

2.4 INSTITUTIONAL FRAMEWORK AND MANAGEMENT PLAN

2.4.1 Summary and Recommendations

This chapter aims mainly to improve the management efficiency of Hanoi Water Business Company (HWBC) till the year 2010, which is the monopolistic water supply company in Hanoi city belonging to Hanoi People's Committee (HPC: municipal government). The biggest problem which HWBC is facing is that non revenue water estimated to reach 70% of production owing to physical leakage, lack of operating meters and weak billing system.

- (1) Under the circumstances of the government subsidies being reduced, Hanoi Water Business Company (HWBC) has become the status of semi-corporatization with partly subsidies and with half autonomy. HWBC should proceed steadily to full-corporatization with strong company cash flow (=self-financing capability) and with autonomy towards the year 2010. Full-corporatization means that HWBC should have the management autonomy and self-accountability separating from the control of HPC. This process can be defined as commercialization which a state run enterprise such as HWBC seeks profit-based efficiency. However it should be noted that corporatization and commercialization are quite different from equitization (initial public offering) and privatization (listing of majority of shares on the stock exchange). The last two stages may not be taken place in the water sector of Hanoi till the year 2010.

Otherwise credit quality will become higher when HWBC will become an excellent company with strong cash flow in the commercialization process. This will result in HWBC's diversity of fund raising including foreign official funds, concession contracts, joint ventures and BOTs.

- (2) It is necessary that HWBC should work more closely with customers whom it serves rather than work too much closely with HPC . If HWBC will not seek sufficient customer-oriented activities and will continue to have huge amount of non revenue water resulting from physical leakage, lack of operating meters and weak billing system, HWBC will have the new entry of efficient foreign private water suppliers to meet the rapid water demand in Hanoi.

- (3) It is effective that the performance oriented salary system should be strengthened in order to increase collecting water charges and reduce system losses. Under this system, performance targets should be set by each unit in consultation between managers and workers. Each unit on HWBC should make detailed benchmark figures on income target and expenditure target in its business plan. The results will be evaluated based on benchmarks and performance. The evaluation should be reflected in salaries and bonuses.
- (4) As shown in other countries' cases especially in China, the involvement of several governmental agencies in the water supply business would have been produced poor results, such as sluggish management decision-making, lagging improvements in managerial efficiency, and delays in trimming supply costs. It is recommendable that the authorities in Vietnam should suitable concentrate and unify several governmental authorities involved in the water supply business.
- (5) The board of directors of HWBC seems presently to involve in the combination of ownership and management. Ownership function results from the present situation that fixed assets of HWBC belong to the government authorities and that directors, managers of HWBC are mostly appointed or approved by the HPC. Potential conflicts of interest have existed because that the board of directors not only perform the ownership function on behalf of HPC, but also is responsible for managing HWBC toward profit based efficiency. Under the circumstances the board of directors would face a dilemma whether water charges should be kept at an affordable level, or, at the level that allow the company to cover costs and make future investments. It is desirable that ownership function should shift from HWBC to the government authorities. Especially, the government authorities should establish the State budget system to give straight subsidies to water management boards in rural district for constructing rural water supply system.
- (6) It is effective that the water plants and business enterprises should be not only defined at the present as internal cost units, but also redefined in the future as internal profit units. This means to place workers profit responsibility and motivation to reduce water leakage and increase collecting water charges.

- (7) The fixed assets of HWBC are formally owned by the government authorities, although they are stated in the balance sheet of HWBC. This is different from the international accounting standards. It is recommendable that HPC should transfer the asset's ownership to HWBC in exchange of holding equity ownership of HWBC. HPC should have indirect control of HWBC through its equity ownership. In this case it is desirable that HWBC should pay dividend to HPC (equity owner) in the future.
- (8) It is necessary that foreign official funds should not be provided as subsidies from HPC to HWBC, but should be provided as loans through governmental financial institutions with guarantee by the central government. In this case HWBC should pay interest to the financial institutions. In the far future, it may be advisable that foreign official funds should be lent to HWBC near at commercial lending rates and not on concessional terms.
- (9) In order to use foreign funds in the future, HWBC will need to establish a strong balance sheet, sufficient cash flows, and to obtain a good rate of return. In addition to this sound financial condition, HWBC will need to provide adequate financial statement to lenders, financial institutions. Financial statements must be prepared in accordance with international accounting standards. It is necessary that fixed assets should be re-valuated and under-estimation of depreciation cost should be corrected. It is not sufficient for HWBC to provide its financial statements audited and certified by a government internal auditor. Financial statements should be audited each year by competent, independent auditors.

2.4.2 Structural Analysis in Transition and Policy Recommendations till the Year 2010

(1) Commercialization

- 1) Under the circumstances of the government subsidies being reduced, Hanoi Water Business Company (HWBC) has become the status of semi-corporatization with partly subsidies and with half autonomy. This process includes, (a) Municipal Organization with subsidies, (b) Semi-Corporatization without essential subsidies with half autonomy, (c) Full-Corporatization with strong company cash flow (=self-financing capability) with autonomy. HWBC should proceed steadily to full-corporatization with strong company cash flow (=self-financing capability) and with autonomy towards the year 2010. Full-corporatization means that HWBC should have the management autonomy and self-accountability separating from the control of HPC. This process can be defined as commercialization which a state run enterprise such as HWBC seeks profit-based efficiency (Fig2.4-1). However it should be noted that corporatization and commercialization are quite different from equitization (initial public offering) and privatization (listing of majority of shares on the stock exchange). These two stages may not be taken place in the water sector of Hanoi till the year 2010.

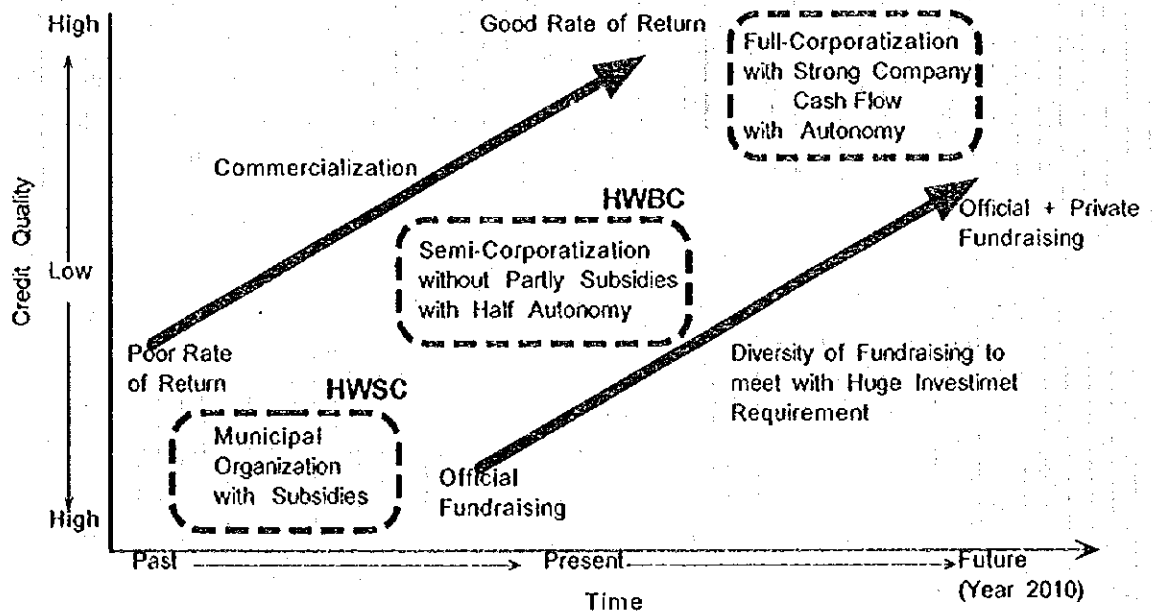


Fig. 2.4-1 Credit Quality in Commercialization Process

- 2) When HWBC borrows the funds from the world bank and foreign governments, credit quality (=bankability) is the most serious thing. Because credit quality effects the interest rate expenses and the availability of loan. Firstly, credit quality becomes lower due to the cutting of government subsidies, as it is difficult for HWBC to expect the governmental financial assistance. Low credit quality leads to high interest rate expenses and low availability of loan. Secondly, credit quality becomes higher when corporatized entity becomes excellent company with strong cash flow. This results in diversity of fund raising including foreign official funds, concession contracts, joint ventures and BOT. It is necessary that HWBC should diversify fund source owing to limits of the government's budget and huge investment required for water development. BOT arrangement will be one of the future solutions to finance new water intake and treatment plans.

- 3) The commercialization requires HWBC to work more closely with customers it serves rather than with TUPWS or HPC (Fig.2.4-2). As HWBC has huge amount of system loss and unaccounted for water, HWBC does not fulfill sufficiently supply responsibility of water. For example non revenue water including system loss and unaccounted for water in Hanoi is estimated to be 70% of production because of physical leakage, lack of operating meters and weak billing system. This estimated figure is much higher than that of Ho Chi Minh City at 37%. When we look at the staff/customer comparison surveyed by SPC (former State Planning Committee, present Ministry of Planning and Investment) and MOC in 1995, the ratio employees per 1000 connections in Hanoi recorded 16.6 higher than that of HCMC at 6.5, Khanh Hoa at 11.6, Thanh Hoa at 16.0. This shows that HWBC has too many staff.

There are two alternatives to solve this issue. The one is that if HWBC moves slowly to the commercialization, namely, if HWBC will not seek sufficient customer-oriented activities, HWBC will have the new entry of private water suppliers to meet the rapid water demand in Hanoi. New entry could be considered including concession contracts, joint venture, BOT especially in industrial area.

The other is that HWBC will seek sufficient customer-oriented activities, HWBC will not have so much entry of private water supplier and leave them marginal suppliers. It is important that HWBC work more closely with customers.

It is said that the first concession agreement in water sector of Hanoi to manage a distribution system was signed between TUPWS, Technoimport and Sour International of France on November 1995. The experimental entity has been established in 1996 and has an investment capital of 7.5 million Francs, which borrows from the French government at an interest rate of 1.5% per year for 15 years including 5 years in favor. The central government contributes 1.5 billion VND (Vietnam Dong) to the project. The water project aims to supply safe water for 54,975 people, office, hotel and restaurants in some area of Hai Ba Trung District. In addition, a number of measures to stop wastage and improve collection of water revenue is planning to be introduced. The project is expected to raise unaccounted for water to 45% in two years from the present 34%.

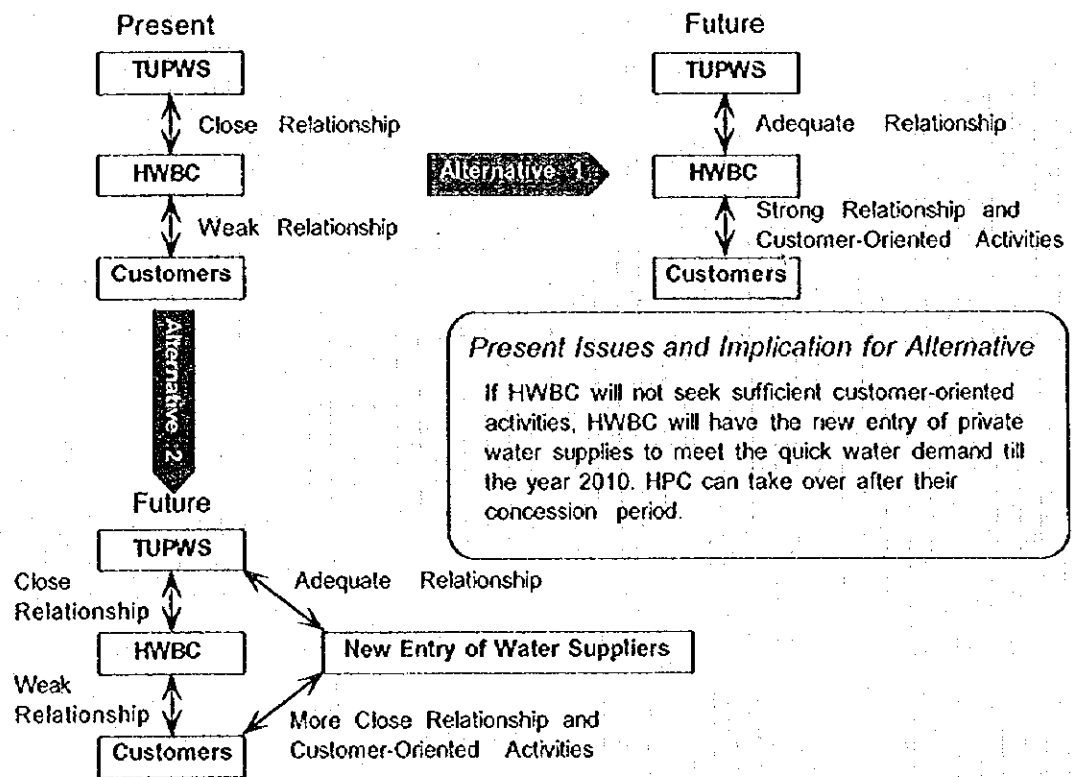


Fig. 2.4-2 Customer Oriented Activities are Important

4) The following measures may be effective to promote the commercialization further.

