	16,6 million units of local cur.
sum of disccounted production	(1991 - 2008)	4,8 million cubic metres
sum of discounted sales	(1991 - 2008)	3,3 million cubic metres
AIC		4.88 per cubic metre

Notes: The figures of the Schedules B and C are used to calculate the economic cost of water. All costs are at 1971 prices.

1 Figures in Schedules C are deflated by a cumulative inflation factor. Foreign costs in constant prices are increased by a foreign exchange premium.

2 Labour costs in constant prices are adjusted by multiplying with correction factors of 1.3 for skilled labour and 0.6 for unskilled labour.

Tariff Structure

Water tariff structures should, as a whole and within each consumption bracket, correspond to the previously defined social, financial and economic criteria. At the time when water rates are set, a thorough study should be made of the implications of water supply in terms of wastewater collection and disposal and other sanitation needs. Due account should be taken of water and sewerage connection and related charges, which often represent major expenditures for the low-income users.

Often, for institutional reasons, water supply and sewerage rates have been calculated, billed and collected independently, for example where a statutory body was in charge of water supply, while a municipal service operated the sewerage system. It is however advised to charge for sewerage according to volumes of water consumed (a surcharge based on polluting loads can be added for specific consumer categories), and to charge for water and sewerage on the same bill, in order to allow disconnection in case of non-payment.

Lifeline Use

It should be possible for the agency and community to agree on an amount of water per capita per day for lifeline use, according to felt needs and willingness to pay. The next consideration is the disposable income of the poorer sections of the community, and the amounts of money which are available after other essential expenditures, including housing, fuel, food and clothing. In previous sections data was collected on household income and expenditure.

Flat Rate Charges and Scaled Rates

If the cost recovery route chosen is flat rate charges, the amount to be paid per household can be easily calculated. It may have been decided to set a different charge for different types of households, or for different types of users. The community should be closely involved in setting the distinctions between different user types. In setting charges, ensure as far as possible that low income users receive basic needs at a price they can afford. This may imply some financial subsidy, as they receive supplies at less than the financial cost. Some, or all, other consumers should then pay more. In setting the charges for non-lifeline use, charge the amount required to meet the overall cash requirement and, if possible, different amounts for different types of users according to volumes used.

Metered Use Charges

Metered use charges are appropriate where consumption is generally above the level of minimum needs, and where there is a significant amount of non-household consumption. The charges should, in combination:

- yield the annual cash requirement;
- ensure that the cost charged per m3 reflects the cost of supply;
- enable low income consumers to meet basic needs.

User Type	Number of Households	Demand (lcd)	Typical Monthly Use (m3)	Revenue per month (Rs)	Persons per House	Charge (Rs/m3)
Low Income Household	5 000	30	45 000	45 000	10	1
Medium Income Household	3 000	150	81 000	162 000	6	2
High Income Household	500	300	18 000	54 000	4	3
Agriculture Use	-	-	16 000	16 000	-	1
Industrial Use	-	-	10 000	40 000	-	4
			170 000	317 000		

N.B. Flat charges are usually appropriate when the majority of consumption is by households of roughly the same income and expenditure. Even if flat charges are used for residential consumers, agriculture and industrial users should usually pay tariffs based on metered consumptions.

Basic needs have already been discussed. They should be met at an affordable tariff, applicable to the lowest consumption bracket. Subsequent blocks would be set to cover the full financial cost, or slightly higher to recover any discount given through the low rate initial block.

Care is needed in defining the sizes of consumption blocks in tariffs for metered consumption. If the consumption of too many consumers falls completely into the first block, cost recovery may be less than expected. There is also an incentive for consumers to disguise consumption so that it falls within the initial block.

The charges to different types of users should also reflect as far as possible the real costs of supply. The cost of supply has two components, construction cost and operating costs. Consumers who use water at peak times (when demand is highest), should pay peak time costs plus normal operating cost. Tariff design therefore needs a good knowledge of both the economic costs of supply and the demand of different consumers and how it varies throughout the year. If costs of supply are higher, in economic terms, to one type of consumer than to another, for example because of seasonal changes in demand, then it would be appropriate to reflect this in the tariff. However, peak tariffs are generally difficult to implement in CWS, and their effectiveness is limited; whenever possible, high peak demand should be avoided.

Schedule E on the facing page shows on the left-hand side how to calculate average tariff requirements, and on the right-hand side how to differentiate rates between consumption blocks and between water and sewerage. Follow carefully the transition from constant to current prices, and the selection of objective service levels (from cost coverage to expansion) requiring different tariffs.

Check of Adequacy of Revenues

After having defined all user charges, revenues should be calculated, added to the other sources of income and compared to the expenses of the project. In comparing cash flows it is important to be realistic in the assessment of non-payment of charges. Indirect sources of revenue should be estimated to a high degree of accuracy. The sustainability of many water supply projects has been undermined because budgeted government subsidies were disbursed late, or not fully, or not at all. The level of such subsidies should be estimated taking into account the past record of such arrangements.

In preparing the sales forecast and the forecast of the cost of production be careful to take into account:

- the limits within which water production can be increased;
- the amount of water which will be unmetered or otherwise lost, and the extent to which such losses can be reduced;
- the demand for water in each tariff group, and likely growth trends;
- anticipated levels of default in each tariff group.

The process of determining tariffs should be reiterated until forecast sales revenue is equal to the identified requirement for full cost recovery (together with whatever safety margin is considered appropriate to ensure project sustainability, even in the case of drop in the demand as a result of price and income changes). If there are one or two years where costs exceed revenues, but in all other years the two are well balanced, it may be possible to adjust the profile of costs, for instance by seeking adjustment of loan terms, so that the cash requirement for repayments and interest charges matches the anticipated flow of funds.

