

CHAPTER 7 Findings Related to O&M of Commune Water Facilities

7.1 Introduction

Vietnam has accepted the principles the 1992 Pre-UNCED Dublin Conference on Water and Sanitation, which are:

- Water has a economic value in all its competing uses and should be recognised as an economic good;
- Water development and management should be based on a participatory approach, involving users, planners and policy makers at all levels, with decisions taken at the lowest appropriate level;
- Women should play a central role in planning and decision making for water supply and sanitation programmes as they have primary responsibility for management of water in most low-income households. They and the children they care for often suffer the most from the effects of inadequate water supplies and sanitation and therefore assign high priority to improving and maintaining services.

The National RWSS Strategy²² is corresponding to this policy as it emphasises a Demand-based Approach. This means that the users, after receiving appropriate advice will:

- Decide on what type of RWSS facilities they want, how they will organise this and how they will pay/finance the facilities;
- Either construct household facilities themselves or arrange for a contractor to build the facilities;
- Pay the contractor;

²² The National Rural Water Supply and Sanitation (NRWSS) Strategy Study was carried out January 1997 and May 1998 by the Centre for Residential Planning and Development (CERPAD) with assistance from a team of Danish and Vietnamese consultants.

- Finance and manage operation and maintenance of the facilities.

The Study on Groundwater Development in the Rural Provinces of Northern Part in the Socialist Republic of Vietnam has adopted this overall approach.

Based on national policies and priorities the groundwater potentials in the 20 communes of the five northern provinces of the country are evaluated through the results of hydrogeological and geophysical surveys and the test drilling. The water quality of the test wells will then be carefully analysed and evaluated.

A groundwater development plan will formulate the selection of possible aquifers, number of wells and their location, optimum pumping rate. Deep well construction techniques and their specification will also be considered before deciding on the technical specifications of the water supply facilities and financing costs.

Different options exist for covering construction costs and which one to select still needs to be decided on. The consumers, however, will cover O&M costs. It is therefore essential that the willingness and ability to pay for the service is evaluated. A comprehensive participatory community based survey is addressing socio-economic conditions and willingness to pay for water supply services. In addition health aspects related to water borne sickness is evaluated at commune level.

It is expected that the water supply schemes will be implemented through the existing institutional framework. O&M is expected to be performed by the Commune Peoples Committee (CPC) or at village level if this is appropriate. A comprehensive institutional assessment is therefore conducted to map stakeholders and their roles in connection with water supply and sanitation. Finally, the organisation of O&M of the water supply facilities is addressed accompanied by measures to sustain and improve service delivery.

It is envisaged that the recommendations and criteria put forward in the study will be adopted in the final detail design of a programme aiming at improving water supply conditions for a number of selected communes within the study area.

This part of the report deals with organisational issues related to O&M of the water supply facilities and environmental health issues related to the use of clean water.

An assessment of selected community water supply facilities has been conducted in order to get a first-hand impression of O&M problems and lessons learned. Discussions have been

held with households, operators of water facilities, Commune Peoples Committee representatives, and selected Provincial CERWASS. Field Reports are annexed to this report providing more detailed information about the water supply facilities visited. Additional information has been collected from available reports and interviews with selected institutions at national and local level.

The assessment is divided into the following sections:

- Project initiation
- Organisation of feasibility study
- Organisation of design
- Mobilisation of communities
- Organisation of construction
- Organisation of O&M
- Assessment of operation and maintenance of established water supply systems
- Overall management and the role of PC
- O&M support
- Overall support to health education and environmental sanitation.

7.2 Project Initiation

For (rural) water works financed under the state budget, the Provincial People's Committee (PPC) through the Department of Agriculture and Rural Development (DARD) must prepare a list of works carried out since July the previous year to justify ongoing and new projects. Upon approval by Department of Planning and Investment, Department of Finance and Provincial State Bank the project is included in the PPC budget for the forthcoming financial year.

Additional financial support can be provided from international donors. UNICEF has over the past few years been supporting rural water supply and sanitation through its WATSAN programme executed through CERWASS. If a PPC wants to include UNICEF funds to support the development of rural water supply, the PPC has to approach Ministry of Agriculture and Rural Development (MARD), which is the responsible agency for rural water supply projects at national level. The day-to-day administration is done through CERWASS.

It is the impression that most rural water supply projects are initiated from province level without any formally adopted selection criteria. A policy of distributing financial support to the most needed districts and the most needed communes is generally the adopted criteria for initial selection. However, no effective mechanisms seem to be in place, which enables the

comparison of needs between different communes, and thereby prioritising of needs. The initial selection of communes is therefore taken by the PPC more or less randomly with support from CERWASS.

After the initial selection discussions are held with the District People's Committee (DPC) followed by the Commune People's Committee (CPC). These discussions are often facilitated by Provincial CERWASS. The CPC is informed about the possibility of receiving water supply if the local conditions are feasible (sufficient quantity and quality of water as well as the communes ability and willingness to pay for water). The CPC is then invited to make a formal request through DPC, which will pass the application on to PPC/DARD and MARD/Central CERWASS.

If the application is accepted a feasibility study is initiated to assess the possibilities of establishing a water supply system.

7.3 Organisation of Feasibility Study

The feasibility study is organised by Provincial CERWASS upon request from Central CERWASS. A fixed report format is used covering the different aspects of a technical evaluation/assessment of the conditions for applying a water supply system in a commune. After Provincial CERWASS has completed the feasibility study including a scanning of the socio-economic conditions in the village, a project proposal is forwarded to Central CERWASS and UNICEF for approval. The proposal includes the main results of the feasibility study and recommendations for technical design.

Provincial CERWASS have both simple hand-drilling equipment and mechanised drilling equipment that can be used in the alluvial lowland areas. Both technologies are simple, cheap and cost effective. However, the generally low standard of the equipment can cause problems in drilling especially in hard rock areas. UNICEF has provided 10 Chinese drilling rigs for drilling hard rock areas, but the quality is not good. In many cases private or government drilling companies are therefore used by CERWASS (and users) to complete drilling works.

7.4 Organisation of Design

The technology selected determines the O&M criteria. It is therefore important that during the design phase considerable attention is paid toward O&M criteria in order to avoid complicated O&M functions. Sophisticated treatment systems has to be traded towards simple and non-expensive O&M routines in order to secure sustainable operations of the water supply facilities.

The Government policy now is to promote piped systems rather than point source. Piped water supply facilities visited by the Study Team indicated the following most commonly used technologies:

- Simple systems using gravity and natural spring water with no treatment of water to improve quality;
- Gravity system or booster pumping supply system using either surface water or groundwater: Biological treatment and mechanical treatment is the most common types used in the rural or semi-urban areas. Often combinations of the two systems are used together with aeration tower and chlorine injection.

The technology of water supply systems visited ranged from simple system using water from spring and distribution by gravity to more sophisticated technology using biological treatment and mechanical treatment some with aeration and chlorine injection. The water sources used were surface water and deep well.

The majority of WATSAN projects is designed by a special design institute²³ under MARD and located in Hanoi based on the feasibility study done by Provincial CERWASS. Ninh Binh CERWASS, Thanh Hoah CERWASS and Nam Dinh CERWASS are the only provincial CERWASS that have permission to make technical design on their own. MARD policy, however, often centralise design work. This policy is limiting the possibilities of provincial CERWASS certified to do design to build necessary design capacity.

7.5 Mobilisation of the Commune

All projects visited have been receiving financial support from UNICEF as part of the organisation's WATSAN 24 Programme. The WATSAN Programme is mainly using CERWASS as implementing agency. Mobilisation is an important component of the Programme to be carried out before any construction is taking place.

Mobilisation includes general awareness and information meetings at district, commune and village level. Information on different technology options should be presented as well as expected contribution from the community/village. An important issue, which is also to be addressed, is the households' payment to cover O&M costs and sustain the system after

23 Centre for Environmental Technical and Urban Industrial Zone.

24 Water and Sanitation.

construction is completed. To facilitate this and to make a consensus and acceptance of having a water supply system several meetings are conducted. The meetings can include all village people, commune PC and participation by CERWASS and representatives from different unions. The WATSAN programme is to a great extent using the different unions as facilitators for awareness rising through different form of campaigns. The Women's Union is particularly involved in this work.

The commune/village is then invited to apply for a water system under the WATSAN Programme. No further specific mobilisation takes place in connection with planning/design of the system.

