CHAPTER 3

MANAGERIAL APPROACH AND FINANCIAL ANALYSIS

CHAPTER 3 MANAGERIAL APPROACH AND FINANCIAL ANALYSIS

3.1 Possible Organisational Structure

3.1.1 Outline of Possible Organisational Structure

The proposed possible organisational structure is outlined below.

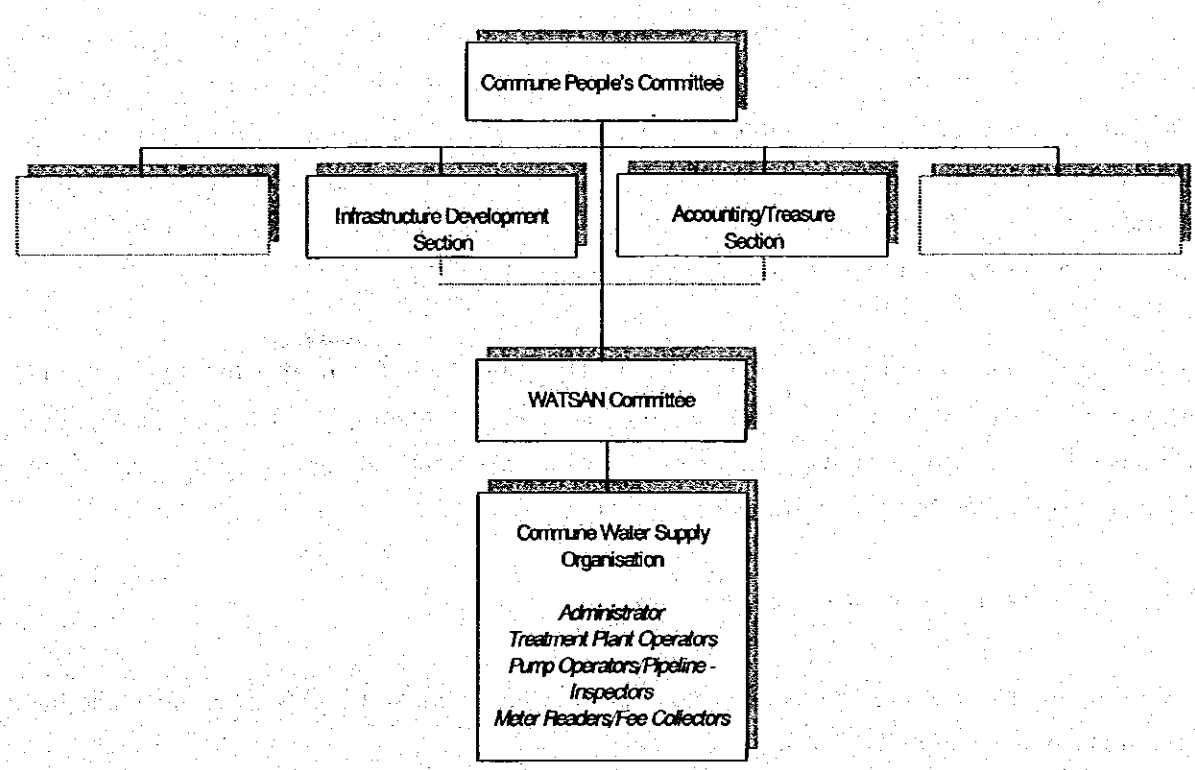


Figure 3.1 Diagram of Proposed Organisational Structure

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 (CPC). 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 (CWSO) 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 CPC 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 CPC 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.

By the application of a WATSAN (Water Supply and Sanitation) Committee it is expected that the CWSO 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 CWSO. 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.

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 CWSO, where the daily management and administration is taking place, and supported by other sections of the CPC.

3.1.2 Description of Roles and Functions

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

(1) The WATSAN Committee

The WATSAN Committee 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:

1) 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 Board[1];

(5) Participate and organise the commune contribution (labor or cash) to complete construction;

(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.

2) During Operation:

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

(2) Approve new household connections.

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

(4) Monitor O&M and ensure that the staff of the CWSO carries out their duties effectively regarding the operation and maintenance of the piped water system and the public taps.

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

(6) 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.

(7) 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.

[1] 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.

(8) Promote regular campaigns on water use and environmental sanitation by involving Village Mobilisers and Commune and Health Center staff.

(2) The Commune Water Supply Organisation (CWSO)

Main O&M Conditions

A Commune Water Supply Organisation will be established to cater for the daily O&M of the water supply system. Functions of the CWSO are characterised by two important flows:

- **flow of water** from the source to the consumer
- **flow of money** from the consumer to the CWSO.

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 CWSO:

- 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 CWSO in:

- taking decisions on the water supply activities
- improving the performance aiming at achieving sustainability i.e. to run the CWSO 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)

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 Collectors[2]

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.

