CHAPTER 4

RURAL WATER SUPPLY

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4.1 Policy and History

For infrastructural development, in particular the development of a rural water supply system, the government conducted a nationwide campaign from the 1960s to promote the construction of shallow wells, toilets and showers in the rural area, in order to provide safe drinking water and ensure a sanitary environment. By 1984, a total of 3.9 million shallow wells have been constructed nationwide under the campaign.

At the end of 1982, the government established the National Committee for Drinking Water Supply and Environmental Sanitation. To collect information on the rural water supply conditions of other nations and learn from their experience, the committee immediately participated in the International Drinking Water Supply and Sanitation Decade Program. This became the turning point in the country's concept of rural water supply. During this period (from 1982), UNICEF started extending assistance, thereby accelerating further developments in rural water supply projects. In 1992, the aforementioned committee formulated the Draft Master Plan for the Development of Water Supply and Environmental Sanitation in the Rural Areas of Vietnam by 2000, based on the results of studies on the hydrogeological and meteorological conditions nationwide.

The master plan underscores the technical and financial guidelines for water supply facility construction, and aims to effect an 80 % increase in the coverage rate of clean water (17 %: 1990 estimate) by 2000. In addition, the master plan targets a water supply facility construction cost of US$ 5.00 per person, and anticipates that the required overall capital would amount to US$ 15 million for 1993~1995 and US$ 27 million for 1996~2000. The capital will be appropriated as shown in the table below.

	Normal Areas	Underprivileged/Ethnic Minority Areas
Users	65 %	30 %
Government (central & local)	25 %	40 %
ODA	10 %	30 %

This master plan, however, is not officially acknowledged. No policies relevant to this master plan have also been devised.

In succession to the Emergency Program it implemented in 1975, UNICEF carried out the

Water and Sanitation (WATSAN) Program from 1982 in three of the provinces within the Mekong Delta. The WATSAN Program gradually expanded its coverage and by 1996 its rural water supply construction and sanitary improvement activities covered 61 provinces, and has constructed 168,121 water points and 126,052 toilets. The table below shows the records of UNICEF on the number of construction work carried out annually.

Table 4.1 Construction Record since 1982

Year	Number of Provinces	Number of Water Points	Cumulative Water Points	Demo Latrines	Cumulative Latrines
1982	3	17	17	-	
1983	6	320	337	-	
1984	6	381	718	-	
1985	6	1,970	2,668	-	
1986	6	2,515	5,203	-	
1987	13	2,400	7,603	-	
1988	13	5,330	12,993	802	802
1989	13	8,800	21,763	4,471	5,273
1990	26	12,160	33,893	9,867	15,140
1991	26	14,570	48,463	9,487	24,627
1992	34	14,733	63,196	10,500	35,127
1993	53	25,625	88,821	28,200	63,372
1994	53	29,000	117,821	21,500	84,827
1995	53	31,700	149,521	30,225	115,052
1996	61	18,600	168,121	11,000	126,052

(Source: NRWSS Study, WATSAN Evaluation Report, 1997)

Water point is defined as a facility that supplies water (120 persons/water point), as shown below:

- Tube wells with or without sand filter
- Pipelines (gravitation system) supplying 1/20 of the required water amount
- 20 rainwater tanks or 40 rainwater jars.

The number of water points constructed after 1989 is shown in the table below.

The aim of the UNICEF program for 1996~2000 is to support the government's rural development plan objective, which is to increase by 2000 the coverage of safe water supply to 80 %, sanitary facilities to 60 %, and to fully implement (100 %) the sanitary education

program in primary schools. The strategies adopted for this program are as follows:

- Target poor areas and focus on the implementation of activities beneficial to women and children
- Adopt suitable and inexpensive technologies for the sustainability of the services
- Link water supply and sanitation with rural development and general health promotion services
- Establish connection with relevant ministries and departments
- Research and develop water supply techniques (including techniques for mountain areas where hydrogeological developments are considered quite difficult to implement)
- Examine issues concerning the sustainability and feasibility of the services, and the residents ability to pay.

Table 4.2 Number of Water Points

Year	Tube Well	Pipes	Rainwater Facilities	Total
1989	- (21,763)	- -	- -	(21,763)
1990	11,297 (33,060)	0	0	11,297 (33,060)
1991	16,950 (50,010)	0	47 (47)	16,997 (50,057)
1992	14,341 (64,351)	0	50 (97)	14,391 (64,448)
1993	26,110 (90,461)	0	1930 (2,027)	28,040 (92,488)
1994	25,090 (115,551)	20 (20)	629 (2,656)	25,739 (118,227)
1995	27,534 (143,085)	260 (280)	231 (2,887)	28,025 (146,252)
1996	14,563 (157,653)	340 (620)	130 (3,017)	15,038 (161,290)

( ): cumulative number of water points
(Source: NRWSS Study, WATSAN Evaluation Report, 1997)

4.2 Present Rural Water Supply Conditions

The rural areas are currently using surface water (e.g., rivers, springs, ponds), groundwater (e.g., shallow wells without linings, 4~5 m wide shallow wells), and rainwater for domestic use. The residents in these areas also use the water supply facilities (e.g., tube wells with

hand pumps, shallow wells with linings, pipes, rainwater tanks) constructed under the WATSAN Program.

The water supply coverage in the rural area, however, still remains unknown. Under the WATSAN Program, the coverage is estimated at about 30 %. This figure varies, however, depending on the what kind of standard for safe water supply is adopted. There is, therefore, a need to determine whether the water supplied is free of harmful chemicals and bacteria according to widely accepted standards such as that of the WHO. Nonetheless, it is impossible to apply this standard to all existing water supply facilities. It would be much more realistic to determine whether the existing facilities are protected against contamination resulting from man-made activities. Accordingly, it would be easy to determine the coverage of safe water supply services if the number of protective facilities and the number of water supply recipients are known.

The table below shows the domestic water use in the rural area based on the Viet Nam Living Standard Survey (VNLS: 1993) and the NWRSS Study (1997).

To determine whether the facilities in every water source are protected, an overall safe water supply rate of 9.25 % was assumed. However, if the stored rainwater is safe and the tube wells and pipelines provide safe water, the water supply rate will amount to 20 %.