At the end of this section, it should be possible to produce a schedule of community charges. These should be agreed in a further consultation with the community.

Other Income

Other income can include different items, such as meter rental charges, conservancy charges, and interest (received). It is always important to segregate these sources of funds from the main operation, and to charge all of these activities at cost, in order to avoid multiple policy orientations, and in some cases neglect of the utility's primary function, which is to provide WSS services. New connections should be sold at average cost, except in the case of premises which are distant from the distribution network.

AVERAGE TARIFF AND TARIFF STRUCTURE

Million (M) colones (c) and m3

	AVERAGE TARIFF REQUIR.	1980	1981	1982	1983	1984
WATER	A. To cover cost					
c/m3	- at cons. 1980 pric.	2.15	2.08	2.40	2.37	2.14
c/m3	- at current prices	2.15	2.35	3.07	3.42	3.24
	B. Financial auton. 1/					
M m3	- water sold	68.2	71.0	74.0	83.3	94.3
M c	- tot. debt service	4.1	10.7	23.9	46.1	68.7
c/m3	- add to tariff	0.66	0.15	0.32	0.55	0.73
	C. Expansion 2/					
000	- urban pop. growth	44	46	48	49	52
M c	- invest. growth 3/	22	23	24	25	26
c/m3	- add to tariff	0.32	0.32	0.32	0.30	0.28
	D. Tariff requirements					
c/m3	- current prices	2.53	2.82	3.71	4.27	4.25
c/m3	- constant prices	2.53	2.54	3.02	3.12	2.80
SEWERAGE	A. To cover cost					
c/con/mth	- at cons. 1980 pric.	24.9	22.4	26.7	33.5	34.3
c/con/mth	- at current prices	24.9	25.3	33.5	47.2	54.1
	B. Expansion 4/					
000	- connection	67.5	76.2	84.0	92.0	100.0
M c	- add to invest	6.0	6.0	6.0	6.0	6.0
c/con/mth	- add to tariff	7.4	6.6	6.0	5.4	5.0
	C. Tariff requirements					
c/con/mth	- current prices	32.3	31.9	39.5	52.6	59.1
c/con/mth	- constant prices	32.3	28.5	31.6	37.6	37.6
TARIFF	Water (recom. average)	2.1	3.2	3.6	4.0	4.4
c/con/mth	Sanit. (recom. aver.)	22.5	37.8	37.8	47.4	60.0

WATER: TARIFF STRUCTURE	Tariffs in c/m3			
0-40 m3/mth (minimum 15)	2.5	2.5	2.5	2.5
41-100 m3/mth	3.0	4.0	5.0	5.5
101-1000 m3/mth	4.0	4.5	5.5	5.5
1001 m3/mth and more	4.5	5.0	5.5	6.0
Water not meter., minimum tariff	2.5	2.5	2.5	2.5
AVERAGE TARIFF	3.2	3.6	4.0	4.4

SEWERAGE: TARIFF STRUCTURE	c/connection/month			
- 0-40 m3/month	10	10	10	10
- 41-100 m3/month	30	30	50	60
- 101 m3/month and more	371	394	485	695
AVERAGE TARIFF	37.8	37.8	47.4	60.0

1/ Government contribution is replaced by a loan.
2/ To cope with urban demand growth (only).
3/ Fund equiv. to 6% of net fixed assets in op. in 1984.
4/ Fund equiv. to 3% of net fixed assets in op. in 1984.

Source: Costa Rica, Tariff Study WHO - PAHO/ WORLD BANK COOP. PROG., April 1980.

CONSTRUCTION AND OPERATION

Introduction

At this stage, the technical option for a WSS service improvement has been selected. The methods of financing its construction and operation have been decided and cost recovery mechanisms have been identified. Arrangements should now be made for the mobilisation of all financial, physical, and human resources required during the construction and operation phase of the WSS scheme. Reporting systems should be designed and implemented, and an accounting system should be adopted. The reports will be used to monitor project implementation and to assess the efficiency of the use of resources during implementation. Key actions at this stage include:

- arranging for the disbursement of agreed government, donor agency, and other project finance;
- ensuring that planned community fund raising activities are initiated;
- procurement of land, goods and services required;
- recruiting and training of staff;
- selecting and implementing an accounting system;
- setting up a reporting system;
- setting up training on interpretation of the information reports;
- understanding procedures for acting on adverse indicators in reports;
- setting maintenance schedules;
- setting budgets;
- financial planning.

The agreement between the agency and the community will have allocated these responsibilities. All interested parties should be officially informed about the commencement date of the project and the detailed schedule for subsequent construction and operation. This provides an opportunity for formally restating all agreements relating to the project, and for emphasizing that the success of the project depends upon adherence to such agreements.

For the implementation stage a project steering committee should be established. It should include representatives from:

- the community;
- the water agency;
- local or national government;
- other interested parties (such as potential major consumers).

The project steering committee should establish reporting arrangements to facilitate the monitoring of project implementation. A number of implementation target dates should be identified, and progress to completion monitored against these.

The plan for the construction and operation of the WSS scheme should be realistic. The community may be over-optimistic about what can be achieved, and its views should be considered within the context of the local situation, and of previous experience of similar projects for both the community and the agency. Whether or not the WSS will be successful in terms of sustainability is critically dependent upon the ability to achieve the project implementation targets.

Any slippage will necessarily result in a greater financing requirement, because, while capital costs may be incurred on schedule, revenue generation needed to cover them may be delayed. Even if additional project financing can be arranged, the aggregate of project cost, and hence water charges, will be higher than anticipated. Such an increase in tariffs, before any of the benefits of the project are apparent, will tend to reduce the community's willingness to pay. A realistic and achievable implementation plan is therefore required from the outset.