Basic Skills and Experiences Required

To perform both the technical and non-technical tasks of the staff of the Commune Water Supply Section should be equipped with the following skills basic skills:

[2] 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.

General:

- read, write and basic communication skills
- simple mathematics
- keep records and books
- ride bicycle (or motorbike for some positions, as e.g. the Administrator)

Technical:

- operate each system element
- repair the system elements
- repair leakage in the pipelines
- replace components,
- install new pipes with joints including couplers, clamps, fittings, etc.
- repair electrical faults

Non technical:

- calculate dues and write bills
- entry into books of accounts
- understand and maintain books of accounts
- understand double entry accounting
- understand manual labor
- have communication skills
- be able to provide support services to other staff
- be able to perform good customer relations

It is recommended that general training is initiated during the construction period while specific training is conducted as part of the running-in phase.

3.2 Workforce Planning

3.2.1 The WATSAN Committee

The WATSAN Committee constellation is expected to be more or less the same in each commune. The number of members should not be more than ten to fifteen[3] in order to make effective decisions and facilitate the ability of members to meet. Each member should have deputy representative, which will attend committee meetings in case of absence of the

[3] Will depend on the number of villages in each commune.

representative. It is expected that the following members will attend the committee:

- The Chairman of the Commune People's Committee (Head of the committee);
- The Chairman of the Commune People's Council (Deputy Head of the committee)
- Village Heads and one elected member from each village;
- Commune Health Center representative;
- Union representatives.

3.2.2 The Commune Water Supply Organisation (CWSO)

Workforce planning of the Commune Water Supply Organisation relates to technical design of the water supply facilities in each selected target commune. The technology of the treatment plant will differ depending on the content of iron and manganese, which can be reduced by aeration or oxidisation by inducing chlorine.

The water distribution supply technology will depend on the terrain and can be classified into two types eg. the gravity flow type, and the pump boosting type. Often these two types are combined. In the case of the selected target communes reservoirs are adapted either as an elevation water tank providing water through gravity flow or as ground water tank using booster pumps to keep up the water pressure.

The technological options can be combined in different ways and thus required different set of O&M skills. The staffing pattern for the plant will, however, be the same for all option. Variations can occur, depending on the distance between the treatment plan and the deep wells and if there is a need to boost the water pressure further down the piping system. In these cases extra manpower might be needed to manage these pumps. This will needs to be decided on case to case basis at the time of project implementation.

The development of the consumption pattern over time and operating hours for each communal water supply system is presented overleaf.

Table 3.2.1 The development of the Consumption Pattern over time and Operating Hours for each communal water supply system

Province	Commune	Production (m3/day)			Operation (hours)		
		2002	2005	2010	2002	2005	2010
		Maximum Daily Distri-bution	Maximum Daily Distri-bution	Maximum Daily Distri-bution	Operating hours	Operating hours	Operating hours
Thai Nguyen	Hoa Thuong	450	780	1.010	11	19	24
	Dong Bam	340	610	860	9	17	24
	Thinh Duc	300	530	690	10	18	24
	Nam Tien	390	720	1.010	9	17	24
	Sub total	1.500	2.630	3.580	10	18	24
Ha Noi	Dong Ngac	470	840	1.200	9	17	24
	Xuan Dinh	1.070	1.920	2.710	9	17	24
	Sub total	1.540	2.770	3.900	9	17	24
Ninh Binh	Dong Phong	650	1.170	1.610	10	17	24
	Quang Son	490	880	1.240	9	17	24
	Yen Thang	550	1.000	1.400	9	17	24
	Sub total	1.700	3.050	4.230	10	17	24
Thanh Hoa	Vinh Loc Town	450	730	1.030	10	17	24
	Vinh Thanh	390	730	1.010	9	17	24
	Dinh Tuong	430	800	1.090	9	18	24
	Thie Hung	450	820	1.130	10	17	24
	Thieu Do	460	860	1.170	9	18	24
	Nong Cong Town	470	800	1.090	10	18	24
	Van Thang	450	810	1.130	10	17	24
	Sub total	3.090	5.510	7.670	10	17	24
Ha Tinh	Yen Ho	350	630	900	9	17	24
	Trung Le	220	420	630	8	16	24
	Bui Xa	280	530	780	9	16	24
	Duc Yen	260	450	700	9	15	24
	Sub total	1.130	2.040	3.020	9	16	24
Total		8.960	16.000	22.410	10	17	24

The diagram indicates that average operational time in year 2002 is 9 hours. In year 2005 operational hours has increased to 17 hours due to increased consumption by the consumers and by year 2010 the water supply system is providing full operational capacity.