Table 4.3 Rural Water Supply Coverage by Technology

Water Source	NRWSS (Estimate of Technological Coverage)	VNLS (Estimate of Technological Coverage)	Remarks	% of Protected Technology	% of Protected Coverage
Dug wells	45 %	57 %	mostly open wells	5 %	2.85 %
Surface water	35 %	23 %	some protected springs	5 %	1.15 %
Rainwater	10 %	13 %	mostly open tanks	5 %	0.65 %
Tube wells	8 %	4 %	mostly with aprons	90 %	3.6 %
Pipes	2 %	2 %	50 % from wells	50 %	1 %
					9.25 %

(Source: NRWSS Study, Interim Report, 1997)

4.3 Rural Development Plan and Rural Water Supply & Sanitation (RWSS) Strategies

Rural development is a new concept to Vietnam. The new policies formulated for this field are stipulated in the Draft Plan for Rural Development in Vietnam for 1996~2000 and 2010. The following are the 5 basic principles of the plan:

① Give high priority to rural development.

② Establish a sturdy regional economy based on competitive regional ranking.

③ Promote phased implementation of development plans and improve the welfare and social conditions of the local residents.

④ Place emphasis on the conservation of the natural environment in the promotion of projects/plans.

⑤ Promote plans under the supervision of the local residents and restrict the government's role to the support level.

Although this plan also covers the 10th regional development plan, it places second priority to the development of rural infrastructure, which incorporates rural water supply development. By 2000, the plan aims to provide 80 % of the rural population and 13,000 of the primary school students with safe water supply.

National Rural Water Supply Strategy (NRWSS)

In accordance with the Draft Final Report submitted in May 1998, these strategies are expected to contribute to the attainment of the objectives of the national development plan by 2020.

① Improvement in public health conditions
② Improvement in living conditions
③ Reduction in pollutants (human excreta)

These strategies aim to attain the following by 2020 for rural water supply development targeting towns with a population of less than 30,000.

① To provide safe domestic water to 90 % of households
② To provide sanitary latrines to 80 % of households

③ To educate 80 % of the residents on personal hygiene

The fundamental principle of the Rural Water Supply Sector (RWSS) is to establish sustainable water supply services especially in terms of utilization, operation and finance. Accordingly, the following approaches will be adopted:

- Approach based on demand: to provide the users, as early as possible, with the capability to independently decide plans and to establish the organizational structure for the operation of the services.
- To have the users shoulder the bulk of the construction expenses and all of the expenses for operation and maintenance.
- Bidding (government and private companies) will be carried out for the future construction of water supply and sanitary facilities.

Although these strategies may be modified depending on the circumstances that may arise, they were formulated taking the following fundamental principles into account.

① Decide the level, techniques and operation methods for the water supply and sanitary systems (RWSS), in view of users' needs.
② Implementation of a program for the effective dissemination of information, educational reasons, and to convey relevant issues prior to the planning and construction of the water supply and sanitary facilities (RWSS facilities).
③ With the exclusion of the poor and the minorities, the users will be made to cover 50 % of the costs for the construction of the water supply and sanitary facilities, as well as 100 % of the operation costs.
④ An administrative system suited to the scale of the facilities should be formed prior to facility construction.
⑤ Promote the use of suitable technology (easily obtainable spare parts, no need to handle excreta, easy to operate (in view of sustainability) and acceptable to the users, environmentally friendly).

After receiving the above report containing the new and detailed strategies for rural water supply development and sanitary improvement, the Government of Vietnam is currently conducting relevant studies.

4.4 Existing Water Supply Facilities In the Study Area

There are five types of domestic water supply facilities in the study area.

4.4.1 Hand-dug wells

The hand-dug wells 0.8~1.2 m diameter and depth of 5~10 m, is traditionally used for domestic water supply. This type of well can be classified into two types. One is a well with protection wall above the ground surface and the hole is lined. Another one is a well without protection wall and not limed. This type of water supply facility is suitable for taking groundwater of shallow water table aquifer and generally used in the Study Area. However, quite a few hand dug-wells are polluted due to waste disposal and fertilizer etc. In addition, the dug wells are often dried up in dry season. Declining of groundwater level caused by heavy pumping in the deep aquifer affects the shallow water table in Hanoi suburban area. It is said that most of the hand dug wells were dried up in this area.

4.4.2 Rain water tanks

Rain water tank is common on locations where availability of freshwater is limited. The system consists of the roof of the house from where rain water flowing through gutters into collection tanks. The size of the tanks varies from 200 liters to 10 m^3. People use rainwater for drinking, cooking and even for washing and bathing in rainy season. However, people save water during the end of the rain season and use saved water only for drinking and cooking in dry season. For this purpose, the tank capacity of 10 m^3 or more is seen in the Study Area.

4.4.3 Tube wells (Drilled wells)

Tube wells are drilled wells with diameter varying from 48 mm to more than 150 mm. They are drilled manually by using drill bit or drilled by using drilling machine (mechanized drilled well). The tube well is fitted with a hand pump or an electric pump. In most cases, however, VN6 suction pump is being used in the small diameter well which is tapping shallow water table.

4.4.4 Small piped systems

Small piped system are defined as simple low cost technologies, usually without any form of treatment of formal management system. There are three types (NRWSS, Mid Term Report,

1997):

- Gravity systems
- Informal pumped systems
- Mini system serving a few households

Gravity systems are mainly found in mountainous areas and normally consists of an intake, a transmission line, and a distribution system to storage tanks. Informal pumped system is common in the south of Vietnam and consist of a pump near a river or a canal. The water is not treated. Mini systems consist of tube well fitted with an electric pump and supply about 20 households.

4.4.5 Central water supply systems (Large Piped Systems)

Central water supply system is usually a large system serving at least 1,000 people and consists of a tube well(s) or a surface water intake, a treatment works, elevated storage and a distribution systems with house connections. In the treatment works, an aeration tower is commonly attached to remove iron in the water. This type of systems is still new in rural water supply. In the Study Area, each provincial CERWASS has constructed these systems since 1995.

4.5 CERWASS Achievement

4.5.1 Thai Nguyen

After 5 years of establishment and development of the Committee for UNICEF program, Thai Nguyen CERWASS carried out more than 2,000 water supply systems, including 20 mechanized drilled wells, 260 hand-drilled wells, 1,511 hand-dug wells, 100 rain water tanks, 10 gravitational water supply systems (from mountainous springs) with individual system supply capacity from 500 to 2,000 households, which is presently serving totally more than 300,000 persons. This number corresponds to 31% of the total province's population.

4.5.2 Ninh Binh

In Ninh Binh Province, CERWASS constructed 81,289 rain water tanks, 12,695 hand-dug wells with protection wall, 83,775 hand-dug wells without protection wall and 844 hand-dug village public wells. In addition, 1,800 small drilled and 12 central water supply systems

were constructed.

Concerning the quality of water presently used, however, the quality is generally not satisfactory except water from small drilled wells, some central water supply systems and low filtration tanks.