(a) The performance oriented salary system will be strengthened in order to increase collecting water charges and reduce system losses. Under this system, performance targets will be set by each unit in consultation between managers and workers. Each unit should make detailed benchmark figures on income target and expenditure target in business plan. The results will be evaluated based on benchmarks and performance. The evaluation should be reflected in salaries and bonuses.

(b) Since 1988, the central government has given the local government the power to determine water charges in consultation with water companies. This is because of encouraging the companies to limit their dependence on subsidies and to become financially self-supporting entities. As a result, the water tariff have been increased at a level that may facilitate the recovery of operation costs and maintenance costs (Table 2.4-1). We compare the movement of domestic the water tariff in HWBC with that of the electric tariff and that of average monthly wages in Hanoi over the period 1988 to 1995 (Table 2.4-2). The electric tariff and average monthly salary in Hanoi increased 12 times and 14 times each over the same period. On the other hand, the water tariff increased 50 times.

The water tariff will continue to increase at a level that allow HWBC to cover costs of operation, maintenance and future investments (interest + depreciation). As fixed assets has not yet re-evaluated in the price movement of around 244% over 1990-1994, profits of HWBC may be pointed out as over-calculation due to the under-estimation of depreciation cost from the viewpoint of the international accounting standards. Therefore it is desirable that under-estimation of depreciation cost should be corrected through the re-evaluation of fixed assets. The other side, gradual increasing of the water tariff would be recommendable in order to avoid large charges increases and to reduce a sudden burden to consumers.

Table 2.4-1 Hanoi Water Tariff Structures and Changes

(VND/m3)

Year	Date of Issue	Domestic	State Enterprises	Private Business	International	Car Wash
1987	1-Nov.	5	15	15	15	
	15-Oct.					
1988	1-Aug.	10 or 20	70	300		
	18-Aug.				150 or 165.6	
1989	1-May.	80	250	600		
1990	1-Jun.	80	420	1000		
1991	1-Dec.	300	500	1500	2500	
1992	1-Jan.	400	700	2,000	5,000	5,000
	1-Mar.	600	1,200	3,000	5,000	5,000
1993	1-Jul.	600	1,600	5,000	5,000	5,000
1994	10-Sep.	1,000	2,000	5,000	5,000	5,000
1995	To date	1,000	2,000	5,000	5,000	5,000

Table 2.4-2 Movements in Price Indicators HWBC 1988 – 1995

Year	Electricity		Average Monthly Salary		Domestic Water Charge	
	VND/kWh	Index	1000 VND	Index	VND/m3	Index
1988	48	100	2936	100	20	100
1989	48	100	32.1	108	80	400
1990	48	100	70.1	236	30	1500
1991	120	250	102.2	344	300	1500
1992	230	480	216.5	729	600	3000
1993	480	1000	367.5	1239	600	3000
1994	550	1146	405.0	1367	1,000	5000
1995	550	1146	416.3	1405	1,000	5000

(2) Future Decision Making System in HWBC

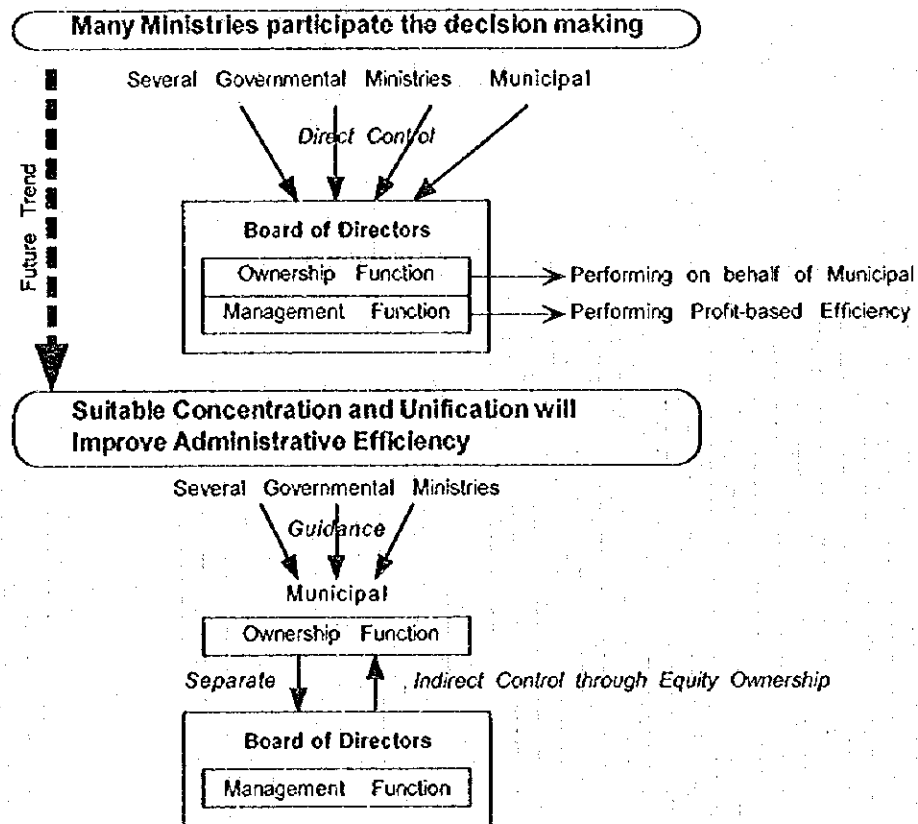
- 1) As stated above, it is important for the authorities of Vietnam to take steady steps towards full corporatization of HWBC till the year 2010. It seems more recommendable to grant autonomy to HWBC with regard to the water tariff revisions, plant and equipment investment, fundraising, etc.
- 2) As shown in other countries' cases especially in China, the involvement of several governmental agencies in the water supply business would have been produced poor results, such as sluggish management decision-making, lagging improvements in managerial efficiency, and delays in trimming supply costs. In the future till the year 2010 there are two alternatives. The first alternative is that the authorities in Vietnam should take some steps to review the system toward suitable concentration and unification of the governmental administrative agencies in the water supply business (Fig.2.4-3).

The second alternative is not to change the present system and not to seek the administrative and managerial efficiency. It is recommendable that the authorities in Vietnam should suitably concentrate and unify many governmental administrative agencies involved in the water sector.

- 3) There is the another important issue (Fig.2.4-3) on future decision making System in HWBC. The board of directors of HWBC seems presently to involve in the combination of ownership and management. Ownership function results from the present situation that fixed assets of HWBC belong to TUPWS or HPC and that directors, managers of HWBC are mostly appointed or approved by TUPWS or HPC.

Potential conflicts of interest have existed because that the board of directors not only perform the ownership function on behalf of HPC, but also is responsible for managing HWBC toward profit based efficiency. Under the circumstances the board of directors would face a dilemma whether water charges should be kept at an affordable level, or, at the level that allow the company to cover costs and make future investments. To keep the affordable level of water charges means that the government continuously give subsidies to water consumers via HWBC. This has resulted in weak collection of water revenue. Additionally HWBC could not have the self-funding ability for replacement of fixed assets.

There are two alternatives toward the year 2010. The one is that ownership function should shift from HWBC to TUPSW or HPC. Especially, the government authorities should establish the State budget system to give straight subsidies to water management boards in rural district for constructing rural water supply system. The another is not to change the present system and leave it to the future solution. The first alternative is recommendable.



Alternative 1 Conflict of Interest should be avoided and Ownership Function should shift to municipal agencies.

Ownership Function : to keep water charges at the affordable level
 —————> This has resulted in weak collection of water revenue.

Management Function : to increase water charges at the level that allow the company to cover costs and make future investment
 —————> The government authorities should establish the State budget system to give straight subsidies to water management boards in rural district for constructing rural water supply system

Alternative 2 is not to change the present system and leave it to the future solution.

Fig. 2.4-3 Future Decision Making System in HWBC

(3) Future Internal Accountability

- 1) At the moment, the water plants and the business enterprises in HWBC are defined as internal cost units and introduced internal cost accounting. Under these circumstances all the water revenue collected by business enterprises are transferred to HWBC headquarters (in accompany with all salary payment by HWBC headquarters transferring to business enterprises).

In the future till year 2010 there are three alternatives (Fig.2.4-4).

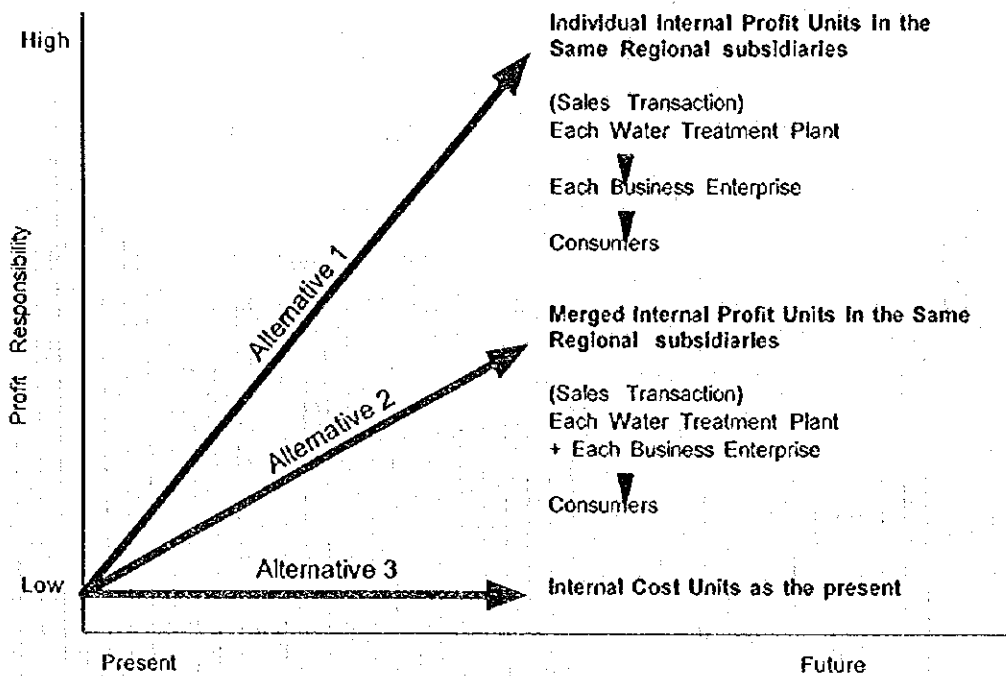


Fig. 2.2-4 Future Internal Accountability

The first alternative is that the water plants and business enterprises should be redefined as different internal profit units because of motivating workers to reduce water leakage and increase collecting water charges. This means to place workers high profit responsibility. In this situation, business enterprises will be able to keep some of water revenue from retailing to consumers. Business enterprises will pay the salaries to their own employees, the water charges to other water plants, and the services charges to department of HWBC headquarters. On the other hand, water plants will get revenue by wholesaling water to business enterprises.

The second alternative is that the water plants and the business enterprises should

be merged as the same internal profit units. The merged enterprises will be able to keep water revenue from selling to consumers. This means to place workers moderate profit responsibility.

The third alternative is that the water plants and business enterprises should remain as internal cost units as the present.

It is effective that HWBC should take gradual steps from the third alternative to the second alternative and from the second to the first toward the year 2010. However, according to the information of some key staff in TUPWS who is in charge of organization of HWBC, the top management of HPC and TUPWS have directed to study for introducing the first alternative from the year 1998 or 1999. Therefore they will skip the second alternative to the third alternative, because they recognize that the first alternative is effective to place workers high profit responsibility.

- 2) The company's fixed assets are formally owned by TUPWS, although they are stated in the balance sheet of HWBC (Fig.2.4-5). This is different from the international accounting standards. There are two alternatives for countermeasures.

The one is that fixed assets that are owned by TUPWS should be leased to HWBC. In this case HWBC should not enter fixed assets into balance sheet of HWBC, but enter lease payment into income statement as expense. Under this system, HWBC is not responsible for financing of major replacement or new investment. In this case HWBC remains dependent on the replacement budget of TUPWS or HPC.

The other is that HPC should transfer asset's ownership to HWBC in exchange of holding equity ownership of HWBC. HPC have indirect control of HWBC through its equity ownership. In this case HWBC should pay dividend to HPC (equity owner) in the future. The last alternative is advisable.