The three scenarios indicate that the consumption pattern will develop progressively according to the households' increased appreciation of access to taped water. In order to meet the production demand of the need-based consumption pattern, operation hours of the water supply facilities will need to increase respectively. The three scenarios are adapted to the

outlined organisation of a CWSO presented in Chapter 3.1. Applying normal Vietnamese working hours (8 hours per shift and 5 working days per week) the following workforce plan for the three scenarios occurs in Table 3.2.2.

Table 3.2.2 Workforce Plan for Commune Water Supply Organisations

Manpower Category	Year 2002		Year 2005		Year 2010	
	Number		Number		Number	
	Weekdays	Weekends	Weekdays	Weekends	Weekdays	Weekends
Administrator	1		1		1	
Treatment Plant Operator	1	1	2	2	3	3
Pump Operator/ Pipeline Inspector	1	1	2	2	3	3
Meter Reader/Fee Collector	8*)		8*)		8*)	
Total **)	11		13		15	

**) According to average number of villages. Only part-time - one week per month.*
***) Part-time Meter Reader/Fee Collector converted into full-time staff.*

While the Administrator and Meter Readers/Fee Collector will attend 5 working days per week, the treatment plant and pumps (submerge and booster pumps) will need attention 7 days a week during plant operation. In cases where an elevated tank is replaced by booster pump or applied in combination with an elevated tank, the pumps then needs 24 hours attention. This needs to be specified as part of the detailed design for each commune. The present manpower plan is therefore tentative only, as variations can occur due to the typographic situation of each commune. For each Commune Water Supply Organisation the Administrator should elaborate a detailed rolling manpower shift plan. This might reduce the number of staff, as weekend staff also will take part in shifts during weekdays. The manpower allocations in Table 3.2.2. is therefore indicative for budget purposes only.

The scenario for year 2002 indicates that production (treatment of water) is only necessary during daytime, as storage tanks will be sufficient to cover evening and night consumption. Dayshift only is therefore sufficient. In year 2005 the demand has increased the production to such an extent that two shifts are needed for the plant. Full production is expected to take place in 2010, demanding 24 hours operation and maintenance.

3.2.3 Tentative Manpower Costs

Based on figures collected during fieldtrips the following tentative salary structure occurs:

- Administrators are expected to receive a monthly salary equal to Commune PC staff

which is excepted to be VND 500.000 per month.

- Pump Operators/Pipeline Inspectors and Treatment Plant Operators are expected a monthly salary between VND 200.000 to 400.000 per month. For budget purposes VND 400.000 per month is applied.
- Meter readers will be paid on provisional basis, but guaranteed a minimum salary of VND 100.000 per month.
- It is recommended that the WATSAN committee members receive meeting allowances to compensate reduced income during meeting session as well as to provide incentives to attend meetings. An estimate of VND 50.000 per person per month is applied equal to VND 500.000 per month if the WATSAN Committee includes 10 members.

The following cost estimate occurs based on the three scenarios in Table 3.2.2:

Table 3.2.2 Workforce Budget O&M of Commune Water Supply Organisation

Manpower Category	Salary Amount VND/month	Year 2002	Year 2005	Year 2010
		Monthly Costs	Monthly Costs	Monthly Costs
		VND	VND	VND
Administrator	500,000	500,000	500,000	500,000
Treatment Plant Operator	400,000	440,000	880,000	1,320,000
Pimp Operator/ Pipeline Inspector	400,000	440,000	880,000	1,320,000
Meter Reader/ Fee Collector	100,000	200,000	200,000	200,000
WATSAN Comm.	500,000	500,00	500,000	500,00
Total		2,080,000	2,960,000	3,840,000

Cost of labor is based on figures from June 1999.