After Provincial CERWASS has completed hydrological investigations and a scanning of the socio-economic conditions in the village, a project proposal is forwarded to Central CERWASS and UNICEF for approval. Technical design is then done by MARD's design institute or an other approved organisation.

During construction people are requested to participate in digging trenches and related construction work. This is generally organised by one of the local organisations e.g. Woman's Union, Farmer Union, Youth Union etc. with support from the Commune PC and Head of Villages. No further mobilisation is taken place in connection with implementation of the water supply facilities. This has some implications:

Detailed planning, such as final selection of technology, location of intake/treatment plant and which households to receive water is done by CERWASS and approved by the PC. The potential users are then only informed afterwards if they are able to received water. Many potential beneficiaries who has been inspired by the mobilisation and awareness campaigns and wants to improve their water supply are therefore left out. Although budget constraints and technology options restricts complete coverage in any commune, the campaigns generate a demand and expectation that can not be fulfilled. Alternative options should therefore be provided to those households that are falling outside the range of a pied water supply system. This is will be more in line with a demand driven approach.

Experience collected during UNICEF's Evaluation of the PPS Component of the UNICEF Assisted Water and Sanitation Programme in Vietnam reveals that in a number of cases the participatory approach to community mobilisation has not been applied in a proper manner. Decisions on type of technology have often been taken without consulting the users and participation limited to user contributions. In these cases the community often does not feel committed towards the O&M conditions of the facilities. If O&M costs is to be kept to a

minimum it is, however, important that the users feel a sense of commitment and responsibility towards the water supply system. Cases reveal that if this commitment is not established households tend to make illegal connections or not paying for water. This can jeopardise the financial sustainability of O&M and the supply of clean water.

7.6 Organisation of Construction

Constructions are in most cases done by private contractors under supervision of a Construction Management Board. The contractor is selected through a bidding procedure where a selected number of companies are invited to submit a tender. The selection is based on general procedures applied in Vietnam but as prices are all based on MOC standard rates there is not competition on price. It is therefore not clear how a contractor is actually selected in practise.

The Construction Management Board usually contains members from: 1) provincial CERWASS (the Provincial CERWASS director or one engineer and one from the Accounting Section); 2) the District People's Committee; 3) The Commune People's Committee. The provincial CERWASS director often heads the board. The main functions of the board includes 1) signing of contracts; 2) monitor/inspect and evaluate implementation; 3) approve and perform handing over procedures.

Procurement is generally carried out by the construction company, but if pipes and other materials are provided by UNICEF, Provincial CERWASS will be responsible for providing these to the project. The Department of Finance and Price at provincial level and the Provincial State Bank will advance a part of the contract sum during the start of the financial year (not exceeding 1/3 of total expenditures). After completion of each work, Provincial CERWASS, the construction company and the Construction Board will make a statement of acceptance and the Provincial State Bank will transfer the remaining contract sum for each work to the contractor.

In the context of rural water supply the construction industry in Vietnam is suffering from lack of adequate machinery and skilled workers. This affects often tanks, which are often built using hand-mixed concrete, as concrete mixers are not always available.

Often organisation of the construction site is poor and materials are often inadequately stored leaving it exposed to the open. There is very limited control on material specification and testing is normally not carried out. Often safety procedures are not followed.

During construction, technical staff from Provincial CERWASS come to the field and assist in supervision of construction. There are norms and guidelines for supervision and commissioning procedures, but they are not strictly followed in rural areas.

7.7 Organisation of Operation and Maintenance

After the handing-over procedures the Commune PC becomes the owner of the water supply system and thus will be responsible for O&M of the facilities. In some cases the responsibility for O&M will be delegated to village level. This is mostly the case when the technology is very simple (usually with natural spring and gravity flow system).

In more urban settings the Construction Management Board is sometimes transformed into a Water Management Team located under the PC of district towns or into a Water Supply Enterprise of the District PC. The organisation usually is in the form of sub-teams or working groups.

The staff of Water Management Teams consists generally between 5-7 people while Water supply Enterprises are staffed with 9-15 people. Managing staff and O&M workers are all trained in a short course (duration 1 - 2 weeks) in order to operate process pumps, technological flow sheet of water treatment, back washing methods for filters, operation of flocculation and disinfecting equipment as well as network operation and maintenance. Post-training of O&M staff is done at other water supply systems using the same technology to learn the practice of O&M. Duration of training is generally one month.

Except for the very simple natural spring and gravity system the organisation of O&M of those water supply facilities visited are all very similar although the number of people involved in O&M varies.

The PC is the lowest government institution and responsible for a number of functions including provision of clean water to the commune. The O&M generally fall under the section responsible for infrastructure (communication, water supply and electrical power supply). However, sometimes O&M functions are delegated to the agriculture co-operative which also falls under PC jurisdiction. In both cases an administrator will be selected and function as a "manager" of the water supply.

The day-to-day O&M functions are normally divided into four main categories:

- Operator of source/water intake (if the source is not located within the plan);
- Plant operator (s);

- Meter readers and fee collectors; and
- Accounting and financial management.

In most cases the operators and meter readers/fee collectors are retired personnel from government services. Often they perform their functions on part-time basis. In case of the operators they might come in the morning to start the operation of the system before returning to other domestic duties. During the day they return to check operations and perform maintenance.

The operating time for most systems is generally not more than 12 hours/day often much less. Average is 5 to 7 hours operating time. As part-time attendance is often practised (do field work in-between), only one shift is applied. Although there might be two operators at the plant they often inter-change and do not attend the plant at the same time unless specific O&M operations has to be done. If the source/pump-intake is located separately from the plant, one operator is generally allocated to this function. In some cases there might be a need for additional boosting of the supplied water to keep the pressure. Additional pumping stations are then stabilised with an operator responsible for O&M of the pump. The design criteria and technology in use are therefore determining the manpower functions and staffing of the water supply system.

Meter reader/fee collectors are mostly selected based on their good reputation or position in the village. If the water supply system covers more than one village, a person from each village is selected. In many cases this person is the Village Head.

A typical rural/semi-rural water supply system in Vietnam based on deep well water source will have to-day have the following manpower attached to O&M functions:

Category	Functions	Number
Manager	Have the overall responsibility for O&M and together with the Chairman of the PC decide on water fees. Located at the PC-level.	1
Accountant/treasurer	Have the responsibility for doing the accounts of O&M and clean deposit of money collected. Located at PC-level.	1 (2 if the accountant and treasurer is not a dual function)

Operator	Responsible for all technical matters related to O&M of intake, plant and piping system.	Depending on system design the number can be from 1 to several people.
Meter-reader/fee collector	Responsible for control of meters, reading consumed water and calculates the price of water used.	1 - 2 If more than one village in connected to the system, or the number of house connections is large, more than one person is required. Often one person reads and calculates the amount used while the other controls and receives the money.

The manager and the accountant/treasurer is also maintaining other (similar) functions and therefore on PC payroll. The operator(s) and meter-reader/collector(s) are receiving their paid from the revenue collected.

Upon requested technical assistance is to be provided by provincial CERWASS. There are no direct organised links between the water supply and health/environmental sanitation. Control of water quality is not organised at PC level in any of the communes visited.

7.8 Assessment of Operation and Maintenance Functions

The assessment is a summary of the Field Reports annexed to this report plus information collected from secondary sources and interviews. The assessment is based the General O&M Functions annexed to this report.

7.8.1 Water Supply Facilities in Thai Nguyen Province

The oldest system visited was in Thai Nguyen Province. In 1996 Dong Hy district town PC bought a water work with biological treatment by a nearby cement factory/quarry company. UNICEF provided the piping system. The plant was built in 1970 and in a very bad condition. The biological filter did not function and the chlorine injection system had not been in operational use for several years.

Although the operators have been responsible for O&M since construction was completed, they have never changed or maintained the filter. The water quality was low with a high

concentration of coliform bacteria infiltrated at the surface water intake.

A simple and low-cost water supply system was completed in La Hien commune (Dong Hy district) in the beginning of 1999. Water source is a natural spring and no purification is applied, only a filter to reduce sand to the system. The O&M requirements are kept to a minimum and delegated to selected household close to where the concrete water reservoir have been constructed. The village head has the overall responsibility for O&M and for collecting a flat water fee of VD 1000 per month from each household. The amount covers recurrent O&M costs.