4.5.3 Thanh Hoa

During 15 years of the realisation of the UNICEF program, the program has widely grown and steadily developed. Thanh Hoa CERWAS successfully achieved many kinds of rural domestic water supply consisting of 9,974 manually drilled wells, 281 hand-dug wells, 420 rain water tanks and 29 central water supply systems.

4.5.4 Ha Tinh

Since establishment of rural water supply program in 1984, Ha Tinh CERWASS constructed approximately 4,000 water points including 3,000 dug-wells and drilled wells, 12 central water supply systems, rain water tanks and filtration tank. About 1,000 water jars are distributed by assitance of UNICEF and DANIDA.

4.5.5 Hanoi

In Hanoi suburban area, people are also using traditional hand-dug wells. However, recently, this type of facility is constructed only hilly Soc Son District and some northern part of Dong Anh District. In addition, Tu Liem and Thanh Tri Districts, shallow groundwater table declined due to heavy pumping of deep groundwater in Hanoi urban area. Therefore, this kind of system may be replaced by other ones.

Not only the hand-dug wells, Hanoi CERWASS constructed the drilled wells and rain water tanks. By the end of 1997, 4,858 drilled wells have been constructed. Moreover, 13 central water supply systems were constructed mainly in Tu Liem and Than Tri Districts, and 4 systems are under construction.

4.6 Existing Central Water Supply Systems in Hanoi Suburban Area

Seventeen (17) central water supply systems exist in Hanoi suburban area. Thirteen (13) systems of them are being operated, however, rest of the systems are still under construction. There are seven (7) systems in Thanh Tri District, nine (9) systems in Tu Liem District and one (1) system in Dong Anh District (see Figure 4.1).

HANOI ADMINISTRATION MAP

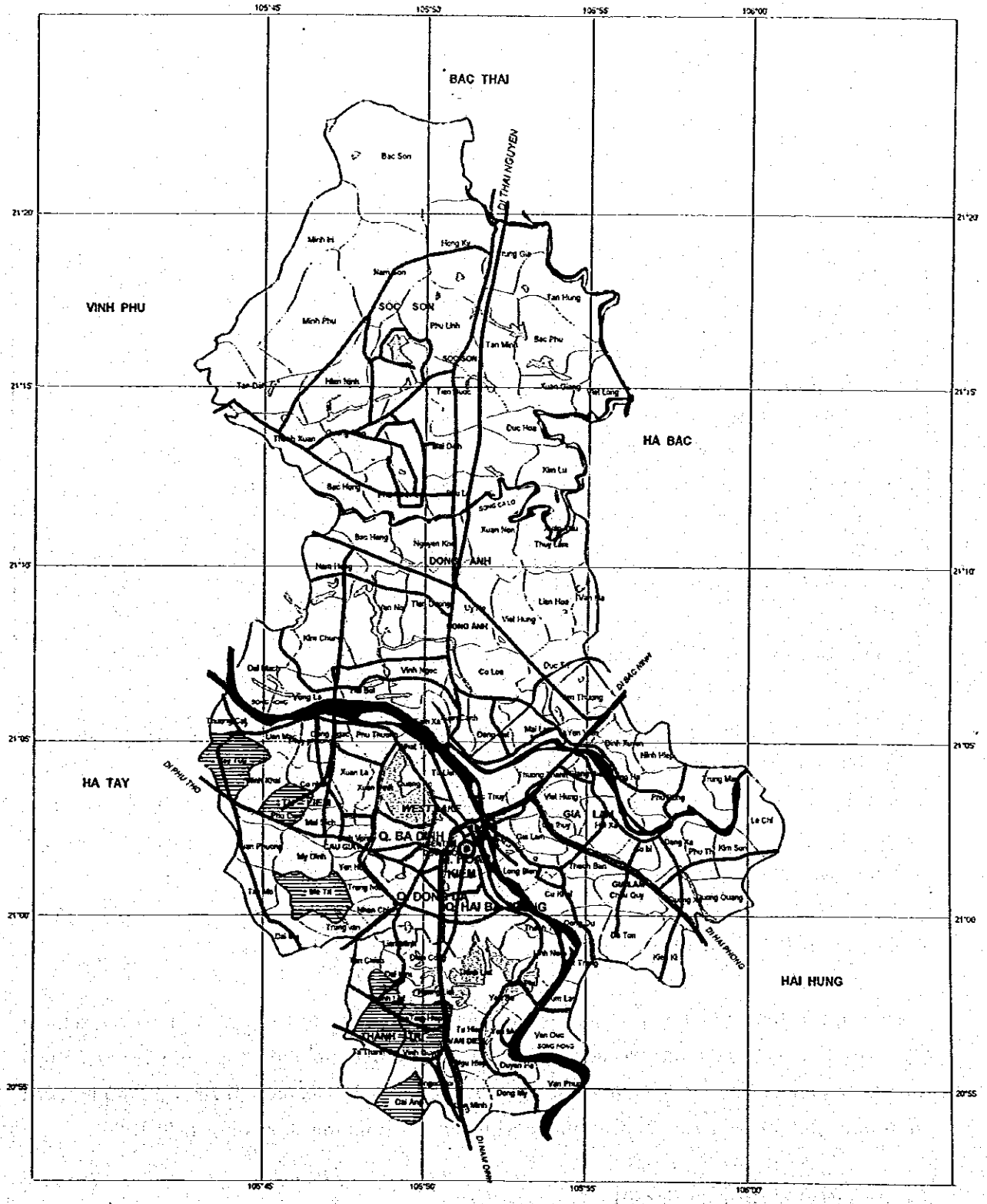

Figure 4.1 Location of the Commune Central Water Supply Systems in Haoi Suburban Areas

Table 4.4 Existing Central Water Supply Systems in Hanoi Suburban Area

No.	District	Commune	Village	Commune Population	Population Served	Capacity m^3/day	Pipeline Length (m)	Cost $x10^6$ VND
1	Thanh Tri	Dai ang	Vinh Trung	7,600	1,200	30	5,108	550
2	Thanh Tri	Thanh Tri	Vinh Thuan	-	-	-	-	345
3	Thanh Tri	Tam Hiep	Huynh Cung	7,400	3,000	160	3,240	484
4	Tu liem	Tay Tuu	Thon 3	12,000	3,810	300	5,743	520
5	Tu liem	Phu dien	Duc dien	9,400	2,180	120	2,460	361
6	Thanh Tri	Thinh liet	Giap Tu	11,953	2,500	150	4,340	402
7	Tu liem	Phu dien	Kien mai	-	1,920	120	1,862	350
8	Thanh Tri	Tan Trieu	Trieu Khuc	10,850	650	150	3,300	510
9	Thanh Tri	Tran Phu	1,2,3,4	5,540	-	-	4,300	610
10	Thanh Tri	Dong My	1,2,3	6,100	-	-	3,750	650
11	Tu liem	Me Tri	Phu Do	13,145	-	-	-	455
12	Dong anh	Lien Ha	Dai vi	12,700	920	90	1,420	399
13	Tu liem	Minh Khai	Nguyen Xa	9,000	1,000	140	3,750	413
14	Tu liem	Me tri	Thon Thuong	13,115	4,500	200	2,300	563
15	Tu liem	Tay Tuu	Thon 2	12,000	3,900	340	4,500	509
16	Tu liem	Phu dien	Dinh quan	9,100	800	70	1,716	355
17	Tu liem	Phu dien	Phu dien	9,100	3,600	200	2,636	482