3.3 Financial Analysis and Economic Effect

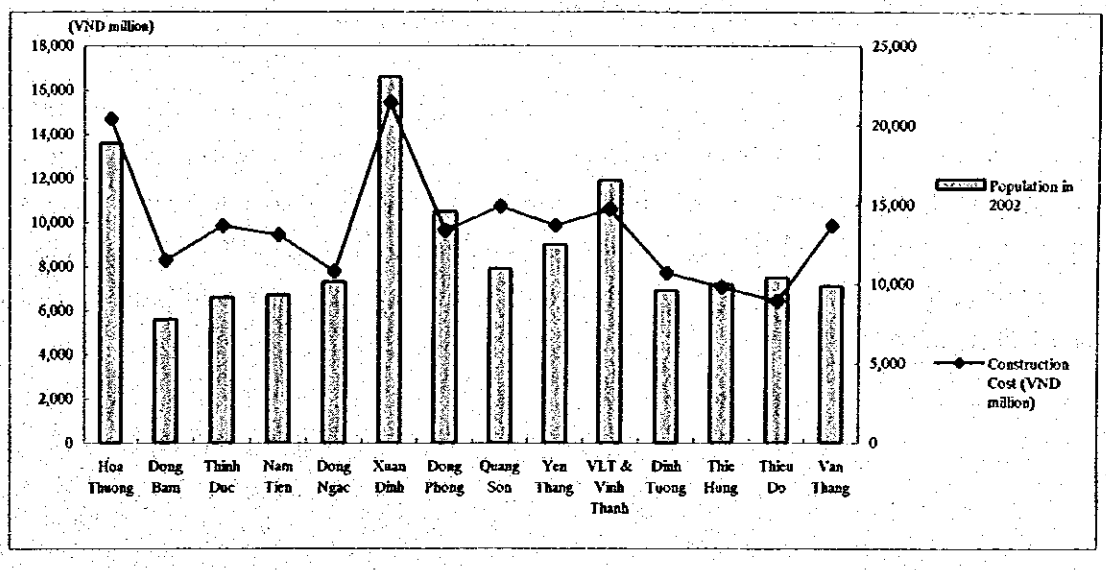
3.3.1 Investment Cost

Since the capital cost of the water supply systems in this project is expected to be financed through a foreign assistance, it is important to examine the efficiency in the investment in facility construction. The following are the results of the comparison of construction costs per user of each water supply system:

Table 3.3.1 Comparison of Population and Construction Cost of Water Supply Systems

Province	Commune	Population in 2002	Construction Cost (VND million)	Construction Cost per user (VND million)
Thai Nguyen	Hoa Thuong	13,600	20,400	1.5
	Dong Bam	5,600	11,500	2.1
	Thinh Duc	6,600	13,700	2.1
	Nam Tien	6,700	13,100	2.0
Ha Noi	Dong Ngac	7,300	10,800	1.5
	Xuan Dinh	16,600	21,400	1.3
Ninh Binh	Dong Phong	10,500	13,400	1.3
	Quang Son	7,900	14,900	1.9
	Yen Thang	9,000	13,700	1.5
Thanh Hoa	Vinh Loc Town & Vinh Thanh	11,900	14,700	1.2
	Dinh Tuong	6,900	10,700	1.6
	Thie Hung	7,200	9,800	1.4
	Thieu Do	7,500	8,900	1.2
	Van Thang	7,100	13,700	1.9
Average		8,900	13,600	1.5

Source: JICA Study Team



Source: JICA Study Team

Figure 3.3.1 Population and Construction Cost of Water Supply Systems

The construction cost per user significantly varies between water supply systems. Although

the construction cost is the highest in Xuan Dinh, its cost performance is relatively good (VND 1.3 million per user) since the commune is highly populated. Three of the four communes in Thai Nguyen Province (Dong Bam, Thinh Duc, Nam Tien), Quang Son Commune in Ninh Binh Province and Van Thang Commune in Thanh Hoa Province show relatively poor cost performance (between VND 1.9 million and VND 2.1 million).

3.3.2 House Connection Cost

House connection must be paid by users, the cost of which was estimated approximately at VND 700,000 per household. This price would be acceptable for prospective water users since the price is at the same level as the construction cost of dug wells or bore holes (see Part III Chapter 2-3). In order to distribute water to those people who cannot afford the house connection fee, the community could introduce a cross-subsidy by levying a variable connection fee based on household income. Furthermore, poor households could contribute to the construction work and trench digging for main and branch pipelines, and in return they could receive a free connection. There is also an option that public taps are installed so that poor households can access clean water without paying the connection charge. In this case, the management method of public taps must be thoroughly discussed and agreed upon by the users.

3.3.2 O/M Cost and Financial Viability of Operation

It is imperative that the operation and maintenance cost be paid by users so that the water supply system is properly maintained. The O/M cost is composed of staff cost, chemical cost, electricity cost, repair cost and administration costs. The O/M cost for each water supply system was estimated and its details are presented in the data report. The following table shows the estimated O/M cost for the 14 water supply systems. The O/M cost varies from VND 1,200 /m^3 to VND 1,700 /m^3.

Table 3.3.2 O/M Cost for Water Supply Systems

Province	Commune	Average O/M Cost (VND/m^3)
Thai Nguyen	Hoa Thuong	1,200
	Dong Bam	1,500
	Thinh Duc	1,700
	Nam Tien	1,700
Ha Noi	Dong Ngac	1,400
	Xuan Dinh	1,200
Ninh Binh	Dong Phong	1,300
	Quang Son	1,500
	Yen Thang	1,400
Thanh Hoa	VLT & Vinh Thanh	1,300
	Dinh Tuong	1,400
	Thie Hung	1,400
	Thieu Do	1,400
	Van Thang	1,500
Average		1,400

Source: JICA Study Team

In this Study, the affordable water tariff is currently estimated at VND 4,500 /m^3 in Ha Noi and 2,300 /m^3 in other four provinces (Part III Chapter 2-3) while the current standard water tariff applied in urban areas is VND 1,500 / m^3 to VND 2,000 / m^3. For the purpose of financial analysis, the balance of O/M costs and tariff revenues which can be retained for the major repair or replacement was calculated on each water system (Table 3.3.4) by applying the water tariff presented in Table 3.3.3, taking into account the affordable water tariff and the future price escalation(5% per year). The water tariff actually to be applied must be determined at each commune level.