The system has only been operating for a short time. So far the consumers were satisfied and the system was operating very well. Compared to the water works in Dong Hy district town, the technology of this water supply system seems to match the O&M skills of the community.

7.8.2 Water Supply Facilities in Hanoi Rural Area

The water work contains a biological treatment plant with aeration tower completed in 1997. The operator was trained by CEWRWASS on how to O&M the plant. He has a background as an army technician - now retired. The second operator has a similar background. None of the operators or commune people did participate in the construction of the plant.

The plant seems to be in good technical condition and the operator was able to demonstrate a number of O&M functions on request. The technology applied is simple and no chlorine injection is applied. Although O&M monitoring, recording and reporting can be improved the operator seems to be able to perform his functions well. The major problem is that the capacity of the biological filter is limited and no control of water quality is made. Households visited were satisfied with the amount of water supplied (7 hours per day plus household water tank).

7.8.3 Water Supply Facilities in Ninh Binh Province

Two facilities were visited in Gia Viên district. In Gia Hoa commune the construction of the treatment plant and piping system was started in 1977 and completed in April 1999 but not yet put in operation. An assessment of O&M was therefore not possible. On the other hand it was possible to address technology issues and the skills of the operator as he was already in place. The treatment plant is to use a combined biological/mechanical system with post treatment using chlorine gas injection. The treatment plant needed to be modified after construction completed. If this was due to faults made by the constructor or design did not

meet required specifications is not clear.

So far the operator had only received initial training and was not aware of the danger related to the use of chlorine gas injector if not operated properly (he was sleeping in the same room as the injector was located). Regular back-washing of the sand filter will be required and a complete understanding of the treatment process is necessary to utilise the potentials of the plant. UNICEF will arrange training for all operators in the province during 1999. It is the impression of the Team that more specialised training should be provided if sufficient quality of O&M is to be maintained.

The water supply facility established in Gia Sinh is only operating 4 hours every second day during rain season and 4 hours each day during dry season. The water work was completed in April 1999 and presently serving only 135 households out of 1550. The main problem of the water supply system seems to be the lack of understanding financial management at PC level as well as there exists a large number of illegal household connections which is jeopardising the financial sustainability of O&M operations. As the system just recently was completed, no major critical O&M issues were discovered. However, some parts of the trenches the distribution pipeline had not been covered with soil. The people in the village also expressed worries about cracks in the storage tank overlooking the village.

7.8.4 Lessons Learned from Other Operating Water Supply Facilities

The objective of a water supply facility is to provide the consumers with clean²⁵ water. The quality of water supplied to the consumers is used in this section as an indicator for how operation and maintenance is performed. The assessment is based on UNICEF's Evaluation of the Pumped Piped System Component of the UNICEF Assisted Water and Sanitation Programme. The evaluation covers 14 case studies from established water supply systems located in each of the provinces of the country.

Although there are no universally accepted standards for drinking water quality, every country needs to have a standard for acceptable drinking water quality. In Vietnam, however, water quality standard is yet to be uniformed. Although there is a lack of a uniform standard it is possible to make some judgement based on the finding of the UNICEF evaluation. The following water quality parameters are used to measure O&M:

- Cleanliness and drainage around water intake and purification plant;

²⁵ As defined in the NRWSS.

- Physical parameters of colour, odour, taste, pH, Chloride and hardness;
- Chemical parameters of iron and manganese;
- Coliform bacteria content

Cleanliness and drainage around water intake and purification plant

In general, cleanliness and drainage was found acceptable except in one case.

Physical parameters of colour, odour, taste, pH, Chloride and hardness

These parameters are sometimes classified as Secondary Drinking Water Standards because they affect the aesthetic quality of the water but do not normally pose a health threat. The evaluation is presented below:

Parameters	Number of systems with bad quality
Colour	1
Unpleasant odour from iron/hydrogen sulphide	7
Unpleasant taste	1
pH	3
Cl	1

Colour can be removed by filtration. Unpleasant odour from iron/hydrogen sulphide can be removed by aeration if applied and properly managed.

Chemical parameters of iron and manganese

These parameters are not thought to have an adverse effect on health in quantities that make it aesthetically acceptable in drinking water. However, Fe and Mn needs to be kept within acceptable limits²⁶ in order to prevent users from reverting to their traditional water source. The findings indicate that 5 systems, or 35% of the systems evaluated have combined Fe and Mn equal to or above the "maximum acceptable" WHO guidelines.

Coliform bacteria content

A coliform test is a reliable indicator of possible faecal contamination and the presence of E-coli bacteria. The intrusion of E-coli can be caused by unprotected water source and thus

²⁶ WHO guidelines recommends a "maximum acceptable quantity" of combined total concentration of Fe and Mn to 0.30 mg/l.

exposed for contamination from human and animal activity. Other causes might be leakage/intrusion of contaminated water in the supply system which can related to bad O&M or insufficient injection of chlorine which might be cause by improper plant management.

- Total coliform bacteria were found in 7 systems equal to 50% of the systems surveyed;
- Faecal coliform bacteria were found in 6 systems equal to 42% of the systems surveyed.

The high number of systems with coliform bacteria was found in those systems, which use surface water as source. However, smaller quantities were also found in 4 systems using ground water source.

The frequent occurrence of coliform bacteria as well as reduced water quality due to high content of physical and chemical parameters indicates that O&M is not functioning properly in many of the established water supply systems. A major problem connected to this is the lack of monitoring of water quality at intake, after purification and at end-user level. Without proper monitoring these quality parameters are difficult to obtain and thereby to take proper action for improving production quality and O&M routines.

More visible evidence on the need for more emphasis on improving O&M can be found in terms of:

- Lack of fencing and clearing of water source;
- Many places pipelines are found uncovered and exposed to damage from people and animals;
- Water leaking from reservoirs and pipe-joint.

Conclusion

In terms of the physical facilities concerned, there is a need for improved skills and procedures connected to O&M. The training of operators are in most cases not initiated until construction has been completed. Experience also shows that training sometimes only conducted randomly and a long time after the plants systems are completed. Very seldom the operators have been participating in the construction of the plant and pipe system and therefore do not have the fully understanding of the production process and related O&M requirements.

7.9 Overall Management of Water Supply Systems and the Role of PC

Overall management is confined to the owner of the water supply system e.g. the Commune PC. This function includes among other things to decide on people's contribution during construction and water fees to cover O&M costs. Meter reading and fee collection is considered to be part of the O&M organisation and not addressed here.

It occurs that financial skills in terms of calculation of costs and fees at Commune PC level in many cases is in great demand. Very often water fees are based on consensus among the users or what is applied in other communes rather than the actual costs of O&M. In some of the communes visited, fees collected did only cover the salary of the operator and not other O&M cost like electricity. Depreciation/renewal funds had not been introduced in any of the communes visited. In case of breakdown funds for new parts is likely to be taken from the PC budget if possible. In cases where costs are too high or funds not available, the part will most likely not be replaced unless donated from other source. In this case the chances of reduced production or complete halt will be overwhelming.

An other issue is the PC ability to attract more household connections. In those communes visited, no campaigning was done to increase house connections and thereby improving the financial sustainability of the system. Increasing the number of customers will also benefit the customer by dividing the recurrent O&M cost on more users and thereby the possibility of reducing water fees.

Other issues related to overall management is monitor O&M including water quality and provide guidance and assistance according to need. If the PC can not provide assistance in specific cases, external assistance is to be called upon.

7.10 Overall O&M Support

CERWASS is to provide services such as support to community planning/feasibility study, design, and supply of materials and equipment. Training is also provided for O&M staffs of the water supply system, including tariff calculation and fee collection methods. This training is often conducted in connection with the handing over procedures.

It is the impression that a very supply-driven approach is applied in many of the projects. Very often it seems that the commune people tend to be told what to do instead of asked what they want. Focus seems also to be more towards technical matters of O&M than the financial

and managerial issues of O&M. This may in the long run jeopardise the sustainability of a water supply system.

UNIFEC (and other agencies) restrict itself to financing and overall guidance. In some cases training is provided within different aspects of community management. These sessions are generally not tailor-made to meet specific project needs, but often conducted for wider target groups. Different unions offered training-of-trainer courses by UNICEF often do facilitation/training at commune level.

Construction/drilling is done either by the users themselves or by private or state companies.

Continuing O&M support is to be provided by provincial CERWASS. This is, however, not done in a structured way. In many cases it seems that after construction has been completed to the CPC (and the communes) are more or less left on their own to operate and maintain the facilities after a short and hand-over procedure.