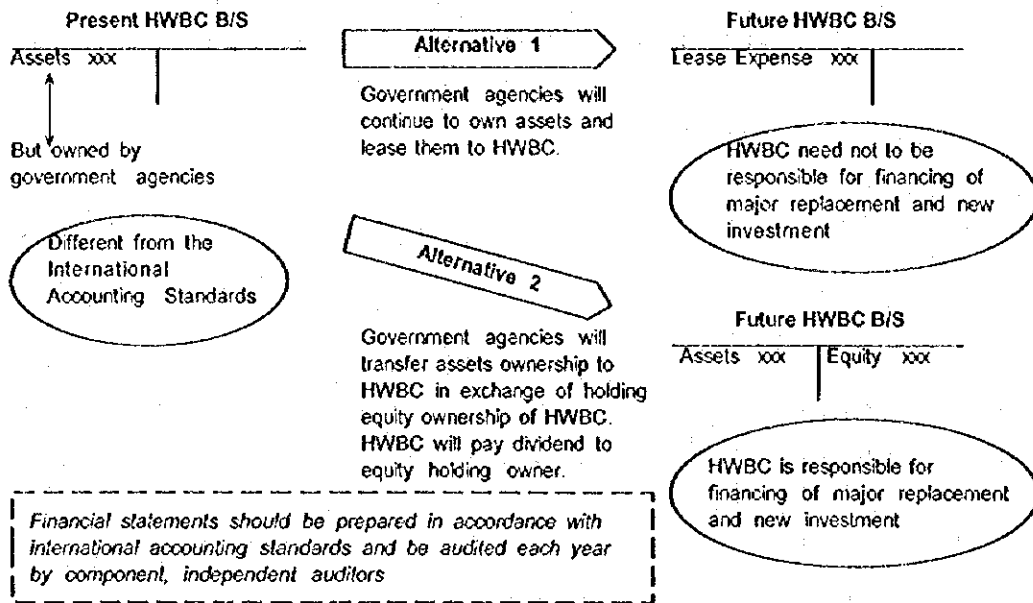


Fig. 2.2-5 Internationalization of Accounting Structure : Example

- 3) It is necessary that foreign official funds should not be provided as cost-less subsidies from HPC to HWBC, but should be provided as loans through governmental financial institutions with guarantee by the central government. In this case HWBC should pay interest to the financial institutions. In the distant future, it may be advisable that foreign official funds should be onlent to HWBC near at commercial lending rates and not on concessional terms (Fig.2.4-6).

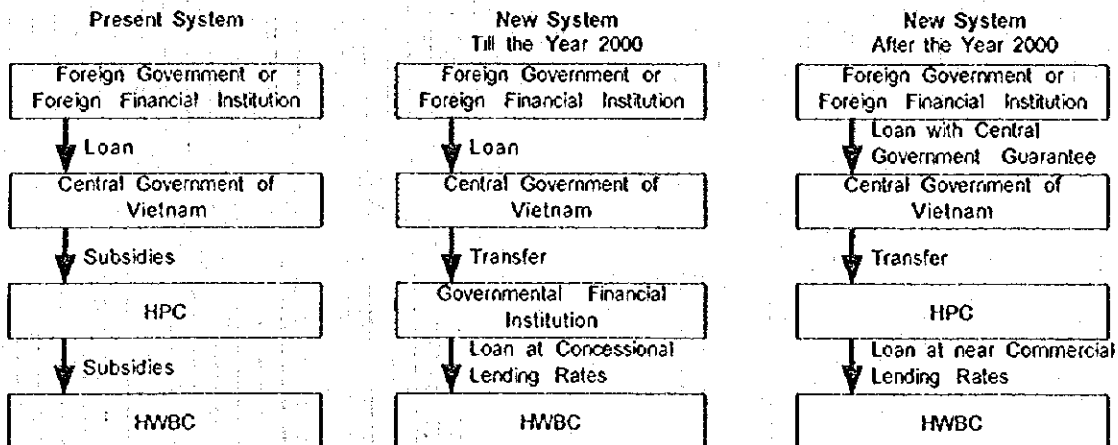


Fig. 2.2-6 Efficient Use of Foreign Official Funds

(4) Fundraising (internal funds and external funds)

- 1) It is the essential task for HWBC to retain internal funds through the collection of water revenue and the reasonable increases in water charges, etc. The financial objectives set by the world bank are that revenue should cover operating and maintenance costs by 1997 and capital costs and debt servicing by the year 2000. HWBC is striving to clear this objectives. To achieve these objectives, the financing program of the world bank assumes;
 - (a) increase in billed water of 5% per year from 1996 to 1999 and 1% per year thereafter till 2004,
(Note) According to the five years plan till year 2000 drafted by TUPWS, the water billing revenue is planned to increase by 2% annually to 50% in the year 2000. In addition, the unaccounted for water is planned to decrease by 1% annually to 40% of production in 2000.
 - (b) increase in water charges by about 20~25% annually from 1996 to 2000,
 - (c) an equity contribution from the HPC of US\$4.36 million for initial support. The world bank says if equity support is larger or if billed water increases faster than assumed, lower increase of water charges would result. The two memoranda of the world bank on January 13 and February 1, 1996 pointed out that the revenue on HWBC did not cover operating and maintenance costs if adequate maintenance was carried out and depreciation shown at level sufficient to reflect true valuation of fixed assets. So the world bank wants to check the complete physical inventory of the fixed assets by the end of February 1996.
- 2) Till the year 2010 huge investments will be required to meet the population and the industry requirements in the water sector. Though the long term investment plan till 2010 has not estimated, HWBC is confronted with the fund shortage owing to limits of the government's budget and huge investment requirement for water development. To face this challenge, it will be necessary for the TUPWS or HPC to diversify fund source. Some private fundraising, will be needed including concession contracts, joint ventures and BOT, which have already been structured in HCMC, is likely to be developed steadily even in Hanoi toward the year 2010.

- 3) There are three BOT projects are going. The first one was licensed in March 1995. The latter two are proposed. The former State Committee for Cooperation and Investment has licensed in March 1995 at Ho Chi Min City for the first BOT project, the Binh An Water Supply project. The contract for this BOT project, designed to produce and supply at least 100,000 m³/day (Could be increased to 150,000 m³/day) of potable water to HCMC and neighboring industrial zone was signed in August 1994 between the People's Committee of HCMC and a joint venture of two Malaysian enterprises (Sedec Malaysian Consortium Sdn Bhd-10%- and the Emas Utilities Corporation Sdn Bhd-90%-). The project is due for completion in the year 1997 and an estimated cost of US\$30 million (fixed capital of US\$29.3 million and working capital of US\$0.7 million).

There is the second BOT project in Vietnam. In March 1995 at Ho Chi Minh City, a consortium (Pengkalen Holdings Berhad-70%-, United Concord International Ltd.-20%-, Thames water International Plc.-5%- and Bovis Malaysia-5%-) submitted a technical and financial proposal to implement the second phase of Saigon River Water System under a Build-Operate-Transfer (BOT) facility with a concession term of 25 years. The scope of work would include the construction of a water intake located on the west side of the Saigon river at Ben Than, a raw water pumping station with a capacity of 306,000 cu.m./day a raw water pipeline of 1500 mm diameter and a total length of 9.5 km., a water treatment plant with a capacity of 300,000 cu.m./day and a treated water pumping station. Treated water pipelines are not included in the project. The estimated construction period is 30 months and the investment costs for the project are estimated to be US\$107.6 million.

The consortium was requested to submit a supplementary proposal that includes the construction and financing of treated water transmission lines connecting the project. This proposal was submitted in August 1995. The estimated cost of the scheme is excluding the cost of treated water transmission pipelines which is US\$105.3 million. The estimated cost for the construction of 1 km pipe of 1500 mm diameter, 8 km pipe of 1000 mm diameter and 5 km pipe of 1200 mm is US\$39.8 million.

The third BOT is proposed in March 1995. Messrs.Lyonnaise des Eaux, France, submitted to HCMC's People's Committee a pre-feasibility study, proposing the duplication of the production capacities of Hoc Moc and Thu Duc Treatment Plants

and the associated transmission pipelines to be implemented under BOT arrangement. The proposed duration of the BOT project is 30 years including the first phase construction period that is from 1996 till the end of 2025. The corresponding investment program was estimated to be US\$185.0 million. Meanwhile the consultants had been informed that the duplication of Hoc Moc Ground Treatment Plant's capacity under a BOT project had been disregarded by the Government of Vietnam. A solution, which include the duplication of The Duc water Treatment Plant Complex's capacity and the construction of only two transmission mains is reported to be favored.

- 4) The medium term plan, this is, the five years plan of water sector in Hanoi till 2000 has drafted by TUPWS (Table 2.4-3). The water sector's investment amount is planned at US\$192 million equivalents. Only 37% of water sector's investment amount is planned to be able to mobilize domestic funds. The other amount is planned to introduce foreign official funds at 29% and foreign direct investment at 34%. The other side, the investment plan and fundraising plan of TUPWS totaled US\$1249 million is consisted of domestic funds at 50%, foreign official funds at 18% and foreign direct investment at 32%. Therefore, the investment plan of water sector depends too much on foreign funds. This is significant character of water sector fundraising.

Table 2.4-3 Investment Requirement Draft in TUPWS 1996 – 2000

(US\$ 1,000)

Targets	Construction Schedule	Capacity of the Plant	Total Cost	Domestic Fund	Foreign Official Fund	Foreign Direct Investment
Total Investment			1,249,023	621,807	229,034	398,182
Water Supply			192,222	70,929	55,893	65,400
Hanoi Water Supply Program (Loan from the World Bank)	1996 – 2000		51,179 (48,770)	19,599 (18,490)	31,580 (30,280)	
Finish Water Supply Program (Loan from FINNIDA)	1996		20,341 (20,341)	2,561 (2,561)	17,779 (17,779)	
Gia Lam Project	1994 – 1996		8,638 (8,638)	3,104 (3,104)	5,534 (5,534)	
Small Water Plants			111,064	45,664		65,400
Dong Anh	1995 – 1997	30,000 m ³ /d	32,700			32,700
Van Dien	1998 – 2000	20,000 m ³ /d	25,000	25,000		
Cau Dien	1999 – 2000	15,000 m ³ /d	20,000	20,000		
Soc Son	1996 – 1997	30,000 m ³ /d	32,700			32,700
Pumping Stations	1994 – 1998		464	464		

- 5) In order to use foreign funds in the future, HWBC will need to establish a strong balance sheet, sufficient cash flows, and to obtain a good rate of return. In addition to this sound financial condition, HWBC will need to provide adequate financial statement to lenders, financial institutions. Financial statements must be prepared in accordance with international accounting standards and audited each year by competent, independent auditors. It is not sufficient for HWBC to provide its financial statements audited and certified by a government internal auditor.

(5) Future Organizational Structure

1) Reorganization of HWBC

The organizational changes which have occurred since 1994 demonstrate a continued move towards a commercial oriented enterprise, but further reorganization is taking place to fully implement a commercial approach. The important approach which is consistent with motivating workers to reduce water leakage and increasing water charges is to divestiture the WBCs into regional subsidiaries redefined as different profit units. However, these regional subsidiaries should not be closed, since seasonal and special fluctuations in demand, as well as emergency such as pipe bursts, fires, or production problems will require transfers across regional boundaries. Therefore, regional subsidiaries should establish managerial accounting system in order to calculate such transfers transaction.

In August 1996, HWBC has split into HWBC and HWBC No. 2. HWBC No. 2 inherits the eastern business territory across the Red River which Gia Lam Water Business Enterprise is. No. 2 HWBC is ready to enlarge the business territory to the northern rural areas in the future. On the other hand, HWBC inherits the western business territory of the Red River which the center of the city is. HWBC will expand the business territory to the southern rural areas in the future.

2) Future Organizational Structure of HWBC

In 1997, there was a further major re-organization as follows (Fig.2.4-7).

- (a) The water production grouping and the water distribution grouping were merged into one grouping. This results in one deputy director managing the both function.
- (b) The supporting grouping under one deputy director becomes one independent grouping separate from the service grouping.
- (c) Some departments and enterprises change in the grouping.
- (d) The deputy director of material manages only one unit named material enterprise. However, it will be merged in the supporting grouping after finishing FINNIDA activities.

Longer-term amendment might be need for improving management efficiency. The following countermeasures will be introduced.

- (a) The cost units so-called "departments" with business capability will change to profit units so-called "enterprises" gradually. Every major district will have one business enterprise in the future. Candidates of new enterprises will be Thanh Xuan, Cau Giay, Tay Ho, etc.
- (c) The water plants will get revenue by wholesaling water to business enterprises in the future. Candidates of new plants will be Cau Dinh, Cau Giay, Nam Du, etc.