Table 3.3.3 Water Charge from 2002

Year	Water Tariff for House Connection (VND/m^3)	Water Tariff for Public Tap (VND/m^3)
2002	1,500	1,000
2003	2,000	1,400
2004	2,500	1,700
2005	2,500	1,700
2006	2,500	1,700
2007	3,000	2,000
2008	3,000	2,000
2009	3,000	2,000
2010	3,500	2,400
2011	3,500	2,400
2012	3,500	2,400

Although the tariff revenues exceed O/M costs in all water supply systems, the level of earnings that each water supply organization can retain for the future major repair or replacement significantly varies between locations. The difference in the level of revenues is mainly attributable to the variety of the population density. Hoa Thuong, Dong Bam, Thinh Duc, and Nam Tien communes will have difficulties in this regard since the population in these communes is rather scattered and thus the number of house connections is limited. On the other hand, the replacement of water supply systems is also difficult in Van Thang, and Quang Son communes, since the construction of these water supply systems is relatively costly compared to the size of their population.

It should be noted that the O/M costs of the water supply systems in Dong Bam, Thinh Duc, and Nam Tien communes are expected to exceed their revenues during the first couple of years of operation. These communes must put up a certain amount of capital before the introduction of the water supply systems so that its operation is not hampered because of financial difficulties.

The tariff revenues relatively highly exceed O/M costs in densely populated communes such as Xuan Dinh, Vinh Loc Town and Vinh Thanh. These communes are expected to retain a certain amount of capital to replace their water supply facilities in the future.

Table 3.3.4 Financial Viability of Water Supply Systems

Province	Commune	Population in 2002	Average Annual O/M Unit Cost (VND/m3)	Average Annual O/M Cost (VND million)	Average Annual Revenue (VND million)	Annual Saving (Revenue - Annual Cost, VND million)	Annual Saving as % of Construction Cost
Thai Nguyen	Hoa Thuong	13,600	1,200	320	620	300	1.5%
	Dong Bam	5,600	1,500	210	360	150	1.3%
	Thinh Duc	6,600	1,700	190	240	50	0.4%
	Nam Tien	6,700	1,700	260	420	160	1.2%
Ha Noi	Dong Ngac	7,300	1,400	260	520	260	2.4%
	Xuan Dinh	16,600	1,200	490	1,170	680	3.2%
Ninh Binh	Dong Phong	10,500	1,300	320	690	370	2.8%
	Quang Son	7,900	1,500	280	530	250	1.7%
	Yen Thang	9,000	1,400	300	590	290	2.1%
Thanh Hoa	Vinh Loc Town & Vinh Thanh	11,900	1,300	380	860	480	3.3%
	Dinh Tuong	6,900	1,400	240	460	220	2.1%
	Thieu Hung	7,200	1,400	240	480	240	2.4%
	Thieu Do	7,500	1,400	250	500	250	2.8%
	Van Thang	7,100	1,500	260	480	220	1.6%
Average		8,900	1,400	290	570	280	2.1%

3.3.4 Economic Effects of the Project

It is expected that use of clean water lead to improvement of people's health. According to the household questionnaire survey, a household spends, on average, approximately VND 300,000 for medical expenses every year in the Study Area communes. Supposing that 10% of medical expenses are saved due to improved water quality, the total saving in the medical expenses in the Study Area turns out to be VND 1 billion per year.

Labor productivity also increases if people's health is improved. Although statistics are not available, people in the Study Area lose a significant number of workdays because of water-bone diseases, according to the interviews with local households. Thus the introduction of piped water schemes will lead to an increase in labor opportunities. Supposing that a household loses ten workdays per year because of water-bone diseases, it is equivalent to a loss of 3% of their income or VND 200,000. The total increase in labor opportunities in the Study Area is estimated at VND 6 billion per year.