Access to spare parts is in most cases not too difficult (if funds are available) if Vietnamese standards or equipment is used and can be found locally.

7.11 Overall Support to Health Education and Environmental Sanitation

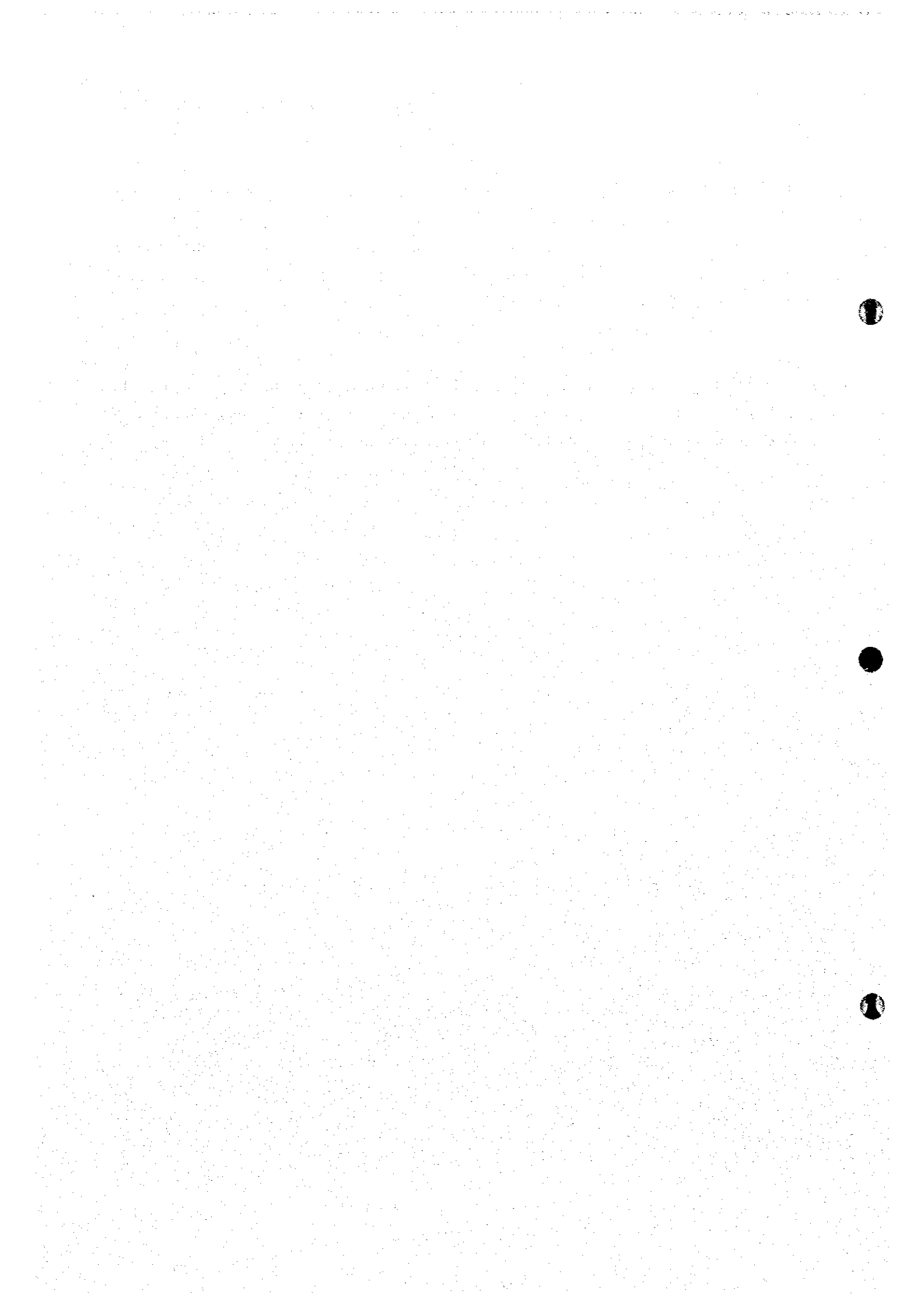
There is a sharp division of responsibilities regarding water supply and health issues. Rural water supply falls under MARD under which CERWASS is the implementing agency. Almost no focus or resources are directed towards health issues by organisations under this umbrella as health issues falls under MOH. Department of Health is implementing agency at province level. Responsibilities and executing function are delegated to District - and Commune Health Centres. These centres are the main providers of health education at commune level. They are also responsible for monitoring water quality and inform the communes about health risks connected to the use of un-boiled surface water for drinking purposes.

Other parties also often involved in health education are:

- MOET/Department of Education applying health education in their curricula;
- Women's Union and other mass organisations, which often administrate revolving funds for sanitation and are applying community IEC campaigns in connection with specific project.

In UNICEF sponsored water supply project, aspects of environmental sanitation are to be included to address health issues at commune level. However, the ability to implement this is often limited as a high priority is put on physical construction. This restricts the resources available for health education and environmental sanitation. Women's Union and other mass organisations are in most cases to do this but limited funds or lack of access to proper training facilities are often hampering the effectiveness of health campaigns.

Very often the Commune Health Centres are left to inform the commune people about health risks related to the use of unsafe water. It is the impression, however, that this is mostly done in connection with epidemic outbreaks and not as a preventive measure.



CHAPTER 8 Recommendations Related to O&M

8.1 Lessons Learned

Providing safe water is the major focus of water and sanitation projects, but installing the water system is only part of the job. Operation and maintenance (O&M) of the water (and sanitation) system is equally important.

Past world experience in general and from Vietnam in particular shows that water supply and sanitation facilities provided directly by government or donor institutions without the active participation of the end user are often not properly operated and maintained, and hence unsustainable. This arises from a variety of factors, including technological inappropriateness, incorrect location, lack of social acceptability and lack of affordability and willingness to pay for the services provided. Taken together these factors lead to lack of commitment to operation and maintenance of the facilities.

Against this background, there is ample evidence to show that most communities have both the willingness and capacity to contribute substantially to the planning, funding (in cash and in kind), implementation, and operation and maintenance of water supply facilities (and sanitation services). In most cases this has been achieved by applying a policy of community ownership, control and management of water and sanitation services. It is important to note that ownership in this context refers to more than just the legal status of any facility, but also to sense of ownership developed through genuine participation in planning and investing in facilities to respond to real needs.

In order to reach this sense of ownership a process of behavioural change must be initiated as a central aspect of community development and integrated into the project implementation activities. Behavioural change can be reached through information campaigns, training, and self-experience.

The initial steps of this approach have already been applied in this JICA study. However, a full-flare adoption of this approach can be applied only as part of the project implementation process. This concept paper outlines this approach in relation to project organisation and capacity building.

It must be noticed that installing a water supply and sanitation system is usually accomplished much quicker than organising a community. It is therefore important to schedule construction in such a way that the formation of a community based organisation to handle O&M is done

as part of the mobilisation phase and thus before any construction takes place. It is recommended that at least four months are used for community mobilisation and capacity building before the water supply system appears in its operating conditions.

8.2 Recommendations on Mobilisation

A community's fully acceptance and understanding of the costs and benefits a piped water supply system will give them can only be achieved if the idea is fully supported by the central and local government. The adoption of the NRWSS Strategy recognises the Government's acceptance of a need- and community based water and sanitation strategy where the beneficiaries pay for the cost of service.

The mode of centralised planning adapted in the Vietnam's political and administrative systems has, however, introduced a top-down planning approach and decision making structure. Lessons learned from other projects in Vietnam indicates that very often the community people are involved in the decision making process at a stage when the main decisions already have been taken. Although local-level management, executed through the Commune People's Committee, is often a forum for powerful and influential community members, decisions affecting local people are often taken at higher political and administrative level.

The initial steps towards a more participatory approach is applied in this Study through community based surveys and discussions with local people as well as PC officials at commune, district and province level. Still, several basic changes in behaviour by a range of people and institutions will have to take place before local decision making fully reflects the needs of the communities. This is, however, a long process, which only can be counted for indirectly in this Study. It is recommended that a full-flagged participatory approach is applied as an integrated part of the project to be implemented based on this Study.

The main behavioural change must start with the people, particularly regarding their hygiene practices and the way they view their water and sanitation facilities. The underlying issue is how to change peoples' behaviour through information campaigns, training, and participation and self-experience in order to create sustainable and clean water supply systems.