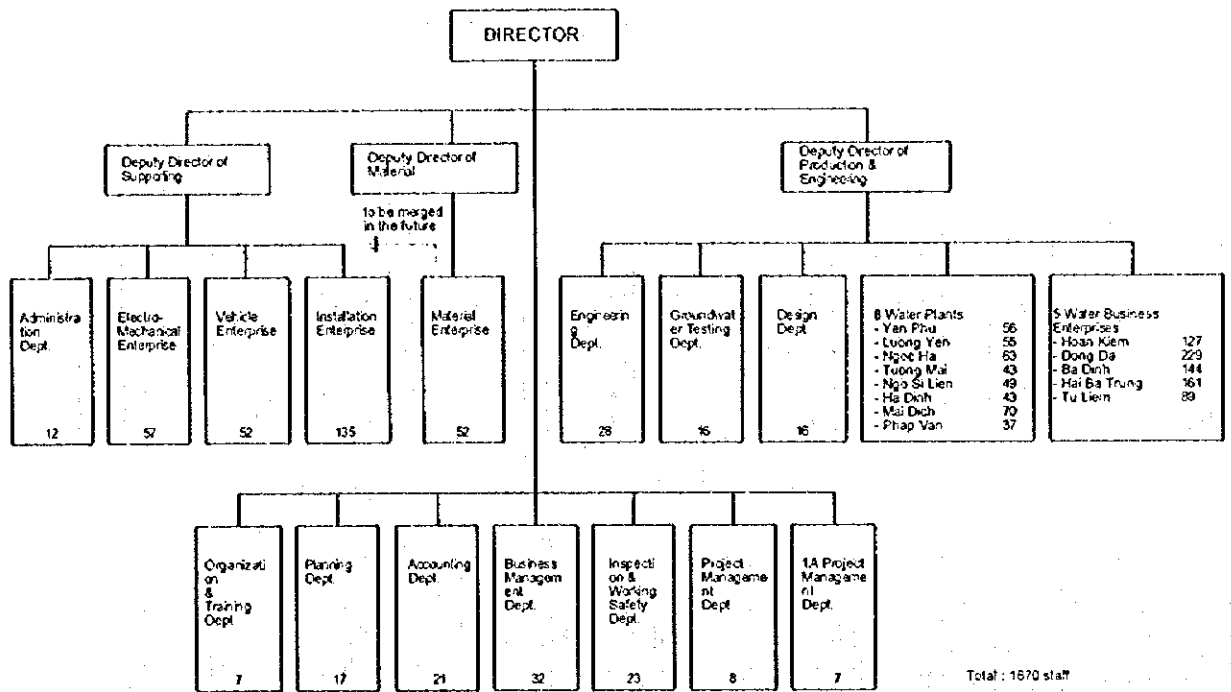
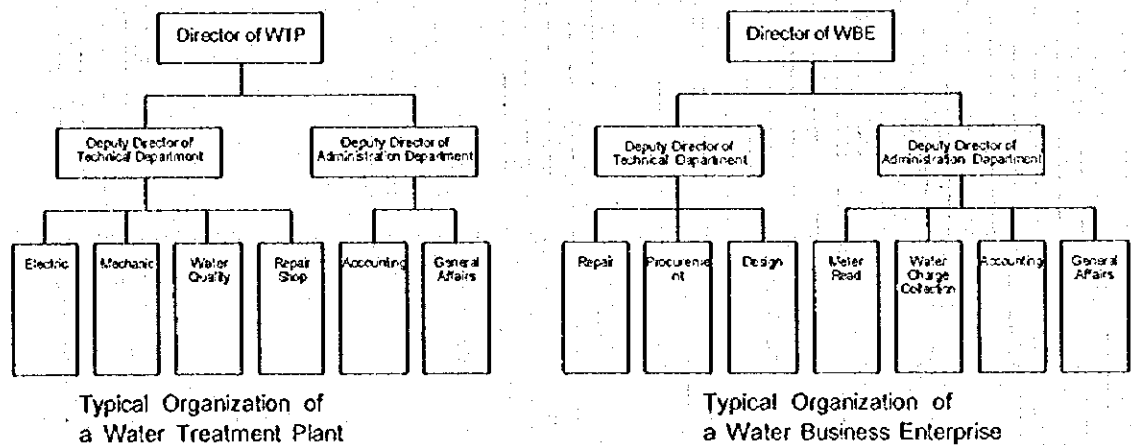


Fig. 2.4-7 The organization chart of HWBC in March 1997 and Future Direction



3) Future Organizational Structure of HWBC No. 2

HWBC No. 2 is given the special treatments which can import the material from foreign country and establish joint ventures with foreign companies based on the decree "so 2882 QD-UB (31/Aug/96)". It is said that these special treatments are only introduced into the HWBC No. 2 and HWBC No. 2 is treated as the model case in all Vietnam. If this trial is successful, the central government will expand these special treatments in other WBCs of Vietnam. The director of HWBC No. 2 explained and indicated the next points in March 1997.

The director of HWBC No. 2 has the authority to propose the planning of its organization, investment, personnel matters and to implement them independent from HWBC.

The director showed the organizational chart of HWBC No. 2 in March 1997 and the future direction (Fig2.4-8). Two ways will be taken place toward the future. One is that the decentralization will be preceded. HWBC No. 2 is ready to enlarge the business territory to the northern rural areas including Dong Anh district and Soc Son district. These two districts will have each water plants and each water business enterprises. The other way is that new departments will be established along with the expansion of the business.

Water plants will be able to sell the water to water business enterprises at the internal tariff in the future (about two years later). Water plants will be able to sell the water to customers at the retail tariff, too. The internal tariff could be approved by Hanoi People's Committee for example TUPWS in the future. The retail tariff could be approved by Hanoi People's Council.

Material department will be able to buy material outside and to sell them the installation enterprise after changing the status from the installation department into the installation enterprise. The transfer price could be proposed to TUPWS from HWBC No. 2.

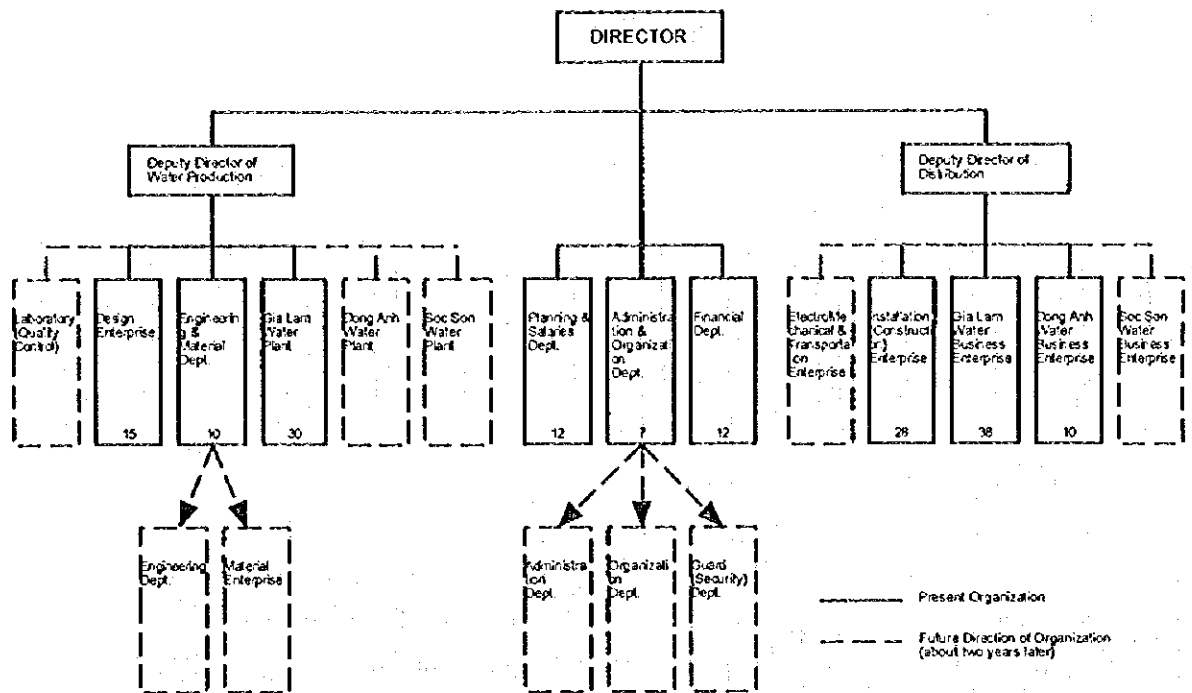


Fig. 2.4-8 The organization chart of HWBC No.2 in March 1997 and Future Direction

4) Future Organization Structure of Rural Areas

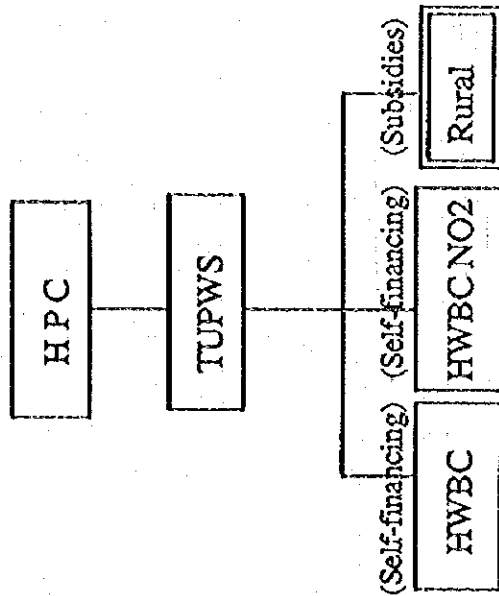
HWBC and HWBC No. 2 are planning to expand the business territory to the rural areas in the future. However, because of the small volume of water to be supplied in each communes of rural areas, the water revenue will not be able to cover the construction cost. Therefore, it causes the issue who should manage and finance the rural areas.

There are three alternatives (Fig2.4-9).

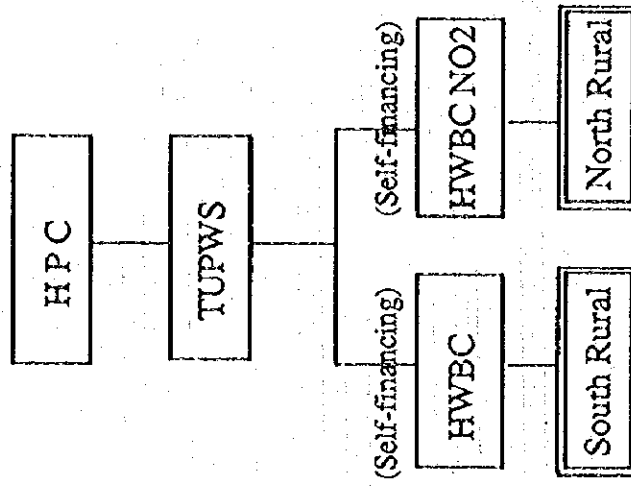
- A. The first alternative means that HWBC and HWBC No.2 might give up the management competence of rural areas due to the poor profitability. In this case, TUPWS will have to establish the special organization for managing rural areas and to provide subsidies for constructing water facilities there. However, this will bring low efficiency to the special organization because it will have the characteristics of municipal organization with subsidies.
- B. The second alternative is that HWBC and HWBC No.2 might have the management competence of rural areas, but the self-financing will be applied to the rural areas from the viewpoint of the commercialization. In this case, TUPWS will not provide subsidies for constructing water facilities there, which making it economical infeasible to supply these small communes with water.
- C. The third alternative is that the water management board of rural might construct water facility there through subsidies provided by rural districts and should transfer water facility to HWBC or HWBC No. 2 after completion. HWBC or HWBC No. 2 could conduct operation and maintenance through taking over water facility.

From managerial view point, the third alternative may be more feasible. One reason is due to the social priority for the development of the rural water supply system. The other reason is due to the good impact of profitability on HWBC and HWBC No. 2.

Alternative (1)



Alternative (2)



Alternative (3)

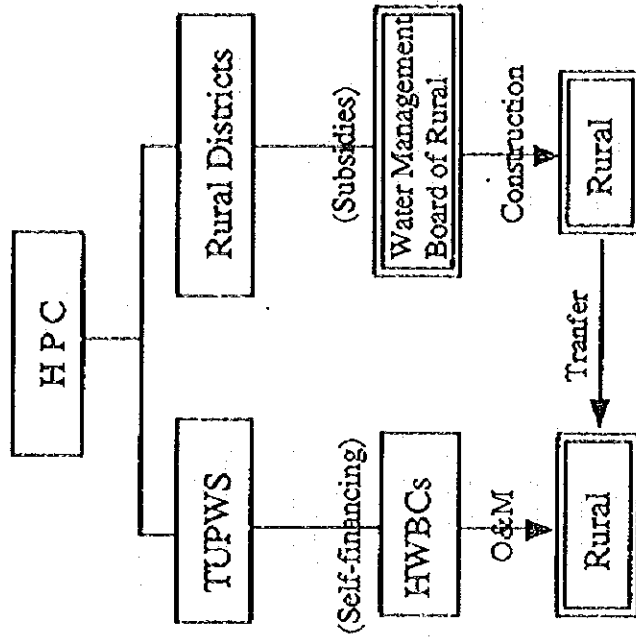


Fig. 2.4-9 Possible Organization Structures of Rural Areas

(6) Outlook for Work Force

The employees of current HWBC are divided into four (4) job categories as follows :

Category 1 :

Water production at the water treatment plants (430 workers are engaged as of March 1996)

Category 2 :

Marketing activities, specifically, meter reading, billing and money collection at the water business enterprises which are subsidiaries of HWBC (770 workers as of March 1996)

Category 3 :

Operational support service activities at the material and related enterprises which are subsidiaries of HWBC (320 workers as of March 1996)

Category 4 :

Planning, organization, accounting, engineering, project management, security and other administrative operations at the departments of HWBC's headquarters (260 workers as of March 1996)

In this study, future work force by water supply system have been estimated as shown in Table 2.4-4. It is not yet certain how 1,780 employees of HWBC will be divided between two new water business companies, HWBC and HWBC No.2. Therefore, it is assumed in this study that employees will be divided in proportion to the distribution capacities in the year 2000. After that, their employees would increase independently in proportion to each distribution capacity. The staff number of rural water supply systems has been estimated according to the paragraph of this report.