Loan Conditions

Loan financing may have been adopted as one of the methods of funding the construction of the scheme. It is very important to arrange terms of repayment that are as favourable as possible, and which match the incoming cash flow profile of the project. This is essential in large water supply projects: for the first few years of the project life water production may be fairly low, building up to a higher capacity utilisation as new connections are made. It may be possible to arrange a grace period on repayments. It may also be possible to arrange lower interest payments in the earlier years. This allows the revenue base to be built up before repayments are made.

Lending agencies may also offer different methods of repaying loans. Loans may be repaid in equal annual installments, with interest being charged on the average balance in the year, or they may be repaid in equal total payments of interest and principal, with low amortization in early years, increasing in later years.

Accounting Systems

The objective of an accounting and reporting system is to provide information to managers, owners and financial institutions, to enable decisions to be made, indicate the level of efficiency of the resources used and determine to what extent the needs of the community are being met. Different types of information are required by different users of the information. The accounting system should therefore record all transactions in an accessible form to enable a variety of reports to be produced.

Choice of Accounting System

The accounting system for the project should represent a compromise between effective financial control and simple project administration. Responsibility for accounting will lie with the community or with the water agency, depending on the complexity of the organization of the scheme. A very simple system of record keeping and reporting is described below. Agency managed systems will usually operate a full system of conventional accounts, and produce standard reports. Small communities will usually opt for a simple system. Whether simple or complex, the accounting procedures and formats should be designed to avoid and detect any misappropriation of funds.

Minimum Accounting System

In a minimum system of accounting a simple receipts and payments account should be kept. This is a cash book in which all financial transactions which relate to the running of the service are recorded, in a simple log of payments and receipts, with running totals being maintained so that at any time an up-to-date picture of the project can be produced. Transactions entered in the book will cover all items, but typical examples will be:

- payments to suppliers;
- wages to employees;
- receipts from consumers.

Payments and receipts should be recorded separately, although different places in the same book will suffice. Each entry should show at least:

- the reference of the voucher;
- the date of transaction;
- a description of income/expense item;
- the amount of the income/expense.

A further refinement, which is easy to carry out and useful when analysing income and expenses, is to report each common type of expense and receipt under key headings. This can be achieved by adopting a columnar layout. In this case, each entry is shown under "transaction", and repeated under the relevant heading. Column totals can then be calculated to report each category item of expense and income. Thus, at the end of each period, using the cash book system, it is possible to see what the total expenses have been and how they have arisen. A similar statement is possible for income.

EXAMPLES OF ENTRIES IN A CASH BOOK

Income

Date	Transaction	Sales	Bank Interest	Bank Balance
	Balance brought forward			300
01/04/91	Sales	20		320
05/04/91	Sales	30		350
06/04/91	Interest on bank deposit		5	355

Expenditure

Date	Transaction	Spares	Salaries	Bank Balance
	Balance brought forward			500
10/04/91	New pipes	50		450
15/04/91	Monthly salaries		30	420
16/04/91	Replacement pump	150		270

Full Accounting System

The minimum system is concerned only with cash and is suitable for very small systems where the value of assets is low and where it is reasonable to assume that annual costs will roughly match annual revenues. In many projects, however, construction costs will be high and may be funded from a variety of sources, including loans, which require various methods of repayment. In such cases it is preferable to introduce a more detailed accounting system which records the investments and shows how they have been financed. Such a system allows the preparation of standard financial statements, which, besides being statutorily required for many agencies, is often part of stipulated loan conditions.

Accounting for the Various Methods of Cost Recovery

Earlier in this handbook, besides contribution in kind, four main cost recovery methods were presented:

- community fund raising;
- indirect taxes;
- regular user charges;
- water vending.

Water vending is equivalent to normal sales in accounting terms. Revenue collected by the agency from vendors should appear under a separate heading under the income section of the income and expenditure statement.

Funds to be collected through indirect taxes by the responsible authority should be recorded as income in the operating statement. If a portion is not collected, or not passed onto the WSS agency, this amount should be recorded as receivable in the balance sheet. Under a simple system of accounts, it should be recorded simply as an amount owed to the WSS agency or the community.

Community funds may be used to contribute to both construction and operational expenses. Funds used in construction should be capitalised in the value of assets constructed, and their value shown as equity or long-term liability in the balance sheet. Where funds are used to contribute to running expenses, this is usually temporary and increases short-term receivables. In case of continuous increase of this item, consolidation into a long-term loan or equity is appropriate.

Electronic Data Processing

Whatever system of accounts is chosen, there may be scope for use of computers to aid book-keeping and report production. Many standard packages now exist to prepare accounts and to produce routine financial and management information reports. While the application of computers to the book-keeping process has potential benefits, computers should not be used indiscriminately. Their use in itself requires some skilled staff to be allocated to this function, which may deprive other areas of management and operation.

If a manual system does not work adequately a computer will not make it work. Computers should normally be introduced only after a manual system has been working successfully for some time, and where there are clear benefits to be obtained.

Preparation of Procedures Handbook

In order to facilitate implementation of accounting procedures, and to be able to train staff adequately, these procedures should be documented in the form of a handbook. This handbook will contain a number of standard practice instructions which will permit a uniform application of all accounting routines. Procedures for the development and authorisation of these standard practice instructions should also be laid down in the procedures handbook.