In order to implement this approach the following guidelines should be followed:

- Effective information, education and communication (ICE) programmes will be started before detailed planning and construction of RWSS facilities in order to mobilise the community to participate and be able to take decisions. Focus will among other things be

on the link between clean water and improved health.

- A WATSAN Committee should be established. The members should be elected from the villages expected to receive water, CPC representatives, Commune Health Centre representatives and members from different unions. During mobilisation this committee will act as mediator between the commune people and the implementing agency (CERWASS). The committee will be responsible for sharing information with the commune people about the project and at the same time provide the implementing agency with information that can facilitate appropriate design of systems and facilities.

The WATSAN Committee can, if possible, be established as a sub-committee under the PC.

Based on this, users will be able to feel consulted and having more say on service level, technology and operational arrangements. This will facilitate more commitment towards O&M of facilities and at the same time a better understanding of the need for clean water in terms of improving health conditions.

8.3 Recommendations on the Use of Village Mobilisers

The extension agent is the pivotal figure in any water and sanitation project. Being the link between the Project and the commune/villages they play a critical role. The Vietnam Women's Union (VWU) (and some other mass-organisation) has already established extension agents called Village Mobilisers (VM) as part of their organisational set-up. Generally, there is one VM for every 15 - 20 households. The VM are used by VWU in connection with the implementation of different national IEC campaigns including establishing WATSAN committees in projects supported by UNICEF. It is recommended that the concept of VM should be adopted as the village extension agents.

The VM will play an important role mobilising the commune and prepare the commune people for active participation and appreciation of the water and sanitation project. The VM will interact directly with the villagers and will be responsible for implementing IEC campaigns in order to:

1. Inform them in more detail about the project;
2. Provide health education and enhance environmental awareness in co-operation with Commune Health Centre staff;

3. Facilitate the formation of WATSAN committees.

Normally, the Vietnam Women's Union applies house visits and village meetings as the common approach to village IEC. The VM in the forthcoming JICA project should apply the same approach.

8.4 Recommendations on the Selection of Appropriate Technology

The design of the water supply system should promote appropriate technologies, meaning that:

- spare parts should be locally available;
- the system is based on a well tested and know technology shown to be sustainable and acceptable by the users; and
- the system is environmental acceptable.

It is recommended to involve provincial CERWASS more in completing the detailed design in order to establish local design capacity. This should be supported by on-the-job training and special training courses for selected staff. This will foster improved design capabilities at province level as a better understanding of O&M procedures of the water supply system. It is envisaged that will facilitate more support to O&M after completion of construction.

8.5 Recommendations on Tendering and Organisation of Construction

Under supervision of Provincial CERWASS the WATSAN Committee will be responsible for selecting contractor and arrange for local participation in the construction of facilities. The committee will also monitoring and approve construction. Provincial CERWASS will support the work of the committee. It is expected that a CERWASS representative will be a committee member during the mobilisation and construction phase.

Provincial CERWASS will in principle have the same functions as to day, but final decisions are to be taken by the commune.

Procurement procedures will be organised in such a way that it will satisfy both Vietnamese

and JICA requirements.

It is expected that possible operators/caretakers will be selected as part of the mobilisation stage and participate in construction of the water supply facilities. The possible operators should be offered basic training in O&M of water supply facilities. A final test will be conducted to select the final candidates for the operator position. Final training will be performed during testing and running in of the system.

8.6 Recommendations on Organisation and Management of O&M

In order to secure proper O&M of facilities, an effective management organisation shall be formed as part of the detailed planning phase and before construction is initiated. This will be done by making the WATASAN Committee a permanent body responsible for the O&M of the water supply facility as well as facilitate awareness related to the use of clean water.

8.6.1 Commune People's Committee

Supporting the works of the VM, the CPC will organise communal meetings bringing representatives from the different target households together and establish communal consensus on the different topics addressed in the IEC e.g.:

- final project acceptance;
- willingness to pay for O&M;
- selecting members to the WATASAN committee

These meetings will be held at the end of each IEC component. Initially to the meeting the CPC has developed an agenda addressing the IEC topics facilitated by the Village Mobilisers. Selected members of the PTT and the Provincial JICA Coordinator will attend these meetings to clarify any issue as well as to monitor the effect of the IEC.

The PTT will also provide training for the Commune People's Committee (CPC) members in order for the CPC to be able to co-ordinate the community mobilisation and to secure that the objectives of the project is rightly understood and communicated to all involved parties.

This approach will allow for continuously feedback from the community to the project and vice versa, keeping the project staff, Village Mobilisers and CPC members in touch with community issues as they arise.

Once the WATSAN committee has been established it will gradually take over the coordinating responsibility for the project at commune level. This will reduce the direct involvement of the CPC in the project. It is, however, expected that the CPC Chairman will head the WATSAN committee and thus keeping a strong link to the CPC, which will have to approve all major decisions regarding the project at commune level.

As the water supply system will be organised under the CPC, using the WATSAN committee as the mediating link, the CPC will also have the overall responsibility for O&M. The day-to-day management will, however, be delegated to the WATSAN committee and executed by the CWSO.

8.6.2 Water & Sanitation Committee

AS indicated, the WATSAN Committee will provide overall management of the water supply system and should be established prior to the construction of the water supply system in order to feel a sense of ownership and commitment towards the project. During the whole project period the WATSAN committee should act as facilitating force and address issues that are vital for the completion of the project.

The concept of a Construction Management Board has already been introduced in connection with CERWASS/UNICEF water supply projects. It is therefore recommended that during construction the WATSAN Committee will, under close supervision by Provincial CERWASS²⁷, act as Construction Management Board ensuring that the contractor fulfils its obligations. This will consolidate the sense of community ownership and strengthen the commitment towards the project.

Under supervision of Provincial CERWASS the WATSAN Committee will be responsible for selecting contractor and arrange for local participation in the construction of facilities.

After handing over the water supply system to the CPC the WATSAN Committee will act as a management body responsible for monitoring O&M, decide on water tariffs approve new house connection etc. The WATSAN committee should also be able to advice CPC on health

²⁷ It is recommended that Provincial CERWASS become a member of WATSAN committee during the construction period, as it is the expert agency dealing with rural water supply as well as the national implementing agent. Provincial CERWASS will in principle have the same functions as to day, but final decisions/approvals are to be taken by the WATSAN committee.

issues related to water.

Prior to construction the responsibilities of the WATSAN committee will in more detail include:

- Participate in the management of the tendering for construction of the water supply facilities²⁸;
- Organise the commune contribution (labour or cash) to complete construction;
- Select commune people responsible for O&M of the water supply system and arrange for their training and participation in the construction of the system.
- Establish rules and regulations for water supply.

The WATSAN committee will monitor construction while Provincial CERWASS will perform site supervision and quality control. A special training programme will be developed to support the functions of the WATSAN committee during tendering and construction. The training will be provided by PTT.

After construction has completed the WATSAN committee will:

- Oversee the O&M of the water supply facilities including managing O&M funds and authorising expenditures for repairs;
- Monitor customer's satisfaction;
- Approve new connections;
- Monitor the financial stand of the water supply utility, and make regular reports to the CPC. The main functions will include:
 - Settle water tariff(s);
 - Enforce rules and regulations for water supply;

²⁸ The concept of a Construction Management Board has already been introduced in connection with CERWASS/UNICEF water supply projects. It is therefore recommended that the WATSAN committee take over this function. Under supervision of Provincial CERWASS the WATSAN Committee will be responsible for selecting contractor and arrange for local participation in the construction of facilities.

- Promote regular campaigns on water use and environmental sanitation by involving Village Mobilisers and commune and health centre staff;

8.6.3 The Commune Water Supply Organisation

A Commune Water Supply Organisation will be established to cater for the daily O&M of the water supply system. The organisational outline is based on the assumption that the numbers of consumers will gradually increase reaching full coverage (80%) 2010. The water supply system will be gravity system designed for 24 hours consumption with a 12 hours storage tank. It is therefore expected that extraction of groundwater and water treatment will be performed during daytime only, as sufficient water will be available from the storage tank for night consumption.

The Commune Water Supply Organisation (CWSO) will be established within the organisational framework of the CPC and under supervision of the WATSAN committee.