(Source: CERWASS)

Total of the systems is seventeen (17), however, there are four (4) systems in Phu dien Commune in Tu Liem District and two (2) systems in Tay Tuu Commune and Me Tri Commune, respectively. Therefore, central water supply system exist in twelve (12) communes in Hanoi suburban area. Detail of these systems were surveyed through questionnaire for the communes. The followings are major findings.

4.6.1 Population Served

Population of the commune is 5,540 in minimum and 13,145 in maximum, however, quite a few communes population exceeds 9,000. The served population (beneficiary) is 650 in minimum and 4,500 in maximum. The water supply coverage is more than 90 % in Phu Dien commune and 60 % in Tay tuu Commune while other commune shows less than 10 %.

4.6.2 Water Supply Facility

Water source of the system is groundwater. Groundwater is pumped from deep well(s) 55~65

m depth and 200 mm diameter. The water supply facilities consist of the deep well(s), aeration tower, filter, reservoir, distribution pump and pipelines. The capacity of aeration and filtration is 15~30 m^3/hour. The capacity of reservoir is 30~70 m^3. Most of distribution pump is made in Vietnam, however, some are made in Japan and China. The capacity of the pump is 15~30 m^3/hour.

Trunk main is made of 90~100 mm diameter PVC pipe and laid down several hundred meters in length. They are connected to 50~32 mm diameter PVC secondary or service pipelines which connect individual house. The total length of the pipeline is 1.4 km in minimum and 5.7 km in maximum.

4.6.3 Water Supply Capacity

Water supply capacity is 30 m^3/day in minimum and 340 m^3/day in maximum. Per capita water supply is 25 ℓ/day in minimum and 230 ℓ/day in maximum averaging 50~80 ℓ/day. This rate, however, shows a supply capacity not a consumption per capita. According to the interview in Tay Tuu Commune, the water consumption per household is about 6 to 7 m^3/month. It can be estimated that the per capita water consumption is approximately 50 ℓ/day.

4.6.4 Construction Cost

The cost of facility construction is ranging from VND 350 to 600 million. Most of the facility cost about VND 500 million. The construction cost of the pipelines makes up about 50 % of the total cost. The deep well construction cost is about VND 70 million per well. The cost is financed by the government fund at 100 % in many communes, while some communes covers the finance by their own fund and UNICEF fund at about 20 %. In addition, users share the cost of VND 100 to 120 thousand to connect service pipe.

4.6.5 Operation and Maintenance

The water supply facility is managed by the Peoples Committee (PC) in the commune. The committee chairperson holds the post of the top administrator of the water supply system concurrently. Staff of the accountant section of the PC and technical staff, usually 2 to 3 persons, operate and maintain the system. The technical staff also do water meter reading and collect water fee from users. Normally water fee is VND 1,500 per m^3/month, while several communes collect VND 2,000 per m^3/month.

4.6.6 Problems and Measures of the Existing Central Systems

Since all of the 17 facilities employ the same water supply system components and design, the current operating state of the four (4) facilities among them was investigated. The following common problems were found.

(1) Problems

Because the original plan or the design parameter was uncertain, present operational results could not be evaluated comparing with them. However, the following points can be pointed out about the current state of the systems.

(2) Management of Water Production and Water Supply

The groundwater is pumped up to the aeration tank, then purified in the gravitational flowing process through aeration, sedimentation, sand filtration and finally the water storage tank. Treated water is supplied directly from the water storage tank to each consumer by the distribution pump.

The flow meter is not installed in any part of water supply systems. The meters installed are a voltmeter, an ammeter and a pressure gauge at the distribution pump of out flow side. Storage tank is not equipped with water level gauge.

It seems that the amount of each well pumping and water delivery are calculated by multiplying operation time to the rating capacity of the pump. Moreover, the operating record is insufficient. Therefore, the accurate measurement records that can be used for management and technical evaluation were not properly preserved in the office.

(3) Water Quality Control

The water quality examination is carried out once in a several months. But in daily operation of the systems, it is important to control water quality in the treatment process even in delivering water, and the operator must know the effect of the system operation. It is not necessary to think the water quality analysis is difficult. Main water quality problems are iron content and bacteria. The relation between the content of the iron and the color is well known. If the color is measured and recorded, the treatment effect can be presumed.

Concerning the measurement of bacteria, special equipment and techniques are necessary. However, it is already understood that bacteria can be removed by chlorine disinfection. The measurement of the residual chlorine is easy. If the residual chlorine

is measured and recorded, safety of water can be guaranteed.

(4) Operation Time of Distribution Pump

There are two distribution pumps. One is used for a backup and the filter back washing. The distribution pump is driven 3 to 10 hours according to a daily schedule.

Such an operation makes extremely dangerous situation. During stopping of distribution pump, the polluted seepage water might be drawn in to the distribution pipes. When the distribution pump is driven again, the polluted water might be supplied to each house.

(5) Water Treatment

The ground water contains a lot of iron. The aeration equipment and the filtration is needed for iron removal. For this purpose, existing and on-going rural commune water supply system introduces the combination of the one aeration and sedimentation unit and the two filtration units in general. Estimating from operating state, the filtration rate is presumed at about 100 m/day and suited the standard of a rapid filtration. There is a plant where two-step filtration is installed, though the technical standard is uncertain.

The filter is washed directly by using the distribution pump. The back-washing rate and time seems to be decided by watching drainage water quality. The waste water is drained directly to a nearby pond etc.

(6) Water Storage Tank

The water storage tank seems to have a function of the finished water reservoir as a buffer between the treatment and distribution facilities. The water storage tank has various capacity from too large to too small one, if it is thought as a finished water reservoir.

The combination of this storage tank and distribution pump is not considered distribution facilities to meet the change of water demand. Because the pump is operated several hours a day on time, the customers store a necessary amount of water in their storage tank during operating hour. In other word, each customer's water storage tank has a function of the distribution reservoir.