CHAPTER 4

PROJECT EVALUATION

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4.1 Need for Safe Water Supply

Based on the results of the household questionnaire survey, the residents are highly dissatisfied with the yield and quality of the existing water sources. Feelings of dissatisfaction are mainly due to shortage in yield, bad taste, smell and unclear water, factors that are usually affected by seasonal changes (see Figure 4.1). Because of this, many of the residents have installed deferrization devices in an attempt to improve the water taste and color, and rid the water of its offensive smell. Nonetheless, the results have not always been satisfactory. In the analysis of the quality of these water resources, shallow wells were detected to contain exceptionally high levels of coliform bacilli, indicating the advanced contaminated conditions of the water resources due to improper domestic and livestock wastewater discharge.

The implementation of the priority project would realize the residents need for safe water as this would provide unrestricted access to chlorinated water through taps. In the long run, safe water supply and the convenience this provides would change the living environment and significantly improve health and sanitary conditions.

4.2 Impacts on Household Economy

The implementation of the water supply project would increase expenses in the household. Studies should be carried out, therefore, to determine the extent of the project's impacts on the household economy. However, as mentioned in *Part 1*, the residents are deemed willing to pay for the services if it means being able to conveniently acquire safe water - as long as the water charge is in accordance with the present income level and equal or less than the electric bill. Separate considerations should be made, however, for the impoverished class.

The impacts of the project on the medical expenses of the households were also analyzed. The water supply project is not going to directly and immediately reduce the prevalence of various diseases in the communes. Through improvements in the sanitary environment, however, the number of disease inflicted patients is clearly foreseen to decrease in the long run. There are hardly no government assistance programs for disease prevention in any of the communes at present. As shown in Chapter 3.2.3, the medical expenses of the residents amount to an annual average of VND 30 million, not exactly a paltry sum. Given this

condition, therefore, it may be said that the project will reflect the new share in household expenses.

4.3 Social Disadvantages

The implementation of the project is going to directly affect water selling activities or the producers of and shops selling bottled drinking water. This impact is seen to affect not only the target communes, but the entire northern region of Vietnam, including Ha Noi. Nonetheless, the study cannot forecast whether these enterprises will go out of business once the water supply system operation starts. Even if a 100 % coverage rate is attained, it is probable that these enterprises would survive to a certain extent in view of the principle of coexistence. The project is considered to bring about both social advantages and disadvantages, however the latter is deemed insignificant compared to the former.

The indirect disadvantages that the project may incur are in the form of what the public considers as partiality in the services. This partiality would be evident in communes where the population is scattered; this condition would raise the cost of the distribution pipelines and consequently deprive some of the residents who cannot afford the cost of the opportunity to receive the services.

Although the ratio is small, the communes also consist of impoverished households. The possibility that these households would impartially receive the benefits of the water supply services is a moot point. Based on the PRA and PCM, the individual income in the communes, water charge the residents are willing to pay, and the residents opinion on having to shoulder a part of the cost for the installation of water supply pipelines, were determined and shown in the table below.

Table 3.2.6 Public Opinion Gleaned Through the PRA & PCM Workshop

	PRA	PCM Workshop
1. Average annual income/worker (VND/year)	Poor: 2,308,000 Middle class: 4,040,000 Affluent: 7,320,000 Average: 4,167,000	Revenue from rice cultivation: 1,250,000 Other source of income is unknown
2. Water charge willing to pay (VND/m^3)	Poor: 900 Middle class: 1,259 Affluent: 1,376 Average: 1,202	800~1,200
3. Cost of installation of household connection (VND)	unknown	180,000~1,000,000
4. Contribution to facility construction cost	Poor: 94,620 Middle class: 245,560 Affluent: 342,310 Average: 226,960	50,000~200,000

The ratio of the poor to the population of the communes varies widely from 5 to 20 %, 15 to 20 % in most. The middle class, on the other hand, make up 50~70 % of the population. The desired water charge and share in the household connection installation cost vary by social strata.

The financial analysis results also clearly show that the O&M cost in communes with dispersed villages and a small population will be high as the construction of the facilities in the area would require a large investment. Discussions and studies should be fully carried out, therefore, regarding the service level in these communes, the service coverage, the share of the residents in the service costs, and how subsidies will be granted. There is also a need to gain the consensus of the commune residents regarding the establishment of a water charge system that takes the conditions of the poor into consideration.

4.4 Community Participation

A number of public organizations, e.g. VWU, are being formed in the communes. Most of these organizations carry out various activities (construction of schools and health centers) with the participation of the residents. CPC directly manages and operates irrigation facilities, and is seen to be a sufficient foundation for the promotion of resident participation.

The table below summarizes the organizations in the study area and their recent community

related activities. VWU, Farmers Union, War Veteran's Union, Old Aged Union, and Youth Union are organizations that can be found in any commune.