The day-to-day management of the CWSO will be done by an Administrator who will oversee the O&M functions performed by the Plant Operators. The Administrator will also take on accounting responsibilities as well as the management of water bills, and customer relations. Other related CWSO staff will be:

- Pump Operators/Pipeline Inspectors;
- Meter Readers/Fee Collectors²⁹ and
- Treatment Plant Operators.

People to fill these posts should be selected by the WATSAN committee and approved by the CPC. The selection should be completed before construction starts in order for their participation in the construction of the system. Combined with training in O&M procedures this will facilitate enhanced knowledge about O&M requirements and the layout of the piping system.

A description of the organisational set-up and main functions of the CWSO is presented in the

²⁹ It should be discussed and decided by the commune how selection of money should be arranged. One option is for the individual households to pay the water bill to the Administrator at the CWSO office. An other option is for the Meter Readers to collect the amount and hand the money over to the Administrator. In both cases receipts will be provided. Either way, the households should have confidence in the arrangement.

next chapter.



CHAPTER 9 Outline of Possible Water Supply Organisation

9.1 Introduction

This chapter addresses possible organisational structures that can be applied at commune level in order to operate and maintain the water supply facilities in a sustainable manner.

In order to make the recommended structure fully operational it is recommended that the capacity building measures outlined in Part III of this report are adopted. It is also recommended that a participatory approach is applied to the organisational process in order to get community acceptance and secure the commitment of the people attached to the commune water supply organisation.

In order to implement this approach the following guidelines should be followed:

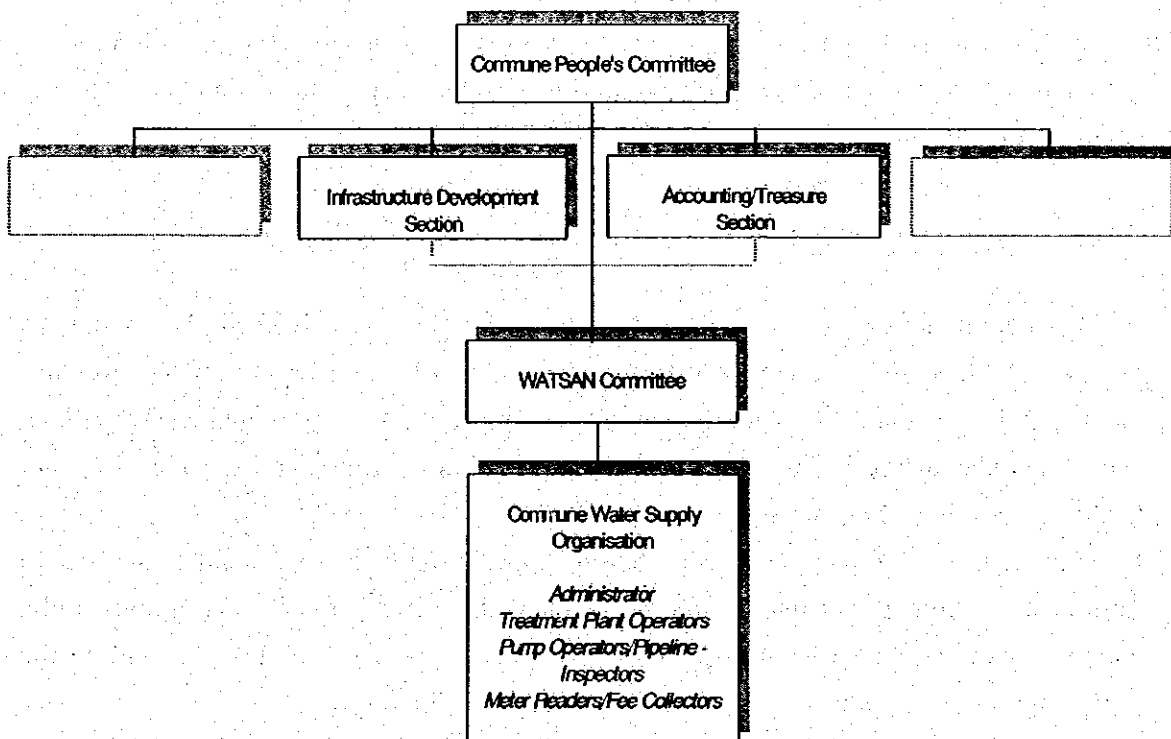
- In each commune a group of Village Mobilisers should be established. The Women's Union (WU) has already established this concept as part of their organisational structure and using this in connection with the UNICEF supported RWSS programme. The Village Mobilisers should receive training in ICE (information, communication education) and health issues related to water supply.
- Effective ICE programmes should start before construction of RWSS facilities in order to inform the commune people in more detailed about the project and mobilise the community to participate in construction activities. The Village Mobilisers should do the ICE with support from the project implementing agency/organisation.
- Special attention should be given to the Commune People's Committee during the mobilisation phase in order to get its approval and commitment to the project.
- A WATSAN Committee should be established as a result of the ICE programme. The members should be elected from the villages expected to receive water, CPC representatives, Commune Health Centre representatives and members from different unions. The commune people will decide upon the final composition of the WATSAN committee. Most likely the WATSAN Committee will be established as a sub-committee under the PC and overlooking the operation and maintenance of the water supply facilities e.g.: the Commune Water Supply Organisation. Each member of the WATSAN should receive specialised training in order to be able to fulfil his/her role and function.
- The day-to-day O&M functions of the water supply facilities will be done the Commune Water Supply Organisation specially trained for this purpose. It is recommended that the selected people for the Commune Water Organisation participate in the construction of the

water supply facilities as well as receive basic training in O&M before the facilities are completed. During the running-in period specialised training should be provided to each member of the Commune Water Supply Organisation.

9.2 Outline of Possible Organisational Structure

The proposed possible organisational structure is outlined below.

Diagram of Proposed Organisational Structure



The outline indicates that the organisation of the commune water supply system will be adapted to the present institutional framework of the Commune People's Committee. This will secure transparency of operations and accountability towards the public regarding the households' request for quantity and quality of water. At the same time it will empower the Commune Water Supply Organisation to enforce rules and regulations for applying house connections, the use of water and as well as the price of water as it becomes part of the official administrative system.

The Commune People's Committee will be the owner of the water supply system and accountable to the Commune People's Council regarding sustainable operation and maintenance of the facilities. This type of organisation will secure a check-and-balance

system, securing sustainable operation and maintenance for water supply facilities.

The organisation of the water supply system will be linked to the Commune People's Committee through a direct link to the Chairman of the CPC and will get support from the sections dealing with infrastructure development and financial management and accounting. This indicates that the operations and developments of the water supply system are confined to the perspective plans of the CPC in terms of developments of new residential areas and extension of the service area for water supply. Day-to-day relations should, however, be restricted to technical support and assistance from the Infrastructure Development Section and the Accounting/Treasurer's Section. Procedures for this should be established when drawing up the by-laws for the water supply organisation.

By the application of a WATSAN Committee it is expected that the Commune Water Supply Organisation will be able to operate relatively autonomous regarding its daily function. The WATSAN Committee will act as an overall management board and financial controller, representing the households as well as the CPC. The WATSAN Committee will be a standing body meeting monthly to review progress reports and financial records of the Commune Water Supply Organisation. It is expected that the Chairman of the CPC will be heading the WATSAN Committee indicating that the committee will report directly the Chairman of the CPC.

The Administrator, who reports to the WATSAN Committee at regular monthly intervals, will conduct the day-to-day management. The Administrator will have budget responsibilities as well as administrative responsibilities towards the utility staff and the consumers.

O&M functions will be confined to the staff allocated to the:

- Water intake/submerge pumps;
- Water treatment plant;
- Booster pump stations (according to needs);
- Pipelines (and household connections)

9.3 Description of Roles and Functions

Management and administration of the water supply production and distribution is a joint responsibility of:

- The **WATSAN Committee**, that has the superior policy and managerial responsibility, and

- The **Commune Water Supply Organisation**, where the daily management and administration is taking place, and supported by other sections such as the Accounting Section and the Infrastructure Development Section of the CPC.

The following roles and functions described below relate to the WATSAN Committee and the Commune Water Supply Organisation.

9.3.1 The WATSAN Committee

The Water Supply and Sanitation Committees (WATSAN) will have responsibility for the water supply activities in the selected target communes. It will also play a central role in promoting general information on sanitation and health risks related to waterborne sicknesses. The main responsibility will, however, be related to sustainable water supply.