(7) Master Meter

There are no mastering meter installed in any existing water supply systems. The

amount of water delivery is calculated by the pump operating time etc.

(8) Water Meter

The charge is collected by reading the every water meter installed at individual house.

(9) Operation and Maintenance of the Distribution Pipe

The distribution pipe and service pipe are laid to the roadside belt very shallowly. It The pipes laid down in the side ditch was also observed. The pipeline attachment such as air-relief valves and drain valves was not found.

(10) Disinfection Facilities

There are no disinfection facilities found in existing water supply systems.

4.6.7 Measures and Improvement

Many unreasonable points can be suggested in the existing system if this system is thought to be a water service facility that supplies a drinking water in general. However, before discussing improvement of these existing systems, it is necessary to clarify the concept below.

It is: "What is a role of the water supply service?".

Generally speaking, Viet Nam is a country given a lot of water. There is already private shallow well in almost all houses in the target communes. Peoples are using several water sources concurrently at their purposes, such as a shallow well, a pond and a river water, respectively. However, the necessity of water services is discussed about the shortage of water resources in dry season, contamination and unpleasantness of the excessive content of iron. Accordingly, it is necessary to clarify what kind of water quality is needed, at first.

If "water service should supply water which suites the drinking water standard", it is necessary to improve present facilities as follows.

(1) 24 Hours Continuous Water Supply

To supply water which suits the drinking water standard with the pipelines, their inside must keep pressure at certain levels for 24 hours. This becomes an absolute condition. Otherwise, the polluted seepage water must be drawn into the distribution pipe. The pollution can be prevented from two methods. One is to operate the distribution pump 24 hours, and another is to supply water from the service reservoir or the overhead tank by gravity flow. The larger the capacity of service reservoir is, the more stable the

water treatment and the water transmission pump operation can be done.

An existing distribution pump can be utilized as a water transmission pump to the overhead tank. In this case, 8 to 12 hours of the hourly water distribution amount might be needed for the overhead tank capacity. Moreover, the expansion of facilities or the 24 hours operation (the well pump and the purification facility) might be needed because the per capita consumption may increase.

(2) Installation of Mastering Meter

It is necessary to understand the amount of production, the water transmission, and the water distribution accurately by installation of the mastering meter and its record.

(3) Disinfection by Chlorine

Disinfection by chlorine is indispensable conditions for the piped water supply. The chlorine agent is injected to keep the residual chlorine at certain level in the water in the distribution pipe. The purpose of chlorination is to give the effect of the disinfection even if the contaminant intruded into the water.

The index of the proof of sanitary safety is that the ammonium nitrogen and the Escherichia coli are not detected. These contents are not disease causing and not harmful to human. However, the existence of such coliform bacteria and ammonia is important index of the pollution. If such contents is removed by disinfection by chlorine, safety of water can be proven. The pathogenic bacteria such as dysentery bacillus is weaker to chlorine than that of the Escherichia coli. Therefore, it can be proven that there is no pathogenic bacteria of these waterborne communicable diseases if there is a residual chlorine.

However, health damage which might be caused by the substance accompanied by chlorination is recently discussed, and there is a tendency to avoid chlorination. However, this discussion talks about the risk of carcinogenesis for 100,000 people when the person continues to take same water all his life. The risk of the waterborne communicable disease can not be compared with this.

Moreover, there is a person who dislikes smell of chlorine. This is thought to be a smell produced by the organic chemical reaction with chlorine. Many of these substances can be removed by boiling. That is, if people keep tradition of boiling water whenever they drink it, a delicious drinking water can be obtained.

The initial purpose of water supply is to protect people from the waterborne communicable disease caused by the polluted water. After achieving this purpose, it is necessary to raise a technological level to treatment and removal of harmful substances contained in a very small amount.

CHAPTER 5

INSTITUTIONAL FRAMEWORK

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5.1 Central-level Stakeholders Involved in the RWSS Sector

5.1.1 Lead Ministries and Institutions

The operating environment of the rural water supply and sanitation sector (RWSS) is in the middle of transition. Presently, water resource management, water supply, organization, sanitation, and hygiene are all guided by a complex set of related legislation which is also reflected in the sector organization.

The most important stakeholders are:

- The National Steering Committee for Water Supply and Sanitation;
- The Ministry of Agriculture and Rural Development (MARD); and
- The Ministry of Health (MOH).

The National Steering Committee for Water Supply and Sanitation (NSCWSS) is the main coordinating body for the sector. Under this mandate the committee advises key ministries on the progress of their programs, preparation of administrative instructions and guidelines, development of new technology etc. The key ministries represented include among others Ministry of Construction and Urban Development (MOC), Ministry of Planning and Investment (MPI), Ministry of Finance (MOF), Ministry of Science, Technology and Environment (MOSTE), MARD, and MOH. The Youth Union is the only mass-organization represented. The chairmanship and physical location of the committee has been moved from MOC to MOSTE.

The MARD is responsible for infrastructure development including water supply in the rural areas and plays a pivotal role in the development of the sector. The Center for Rural Water Supply and Sanitation (CERWASS) was transferred to MARD when the ministry was reconstructed in 1995. The re-organization brought the entire water sector management into MARD. Due to its central role in rural water supply a closer description of CERWASS is presented in a separate section.

Ministry of Health (MOH) takes care of preventive and curative health services including

environmental sanitation[1]. In the water and sanitation sector the role of MOH is to provide health education, to promote proper water supply and sanitation practices, and to implement sanitation programs in the rural areas. In the RWSS sector the Law on Public Health (1989) assigns mainly regulatory functions and information and education campaigns (IEC) to MOH. However, the main responsibility of MOH is prevention of communicable diseases through the operation of the primary health care system. As this also includes RWSS gives MOH an important position in the sector.

Other ministries with a more indirect, but still important role in the RWSS sector are:

- MOSTE responsible for environmental protection;
- The Ministry of Education and Training (MOET) responsible for health education in schools and one of UNICEF's counterparts in promoting school sanitary facilities;

5.1.2 The Center for Rural Water Supply and Environmental Sanitation

The Center for Rural Water Supply and Environmental Sanitation (CERWASS) was established in 1982 to implement activities in connection with the UN Water Decade. In its initial phase it was only responsible for water supply but since 1995 when it was transferred from Ministry of Labor, Invalids and Social Affairs (MOLISA) it has also been responsible for environmental sanitation.

<Main Functions>

The center acts as a counterpart agency for UNICEF but also implements a limited number of other projects with national and international financing.