Financial Reports

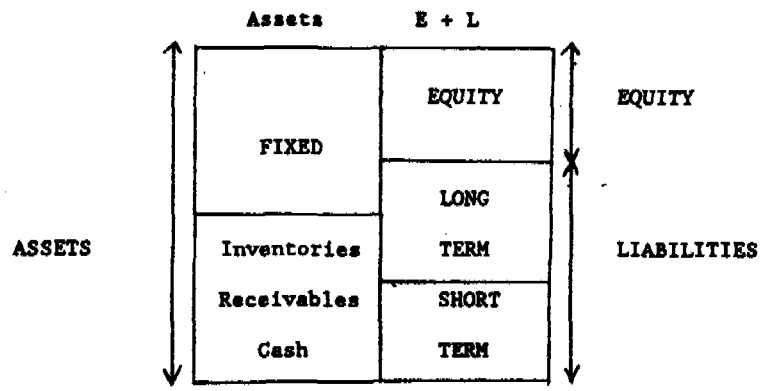
The routine accounting procedures culminate in the preparation of annual financial statements in accordance with statutory and audit requirements. In addition, management information reports (MIS) provide data required for monitoring the existing system, and for further planning of O&M costs and long term expansion to the system. The following reports are usually produced:

- balance sheet;
- income and expenditure statement;
- statement of source and application of funds;
- cash flow analysis;
- details of debtors and creditors;
- other management information reports.

Simplified balance sheet, income and expenditure and cash flow statements, as well as lists of debtors and creditors, are essential for reporting to a community on the use of the WSS facilities and the resources made available.

Balance Sheet

This fundamental accounting statement is split into two sections - assets and liabilities (+ equity); these are always in balance. The report describes the assets and liabilities of the entity at a particular date, usually the end of a financial year, but it can be prepared at any date. The items listed on the assets side are the economic resources of the entity as of the date of the balance sheet. Liabilities are claims against the entity as of the same date. These are the claims of outside parties - amounts that the entity owes to banks, its employees and other creditors. A balance sheet is illustrated below in schematic form, and in more detail (including projections) in Schedule F, page 89.



Balance sheet (at ...)

Being a photograph of the undertaking at a given time, the balance sheet shows as assets what it owns (fixed assets, inventories, receivables, cash) and as equity and liabilities what it owes (shareowners' capital and reserves, long term debt, short term payables). Ideally:

- Capital, reserves and long term debts should be fully invested in fixed assets in operation (e.g. treatment plant). Works in progress (e.g. under construction) and inventories (e.g. spare parts) should be kept at the level required to meet O&M needs.

- Short term payables should be largely covered by short-term receivables and cash:
  - if there is no risk of dependence on tied aid (subject to specific procurement conditions), suppliers' credit should be kept such that the number of days of suppliers'credit be as close as possible to that granted to clients;
  - short term banks' credits should be low or nil, as interest rates on short term facilities are high, and the practice is rarely consistent with public interest objectives.

- Fixed assets should as much as possible be financed by equity (capital, reserves); the long term debt should never be so high that the year's maturity, which is included in the short term, can exceed what the utility can afford to pay.

- Short term receivables (clients) should amount to three to six months (at most) of turnover; amounts in arrear beyond six months should be accounted-for in a special allowance (or at least a special account), as the normal allowance for bad debts can not exceed the amounts which are actually declared irrecoverable. If monthly billing is administratively cumbersome and costly, it can be changed to quaterly or even bi-annual meter reading and billing, with fixed monthly installments in between, based on past seasonal consumption.

Income and Expenditure Statement

The statement of income and expenditure is a film of the undertaking during a given period; it records on the credit side the products, essentially sales of water, sanitation surtax and other receipts (meter rental, direct labour, product of various operations), as well as financial income, and some other receipts which are not directly linked to water and sanitation, and which as previously indicated should preferably be recorded separately.

It is also recommended to keep an account of the products of the water supply operation in volume, showing production and sales, and also unaccounted-for water (production minus sales); the percentage of non-revenue water is obtained by adding to the percentage of unaccounted-for water the percentage of unpaid-for water (not invoiced or included in bad debts).

Non-revenue producing water can reach forty to fifty percent of water produced. This loss, which affects all connected consumers, does not take into account the absence of income from privately owned and operated supplies.

The income and expenditure statement includes an allowance for depreciation, a non-cash expense, which is chargeable as a cost of using the assets during the year. Increasingly, utilities are required to calculate depreciation on the basis of the current cost of their assets, rather than on the historical cost at which they were purchased. The current cost value is a percentage of the value of the asset, if it were to be rebuilt or replaced during the current year. Charging depreciation on this basis ensures that revenues are sufficient to cover the real cost of use of an asset. This is important in countries where inflation is high or where there are large changes in exchange rates, or where the assets in operation are nearing the end of their useful life, as in these cases the current value will be very much greater than the historic cost of the assets.

An income and expenditure statement is illustrated below in schematic form, and in more detail (including projections) in Schedule G, page 90.

Expenditure	Income
Purchase of water Consumption of other goods and services	Sales of water
Personnel Interest Depreciation	Other income

Statement of Income and Expenditure. (from ... to ...)

Statement of Source and Application of Funds

This statement relates the history of the operation during the review period, as it indicates where resources came from (sources of funds) and how they were used (application of funds). These indications have their source in the balance sheets at the beginning and the end of the financial year, and the statement of income and expenditure for the year.

The difference between income and expenditures equals the difference between equity and liabilities and assets. It can be a source of funds if it is a profit, or an application of funds if it is a loss. In WSS, the most important source of internal cash generation is usually the allowance for depreciation. Besides internal cash generation (depreciation allowance + profit), the sources of funds include borrowings and subsidies received.

The non-cash working capital (short-term receivable + inventory - short-term payable) can have increased or decreased during the review period. If it has increased, there has been an application of funds for the corresponding amount (it may be for instance that the level of purchases and inventories has been increased); if it has decreased, this decrease constitutes a source of funds (for instance clients paying their debts).

The other applications of funds are constituted by investments and debt-service. It should be noted that an undertaking which has an increase in working capital may not have an improving performance, if the accounting value of the working capital includes bad debts or useless stock; similarly, if long-term borrowings are large as compared to fixed assets in operation, this can mean that the value of works in progress is increasing, so that the undertaking pays interest without producing water.