The main roles and functions of the WATSAN Committee will be:

A) During Project Implementation:

- 1) Approve the site selection of public stand-posts and secure procurement of land for the deep wells, overhead tanks, treatment plant etc.
- 2) Inform and motivate the public to use and maintain water and sanitation facilities in a proper manner.
- 3) Formulate and approve a set of by-laws including how to settle tariffs for the operation and maintenance of a piped water supply system in the commune and revise the by-laws when necessary.
- 4) Participate in the Construction Management Board³⁰;
- 5) Participate Organise the commune contribution (labour or cash) to complete construction;

³⁰ The concept of a Construction Management Board has already been introduced in connection with CERWASS/UNICEF water supply projects. It is therefore recommended that during construction the WATSAN Committee will, under close supervision by Provincial CERWASS, act as Construction Management Board ensuring that the contractor fulfils its obligations. This will consolidate the sense of community ownership and strengthen the commitment towards the project.

6) Select commune people to be responsible for O&M of the water supply system and arrange for their training and participation in the construction of the system.

B) During Operation:

7) The WATSAN Committee approves the management policy, tariffs and budgets, and supervises as well as monitors the Commune Water Supply Organisation's operations. Within the guidelines given by the WATSAN Committee, the Administrator of the Commune Water Supply Organisation will be responsible for day to day operations.

8) Approve new household connections.

9) Establish production and service targets and monitor and evaluate production performance and household's service satisfaction.

10) Monitor O&M and ensure that the staff of the Commune Water Supply Organisation carries out their duties effectively regarding the operation and maintenance of the piped water system and the public taps.

11) Ensure that the required payment is made for water and that defaulters have their taps disconnected and punished.

12) Ensure that a separate bank account is maintained for O&M activities, that all water revenue is put into the account, and that the account is used only for the operation and maintenance of water supply.

13) Make regular reports to the CPC on the financial positions of the water works, new connections and development plans as well as any problems to be addressed to secure sustainable O&M.

14) Promote regular campaigns on water use and environmental sanitation by involving Village Mobilisers and Commune and Health Centre staff.

9.3.2 The Commune Water Supply Organisation

Main O&M Conditions

A Commune Water Supply Organisation will be established to cater for the daily O&M of the water supply system.

The Commune Water Supply Organisation (CWSO) will be established within the

organisational framework of the CPC and under supervision of the WATSAN committee. Functions of the Commune Water Supply Organisation are characterised by two important flows:

- flow of water from the source to the consumer, and
- flow of money from the consumer to the Commune Water Supply Organisation.

The flow of water from the source to the consumer can be subdivided into a number of stages:

- raw water pumping;
- treatment;
- transmission / storage
- distribution;
- consumption.

To obtain a flow of money from the consumer to the Commune Water Supply Organisation:

- water production and use must be recorded;
- water bills must be prepared;
- revenues must be collected.

A management information system should therefore be elaborated as part of the detailed design process taking in order to monitor and manage the different flows. The information system should be elaborated in a manual and data should be recorded in a logbook for regular analysis and reporting. In this way the Management Information System should support the WATSAN Committee and the Water Supply Section in:

- taking decisions on the water supply activities
- improving the performance aiming at achieving sustainability i.e. to run the Commune Water Supply Organisation on financial sustainable grounds.

Operation and maintenance activities are involved in all the mentioned stages and task can be divided into **technical tasks** and **non-technical tasks**. The tasks can be categorised into three groups:

- Routine tasks (like daily administration and operation and preventive maintenance;
- Periodic tasks (like administrative reporting, billing and fee collection and larger maintenance tasks including overhauling pumps etc.)
- Occasional tasks (like major repairs or changing of equipment)

Maintenance can be defined as "work undertaken in order to keep, restore, or improve every facility, its services and surroundings to a currently acceptable standard, and to sustain the utility and value of the facility". Maintenance a planned activity which has to be incorporated into the manpower planning. Maintenance should be carried out on a preventive basis, with specific time cycles allocated for each particular task. The O&M tasks are to be distributed to the different categories of staff, and performance should be monitored by the Administrator according to task schedules and target figures.

Organisational Set-up

The day-to-day management of the CWSO will be done by an Administrator who will oversee the O&M functions performed by the Plant Operators. The Administrator will also take on accounting responsibilities as well as the management of water bills, and customer relations.

Other related CWSO staff will be:

- Treatment Plant Operators
- Pump Operators/Pipeline Inspectors;
- Meter Readers/Fee Collectors³¹

People to fill these posts should be selected by the WATSAN committee and approved by the CPC. The selection should be completed before construction starts in order for their participation in the construction of the system. Combined with training in O&M procedures this will facilitate enhanced knowledge about O&M requirements and the layout of the piping

The Administrator

³¹ It should be discussed and decided by the commune how selection of money should be arranged. One option is for the individual households to pay the water bill to the Administrator at the CWSO office. An other option is for the Meter Readers to collect the amount and hand the money over to the Administrator. In both cases receipts will be provided. Either way, the households should have confidence in the arrangement.

In an organisation or enterprise, like the Commune Water Supply Organisation, different people carry out different tasks, but their activities are interdependent. Effective results can therefore only be achieved through combined efforts. It is the task of the management, i.e. the WATSAN Committee and the Administrator, to co-ordinate the efforts of the staff, so each of the employees do their best in the organisation.

The main functions of management of the Administrator will be to:

- plan;
- instruct/delegate
- co-ordinate;
- motivate;
- supervise; and
- control

The Administrator, as Head of the Commune Water Supply Organisation should have power to elaborate and implement plans, to procure materials, to employ staff on master role basis, and to administer a limited amount of the Commune Water Supply Organisation's funds.

The Administrator will be accountable to the WATSAN Committee for all his actions. These actions are based on targets to be reached and it is the Administrator's role to secure that the Commune Water supply Organisation reaches these targets.

The Administrator is the over all responsible for of the entire Commune Water Supply Organisation and his main tasks related to operation and maintenance will include:

- Overall management of the water works, including staff.
- Administer the entire system as per guidelines, by-law etc.
- Ensure overall maintenance of the treatment plant, water tower, sludge tank, administration building, tools, spare parts etc.
- Elaborate the daily, weekly and monthly work schedules for the pump operators/pipeline inspectors and the plant operators.
- Instruct and advise the pump drivers, the plant operators and the plumber about their respective job tasks and ensure continuous quality.
- Monitor and supervise the work of O&M staff and take necessary steps in consultation with the WATSAN Committee.
- Calculate the amount of chlorine for the appropriate daily dosing the solution.
- Do stock management.
- Test the water quality.
- Overall responsible for all entering of data in the relevant registration forms, logbooks etc.

- Collection and calculation of the data for the Management Information System and ensure that these data are properly filed.
- Responsible for safe and proper storing and use of all spare parts and tools.
- Ensure 24 hours water supply and accordingly take the appropriate steps when necessary.
- Contact mechanic and / or electrician, workshop etc. as and when required.
- Periodically visit the distribution lines and other structures in the system, house connections and communal taps. and assess the need for maintenance and repairs as well as make sure that the necessary steps are taken.
- If a section of or the entire water supply system will be closed for major repairs, cleaning, disinfection etc. the Administrator shall be responsible for informing the consumers through appropriate means (leaflets, microphones etc.) that they shall store sufficient water for a limited period of time.
- Calculate household water consumption, issue water bills and collect water fees;
- Keep financial records/accounts and maintaining bank account or some other means of safety holding money (hand over money to PC treasurer/accountant)
- Perform banking functions, pay bills and arrange staff salary payments.
- Make monthly and quarterly financial reports to the WATSAN Committee.

Treatment Plant Operator

O&M of Wells

Operation and maintenance of wells is a part of the maintenance for pumps. Preventive maintenance shall be made in accordance with a defined checklist based on the Maintenance Manual. Motor and pump should be operated and maintained according to supplier's specification. To prevent pump damage preventive maintenance should be carried out involving greasing the motor.

O&M of Pumps

The operation procedures of the water treatment plant must be clearly specified in the O&M Manuals for Plant Operation and be prepared by the contractor. The following outline is only preliminary, but highlights some of the issues to pay attention to when planning manpower allocation to the plant.

The Plant Operator(s)³² shall operate all the valves and the High Lift Pumps for filtration and back washing. They will further performing the chlorination according to specified instructions by the Administrator.