The ratio of customers to workers is a parameter which shows an efficiency of water supply service. HWBC has the ratio of 713 customers/worker, which shows inefficiency in comparison with the ratio of 1406 customers/worker of the Water Supply Company in Hochiminh city. HWBC and HWBC No. 2 should restructure

the working staff and increase the ratio at least to the same level that the company in Hochiminh city has. The ratios of efficiency would increase gradually and reach the level of 1400 customers/worker by the year 2010 as follows :

Year 2000	1,100 customers/worker
Year 2005	1,250 customers/worker
Year 2010	1,400 customers/worker

As for the rural water supply systems, a capacity of each system would be so small that it would be difficult to increase the efficiency to such extent. Therefore, any targets of restructuring rate have not been applied for the estimation.

Table 2.4-4 shows that total workers of HWBC and HWBC No. 2 would slightly increase by 10% from 1995 till 2010, though total water distribution capacity would be greatly expanded three times as much as the present capacity. It means not only that the targeted efficiency would be achieved by restructuring, but also that restructuring to that extent would not necessarily need dismissal so much but need to rearrange the work forces reinforcing them with training and education.

Table 2.4-4 Outlook for the Number of Workers by Water Supply System

Year 1995

Job Category	HWBC	HWBC No.2	Rural	Total
1. Water Production	430	-	-	430
2. Business	770	-	-	770
3. Operational Support	320	-	-	320
4. Headquarters	260	-	-	260
Total Employees	1,780	-	-	1,780
Piped Watered Population	1,251,787	17069	0	1,268,856
Distribution Capacity (m3/d)	363,000	7000	0	370,000
Restructuring Rate (%)	0	-	-	-
Efficiency (Population/Worker)	713	-	-	713

Year 2000

	HWBC	HWBC No.2	Rural	Total
Total Employees	1,390	104	200	1,694
Piped Watered Population	1,529,472	114,623	222,477	1,866,572
Distribution Capacity (m3/d)	463,000	37,000	21,200	521,200
Restructuring Rate (%)	37.6	41.6	-	57.9
Efficiency (Population/Worker)	1,100	1,102	1,112	1,102

Year 2005

	HWBC	HWBC No.2	Rural	Total
Total Employees	1,361	617	600	2,578
Piped Watered Population	1,701,308	771,571	412,446	2,885,325
Distribution Capacity (m3/d)	633,000	367,000	63,600	1,063,600
Restructuring Rate (%)	55.3	65.1	-	57.9
Efficiency (Population/Worker)	1,250	1,251	687	1,119

Year 2010

	HWBC	HWBC No.2	Rural	Total
Total Employees	1,271	688	600	2,559
Piped Watered Population	1,779,058	963,192	441,542	3,183,792
Distribution Capacity (m3/d)	713,000	427,000	63,600	1,203,600
Restructuring Rate (%)	62.9	66.5	-	57.9
Efficiency (Population/Worker)	1,400	1,400	736	1,244

2.4.3 Training for Work Force

In order to keep the work forces required for the proposed organization, rationalization and employment of staff will be needed. At the same time, training and education for the staff would be necessary to maintain and develop the water supply systems. The following training and education courses are proposed.

Managing staff:

learn how to manage an organization and to acquire knowledge of new technology

Water supply engineer:

to learn how to plan a water supply scheme and how to manage water sources and water quality, and to acquire techniques of water treatment and plant operation

Staff in charge of construction and maintenance of facilities:

to learn how to control a time-schedule and quality of work, and how to inspect and repair equipment, machines and facilities

Staff in charge of business and public relations:

to learn how to effectively collect water charge and how to pleasingly serve users

Staff in charge of finance and accounting:

to learn how to keep accounts, how to plan a financial scheme, and how to finance

At present, the Ministry of Construction has a plan to establish a training center for water supply and sanitation. The plan includes technical courses for water supply engineers, therefore water supply systems in Hanoi should actively utilize these training courses for their staff.

Engineers/workers for operation and maintenance of water treatment facilities in rural water supply systems should be trained by an on-the-job way at the existing plants. Therefore HWBC and HWBC No.2 should provide a training section in their organizations.

Training for HWBC's staff in charge of finance and accounting is to be carried out by the year 2000 as a component of the project financed by the World Bank.

HWBC No.2 should enroll the staff to be transferred to HWBC No.2 in the training course and develop the talents in this field by the year 2000.

It is imperative in the future that a training system be established in the Gia Lam new water treatment plant that train the staffs of HWBC No.2.

Staff in charge of water quality monitoring should be trained mainly at the existing water quality laboratory of HWBC. Main training courses should be a lecture of chemistry and a practical training of water quality analysis. Analysis of special substances such as heavy metals or agricultural chemicals should be subcontracted to special institutes which have sufficient devices for chemical analysis. However, higher level of knowledge of chemistry should be acquired through training and education in order to examine and evaluate the results.

2.5 FINANCIAL PLAN

2.5.1 Discussion on the Water Tariff

(1) Introduction

Water tariff should meet two contradictory objectives – financial and social objectives. Water tariff should make a water company financially healthy, yet at the same time price level should be kept low enough for even low income households. In 1995, National Water Tariff Policy Study in Viet Nam (NWTS) was carried out funded by the Asian Development Bank and was participated by the Central Government including the Ministry of Construction and 53 provincial water companies in order to determine optimum water tariffs. As of March 1996, nevertheless, water tariffs throughout the country turned out to be too low considering financial viability of water companies in Vietnam. Therefore necessary increases in tariffs were recommended in the NWTS together with improvements in billing & collection system and consumers education.

(2) National Level Discussions

1) Strategies in National Urban Water Supply Sector

Based on the national strategy, urban centers should be provided with piped water according to the following plan.

Planned Water Supply Coverage & Service Levels

Year	Consumption(l/c/d)		Service Area Coverage (%)
	Domestic	Commercial & Industrial	
1995	80-110	150	To be based on investigations and records
2000	150	250	70 to 80
2010	180	300-350	85 to 90

Source: Ministry of Planning and Investment

The Government used to provide big funding for water supply sector, but now the policy has changed to make the urban water sector more self-financing through various methodologies such as appropriate tariff policies.

It is important to point out that the Government is encouraging private enterprises and foreign entities participation through joint venture schemes and/or BOT projects. For example in Ho Chi Minh City, three BOT projects are ongoing in the water supply sector.

2) Organizations relating to Tariff Setting

In the urban water supply sector, the Central Government of Vietnam is essentially responsible for preparing national plans, approving regulations and allocating budgets for investment.

The Ministry of Construction (MOC) is the main central government level entity responsible for water supply in Vietnam. The MOC has wide responsibilities in planning, regulations, designs, construction, and investment of water supply.

The provincial People's Committees have substantial authority to determine water supply policies such as production and distribution and decide on financial policies of water companies including subsidies and investment. They are the key decision makers in each province for setting tariffs.

Water supply services in provincial urban centers are managed and operated by provincial water companies currently reporting to the provincial People's Committees (in the case of Hanoi, through the Director of TUPWS).

3) Existing Tariff Setting Procedures

Since late 1980's the Central Government has been decentralizing water tariff setting to provincial governments in order to decrease their dependency in subsidies and for them to become self-financing.

The first step of tariff setting is for the water company to prepare a detailed proposal and recommendations of a new tariff. Then the proposal is submitted to an Assessment Committee of the provincial People's Committee, made up of Department of Finance and Pricing, Department of Construction and provincial Planning Committee. Following this review, new tariff recommendations are put for approval by provincial People's Committee.

4) Existing Financial Objectives for Water Companies

In the past, there were no clear financial objectives for State Enterprises (SEs) in Vietnam. Now under the State Enterprises Reform Program, SEs are required to make profits. However the adequacy of the profit has not yet been specified. In the NWTS, water companies were required to set tariffs to cover full operating costs, depreciations, tax obligations, and a regulated profit percentage (up to 5% of operating cost in the Study).

Generally speaking, until 1994, water tariffs had not been set at levels to maintain fixed assets in good conditions, with depreciation amount paid out to the provincial People's Committee. For water companies taxes and depreciation payment were the priorities as such sufficient money was not spent on maintenance. Just minimum expenditure to prevent the system from collapsing had been disbursed. Thus in many locations major rehabilitation is now required. Given the shortage of Government funds Vietnam relies on grant aids and development loans from multinational or bilateral sources for this purpose.

(3) Water Tariffs in Hanoi

1) Present Level in Hanoi

Historical trend of water tariff in Hanoi is presented in Table 2.5-1.

Table 2.5-1 Water Tariffs in Hanoi

(Unit: VND/m³)

Customer Categories	1992	1993	1994		1995	1996	
			Jan. to Sep.	Oct. to Dec.		Jan. to Jul.	From Aug.
1. Domestic	600	600	600	1,000	1,000	1,000	1,200
2. State Enterprises/Public Services	1,200	1,600	1,600	2,000	2,000	2,000	2,400
3. Private Businesses	3,000	5,000	5,000	5,000	5,000	5,000	5,500
4. International Customers	5,000	5,000	5,000	5,000	5,000	5,000	5,500

Domestic category is limited to household water use. The second category is applied to government owned factories and enterprises, schools, hospitals, and administrative offices. Private Businesses are mainly service organizations such as hotels and restaurants. International customers mean foreigners and joint venture enterprises.

Key point of present water tariff structure in Hanoi is that all customers are charged a flat rate tariff depending on the classification. According to the survey by ADB in 1995 only 35% of domestic and 67% non-domestic customers were metered. The remaining customers pay a flat rate based on a contract amount per month. For domestic customers it is calculated based on 4 m³/capita/month where water pressure is weak and 6 m³ where water pressure is high. For non-domestic the contract is calculated by estimated usage. As a natural result, both domestic and non-domestic consumption is largely underestimated.

2) Future Tariff Forecast Process

In this report, the calculation of the Water Production Cost will be conducted as the basis of future tariff forecast, which should be quite logical context given the prevailing policy in Vietnam of self-financing Water Companies.

As of May 1997, there are several future tariff forecasts available from other sources. Namely, NWTS, World Bank's Final Report, and Estimated Financial Plan by HWBC submitted to the World Bank mission in April 1996.

According to the opinion letter to NWTS issued by HWBC in March 1996, total project water cost in year 2000 is estimated 3,900 VND/m³ for inclusive of both domestic and non-domestic customers. Apparently, present water tariff table means too low tariff for domestic customers and strong cross subsidies from non-domestic customers. Thus it is generally accepted that until year 2000, rather rapid increase in water tariff as high as some 20% per annum, should be justified in Hanoi, especially for domestic customers.

In March 1996, Table 2.5-2 was proposed for Hanoi by NWTS until year 2001 supported by MOC. The proposal assumes progressive structure in most categories with 3 steps for domestic (a lifeline block of 20m³) and two steps or flat rate charges for non-domestic customers.

Table 2.5-2 Proposed Water Tariff by NWTS

			(VND/m ³)					
	(m ³ /month)	Factor	1996	1997	1998	1999	2000	2001
Domestic	0-20	1	1,000	1,240	1,545	1,915	2,380	2,522
	21-40	1.5	1,000	1,860	2,315	2,875	3,570	3,785
	>41	2	1,000	2,480	3,085	3,830	4,760	5,040
Institutions	0-40	1.5	1,000/2,000	2,000	2,315	2,875	3,570	3,785
	>41	2	2,000	2,480	3,085	3,830	4,760	5,040
Industry / State Enterprises	0-40	2	2,000	2,000	3,085	3,830	4,760	5,040
	>41	3	2,000	3,720	4,630	5,750	7,140	7,570
Commercial / Foreign	All Consumption	5	5,000	6,200	7,700	9,600	11,900	12,600

Notes:

1/ Relationship to lifeline domestic charge

2/ The above rates are inclusive of drainage surcharge of 10% per m³

In April 1996, HWBC themselves made an estimation for water tariff until year 2004 as shown in Table 2.5-3 taking the World Bank Project into consideration.

Table 2.5-3 Estimation for Water Tariff

		(VND/m ³)								
Customer category		1996	1997	1998	1999	2000	2001	2002	2003	2004
1. Domestic		1,166	1,375	1,650	2,000	2,425	2,775	3,050	3,350	3,625
2. SEs/ Public Services		2,333	2,750	3,300	4,000	4,850	5,550	6,100	6,700	7,750
3. Private Businesses		5,000	5,500	6,000	6,750	8,000	8,400	9,200	10,000	10,800
4. Foreigner		5,000	5,500	6,000	6,750	8,000	8,400	9,600	10,000	10,800

Source : HWBC/TUPWS

In November 1995, World Bank Final Report presented water tariff forecast for 2000 until 2010 as attached in Table 2.5-4.

Table 2.5-4 Water Tariff Forecast

		(VND/m ³)										
Customer Category		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Domestic		2,767	3,050	3,203	3,363	3,531	3,708	3,893	4,088	4,292	4,507	4,732
SEs/ Public Services		5,534	6,101	6,406	6,726	7,063	7,416	7,787	8,176	8,585	9,014	9,465
Private Businesses		13,834	15,252	16,015	16,816	17,657	18,539	19,466	20,440	21,462	22,535	23,661
Foreigner		13,834	15,252	16,015	16,816	17,657	18,539	19,466	20,440	21,462	22,535	23,661

Source : World Bank Final Report

In those forecasts, calculations on Water Production Cost are not exactly done. It is assumable that this is due to inaccurate available financial information regarding the current Water Production Cost. In this Master Plan, after calculating Water Production Cost, those other forecasts will be taken into account to finalize the tariff setting.