Table 3.2.7 Organizations in Target Communes and their Recent Activities

Province	Commune	Organization	Recent Activities
Ha Noi	Dong Ngac		Celebrate Health and Sanitation Day (Saturday)
	Xuan Dinh	WATSAN	
Ninh Binh	Yen Thang		Elementary school construction
Thanh Hoa	Thieu Do	Livestock union	1) Roof tiling, 2) irrigation drainage canal construction, 3) concrete pavement of roads, 4) electric installation work, 5) family planning, 6) sanitary education
	Dinh Thuong		Environmental sanitation
	Vin Loc Town		Environmental sanitation
	Vinh Thanh		Child health education
Ha Tinh	Yen Ho		Construction of cemetery
	Bui Xa		Organize wage increase activities

Public organizations, such as VWU, mainly promote the project through resident mobilization activities. And with the assistance of the regional CERWASS office and PTT, attaining community participation for the project is not impossible at all.

4.5 Conclusion

As aforementioned, the project should be implemented as it is assessed to bring about many social benefits. The financial analysis, on the other hand, showed that the per capita construction cost is high in sparsely populated communes and this would also incur high O&M costs. It is, therefore, necessary to fully conduct discussions on the details of the water supply plan and the operation and management of the facilities. The discussions should involve all target communes in order to gain the consensus and the commitment of the public to promote the project.

PART V

RECOMMENDATIONS

PART V RECOMMENDATIONS

Contents

PART V RECOMMENDATIONS

1. GROUNDWATER DEVELOPMENT PLAN

1.1 Comprehensive Groundwater Management in Ha Noi

An independent groundwater development plan was proposed for the 2 communes in Ha Noi, which are not covered by the city's water supply services despite their proximity. However, the Hanoi water works has already been pumping huge amount of groundwater, decline in groundwater level and land subsidence reportedly occur in Hanoi area of the Red River delta. Taking these concerns into account, a plan to construct a new well field along the right bank of the Red River for the Ha Noi waterworks system is devised.

There is also a high possibility that the operation of the Ha Noi waterworks system would affect the groundwater, e.g. decline in groundwater level and deterioration in groundwater quality, in target communes. Relevant agencies should, therefore, urgently implement a comprehensive groundwater management plan by conducting studies involving a wide area to determine how to preserve and effectively use groundwater resources in Ha Noi.

1.2 Considerations in the Development of Limestone Aquifers

In Dong Bam in Thai Nguyen, a test well drilling was carried out in fractured limestone with cavities, and the surrounding ground collapsed when a well was being developed. The detailed reasons behind the collapse is unknown, although the runoff of the clay that filled the cracks in the limestone was observed when groundwater was pumped up during the well development. It is also estimated that the subsidence must have resulted from the occurrence of a cavity due to the suction of unconsolidated sediments in the basement rock. Most limestone with many cavities or cracks make good aquifers. Other limestone areas were also confirmed to have cavities filled with soft clay. If there are houses near this area, these conditions could precipitate accidents that may be life threatening or cause damage to properties. Taking this into account, sufficient studies should be carried out on surrounding ground and land use conditions when selecting well drilling points.

1.3 Improvement in Well Drilling Techniques

Deep well drilling under this study was entrusted to local well construction firms who are still using outmoded Russian well drilling machinery. Since the machinery was not a sufficient capability of drilling, the drilling works were carried out as: first drilling a small hole and then expanding the hole gradually. Drilling, therefore, was extremely time consuming resulting in the use of huge amounts of mud water, which again took time to remove during the well development work. All in all, the work was inefficient. As well drilling in areas with complex geological conditions, e.g. hard basement rock, is expected to increase, suitable drilling rigs should be introduced, along with highly advanced and efficient drilling and well construction techniques.

1.4 Periodical Analysis of Water in Test Wells & Continuous Groundwater Leveling

The quality of the water in the test wells was only analyzed once during pumping tests carried out after the well completed. The results were used to design the water supply facilities. Carrying out a water quality test once, however, would not determine seasonal changes in the water quality and the extent of these changes. It is recommended, therefore, that analysis of the water quality of the test wells should be carried out at least twice, once in the dry and in the rainy season.

This study installed automatic water level recorders in the test wells to successively measure groundwater level. Only about several month's worth of data has been acquired so far. Groundwater level monitoring is important to acquire the information basic and therefore essential to groundwater use and management, and hence should be carried out continuously.

2. WATER SUPPLY PLAN

2.1 Development of Alternative Sources

As a water source, the development of nearby groundwater resource would be the best idea. This type of groundwater development was not expected, however, for the communes in Ha Tinh (4) and in Thanh Hoa (1) which are excluded from the priority project. The communes to be covered by the priority project were restricted to those with favorable groundwater yield

and quality, although it does not indicate a huge disparity exists in the water shortage problems among the communes. It is, therefore, important to immediately carry out studies on the development of surface water or other alternative water source for these communes in line with the details specified in this report.