A statement of sources and applications of funds is illustrated below in schematic form, and in more detail (including projections) in Schedule H, page 91. These statements are called cash-flow statements, because they show in perspective the evolution of the cash position of the undertaking. They are therefore the most important indicators in relation to the liquidity maintenance policy previously outlined (Part I).

Sources	Applications
Profit + Depreciation Allowance = Internal Cash Generation	Debt Service
+ Decrease (- Increase) in working capital	
Borrowings	Investment
Subsidies	

Cash-flow statement
(from ... to ...)

NOTES TO FINANCIAL PROJECTIONS

Schedule A - Community Data (p. 41)

This schedule provides the community data on which the fictitious case of Schedules B, C, D, F, G and H is based.

Schedule B - Water Supply and Demand (p.47)

The case study is based on the evolution of demand in a small town. Design consumptions from private connections and from vendors are low, while consumption through standpipes is projected at a high level, requiring organized retail sale operating from the standposts, besides the official vendors.

In the year when the works are commissioned, only a minority of the population have private connections, and therefore standposts are used by most people who do not benefit from vendors services. The official record accounts for only 10% of the population (the design criterion) served by standposts. The actual figure is probably much higher, since standposts are used by vendors.

There are a few small factories, and municipal water supplies are also used to irrigate trees and small gardens.

The initial promotion campaign has resulted in an immediate sale of meters to about one-third of the population. A bulk order has been placed abroad, and the meters have arrived in one consignment, shortly before the new system was commissioned. However they were found defective during installation and initial testing, which revealed under-recordings; these, together with flushing needs during installation of new connections, have raised considerably the level of unaccounted-for water, which is however planned to decrease gradually.

Schedule C - Cash Flow (p. 59)

Although this statement usually reflects cash transactions only, a value has been given to in-kind construction, based on provision of services by unskilled local labour, valued at minimum hourly wages in the area.

Replacement is undertaken every five years, and therefore shown for 1996 only. Every five years, the investment in replacement or rehabilitation is based on 10% of the original construction cost, adjusted for inflation.

Although the local loan has been provided without a grace period, and one-third of the amount has been disbursed during the first year of construction, no interest is charged to the second year; real interest is therefore lower that the nominal 15% rate. Similarly, since interest on the foreign loan does not start until after the end of the grace period, real interest is much lower than the nominal 8% rate.

The operations are carried out by a small team of 25 to 30 (including 15-20 unskilled labour). For purposes of simplification, overhead costs are included in personnel expenditures.

New connections are sold directly and at cost to the users, and therefore they do not appear as expenditure of the undertaking.

Schedule D - Average Incremental Cost (p.73)

The expression "economic wage rate" is used to reflect the level of employment of personnel resources. It is also quite common to refer to economic values as "real" costs.

A period of 17 years has been chosen arbitrarily to calculate the average incremental cost, major capacity increases are often required between 15 to 20 years after the works have been commissioned.

Schedule E - Tariff Structures (p.77)

This table is based on a real case (Costa Rica), and it is therefore independent from the other schedules.

Schedule F - Balance Sheet (p.89)

The presentation does not show as current liability the year's maturity of long-term debt. This can cause serious misunderstanding of the structural ratios of the undertaking. However, in the present circumstances, the situation of the utility is such that ratios are not very useful. Deferred taxes and debt-service arrears amount to more than two years of receivables, three years after the start of the project. After 1996, although these arrears are assumed to be free of interest, they exceed total annual revenue; such long-term projections are not worth much consideration; obviously fundamental changes are required in the shorter term.

Schedule G - Income and Expenditure Statement (p.90)

The sum of operating costs, depreciation allowance (which is often counted as operating cost) and interest represents total income required for the undertaking to break even (total income = total expenditure). The average financial cost is therefore equal to this sum divided by the volumes sold. The average tariff requirement differs from average incremental cost. It also requires a shorter calculation period (usually 5 years instead of 15 to 25) and more frequent adjustments.

BALANCE-SHEET

End of year Current prices	Note	1991	1992	1993	1998
ASSETS					
gross book value	1	0	0	10 360 000	11 746 402
less cumulative depr.		0	0	259 000	1 657 980
Net fix. assets (net)		0	0	10 101 000	10 088 422
Work in progress	2	4 000 000	10 360 000	0	0
cash and banks	3	0	5 871	53 813	78 977
accounts receivable	4	0	0	339 819	576 250
inventories	5	0	12 720	116 594	171 119
other (prepayments)	6	0	2 544	91 283	149 474
Total current assets		0	21 135	601 509	975 820
Total assets		4 000 000	10 381 135	10 702 509	11 064 242
LIABILITIES - EQUITY					
retained earnings		0	(50.880)	(222 736)	692 528
government equity	7	500 000	1 000 000	1 000 000	1 000 000
community funds		50 000	100 000	100 000	100 000
Total equity		550 000	1 049 120	877 264	1 792 528
foreign loans		2 400 000	6 216 000	6 216 000	4 972 800
local loans		1 050 000	3 044 000	2 739 600	1 217 600
Total long liabilit.		3 450 000	9 260 000	8 955 600	6 190 400
accounts payable	8	0	10 176	93 276	136 895
deferred taxes	9	0	5 088	46 638	983 712
overdraft	10	0	56 751	0	0
debt service arrears	11	0	0	729 731	1 960 707
Total current liabil.		0	72 015	869 645	3 081 314
Total liabilities		4 000 000	10 381 135	10 702 509	11 064 242

Notes:
1 Historical cost value of fixed assets in use.
2 Facilities are commissioned at the beginning of 1993.
3 Surplus cash is held on bank deposit. Cash is maintained at 6% of average weekly cash operating costs.
4 4 months of average monthly revenue in 1993, reduced to 3 months over 2 years.
5 3% average monthly cash operating costs.
6 20% of accounts receivable plus inventory.
7 Cumulative value of Government grant financing.
8 20% of the value of cash operating costs.
9 Half the value of accounts payable.
10 Only if cash revenue is insufficient to cover operating expenses and working capital requirements.
11 Only if cash is insufficient.