2.5.2 Financial Planning Procedures

(1) Common Procedures

For formulating the financial aspect of the Master Plan, the following steps will be undertaken :

- 1 Determination of the Project Cost**
- 2 Determination of the Total Financing Required**
- 3 Determination of the Water Tariff by adjusting the Annualized Costs concept**
- 4 Calculation of IRR based on the estimated Revenue and Cost figures**
- 5 Financial Analysis including the Profit & Loss and Funds Application / Source projection**

The above procedure is applicable to the related three plans. Namely, for plans in the south Hanoi, the north Hanoi, and the rural area.

Exchange rate is fixed at 11,000 VND/US \$. (Government of Vietnam will bear the foreign exchange risk)

Throughout the Financial Plan, all the figures are presented in real-terms at price level of year 1997 (not nominal, unless stated otherwise).

(2) Scope of the Financial Plan

1) The South Hanoi

HWBC continues to cover the water supply services in the south Hanoi area. Thus HWBC's future water supply system includes existing plants, Yen Phu plant extension by FINNIDA, and New Cao Dinh plant and New Nam Du Thung plant by the World Bank in addition to this JICA project. However, international standard financial information are limited as for existing facilities. According to their Final Report, the World Bank project will lead HWBC to go through the break even point after year 2001. Given this environment, main focus on Incremental Cash Flows shall be justified for this report.

In this context, this JICA Study has two sources of incremental cash flows. That is, (a) Cash flows from new plants extension and (b) Cash flows from rehabilitation of existing facilities.

2) The North Hanoi

HWBC No.2 provides water supply services in the north Hanoi area. HWBC No.2's future water supply system includes existing plants (7,000 m³/day capacity), New Gia Lam plant by Japanese Grant in addition to this JICA study.

In this report, analysis on the incremental cash flows by the JICA study shall be focused considering as for the existing plants, capacity itself is quite small and international standard financial information is not available as of May 1997. New Gia Lam is a grant project where financial evaluation standards are different.

As there is no rehabilitation program in the north, analysis will be made on the six new plant expansions explained in Chapter 2.2.

3) The Rural Hanoi

Regarding the Water Supply Plan for the rural Hanoi area, piped water system is completely new. Therefore, financial analysis on the new facility constructions shall be conducted to evaluate the financial position of the area.

(3) Common Assumptions for Project Cost Calculation

1) O&M Cost

A. Rehabilitation of the Existing Facilities

This JICA M/P includes the rehabilitation program of the existing facilities of the south Hanoi after the World Bank finishes their project. Thus there will be incremental O&M Costs by rehabilitation to carry out the program in the south Hanoi.

B. New Plant Extensions

The following three types of O&M Costs are to be involved :

- | | |
|---------------------|---|
| (a) Plant O&M | O&M Costs born in the New Water Treatment Plant |
| (b) WBE O&M | O&M Costs accrued for the Water Business Enterprise |
| (c) Head Office O&M | O&M Costs allocated to the HWBC Head Office |

(Note)

In the rural Hanoi project, different terms are defined on account of the different character of the water supply organization. They are, (a) Facility O&M and (b) Marketing O&M.

(a) Plant O&M

Plant O&M Cost (VND/year) is to be calculated by using the formula below :

$$[\text{Plant O\&M per Production (VND/m}^3)] \times [\text{Average Daily Production (m}^3/\text{day)}] \times [\text{AFW ratio : 0.7}] \times 365 \text{ (days)}$$

Plant O&M Cost per Production consists of (a1) Staff Cost, (a2) Chemical Cost, (a3) Electric Cost, (a4) Repair Cost and (a5) Other Cost.

(for the current price level of 1997 i.e. *growth* means real term growth)

(a1) Staff Cost

$[\text{Numbers of Staffs}] \times [\text{Staff Salary : 760,000 (VND/month/person)}] \times 12 \text{ (months/year)}$

« basic salary 10%p.a. growth until 2010, 5%p.a. growth until 2020, 3%p.a. growth until 2030 »
(Assumption sources : HWBC Finance Dept., Estimated Financial Plan by HWBC, JICA Study Team)

(a2) Chemical Cost

$[\text{Daily Maximum Production (m3/day)}] \times [\text{Plant Loss : 1.05}] / [\text{Daily Maximum Factor : 1.35}] \times$
 $[\text{Chlorine Dosage : 5/1000(kg/m3)}] \times [\text{Unit Cost of Chlorine : 4,900(VND/kg)}] \times$
 $365(\text{days/year})$

The above formula is applied to the urban water supply systems, namely the north and south Hanoi projects. In the rural Hanoi project, Hypochloride is used for disinfection instead of Chlorine. Unit cost of the 6.5% Hypochloride liquid is 650 VND/liter. Dosage is to be 2ppm. Accordingly, the formula of the chemical cost of the rural Hanoi is :

$[\text{Daily Maximum production}] \times [\text{Plant Loss : 1.05}] / [\text{Daily Maximum Factor : 1.35}] \times$
 $[\text{Dosage : 0.002 kg/m3}] \times [\text{Unit Cost : 650 / 0.065 VND/kg}]$

(Assumption sources : HWBC, JICA Study Team)

(a3) Electric Cost

$[\text{Daily Maximum Production (m3/day)}] / [\text{Daily Maximum Factor : 1.35}] \times 365(\text{days/year}) \times$
 $[\text{Electric Consumption per Production : 0.5(kWh/m3)}] \times [\text{Unit Electric Cost : 600(VND/kWh)}]$

« unit electric cost 5%p.a. growth until 2010, 2%p.a. growth after 2011 »
(Assumption sources : HPC, JICA Study Team, World Bank Electric Sector Review)

(a4) Repair Cost

$[\text{Construction Cost}] \times 1\%$

(Note)

In the rural Hanoi project, Repair Cost is estimated to be 1.5 % of the construction cost.
(Assumption sources : HWBC, JICA Study Team)

(a5) Other Cost

$[\text{Total of the Above Costs}] \times 15\%$

(Assumption sources : HWBC, JICA Study Team)

Given the Total Plant O&M Costs presented, Plant O&M Cost per Production (VND/m3) can be calculated as the following formula :

$[\text{Plant O\&M Costs : (a1)+(a2)+(a3)+(a4)+(a5) (VND/year)}] / [\text{Average Daily Production (m3/day)}] / [\text{AFW ratio : 0.7}] / 365 \text{ (days/year)}$

(b) WBE O&M

Additional water distribution by the new plants will naturally increase the work load of the Water Business Enterprises in the area. However, because internal unit cost accounting has not yet been applied in HWBC nor HWBC No.2, there is no statistical data available on the proportion of WBE O&M costs to total HWBC O&M costs.

For calculation purpose, 15% of plant O&M Costs is assumed for WBE O&M costs based on the historical data in Japan and the other South East Asian countries such as Indonesia.

(c) Head Office O&M

10 % of Plant O&M Costs shall be allocated to the Head Office O&M Costs, due to the same reasoning of WBE O&M Costs.

O&M Costs by New Plant extensions for each year can be calculated as :

$[\text{O\&M per Production (VND/m}^3)] \times [\text{Incremental ADD (m}^3/\text{day)}] \times [\text{AFW ratio : 0.7}] \times 365$
(days/year)

(Note) ADD : Average Daily Demand

2) Investment (Construction) Related Cost

In addition to the construction costs explained in Chapter 2.2, physical contingency and price contingency should be taken into consideration.

Main assumptions are as follows :

- (a) Physical contingency would be 10% of the construction costs.
- (b) F/C portion will account for 59% of total construction whereas L/C portion 41%.
- (c) Price contingency (inflation) shall be composed of F/C portion and L/C portion.

2% p.a. inflation is applied to F/C portion based on the World Bank indices, and 9% p.a. inflation is applied to L/C portion based on the State Bank of Vietnam forecast. This results in the future price index of :

Future Price Index

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
F/C	100.00	102.00	104.04	106.12	108.24	110.41	112.62	114.87	117.17	119.51
L/C	100.00	109.00	118.81	129.50	141.16	153.86	167.71	182.80	199.26	215.20

(4) Determination of Total Financing Required

1) Total Financing Required

Considering the prevailing national policy in Vietnam of toward self-financing Water Companies, O&M costs shall be sustained by water charges. This implies that all the investment cost is equivalent to the total financing required. Given it, financial obligations shall be calculated.

2) Depreciation

The straight line method with lifetime 20 years for all construction is assumed based on information of a big Six Accounting Firm .

3) Financing

The external loan funding source shall be assumed. The loan conditions would be :

Loan Period	30 years (no grace period assuming repayments to the Governmental Financial Institution)
Repayment	semi-annual installments
Interest Payment	2.3% p.a.
Draw Down	at the beginning of the year of construction

(5) Determination of Water Tariff

1) Annualized Water Price

In this study, Annualized Water Prices are to be used for the basis of water tariff calculation. Annualized Water Prices mean unit water prices for each year to cover the all project related costs per production. Calculation processes of the annualized prices for new plant extensions are shown below.

$$\begin{aligned} \text{[Annualized Water Price]} &= \text{[O\&M Costs : (Plant O\&M)+(WBE O\&M)+(HO O\&M)]} \\ &+ \text{[Debt Services : (Principal + Interest)]} \\ &+ \text{[Regulated Profit : 5\%]} \end{aligned}$$

(Note)

$$\begin{aligned} \text{[Debt Services (VND/m}^3\text{)]} &= \text{[Annual Repayment Amount (Principle and Interest) (VND/year)]} \\ &/ \text{[Accounted for Water (m}^3\text{/day)]} / 365 \text{ (days/year).} \end{aligned}$$

2) Tariff Setting

It should be noted that for setting the water tariffs, the following three points shall be considered to adjust the Annualized Water Prices discussed above.

(a) The first new operation will start after several years of construction period. Thus, beforehand no water revenue will be accrued, although the annualized prices imply debt services starts right after the loan draw down.

(b) The above calculations does not consider the time value of money. This project has a series of up-front disbursements, which has negative impact on the net present value of cash flows.

Because of the above two reasons, future Water Tariffs should be higher than the Annualized Water Prices to cover all project costs and achieve adequate IRR.

(c) Another element to be considered is the incremental revenue generation by the rehabilitation of the existing facilities (this should be considered only in South Hanoi area). Apparently, co-relation between revenues and costs are different from the case of new plant extensions, because rehabilitation can take advantage of the past investments for free to some degree.

Therefore, in order to come up with the appropriate Water Tariffs, internal circulation with integration test starting from the Annualized Water Prices shall be the most convenient way.

The projected water tariff is tabulated in Table 2.5-4. The tariff is well comparable with projections by other sources. Until year 2004, figures are almost same as Estimated Financial Plan by HWBC. After year 2004 for domestic customers tariffs are close to the forecast in the World Bank Final Report and for other customer categories, average 5% per annum increases are assumed. Overall the projected table is more conservative than World Bank Final Report forecast and milder in cross-subsidies between domestic and non-domestic customers.

Table 2.5-4 Projected Water Tariff

Customer Category	(VND/m ³)						
	1997	1998	1999	2000	2001	2002	2003
Domestic	1,375	1,650	2,000	2,425	2,775	3,050	3,350
SEs/ Public Services	2,750	3,300	4,000	4,850	5,550	6,100	6,700
Private Businesses	5,500	6,000	6,750	8,000	8,400	9,200	10,000
Foreigners	5,500	6,000	6,750	8,000	8,400	9,200	10,000

	2004	2005	2006	2007	2008	2009	2010
Domestic	3,625	3,750	3,900	4,100	4,300	4,500	4,700
SEs/ Public Services	7,750	8,135	8,550	8,970	9,420	9,900	10,390
Private Businesses	10,800	11,340	11,900	12,500	13,120	13,790	14,470
Foreigners	10,800	11,340	11,900	12,500	13,120	13,790	14,470

(6) Financial Analysis

1) Revenue Forecast

A. Revenues from Rehabilitation

By year 2000 the World Bank is to make network rehabilitation in order to reduce UFW in the south Hanoi. This Master Plan assumes necessary rehabilitation program will be continued to achieve the UFW reduction target of 30% in 2010.

	Existing Plants	
	Capacity (m ³ /day)	UFW (m ³ /day)
1996	363,000	257,730
1997	363,000	239,580
1998	363,000	221,430
1999	363,000	206,910
2000	363,000	192,390
2001	363,000	177,870
2002	363,000	166,980
2003	363,000	156,090
2004	363,000	145,200
2005	363,000	134,310
2006	363,000	123,420
2007	363,000	119,790
2008	363,000	116,160
2009	363,000	112,530
2010	363,000	108,900

▲ figure A

(Unit: m³/ day) ▼ figure B

	Total Capacity	UFW	Effective Water	Water Demand	Revenue Water	Revenue Water of Existing Plants and on-going Projects	Revenue Water of Extension Plants	Revenue Water by means of UFW improvement from 2001
1996	363,000	257,730	105,270	231,097	105,270	105,270	0	-
1997	403,000	251,580	151,420	252,049	151,420	151,420	0	-
1998	403,000	233,430	169,570	273,001	169,570	169,570	0	-
1999	403,000	218,910	184,090	293,953	184,090	184,090	0	-
2000	463,000	222,390	240,610	314,905	240,610	240,610	0	-
2001	553,000	234,870	318,130	327,169	318,130	255,130	63,000	14,520

Figure A shows UFW volume on Existing Plants based on the UFW reduction target. Figure B shows incremental revenue water volume by new plant extension.