Ministerial Decree 236 NN-TCB/QD issued on December 12, 1995 outlines the following main functions of the center:

- Report on the RWSS situation to MARD and assist the ministry in the preparation of annual-, medium-, and long-term planning for the sector;
- Prepare plans and projects for capital investments (including international investments);
- Implement programs and projects in co-operation with other government institutions;

[1] It is therefore misleading when the phrase "environmental sanitation" is used in connection with CERWASS as the main task of this institution is rural water supply. Sanitation is to be dealt with by MOH institutions.

- Organize research and development of appropriate technology for rural water supply and sanitation;
- Organize intensive training courses in existing and new technology for cadre, workers and farmers on RWSS;
- Organize the supply of material and equipment together with technology transfer services on RWSS;
- Manage staff and facilities of the center.

<Organization and Staffing>

The center has 43 staff in Hanoi and about 2,500 in the provinces. Each province has approximately 40 members of staff.

Central CERWASS is headed by a director and a vice-director and organized into the following five sections:

1) Planning and Investment Section

In charge of project planning and management and the preparation of cost estimates for selected projects submitted by the Provincial CERWASS. Although CERWASS has its own seal and account, the Ministry must approve projects. The section is also in charge of the UNICEF program and co-ordination with international organizations.

2) Technology and Capital Investment Section

The main responsibility is the approval of water supply and hydrogeology technology schemes that are submitted by the Provincial CERWASS. It co-operates with the Water Resources Management Department within MARD and to a limited degree supervise construction.

3) Environment, Communication and Sanitation Section

Provides the main link with the provinces and application of IEC components. Activities seem to be very limited. An Environmental Sanitation Unit has been created within the section dealing mainly with agriculture related environmental problems.

4) Building Material and Equipment Administration

Financial and personnel administration, administration of the workshop compound, office buildings, equipment and materials inventory for the entire country as well as donations in kind from UNICEF.

5) Station for Technology Transfer for RWSS

A small station in Ha Dong outside Hanoi cater for materials and water quality testing, testing of new technologies and conducts training courses in new technologies.

<Programs and Activities>

The UNICEF program takes up a large part of the activities. CERWASS only handles the water supply component of the program while MOH is in charge of the sanitation component.

The Women's Union and the Youth Union play major parts in the community mobilization campaigns and the administration of the revolving funds for sanitation.

Central CERWASS staff has no direct implementation responsibilities for the UNICEF program apart from approval of projects and supervision. The Central CERWASS is in charge of planning, monitoring and financial reporting duties of the program (substantial workload).

CERWASS has also started co-operation with EAST (a French NGO) in two provinces — Hanoi and HCMC. In the nearest future CERWASS will act as the implementing agency of the ADB sponsored Rural Infrastructure Project.

<Strengths and Weaknesses>

Through its involvement in UNICEF's WATSAN program CERWSS has amassed considerable experience in designing and implementing different forms of rural water supply through its provincial units. Although MARD, of which CERWASS is part of, has been named lead ministry for the RWSS sector there is little indication that it is yet in a position to undertake concerted action in the field of sanitation. Only the RWS component of WATSAN has so far been the main focus of CERWASS. It appears that the UNIFEF assisted RWS and ES components of the WATSAN program are largely developed and implemented along parallel tracks with little co-ordination with each other.

Central as well as provincial CERWASS staff is all well qualified professionals within the technical disciplines of rural water supply but there is a lack of professionals with degrees in sociology and rural development. To a great extent water supply is regarded as a technical matter while proper community mobilization and participation, which is important for sustainable O&M of facilities, gets less attention.

5.2 Provincial Stakeholders Involved in the RWSS Sector

5.2.1 Introduction

The provincial level administration is very much a reflections of the national level structure. It includes departments and committees representing the various national level ministries.

The provincial (and district) departments and offices and centers are all part of the State Management System, which is governed by the principles of dual authority. This complies that a provincial department is administratively responsible to the People's Committee and their Chairman. It is also, however, responsible for technical affairs to its parent ministry at the national level. As such staff at provincial (and district level) is accountable to their departmental superiors for technical work, and to the (provincial or district) People's Committees for administrative matters and implementation of development plans. Enterprises and factories under provincial authority are managed in the same manner.

While laws and decrees can only be promulgated at the central level through the National Assembly, provinces are in a position to promulgate decisions and directives under the general national framework. This implies that the National Government provides guidelines, which are further detailed into master plans by the provinces on which they must report annually to the National Government.

The two main actors involved in implementing RWSS activities at province level are:

- the Provincial Department of Agriculture and Rural Development (DARD) through the Provincial CERWASS; and
- the Department of Health (DOH).

There are a number of other stakeholders involved in a more indirect manner. Together with the main stakeholders they are represented through the Provincial Steering Committee for Water and Sanitation (PSCWS).

Among Mass-organization the Vietnam Woman's Union (VWU) and the Youth Union are the most active.

5.2.2 The Department of Agriculture and Rural Development

(1) Organizations

The most important organizations within DARD involved in RWSS are:

- CERWASS responsible for design and implementation of rural water supply facilities;
- Water & Hydrology Facility Management Authority responsible for managing ground and surface water resources. This includes giving license to exploit water resources. The authority is also overall responsible for approving projects dealing with water resource exploitation, monitoring and control.
- The Labor Arrangement Section is involved in terms of its overall control of CERWASS staff.
- Planning Section is responsible for compiling all plans within the sector including CERWASS projects.
- Social Section makes policies on water tariffs/financial support to poor households/communes.

An outline of the organization of DARD is presented below (example from Than Hoa Province).