INCOME AND EXPENDITURE STATEMENT

Current prices	Note	1993	1994	1997	1998
INCOME					
from vendors		237 865	91 486	(0)	(0)
from standpipes		43 201	46 710	59 037	63 830
from met. connections		738 390	1 340 617	2 072 854	2 241 170
Total sales	1	1 019 456	1 478 813	2 131 891	2 305 000
Interest received	2	881	8 072	10 851	11 229
Total income		1 020 337	1 486 885	2 142 742	2 316 229
EXPENDITURE					
water treatment		102 559	113 900	146 062	157 922
labour		161 799	238 203	295 051	324 784
other		202 020	196 840	207 642	201 768
Total		466 378	548 943	648 755	684 474
Operating surplus		553 959	937 942	1 493 987	1 631 755
Depreciation allowance	3	259 000	259 000	293 660	293 660
Prof. bef. int. and tax		294 959	678 942	1 200 327	1 338 095
Interest paid	4	466 815	410 940	736 422	650 989
Net profit before tax		(171 856)	268 002	463 905	687 106
Tax	5	0	134 001	231 952	343 553
Net profit		(171 856)	134 001	231 953	343 553

Notes: The operation starts on 1 January 1993. There is no income in 1992. The only expenditure in 1992 is in unskilled labour (50 880).

1 The municipality is encouraging new settlements, and compensates the utility, for unauthorized use. The tariff is assumed to be 1 local currency unit per cubic metre sold from vendors, 1.5 unit from standpipes, and 3 units from metered cnnections. The tariff increases with inflation (basis at 1991 prices).

2 Interest on cash deposits is earned at a rate of 15%.

3 2.5% of the gross book value of fixed assets in use.

4 Sum of interest on local and foreign loans, plus interest on any overdraft charged at 18% of the previous year end balance.

5 Tax is assumed to be 50% of net profit before tax.

STATEMENT OF SOURCE AND APPLICATION OF FUNDS

Current prices	Note	1991	1992	1993	1998
SOURCES					
Profit bef. int. tax		0	(50 880)	294 959	1 338 094
plus depr. allowance	1	0	0	259 000	293 660
Intern. gener. funds		0	(50 880)	553 959	1 631 754
foreign loans		2 400 000	3 816 000	0	0
local loans		1 050 000	1 994 000	0	0
overdraft increases		0	56 751	(56 750)	0
government grants		500 000	500 000	0	0
community funds		50 000	50 000	0	0
Total external funds		4 000 000	6 416 751	(56 750)	0
Total sources of funds		4 000 000	6 365 871	497 209	1 631 754
APPLICATIONS					
Constr., replacement		4 000 000	6 360 000	0	0
interest		0	0	41 484	0
repayments		0	0	0	0
arrears		0	0	0	1 575 700
Total debt service	2	0	0	41 484	1 575 700
Tax		0	0	0	0
Increase in cash		0	5 871	47 942	4 121
Inc. n.-cash work cap.		0	0	407 783	51 933
Total applic. of funds		4 000 000	6 365 871	497 209	1 631 754

Notes:
1. 2.5% of assets, worth 600 units of local currency per capita served. This figure can be compared with the tariff of 1 to 3 units per m3 sold.
2. Debt service payments are paid if cash is sufficient after meeting other requirements, including cash operating costs, increases in non-cash working capital, and capital expenditure. Payments shown may be less than the payment required, in which case arrears are shown in the balance sheet as current liabilities.

Note: The columns are different in the various schedules. The reader however has all the information needed to calculate the results year by year for the whole 1991-1998 period.

WSS undertakings are generally not much affected by taxes on profit, because they are able to constitute various provisions, or because they are exempt. Care should however be taken to prevent taxation on profit generated from incorporation of inflation into depreciation (at replacement costs) and other calculations. If for instance an undertaking has an internal cash generation (operating surplus + depreciation allowance) of x% of its fixed assets in operation at replacement cost, this will enable it to extend its facilities to match demand growth. However the fiscal (tax accounting) return, calculated on historical values, will be much higher than x%, and there is a danger that excessive taxes be applied to this surplus.

Unauthorized use (Schedule B) represents water used by new settlements through illegal connections. The municipality, which encourages new settlements, compensates the undertaking for its loss, by paying a yearly amount equal to the estimated consumption times applicable tariffs.

For purposes of simplification, interest received has been projected on the basis of cash at the end of the year, instead of average cash available during the year. A 15% rate is applied, which is high in the circumstances (6% inflation).

Interest paid includes interest on overdraft, calculated at 18% of the average amount outstanding (Schedule F). There is no interest paid on arrears of debt-service and deferred taxes.

The salaries on Schedule G include only those amounts which have been paid by the undertaking to skilled staff. Unskilled staff (Schedule D) is constituted by labourers from new settlements, who are entirely paid by the municipality. Thus, while there is no financial cost to the undertaking, there is a cost to the economy, which is adequately reflected in Schedule D.

Schedule H - Sources and Applications of Funds (p.91)

Internal cash generation is nearly always more than 10% of net fixed assets in operation, although depreciation allowances are kept at 2.5%. The detail of planned investment would have been useful in more complex situations involving several projects within the same utility. It should show yearly investment, works in process and works commissioned, and draw attention to the need to minimize works in process in order to improve the cash-flow.