Thus ratio of revenue water volume increase of rehabilitation to new plant is 23% at the time of total UFW 42.5%. This is overestimated, however, largely due to free use of rehabilitation by World Bank project. By year 2000, 80% of rehabilitation work is to be done by the World Bank.

Therefore as an expedients $23.0\% \times 0.20 = 4.6\%$ can be assumed for the calculation base of incremental water revenue by rehabilitation, as compared to the new plant expansion in year 2003.

In year 2010, when total UFW is to be improved to 30%, same calculation base of incremental water revenue by rehabilitation as compared to the new plant expansion is: $23.0\% \times 0.20 \times 57.5 / 30.0 = 8.2\%$. The same formula is applied to year 2005, resulting 10.1%. For other years, rounded least square method is applied.

B. Incremental Revenues from the New Plant Extensions

Main assumptions in calculating the Incremental Revenues from the New Plant extensions are :

- (a) Calculation base of revenue is Average Daily Distribution (ADD) explained in Chapter 1.4 and 1.5.
- (b) Regarding water consumption by customer category, Water Demand Forecast in Chapter 1.5 is applied.
- (c) In terms of UFW, 15% administration loss is assumed in addition to 15% physical loss, to be conservative.
- (d) Incremental Water Revenue by the New Plant extensions will start from year of starting their operation coinciding with the construction program shown in Chapter 2.2.
- (e) Revenue continues to increase at 5% per annum after 2010 on assumption that water tariff be raised at the same rate.

Based on the above calculated revenues, the free cash flow is calculated in the table. IRR rates for the projects are also presented in the table.

2) Profit & Loss Statement

The Profit & Loss statement of each project until year 2030 will be presented based on the above calculations. The table shows break-even point as well.

3) The Applications and Sources of Funds

The applications and sources of funds until year 2030 will be calculated in the table to illustrate the fund flows.

2.5.3 Financial Plan for the South Hanoi

(1) Determination of the Project Cost

1) O&M Costs

A. O&M - Existing Facilities Rehabilitation

Rehabilitation coverage will be 20% of existing plants i.e. 70,000 m³/day capacity. This capacity is assumed to be composed of 30,000 m³/day plant and 40,000 m³/day capacity plant. Each new construction cost could be US\$ 15,940,000 and US\$ 20,070,000 respectively.

Because this rehabilitation is mostly for secondary/tertiary pipes, rehabilitation cost is estimated 20% of new construction. Thus total rehabilitation cost would be US\$ 7,200,000, which should be disbursed equally for the period of 2003 - 2007, namely annual US\$ 1,440,000 equals 15,840 million VND disbursement.

B. O&M - New Plant extensions

The O&M costs per production for each new plant can be driven as Table 2.5-5.

Table 2.5-5 O&M Cost per Production of the South Hanoi

(VND/m3)

	Central Hanoi (1)				Central Hanoi (2)				Central Hanoi (3)			
	Plant	WBE	HO	Total	Plant	WBE	HO	Total	Plant	WBE	HO	Total
1997	(1,036)	(155)	(104)	(1,295)	(1,076)	(161)	(108)	(1,345)	(1,063)	(159)	(106)	(1,329)
1998	(1,063)	(159)	(106)	(1,329)	(1,103)	(166)	(110)	(1,379)	(1,090)	(164)	(109)	(1,363)
1999	(1,091)	(164)	(109)	(1,364)	(1,132)	(170)	(113)	(1,415)	(1,119)	(168)	(112)	(1,398)
2000	(1,121)	(168)	(112)	(1,401)	(1,162)	(174)	(116)	(1,452)	(1,149)	(172)	(115)	(1,436)
2001	(1,152)	(173)	(115)	(1,440)	(1,194)	(179)	(119)	(1,492)	(1,181)	(177)	(118)	(1,476)
2002	(1,184)	(178)	(118)	(1,481)	(1,227)	(184)	(123)	(1,534)	(1,214)	(182)	(121)	(1,518)
2003	1,219	183	122	1,524	(1,262)	(189)	(126)	(1,578)	(1,249)	(187)	(125)	(1,562)
2004	1,255	188	126	1,569	1,300	195	130	1,624	(1,287)	(193)	(129)	(1,609)
2005	1,294	194	129	1,617	1,339	201	134	1,674	(1,326)	(199)	(133)	(1,658)
2006	1,334	200	133	1,668	1,380	207	138	1,725	(1,368)	(205)	(137)	(1,710)
2007	1,377	207	138	1,722	1,424	214	142	1,780	1,412	212	141	1,765
2008	1,422	213	142	1,778	1,471	221	147	1,838	1,458	219	146	1,823
2009	1,470	221	147	1,838	1,519	228	152	1,899	1,507	226	151	1,884
2010	1,520	228	152	1,901	1,571	236	157	1,964	1,559	234	156	1,949
2011	1,552	233	155	1,940	1,603	240	160	2,004	1,591	239	159	1,989
2012	1,584	238	158	1,980	1,636	245	164	2,045	1,624	244	162	2,030
2013	1,617	243	162	2,022	1,670	251	167	2,088	1,658	249	166	2,073
2014	1,652	248	165	2,064	1,705	256	171	2,132	1,694	254	169	2,117
2015	1,687	253	169	2,109	1,742	261	174	2,177	1,730	260	173	2,163
2016	1,724	259	172	2,155	1,779	267	178	2,224	1,768	265	177	2,210
2017	1,761	264	176	2,202	1,818	273	182	2,273	1,807	271	181	2,259
2018	1,800	270	180	2,250	1,858	279	186	2,323	1,847	277	185	2,309
2019	1,841	276	184	2,301	1,900	285	190	2,374	1,889	283	189	2,361
2020	1,882	282	188	2,353	1,942	291	194	2,428	1,931	290	193	2,414
2021	1,923	288	192	2,404	1,984	298	198	2,480	1,973	296	197	2,466
2022	1,965	295	196	2,456	2,027	304	203	2,533	2,016	302	202	2,520
2023	2,008	301	201	2,510	2,071	311	207	2,588	2,060	309	206	2,575
2024	2,053	308	205	2,566	2,116	317	212	2,645	2,105	316	211	2,632
2025	2,099	315	210	2,623	2,163	324	216	2,703	2,152	323	215	2,690
2026	2,146	322	215	2,682	2,211	332	221	2,763	2,200	330	220	2,750
2027	2,194	329	219	2,743	2,260	339	226	2,825	2,250	337	225	2,812
2028	2,245	337	224	2,806	2,311	347	231	2,889	2,301	345	230	2,876
2029	2,296	344	230	2,870	2,364	355	236	2,955	2,354	353	235	2,942
2030	2,349	352	235	2,937	2,418	363	242	3,022	2,408	361	241	3,010

(Notes)

Plant : New Plant O&M

WBE : Water Business Enterprise O&M

HO : Head Office O&M

By using figures in (A) O&M cost by rehabilitation and (B) O&M cost by new plants, annual O&M cost is calculated in Table 2.5-6.

Table 2.5-6 Annual O&M Cost of the South Hanoi

Year	O&M by New Plants					Incremental ADD (m3/day)	Total O&M by New Plants (VND/year)	O&M by rehabilitation (VND/year)	Grand Total O&M (VND/year)
	O&M per production				Average (VND/m3)				
	Central Hanoi(1) (VND/m3)	Central Hanoi(2) (VND/m3)	Central Hanoi(3) (VND/m3)	Average (VND/m3)					
1997	(1,296)	(1,345)	(1,329)						
1998	(1,329)	(1,379)	(1,363)						
1999	(1,364)	(1,415)	(1,398)						
2000	(1,401)	(1,452)	(1,436)						
2001	(1,440)	(1,492)	(1,476)						
2002	(1,481)	(1,534)	(1,518)						
2003	1,524	(1,578)	(1,562)	1,524	102,563	39,936,186,066	15,840,000,000	55,776,186,066	
2004	1,569	1,624	(1,609)	1,597	116,991	47,733,333,173	15,840,000,000	63,573,333,173	
2005	1,617	1,674	(1,658)	1,646	131,419	55,251,903,228	15,840,000,000	71,091,903,228	
2006	1,668	1,725	(1,710)	1,697	149,368	64,755,576,844	15,840,000,000	80,595,576,844	
2007	1,722	1,780	1,765	1,756	167,317	75,047,830,130	15,840,000,000	90,887,830,130	
2008	1,778	1,838	1,823	1,813	185,266	85,818,454,495		85,818,454,495	
2009	1,838	1,899	1,884	1,874	203,215	97,284,161,472		97,284,161,472	
2010	1,901	1,964	1,949	1,938	221,164	109,500,690,317		109,500,690,317	
2011	1,940	2,004	1,989	1,978	221,164	111,743,902,657		111,743,902,657	
2012	1,980	2,045	2,030	2,018	221,164	114,059,889,008		114,059,889,008	
2013	2,022	2,088	2,073	2,061	221,164	116,451,106,474		116,451,106,474	
2014	2,064	2,132	2,117	2,105	221,164	118,920,099,564		118,920,099,564	
2015	2,109	2,177	2,163	2,150	221,164	121,469,503,502		121,469,503,502	
2016	2,155	2,224	2,210	2,196	221,164	124,102,047,666		124,102,047,666	
2017	2,202	2,273	2,259	2,244	221,164	126,820,559,169		126,820,559,169	
2018	2,250	2,323	2,309	2,294	221,164	129,627,966,580		129,627,966,580	
2019	2,301	2,374	2,361	2,345	221,164	132,527,303,806		132,527,303,806	
2020	2,353	2,428	2,414	2,398	221,164	135,521,714,120		135,521,714,120	
2021	2,404	2,480	2,466	2,450	221,164	138,436,004,336		138,436,004,336	
2022	2,456	2,533	2,520	2,503	221,164	141,437,723,259		141,437,723,259	
2023	2,510	2,588	2,575	2,558	221,164	144,529,493,750		144,529,493,750	
2024	2,566	2,645	2,632	2,614	221,164	147,714,017,355		147,714,017,355	
2025	2,623	2,703	2,690	2,672	221,164	150,994,076,669		150,994,076,669	
2026	2,682	2,763	2,750	2,732	221,164	154,372,537,761		154,372,537,761	
2027	2,743	2,825	2,812	2,793	221,164	157,852,352,687		157,852,352,687	
2028	2,806	2,889	2,876	2,857	221,164	161,436,562,060		161,436,562,060	
2029	2,870	2,955	2,942	2,922	221,164	165,128,297,715		165,128,297,715	
2030	2,937	3,022	3,010	2,990	221,164	168,930,765,439		168,930,765,439	

(Notes)

[Total O&M by New Plants] = [Average O&M per production] x [Incremental ADD] x [AFW ratio : 0.7]

[Grand Total O&M] = [Total O&M by New Plants] + [Total O&M by Rehabilitation]

2) Investment (Construction) Related Costs

The calculation of Investment Costs is presented in Table 2.5-7.

Table 2.5-7 Disbursement Schedule for New Plants in South Hanoi

	(US\$)							
	1999	2000	2001	2002	2003	2004	2005	2006
Central Hanoi (1)								
Construction Cost	10,815,000	10,815,000	25,235,000	25,235,000				
Physical Contingency	1,081,500	1,081,500	2,523,500	2,523,500				
Subtotal	11,896,500	11,896,500	27,758,500	27,758,500				
Price Contingency F/C	283,565	429,559	1,349,507	1,704,899				
Price Contingency L/C	917,470	1,438,882	4,684,413	6,129,799				
Total Financing Required	13,097,535	13,764,940	33,792,421	35,593,198				
Central Hanoi (2)								
Construction Cost		8,130,000	8,130,000	18,970,000	18,970,000			
Physical Contingency		813,000	813,000	1,897,000	1,897,000			
Subtotal		8,943,000	8,943,000	20,867,000	20,867,000			
Price Contingency F/C		322,914	434,773	1,281,630	1,553,715			
Price Contingency L/C		1,081,656	1,509,185	4,607,976	5,792,909			
Total Financing Required		10,347,570	10,886,958	26,756,606	28,213,624			
Central Hanoi (3)								
Construction Cost					9,045,000	9,045,000	21,105,000	21,105,000
Physical Contingency					904,500	904,500	2,110,500	2,110,500
Subtotal					9,949,500	9,949,500	23,215,500	23,215,500
Price Contingency F/C					740,820	872,899	2,351,800	2,672,313
Price Contingency L/C					2,762,091	3,377,656	9,447,919	10,965,145
Total Financing Required					13,452,411	14,200,056	35,015,219	36,852,958
Grand Total	13,097,535	24,112,510	44,679,378	62,349,804	41,666,034	14,200,056	35,015,219	36,852,958
	271,973,492							

(2) Determination of Total Financing Required

A. Total Financing Required

The total financing required would be US\$ 271,973,492 or 2,991,708 million VND.