2.2 Unification of Water Supply Services

The waterworks industry is reliant on equipment and facilities, whose scale usually determines the cost of the water (the bigger the scale the cheaper the water cost). As clearly confirmed from the financial analysis results, several communes where construction cost is high requires the adoption of countermeasures for the administrative aspect of water supply services to successfully work. In particular, a single water supply system in scarcely populated communes like the 4 communes in Ha Tinh would be difficult as the development of surface water as a supply source would only further raise the estimated development costs. What would be most recommendable, therefore, is the development of a water supply service that covers a wide area and is jointly managed by the areas concerned. The desire of Vin Loc Town and Vinh Thanh in Thanh Hoa to jointly operate and manage a waterworks system is considered as a good idea. Studies should be carried out, therefore, regarding the possibility of developing a water supply system jointly operated and managed by Nong Cong Town, which is excluded from the priority project, and its neighboring communes.

The development of a piped water supply system in every commune in Vietnam would result in the birth of a large number of small scale water supply systems that is feared to cause problems in water resource and service operations in the future. Strategies should be adopted therefore in view of the nationwide implementation of the rural water supply plan to unify the services in the future.

2.3 Ha Noi Waterworks System Expansion & the Two Communes

The 2 target communes in Ha Noi are situated within the zone where the water source targeted for the expansion project of the city's waterworks system is located. The urban development plan of Ha Noi covers the administrative area of these communes, and these communes are not responsible for the water supply in this development plan. Therefore, the proposed water supply plan of these two communes considers supply of domestic use only. Because these two communes are both highly populated, the implementation of a water supply project is assessed as a high cost-performance and would be feasible therefore.

However, since this would mean the utilization of the groundwater resource which is also exploited by the Ha Noi waterworks system, concurrent groundwater pumping is presumed to take place in the future. Originally, it was considered that these two communes should be covered by the Ha Noi waterworks system expansion project. Planning adjustments should be carried out therefore by discussions with relevant authorities.

2.4 Water Supply Through Household Connections

With the use of piped water supply, the disadvantage is in the installation of service pipes that would connect the system to the recipient households. Majority of the leakage in the system takes place in these service pipes. The pipe material, structure, standards for completion inspection, cost allocation, etc. are issues concerning the water supply facilities that have to be clearly specified prior to construction.

3. FINANCIAL PLAN

3.1 Public Understanding

Because the population is comparatively less concentrated, the rural waterworks system is less efficient than the urban and the facility O&M cost is relatively high. Because the rural household income is generally lower than the urban household income, it is inevitable that the water charge to be imposed under this project would occupy a considerable share of the household economy. If the residents can not bear the water charge, facility operation and maintenance would be difficult to implement. Gaining the residents full understanding of this issue is, therefore, considered a major premise to the promotion of this project.

3.2 Establishment of Water Charge

There will be a need to keep the water charge comparatively low at the beginning of project implementation, to promote the waterworks system. If the O&M expenses are estimated to exceed the revenue form the water charges several years after the project is commenced, the WATSAN committee should pool in advance a certain amount for service management. Adopting method should be discussed with the commune authorities prior to project implementation.

3.3 Consideration of Facility Renewal Cost

Because the social implications of the project are very significant, the investment and depreciation costs were excluded from the financial calculation. A reserve should be put away for the costs that will be incurred in the future renewal of the facilities. In communes where the operations can be efficiently carried out due to a relatively high population density, the introduction of a water charge that also covers future renewal costs may be possible.

4. ORGANIZATIONAL PLAN

Generally, the construction of the water supply facilities is expected to be done faster than the building of new organizations in rural areas. Because of this, forming organizations that would help mobilize the residents and implement facility O&M prior to facility construction is of extreme importance. At least 4 to 6 months prior to construction, resident mobilization should be carried out and the forming of organizations should be commenced. In addition, these organizations should be reinforced by holding training programs along with the construction work. After construction, on-the-job training should be carried out to develop an organization capable of realizing the sustainable operation and management of the facilities.

5. SANITARY ENVIRONMENT

5.1 Education on Sanitary Issues

Basic means of educating the residents of every commune regarding sanitary issues have already been taken. What would be most desirable next is the conduct of a sanitary campaign in connection of the water supply facility construction project. In particular, a continuous education program should be held for households and schools to encourage the residents to acquire deeper knowledge on the issues concerned. The production of relevant texts is also recommended.

5.2 Environment

Night soil is currently used as fertilizer. To eliminate pathogens and promote composting, the construction of a septic tank with double storerooms should be encouraged. The use of simple alternative techniques, e.g. construction of a simple drainage connected to the garden in the backyard, installation of a stabilization pond, adoption of a biogas tank system, should also be promoted for domestic and livestock wastewater treatment.