The presentation can be misleading, in the sense that cash seems to be permanently available, while there is very little debt-service and no taxes paid. If the projection had been prepared differently , with all payments due reflected year by year, the cash situation would have been serious enough to warrant immediate changes in investment, operational and financial policies. Better loan conditions, equity increases, less expansive treatment and distribution technologies, or higher tariffs could for instance have been sought.

Other Financial Reports

Cash Flow Analysis

An analysis of the cash book enables to monitor the different categories of expenditure over time and to establish how resources have been used. Improvement or deterioration can be identified and the budget updated to take account of any change. Increased maintenance expenditure may for instance indicate that equipment is becoming old and needs to be replaced.

Details of Debtors and Creditors

Their lists can be produced using the information stored in the purchase and sales accounts, in which each debtor/creditor is shown, or from the cash book, in the case of the minimum system. A summary of the nominal value of outstanding debts and dues can be prepared in association with an analysis of the age of these items (for how long the account has been unpaid). This will indicate customers in arrears and can be used to identify those customers which should be disconnected for non-payment.

A computerized customer information system provides useful data, which can be easily retrieved, on number of consumers and volumes consumed in specific consumption brackets. Accounts receivable in arrears can also be identified in the programme.

Management Information Reports

A second category of reports is produced and used as management information reports (MIS). These include financial and technical information on performance and utilization of resources. It may be necessary to accompany them with a written commentary. The information can also be summarised, usually on a quarterly basis, to provide a view of the financial performance of the project as a whole for the senior managers of the water agency or for interested government departments.

- Capital Projects Progress Report (MIS 1)
  Reports progress of project(s) against target.

- Technical Operations Report (MIS 2)
  Reports on production, trends in quality, nature of fault, and their duration. A technical report - no financial information.

- Billings and Collection Report (MIS 3)
  Shows on a progressive monthly basis the sales by consumer categories, and the accounts receivable outstanding

- Statement of Operating Expenses (MIS 4)
  Sets out the expenditure incurred during the month and cumulative expenditures in appropriate detail with a comparison of actual against budgeted amounts. Routine and major maintenance expenditures can be shown in a special report.

- Principal Financial Ratios (MIS 5)
  Indicates performance in terms of principal financial ratios enabling different projects and systems to be compared (manpower per thousand connections, sales per consumer, accounts receivable, etc ...).

Maintenance Schedules

A maintenance schedule should be a plan of labour and materials inputs required to carry out routine preventive maintenance over the next year, or quarter. It will be useful to prepare a projection in physical terms (hours of labour and units of materials). In kind contributions can then be offset, and a schedule of cash requirements for labour and materials prepared.

Budgets

Preparation

Budgeting involves identifying objectives and formulating detailed plans to meet these objectives. A budget is a plan of expenditure year by year, prepared on the basis of knowledge of previous periods and judgements on what levels of expenditure are required in the next periods to meet the objectives which have been set. Budgets should therefore be based on technical factors such as production and unaccounted-for consumption. They should reflect all items of expense that can be anticipated, including regular expenses such as administration staff wages, loan repayments, etc.

The maintenance programme should be incorporated. Any effort to reduce leakage should be included in the budget, in terms of the costs incurred and the improved utilisation of water produced. Budgets should be established for each area of responsibility, identifying income to be received and expenditure to be incurred in meeting agreed objectives. The consolidation of the budgets for the different departments or regions is the budget of the undertaking as a whole.

Use

Actual results are compared with budgeted results on a continuing basis. It is therefore essential to prepare monthly or quarterly MIS reports and to analyse differences between budgeted and actual performance. Action should be taken to determine why variances have arisen. If these variances are significant, remedial action should be taken, or the budget should be changed.

MIS 1 - Capital Projects Progress Report

Project Item	Project Cost			Project Timing		
	Actual	Planned	Difference	Actual	Planned	Difference

MIS 2 - Technical Operations Report

Month actual budget

Production during the month
Peak daily production required (m3)
Available capacity (m3/day)
- production
- treatment

Average utilisation of capacity
- production (%)
- treatment (%) *

Fault level
- pumping station
- treatment works
- other

Sales in the month (from MIS 3)
Losses (monthly production less sales)
Quality
- parameters used
- standard values
- largest deviations

Complaints (number)
- no water
- low pressure
- bad colour
- bad taste
- other

Metering
- connections without meters
- connections with meters
- meters not working
- meters repaired/replaced
- meters tested

Use of chemicals
- chlorine (kg)
- alum (kg)
- lime (kg)
- other (kg)

Use of fuel and electricity
- fuel (litres)
- electricity (kWh)

* Peak utilisation should be compared not to average capacity but to available (nominal) capacity.

MIS 3 - Billings and Collections Reports

MONTH: ...

Billings	This month	Cumulative in the year
domestic		
commercial		
industrial		
agricultural		
other (municipal)		
Total		

Collections	This month	Cumulative in the year
domestic		
commercial		
industrial		
agricultural		
other (municipal)		
Total		

Accounts Receivable	total value	0 - 30 days	30 - 90 days	above 90 days
domestic				
commercial				
industrial				
agricultural				
other (municipal)				
Total				

Connections	new this month	total in service	no of requests outstanding

---

MIS 4 - Statement of Operating Expenses

MONTH: ...