³² The number will be specified in the next Chapter – Workforce Planning.

The operating of the division chamber, the aerators (if fitted) and the filters can be arranged in collaboration with the Pump Operators. The operation procedures of the water intake should be described in the O&M Manual.

O&M of Valves and Piping System

The valves and piping system requires very little maintenance in general if the water is not too aggressive leading to corrosion of pipes and valves. If problems arise leaking glands around the spindle of the sluice valves or leaking pipes usually causes them. Regular inspection should therefore be applied to detect any leakage. The instructions for maintenance of valves and piping should be specified in the Maintenance Handbook.

O&M of Filter

Before back washing a filter it shall be ensured that the sludge tank is emptied to the minimum water level. Special attention shall be paid to the visual control of the filter surface at the end of the back wash period. The water above the filter sand must be completely clean over the total filter area. The backwash procedures should be described in the O&M Manual.

If any part of the filter surface is not visible the Administrator shall be called for assistance, which will contact CERWASS if needed. As soon as possible the back washing procedures for the actual filter must be repeated. The Water Treatment Plant Operators must keep in mind that the efficiency of the back washing shall be checked after end of cleaning.

The maintenance of the filters is mainly done through the back-washing process although the filter sand needs renewing from time to time. Back-washing of the filters requires more attention than just operating certain valves; the time during which the valves are opened or closed and the rate of operation are important. It is therefore important that emphasis is put on the establishing a comprehensive understanding by the operators regarding the technology of the filter as well as the proper maintenance measures to be applied. This should be clearly described in the Maintenance Manual.

The sludge tank serves as a temporary buffer for the backwash water. To secure that the sludge has settled on the bottom of the sludge tank, the sludge tank should be emptied 6 - 8 hours after each backwash. On the bottom of the sludge tank and in the discharge pipe a sediment layer can be formed. Once every the two year the sludge tank should be checked on leakage

O&M of the Chlorination Unit

The main aspects of operating the dosing equipment and the chlorination unit must be clearly explained in the Operating Manual for the Chlorination Unit. Only trained personnel should have access to the Chlorination Unit.

The adjustment of the dosing capacity should be done when the Deep Tube Wells are delivering water through the filters to the clear water tank. The calculation of the amount of chlorine shall taken into account the maximum residual amount of chlorine at end tap. The Administrator shall make sure that the right quantity is applied.

O&M of the High Lift Pumps

The main point of attention when operating the High Lift Pumps is the restarting after power cuts and when the maximum water alarm has been activated. The operation of the High Lift Pumps should be described in the O&M Manual.

Before starting the High Lift Pumps it shall be ensured that there is no air in the pump. The Operator must check the manually operated air release valve to ensure this.

O&M of Overhead Tank

Once every two years the clear water reservoirs and the Overhead Tank need a complete inspection and cleaning. Two reservoirs is to be constructed and in the case of cleaning the Clear Water Reservoir and/or the Overhead Tank the provision of water to the consumers will not be halted.

Pump Operator

The operation and maintenance procedures of the deep well pump should be described in the O&M Manual for the Deep Well Pump. In order to operate and maintain the pump properly the Pump Operators must be familiar with all pump installations and the working conditions and O&M requirements. The O&M requirements must be specified by the contractor. The contractor should also provide O&M training as part of the contract.

The main tasks for the pump operators include all the functions related to the operation and maintenance of the Deep Well and the installed pump and will include:

- Daily inspection of raw water pump operation and lubrication of movable parts;
- Daily monitoring and recording volume of water extracted, power consumption and pumping pressure;

- Daily control of facilities and protection of source from contamination/infiltration of pollutants ;
- According to conditions of well cleaning submerge pump/filter (manually and by back-washing or gravity) annually.

Motor and pump should be maintained according to supplier's specification. To prevent pump damage preventive maintenance should be carried out involving greasing the motor. The supplier of equipment must provide detailed specifications on maintenance. This shall be recorded in the Maintenance Handbook.

The Pump Operators shall further assist the Treatment Plant Operator in the O&M of the treatment plant as well as the plumber in his daily work in the distribution lines and house connections as required.

The maintenance of the water intake and the filters are some of the routines to be carried out by the Water Treatment Plant Operators if the well is located close to the treatment plant.

Pipeline Inspector

The water supply system is designed to supply the customers with clean water 24 hours per day and therefore the conditions of the pipes and fittings should be optimal to function all the time.

For this reason a Pipeline Inspector must regularly supervise the entire system and any irregularities must be observed. If damages or leakages are observed, repair should take place immediately.

The post of the Pipeline Inspector can be combined with the one of the Pump Operator if the local conditions allow it. The person should most likely be a plumber of profession and shall be responsible for installation and supervision of new house connections when a consumer applies for an installation and the connection fee has been paid.

The pipelines require only little maintenance but all the lines must frequently be checked for leakages or corrosion. If leakages are identified the necessary repair should be carried out immediately.

Experiences from water distribution systems indicate that the house connections are elements,

to which most attention should be paid. Leakages very often occur in the connection clamps between the main pipe and service line for the house connection. In the management plan for the distribution system, a systematic inspection of the house connections must be introduced.

The Pipeline Inspector must also pay attention to the condition of the Public Tap posts. They are in use many hours a day and therefore the risks of damages on the taps are great. It is recommended that each public tap have a Care Taker living close to the stand post looking after the tap and call the Pipeline Inspector in case of leakage or when there is a need for repair.

The main functions of the Pipeline Inspector includes:

- Identify and minimise any loss of water from the distribution system by careful monitoring the daily water consumption. Register any abnormal increase of the amount of water delivered from the treatment plant;
- Ensure that the visible pipes are not damaged by overload from the traffic, by erosion of the traces for the pipes or by corrosion of the metal pipes (GI and MS);
- Ensure that the crossings of culverts and bridges are not weakened by corrosion or damaged by traffic or vandalism;
- Check the clamps periodically and replace if ruined by weather or by other means.
- Make sure that air release valves (manually operated) at bridge crossings are properly functioning
- Make sure that all the sluice valve installations are in proper conditions and the sluice valve chambers are without any damages;
- Make sure that House Connections are in good condition and without any leakages.
- Installation of new house connections and re-connections;
- Disconnection of lines in case of lack of household payments;
- Repair of leakage and defects in pipelines, sluice valves, house connection clamps, joints etc.;

- Replacement and rehabilitation of house connections, pipelines and fittings;
- Water quality testing;
- Measuring line pressure and discharge of water at selected points;
- Make sure that the necessary parts for installations are available on the stock.

Meter Reader/Fee Collectors

Different option exists regarding the organisation of payment of water fees and it will be finally decided by the communes which system to be applied. In any case, a person, or several persons – depending on local conditions – will be needed for reading the water meters at the end of each month in order to calculate household consumption.

It is expected that meter reading will be performed as a part-time job by a trusted person selected in each village. The total number will therefore be depending on the number of village connected as well as the number of households in each village.

Depending on the local condition and the skills of the Meter Reader the following options for calculation and collection of fees might exist:

1. The Meter Reader reads the water meter and calculates the fees at the spot and present the water bill to the household for payment immediately (will depend that at least one adult person are home at that time). The Meter Reader hands over the amount to the Administrator who deposits the collected fees in a bank for safekeeping.
2. The Meter Reader reads the water meter and calculates the fees at the spot and leave the bill at a specific place (post box) for the household to collect (does not need the presence of any adult person at the time of the visit). A household representative takes the bill to the office of the Administrator and pays the bill. The Administrator deposits the collected fees in a bank for safekeeping.
3. The Meter Reader only reads the water meter and the Administrator calculates the fees. The bill can then either be presented to the household at the next months meter reading by the Meter Reader or a household representative approach the office of the Administrator and pay the bill. The Administrator deposits the collected fees in a bank for safekeeping.

The main functions of the Meter Reader/Fee Collector will depend on the selected option presented above, but will at least include:

- Control the functioning of meter and that the seal is not broken;
- Read the meter and record consumption;
- Take note of any comments made by the households regarding service delivery in a Meter Reader's Logbook and report to the Administrator on the issues;
- In case of option 1) calculate consumption and water bill and hand it over to household representative for collection of payment;
- In case of option 2) read the water meter and calculate the fee at the spot and leave the bill at a specific place (post box) for the household to collect and pay at the Administrator's office;
- In case of option 3) read the water meter and hand over the recorded figures to the Administrator.