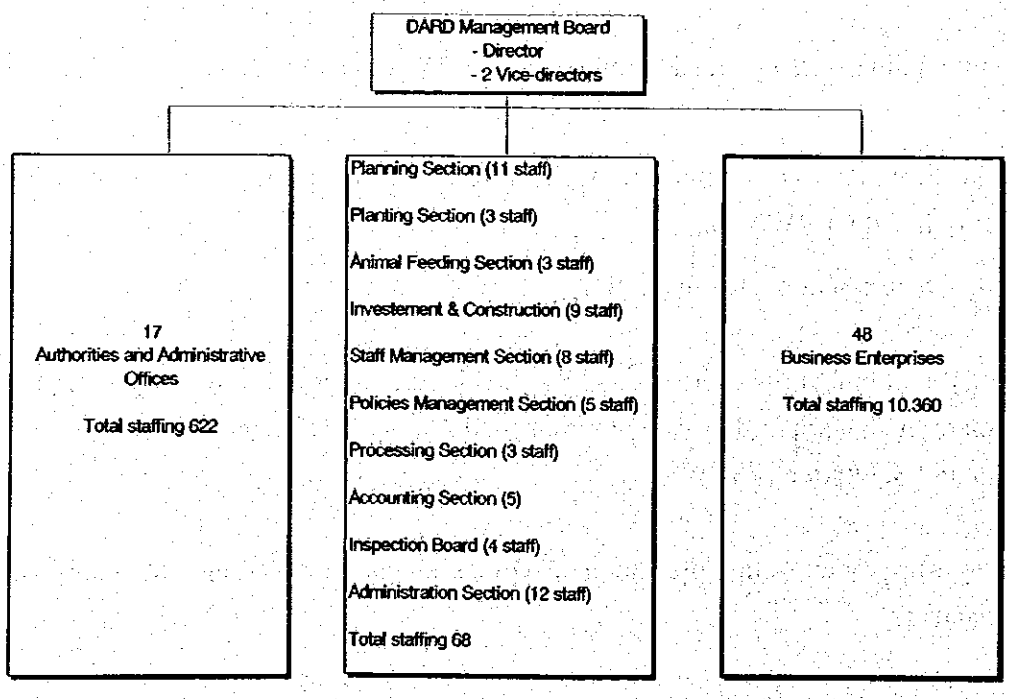

Figure.5.1 DARD Organisation (using Than Hoa as an example)

(2) Responsibilities and duties

The main responsibilities and duties of DARD are related to agriculture production and water supply to domestic consumption and production.

DARD's (and CERWASS') involvement in environmental sanitation is very limited. Therefore, the Provincial Department of Health and Department of Science, Technology & Environment gives guidelines to CERWASS on RWSS project issues.

5.2.3 The Provincial CERWASS

(1) Main functions

The main functions of the center are to:

- Evaluate present water supply systems;
- Assist the province in planning (short, medium and long-term) water supply;
- Organize and implement projects;
- Share domestic finances to execute work;
- Implement water supply projects supported by UNICEF;
- Authorized to make proposals supported by domestic organizations and international donor agencies;
- Carry out campaigns on environmental management and protection - train staff to do this;
- Construct pilot projects on RWSS

Plan and implement piped rural water supply as well as provide bore-holes/wells for villages;

- Training of local users to O&M
- Provide guidance;
- Enforce sector regulations

The Provincial CERWASS is guided by the Central CERWASS, which undertakes the following support functions for the provincial centers:

- Co-ordinate operations and priority investments in the sector;
- Prepare medium, and annual plans and approve implementation of projects;
- Initiate the implementation of plans approved by national and provincial

administration (MARD, DARD and Provincial People's Committee);

- Supervise the quality of construction and service delivery;
- Organize, directs and monitor domestic and foreign funds (including UNICEF funds);
- Organize training courses for participants from the RWSS sector.

CERWASS' involvement in environmental sanitation is very limited as this is the responsibility of the Department of Health.

(2) Organization and staffing

CERWASS is the lead agency in the rural water supply sector and have created many of the norms and approaches that are now applied nation-wide. CERWASS is a center under the Department of Agriculture and Rural Development (DARD) and reports directly to the provincial director of DARD and to Central CERWASS.

Most centers were established in the 1980s to work with UNICEF and other international organizations in RWSS in connection with the set-up of a new provincial administrative structure. In its initial phase CERWASS was only responsible for water supply but since 1995, it has (in principle) also been responsible for environmental sanitation.

The centers are headed by a Director and supported by a Vice-director who together constitutes the Management Board. In most cases CERWASS is divided into four Sections.

The Administrative Section is generally staffed with a head of section supported by a document keeper. The main functions of the section are to perform staff management, administrate all documents, purchasing and handle security measures.

The Technical Section has generally a head of section that often is a geological engineer, which is supported by a technical expert in water supply. The main functions of the section are to prepare and collect all technical data on RWSS systems; make feasibility studies including preliminary technical drawings; conduct construction and facility inspection and handing over procedures including training of O&M operators.

In some provinces the Provincial CERWASS has not the authority to make detail technical design. In those cases this is performed by the Department of Construction under the Provincial People's Committee on payment basis (VND 500,00 for each

drawing) or by central CERWASS' Technology Transfer Section also on payment basis.

The Planning Section has generally a head of and selected numbers of expert in charge of planning and cost estimates and calculations. The main functions of the section are to make annual projection plans according to the proposed RWSS projects to be investigated and implemented[2]. The planning is based on:

(1) annual national government targets (MARD);
(2) requested projects from the districts/communes;
(3) Central CERWASS approval and priorities

The Accounting Section has generally two staff members: head of section is BA, very often with a degree in economics, and an office. They are responsible for managing the internal operating budget and income generating activities of Provincial CERWASS (but not project related cost estimates, which is done by the Planning Section). Income generating activities are used to finance non-state employees (those who are not on the national/provincial budget pay-list. Accounts are audited by a state company under MOF.

Drilling Teams: Well drilling is done by the Drilling Units, which are under the supervision of the Technical Section regarding job performance while the Planning Section directs job opportunities.

Total staffing is generally between 25 and 40 of which 2/3 are assigned to the drilling team. An outline of CERWASS' organizations is presented below.

[2] The Administrative Section does administrative planning on the operations of CERWASS. The operational budget is allocated from the provincial finances through national budget allocations.

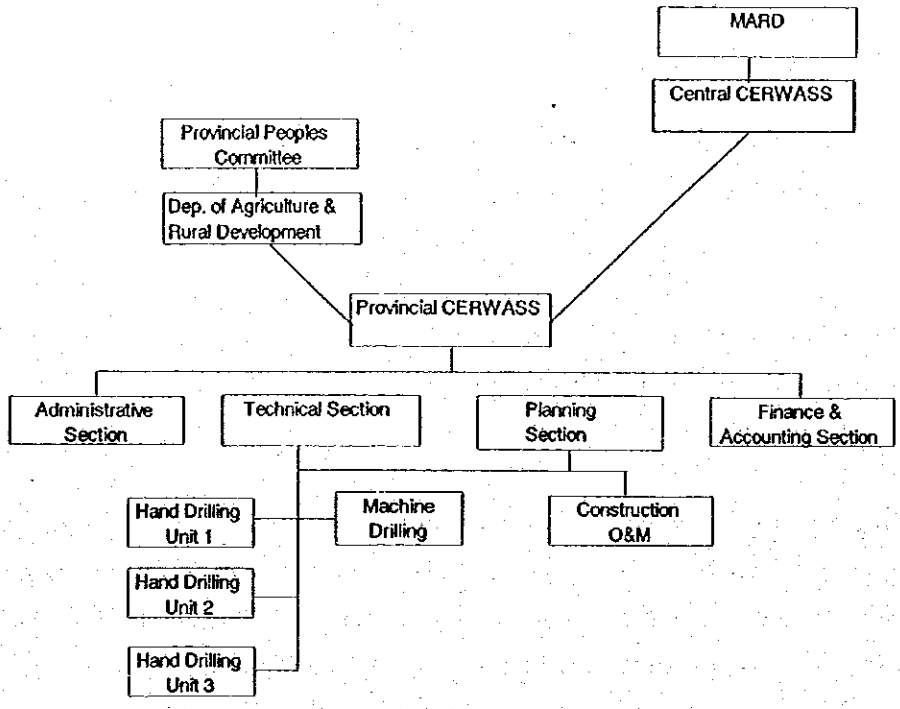

Figure 5.2 Organisation of CERWASS Ha Tinh Province

A typical staffing pattern of CERWASS is outlined below.