	TOTAL EXPENDITURE			COMMENTS
	Budget	Actual	Variance	(reasons etc ...)
1. Wages				
2. Materials				
3. Chemicals				
4. Fuel and energy				
5. Transportation				
6. Depreciation allowance				
7. Allowance for bad debt				
8. Interest Charges				
9. Other Expenses *				
Total Expenses				

* Including management overhead

MIS 5 - Principal Financial Ratios

Ratio	Computed as	Half-Year This	Half-Year Previous	Note
Rate of Return	Net Income to Average Net Fixed Assets in Operation			(i) (ii)
Operating Ratio	Operating Expenses to Operating Income			(iii)
Current Ratio	Current Assets to Current Liabilities			
Debt Equity Ratio	Long Term Debt to Equity			
Debt Service Ratio	Net Internal Cash Generation to Total Debt Service			
Self Financing Ratio	Net Internal Cash Generation less Debt Service to Capital Expenditure			(iv)
Average revenue per unit sold - domestic - agricultural - industrial	Income/m3			
Average cost per unit sold - production cost - distribut. cost - treatment cost - billing cost - administrat. cost	Cost/m3			

Notes: (i) Average net fixed assets is the average of opening and closing balances of net fixed assets.

(ii) Net income means net operating income after tax but before interest.

(iii) Operating income means income arising out of normal operation.

(iv) Net internal cash generation means net income plus depreciation allowance.

Financial Planning

Long-term financial planning, with annual monitoring and updating, should be undertaken in all WSS operations, in the form of a projection of the operation and of the corresponding financial statements (income and expenditure, sources and applications of funds, and balance sheet). All projections should be at constant and at current prices. The purpose is to check that tariffs and other charges will be adequate to maintain a healthy financial position - or to foresee when tariff increases will be required.

In making financial projections, a large number of assumptions have to be made concerning: inflation, exchange rates, sales, levels of expenditure on maintenance, chemicals etc., losses, tariff levels and other charges, and future financing terms.

Prediction of some of these items - inflation and exchange rate for example - may be obtained from central Government or lending agencies. It is necessary to consider a range of probable values.

Use of Management Information Reports

Management information reports enable the managers to assess the success of the project in meeting its objectives. Thus it is possible to see:

- whether the system is providing the levels of service and other benefits which it was designed to achieve;
- whether the cost recovery scheme is functioning as originally envisaged;
- whether the facilities are being maintained satisfactorily;
- whether there is potential for expanding or duplicating the scheme;
- whether resources are being used efficiently.

The management information reports are designed to identify trends in important indicators and measures, so that early action can be taken to avoid a deterioration in financial performance.

Indicators Derived from the Financial Statements

Besides the indicators derived from the balance sheet and described at page 84, some ratios can be helpful in financial management. The debt/equity ratio should reflect sound negociation strategies resulting in a minimum financial burden. Where possible, credit facilities made available by government should be consolidated in equity. Generally, a minimum cash reserve should be maintained.

The return on assets is calculated from the operating statement and the balance sheet. It shows how effectively the assets of the business are used. Target rates of return are usually set.

The self financing ratio shows how much of the annual construction expenditure is met from funds generated by the undertaking. The remainder is met by loans or grants. Comparison of internally generated funds with debt service requirements enables calculation of debt service coverage ratios. Targets are often set for this indicator by the agency management and by financing agencies.

Action on Adverse Indicators

Indicators of cost, debt service coverage, return on assets, and self financing can all be compared to targets. An inadequate or deteriorating performance on revenues, costs and other targets may be apparent. Achieving and maintaining targets and general efficiency will:

- maximise the opportunities for using the financial resources available to extend the coverage of the services provided to the population;
- release financial resources which can be used to improve the quality of the services provided;
- minimise the financial burdens on households and businesses.

Improvements against targets and increased efficiency can be achieved through increasing revenues or reducing costs.

Revenue can be enhanced by increasing tariffs, but the effect of price elasticity may lessen the expected increase in revenue. Consideration is sometimes given to changing the tariff structure: in many countries for instance, additional income can be generated by charging the high-income consumers on all of their consumption, rather than limiting the extra charge to the high consumption bracket.

There may be scope for improving the cash flow by billing more frequently. However, in some communities where there is a dramatic seasonal fluctuation in community income, there may be an advantage in requesting annual payment for water. The optimum frequence of billing depends on the circumstances; usually, a monthly bill, adjusted every three months, is both accepted and accurate enough.

Cash flow can also be improved through efforts to reduce accounts receivable. The analysis of the time for which bills have been outstanding can be used to identify which debtors to pursue for collection of bills.

More connections may also improve the cash flow, if those to whom new connections are made pay promtly. Where the cost of a new connection, although normal, represents a high percentage of income (sometimes several months), payments can be made by instalments, or by adding a small surtax to the selling price of water. Interest should be reflected in these "social connections" programmes.

Each category of operating costs requires continous critical appraisal. The MIS reports identify costs per employee and per unit sold. Continual review of these reports will reveal trends in these figures.

For labour, it is possible to gauge manning levels against internationally accepted ratios, taking into account the proportion of external contractors involved in construction and operation. Other items such as chemicals, depend more on local factors. It is important to set target levels and to ensure that expenditure does not exceed these limits.

Efforts to reduce the number of illegal connections should be undertaken; the policy of disconnection of customers in arrears of payment should be rigorously applied.

Reduction of water losses will improve the cash flow. Separate losses into those which arise in treatment, in mains flushing (sluicing), and in storage and distribution (leakage, overflow, meter under-registration).

Review critically whether use of water in mains cleaning is excessive. Undertake an analysis of the cost of reducing leakages. Where losses are already low by comparison with similar systems, further investment to reduce losses by a further percentage point may not be cost effective.

The timing of debt service payments can be reviewed to ensure that the terms are favourable with respect to cash flow. Renegotiation of loan terms could be an option.

Continuing Consultation

The agreement of the community should be sought by the agency for any change in technical design, levels of service, cost recovery mechanisms, or the community's responsibilities for construction, operation, or maintenance. Regular visits should be made so that agency and community representatives can discuss matters which concern water supply and sanitation.

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