Category	Mgt. Board	Adm.	Technical	Planning	Accounting	Hand Drilling	Machine Drilling	O&M
Univ. grad	1		1	1	1			
Technicians		2	1	2	1			
Workers		1				12	6	3
Total532	1	3	2	3	2	12	6	3

(3) Operations

The operations of CERWASS are related to planning and implementation of water supply facilities including well drilling for villages.

The work of CERWASS can be grouped into three main categories:

- Emergency drilling projects due to lack of water in dry seasons. Funds from MARD and MOF.
- Ordinary projects related to drilling for UNICEF projects as well as managing the building of rainwater jars. CERWASS provide the materials for the communes on

payment basis.

- Larger-scale piped water supply projects with either gravity flow or ground water pumping.

Until now the main workload of CERWASS has been coming from it involvement in the planning and implementation of UNICEF's WATSAN Program.

(4) O&M Acitvities

The main strategy is to make the local communities able to operate and maintain the water supply facilities themselves and by their own financial means[3]. A central activity of CERWASS is therefore to make the O&M of facilities sustainable. This is done by:

- Training of selected local people to O&M the facilities;
- Distribute manuals/booklets guiding O&M;
- Supply materials and spare parts (generally this can be purchased in the nearest town) or establish material shop where spare parts can be purchased;

After handing-over, the facilities are to be managed by the Commune People's Committee (CPC). One caretaker who gets assistance from CPC on fee collection and administration generally performs operation and maintenance. The caretaker performs general maintenance, while CERWASS or any other licensed company can do major repair. Spare parts can in most cases be obtained from the nearest town. CERWASS has no spare parts in stock.

(5) Monitoring

DARD is responsible for monitoring the work of CERWASS. According to DARD more emphasis must be put on improving local capacity as well as the professional skills of management organizations (CERWASS). However, limited resources are available for post-graduate training of professionals, most enhancements of skills and knowledge come from on-the-job experience.

Other provincial stakeholders involved in RWSS sector are described in the Supporting Report.

[3] Financing O&M is based on payment according to consumption – as "it is the people's facility so they have to pay themselves".

5.3 District and Commune Level Stakeholders Involved in the RWSS Sector

5.3.1 District level

The district stake holders are District Agriculture and Rural Development Office (DARDO), District Health Center (DHC) and District RWSS Management Board.

However, DARDO is to a very limited extent involved in RWSS. Formally, all requests on support on water supply goes through DARDO which forwards a letter to DARD and CERWASS. DARDO has also the right to request private drilling companies with a license to make wells upon approval from DARD and the Provincial Authority for Water Resources Management which is represented at district level by the Office of District Authority for Water Resources Management[4].

At the district level it is the District Health Center (DHC) which have the form responsibility for the implementation of rural environmental sanitation projects. The DHC is also in charge of the monitoring of water quality and sanitation in the district. DHC also manages the revolving funds set up under the WATSAN program and undertakes promotion campaigns and training courses in the construction of latrines for the community health workers and masons at commune level.

5.3.2 Commune level

The main involved stakeholders at commune level are:

- The Commune People's Committee (CPC)
- Commune Health Centers (CHC)
- Local Mass-organizations;
- Village committees

(1) Commune

A commune consists of several villages, which is divided into hamlets. There might

[4] The co-operation between Office of District Authority for Water Resources Management (ODAWRM) and DARDO is restricted to provision of collected data. DARDO collect data on the need for water resources for agriculture production which is provided to ODAWRM which then make projections on water needs and calculates water costs for each co-operative (water is treated as an economic good).

also be one or more production co-operatives within a commune. Most of the functions found separately at district and province level are collected under the umbrella of the Commune People's Committee. The CPC has taken over many of the responsibilities from the co-operatives. It manages land and other natural resources, collect taxes, takes care of social welfare and prepare development plans and projects for the Commune People's Council to approve. It carries out the administrative, political and economic decisions of the People's Council, but is also a relatively independent body. In most commune the following functions can be found under the jurisdiction of CPC:

Section/Function	Staffing
Management Board (Chairman and Vice-chairman)	2
Military	2
Police & Security	2
Family Planning & Population	9
Culture & Social Matters	2
Administration	1
Finance & Accounting	2
Land Property	1
Communication, Water Resources & Sanitation	1
Total	22

Example fromDuc Yen, Ha Tinh Province

Domestic water supply is mainly provided through household wells or common wells. CPC involvement in water supply is therefore very limited. Involvement is mostly restricted to protect water source from flooding during rain seasons and close wells if condemned. Environmental sanitation is left to the CHC which gets additional support during national campaigns or when directives are received from higher level of administration.

In general, it appears that CPC is very limited involved in any kind of infrastructure development as this is provided the district authorities and the province. Although some experience on utility management has been obtained by selected CPC staff through employment in the agriculture co-operatives the CPC have very limited experience in managing public utilities.

(2) CHC

Generally, CHC performs the following:

- Conduct awareness campaigns together with Commune People's Committee members and village/hamlet chiefs;
- Promote use of clean latrines and how to produce safe water;
- Take regular water samples and dispatch them to DHC for testing.
- Monthly reports are sent to DHC upon which meetings are held with DHC and CPC.

(3) Commune RWSS Management Board

Board members are composed of the Chairman of the People's Committee (Chairman of the RWSS Board, vice-chairwoman of the Women's Union, representatives from the other unions, chief of the CHC, one member of the CPC and Chief of villages (an example of Xuan Dinh Commune).

The board meet once a month to review the RWSS situation and outline actions to be taken before the next meeting. At the annual meeting the board outline the actions to be taken the following year supported by target figures on RWSS facilities.

(4) The Women's Union (WU)

The Women's Union (WU) is generally considered to be the most active mass organization at community level. Like most mass-organization in Vietnam, WU has an organizational network from national to village level. WU is involved in a number WATSAN project supported by UNICEF but have also its own agenda dealing with the economic and social position of women. This includes among other things credit schemes, mother and child care programs etc.