B. Annual Repayment

The annual repayment amount would be US\$ 9,065,783 or 99,724 million VND starting year 1999.

C. Annual Interest Payment

The annual interest payment would be US\$ 6,255,390 or 68,809 million VND starting year 1999.

(3) Financial Analysis

1) Revenue Forecast

Table 2.5-8 Revenue Forecast of the South Hanoi

Year	Incremental ADD (m3/day)	Customer Category of New Plants			Revenue by New Plants Total (million VND)	Revenue by Rehabilitation (million VND)	Incremental Revenue Total (million VND)
		Domestic use (million VND)	State & Public Use (million VND)	Private & Foreign Use (million VND)			
2003	102,563	57,939	28,092	47,169	133,199	6,127	139,326
2004	116,991	71,515	37,065	58,108	166,688	6,801	173,490
2005	131,419	83,104	43,705	68,539	195,347	19,730	215,078
2006	149,368	98,233	52,208	81,746	232,187	22,613	254,800
2007	167,317	115,680	61,354	96,166	273,221	25,511	298,732
2008	185,266	134,338	71,344	111,787	317,469	28,409	345,878
2009	203,215	154,207	82,244	128,879	365,330	31,307	396,637
2010	221,164	175,286	93,938	147,179	416,403	34,145	450,548
2011	221,164	184,050	98,635	154,538	437,223	35,852	473,075
2012	221,164	193,253	103,567	162,265	459,084	37,645	496,729
2013	221,164	202,915	108,745	170,378	482,039	39,527	521,566
2014	221,164	213,061	114,182	178,897	506,141	41,504	547,644
2015	221,164	223,714	119,891	187,842	531,448	43,579	575,026
2016	221,164	234,900	125,886	197,234	558,020	45,758	603,778
2017	221,164	246,645	132,180	207,096	585,921	48,046	633,966
2018	221,164	258,977	138,789	217,451	615,217	50,448	665,665
2019	221,164	271,926	145,729	228,323	645,978	52,970	698,948
2020	221,164	285,522	153,015	239,739	678,277	55,619	733,895
2021	221,164	299,798	160,666	251,726	712,191	58,400	770,590
2022	221,164	314,788	168,699	264,313	747,800	61,320	809,120
2023	221,164	330,528	177,134	277,528	785,190	64,386	849,576
2024	221,164	347,054	185,991	291,405	824,450	67,605	892,054
2025	221,164	364,407	195,290	305,975	865,672	70,985	936,657
2026	221,164	382,627	205,055	321,274	908,956	74,534	983,490
2027	221,164	401,759	215,307	337,337	954,403	78,261	1,032,664
2028	221,164	421,847	226,073	354,204	1,002,124	82,174	1,084,298
2029	221,164	442,939	237,376	371,914	1,052,230	86,283	1,138,513
2030	221,164	465,086	249,245	390,510	1,104,841	90,597	1,195,438

(Note)

[Revenue by New Plants] = [Domestic Use] + [State & Public Use] + [Private & Foreign Use]

[Incremental Revenue Total] = [Revenue by New Plants] + [Revenue by Rehabilitation]

While Incremental ADD stops rising after 2010, revenue continues to increase at 5% per annum based on an assumption that water tariff continue to be raised afterward.

2) Free Cash Flow Analysis

Water Tariff calculation is carried by the internal circulation with integration test starting from the Annualized Water Prices, and outcome Free Cash Flows are presented in Table 2.5-9.

The calculation results in reasonable IRR of 14.12% for the period of 30 years inclusive of the new plants and rehabilitation.

Table 2.5-9 Free Cash Flow of the South Hanoi

Year	Cash In Flow		Cash Out Flow		Free Cash Flow
	Incremental Revenue	Investment	O&M		
1999		118,965	0		-118,965
2000		208,395	0		-208,395
2001		367,015	0		-367,015
2002		486,255	0		-486,255
2003	139,326	308,165	55,776		-224,615
2004	173,490	99,495	63,573		10,421
2005	215,078	232,155	71,092		-88,169
2006	254,800	232,155	80,596		-57,951
2007	298,732		90,888		207,844
2008	345,878		85,818		260,060
2009	396,637		97,284		299,352
2010	450,548		109,501		341,047
2011	473,075		111,744		361,332
2012	496,729		114,060		382,669
2013	521,566		116,451		405,115
2014	547,644		118,920		428,724
2015	575,026		121,470		453,557
2016	603,778		124,102		479,675
2017	633,966		126,821		507,146
2018	665,665		129,628		536,037
2019	698,948		132,527		566,421
2020	733,895		135,522		598,374
2021	770,590		138,436		632,154
2022	809,120		141,438		667,682
2023	849,576		144,529		705,046
2024	892,054		147,714		744,340
2025	936,657		150,994		785,663
2026	983,490		154,373		829,117
2027	1,032,664		157,852		874,812
2028	1,084,298		161,437		922,861
2029	1,138,513		165,128		973,384
2030	1,195,438		168,931		1,026,507

(million VND)

IRR = 14.12%

3) Profit & Loss Statement

Table 2.5-10 presents the Profit & Loss statement of the south Hanoi project until year 2030 based on the above calculations. The table shows break-even point would be year 2006 which is a little late due to early start depreciation and no grace assumption on interest payments.

Table 2.5-10 Profit & Loss Statement of the South Hanoi

(million VND)

Year	Total Revenue	Total O&M Costs	Depreciation	Interest Costs	Profit & Loss
1999			5,948	68,809	-74,757
2000			16,368	66,515	-82,883
2001			34,719	64,222	-98,940
2002			59,032	61,928	-120,960
2003	139,326	55,776	74,440	59,634	-50,524
2004	173,490	63,573	79,415	57,341	-26,839
2005	215,078	71,092	91,022	55,047	-2,084
2006	254,800	80,596	102,630	52,754	18,821
2007	298,732	90,888	102,630	50,460	54,754
2008	345,878	85,818	102,630	48,166	109,264
2009	396,637	97,284	102,630	45,873	150,850
2010	450,548	109,501	102,630	43,579	194,838
2011	473,075	111,744	102,630	41,285	217,416
2012	496,729	114,060	102,630	38,992	241,048
2013	521,566	116,451	102,630	36,698	265,786
2014	547,644	118,920	102,630	34,405	291,669
2015	575,026	121,470	102,630	32,111	318,816
2016	603,778	124,102	102,630	29,817	347,228
2017	633,966	126,821	102,630	27,524	376,992
2018	665,665	129,628	102,630	25,230	408,177
2019	698,948	132,527	91,022	22,936	452,462
2020	733,895	135,522	79,415	20,643	498,316
2021	770,590	138,436	74,440	18,349	539,365
2022	809,120	141,438	59,032	16,055	592,594
2023	849,576	144,529	34,719	13,762	656,565
2024	892,054	147,714	16,368	11,468	716,504
2025	936,657	150,994	5,948	9,175	770,541
2026	983,490	154,373	0	6,881	822,237
2027	1,032,664	157,852	0	4,587	870,225
2028	1,084,298	161,437	0	2,294	920,568
2029	1,138,513	165,128	0	0	973,384
2030	1,195,438	168,931	0	0	1,026,507

4) Applications and Sources of Funds

Table 2.5-11 illustrates the applications and sources of funds until year 2030. As seen from the table projected fund flows are quite smooth, represented by the positive net cash position throughout the period.

Table 2.5-11 Applications and Sources of Funds of the South Hanoi

(million VND)

Year	Application				Source			Net Cash Position
	Total O&M Costs	Investment	Interest Costs	Loan Repayment	Cash Position from the Previous Year	Water Revenue	Loan Advance	
1999		118,965	68,809	99,724	0		2,991,708	2,704,210
2000		208,395	66,515	99,724	2,704,210		0	2,329,576
2001		367,015	64,222	99,724	2,329,576		0	1,798,615
2002		486,255	61,928	99,724	1,798,615		0	1,150,708
2003	55,776	308,165	59,634	99,724	1,150,708	139,326	0	766,735
2004	63,573	99,495	57,341	99,724	766,735	173,490	0	620,091
2005	71,092	232,155	55,047	99,724	620,091	215,078	0	377,151
2006	80,596	232,155	52,754	99,724	377,151	254,800	0	166,722
2007	90,888		50,460	99,724	166,722	298,732	0	224,382
2008	85,818		48,166	99,724	224,382	345,878	0	336,552
2009	97,284		45,873	99,724	336,552	396,637	0	490,308
2010	109,501		43,579	99,724	490,308	450,548	0	688,052
2011	111,744		41,285	99,724	688,052	473,075	0	908,374
2012	114,060		38,992	99,724	908,374	496,729	0	1,152,328
2013	116,451		36,698	99,724	1,152,328	521,566	0	1,421,020
2014	118,920		34,405	99,724	1,421,020	547,644	0	1,715,616
2015	121,470		32,111	99,724	1,715,616	575,026	0	2,037,338
2016	124,102		29,817	99,724	2,037,338	603,778	0	2,387,472
2017	126,821		27,524	99,724	2,387,472	633,966	0	2,767,370
2018	129,628		25,230	99,724	2,767,370	665,665	0	3,178,453
2019	132,527		22,936	99,724	3,178,453	698,948	0	3,622,213
2020	135,522		20,643	99,724	3,622,213	733,895	0	4,100,220
2021	138,436		18,349	99,724	4,100,220	770,590	0	4,614,301
2022	141,438		16,055	99,724	4,614,301	809,120	0	5,166,204
2023	144,529		13,762	99,724	5,166,204	849,576	0	5,757,764
2024	147,714		11,468	99,724	5,757,764	892,054	0	6,390,912
2025	150,994		9,175	99,724	6,390,912	936,657	0	7,067,677
2026	154,373		6,881	99,724	7,067,677	983,490	0	7,790,190
2027	157,852		4,587	99,724	7,790,190	1,032,664	0	8,560,690
2028	161,437		2,294	99,724	8,560,690	1,084,298	0	9,381,534
2029	165,128		0	0	9,381,534	1,138,513	0	10,354,918
2030	168,931		0	0	10,354,918	1,195,438	0	11,381,426

2.5.4 Financial Plan for the North Hanoi

(I) Determination of the Project Cost

1) O&M Costs – New Plant Extensions

Total O&M Cost per production for each new plant can be driven as Table 2.5-12.

Table 2.5-12 O&M Cost per Production of the North Hanoi (1/2)

(VND/m³)

Year	Gia Lam(1)			Gia Lam (2)				Soc Son				
	Plant	WBE	HO	Total	Plant	WBE	HO	Total	Plant	WBE	HO	Total
1997	(1,049)	(157)	(105)	(1,311)	(1,194)	(179)	(119)	(1,492)	(1,076)	(161)	(108)	(1,345)
1998	(1,076)	(161)	(108)	(1,345)	(1,223)	(183)	(122)	(1,529)	(1,103)	(166)	(110)	(1,379)
1999	(1,104)	(166)	(110)	(1,380)	(1,254)	(188)	(125)	(1,568)	(1,132)	(170)	(113)	(1,415)
2000	(1,134)	(170)	(113)	(1,417)	(1,287)	(193)	(129)	(1,609)	(1,162)	(174)	(116)	(1,452)
2001	(1,165)	(175)	(117)	(1,457)	(1,322)	(198)	(132)	(1,652)	(1,194)	(179)	(119)	(1,492)
2002	(1,198)	(180)	(120)	(1,498)	(1,358)	(204)	(136)	(1,698)	(1,227)	(184)	(123)	(1,534)
2003	1,233	185	123	1,542	(1,397)	(210)	(140)	(1,747)	(1,262)	(189)	(126)	(1,578)
2004	1,270	191	127	1,588	(1,438)	(216)	(144)	(1,798)	1,300	195	130	1,624
2005	1,309	196	131	1,636	(1,482)	(222)	(148)	(1,853)	1,339	201	134	1,674
2006	1,350	203	135	1,688	1,528	229	153	1,911	1,380	207	138	1,725
2007	1,393	209	139	1,742	1,578	237	158	1,972	1,424	214	142	1,780
2008	1,439	216	144	1,799	1,630	244	163	2,037	1,471	221	147	1,838
2009	1,487	223	149	1,859	1,685	253	168	2,106	1,519	228	152	1,899
2010	1,538	231	154	1,923	1,744	262	174	2,180	1,571	236	157	1,964
2011	1,570	236	157	1,963	1,780	267	178	2,224	1,603	240	160	2,004
2012	1,603	240	160	2,003	1,817	273	182	2,271	1,636	245	164	2,045
2013	1,636	245	164	2,045	1,855	278	186	2,319	1,670	251	167	2,088
2014	1,671	251	167	2,089	1,895	284	189	2,368	1,705	256	171	2,132
2015	1,707	256	171	2,134	1,936	290	194	2,420	1,742	261	174	2,177
2016	1,744	262	174	2,180	1,978	297	198	2,473	1,779	267	178	2,224
2017	1,782	267	178	2,228	2,022	303	202	2,528	1,818	273	182	2,273
2018	1,822	273	182	2,277	2,068	310	207	2,585	1,858	279	186	2,323
2019	1,863	279	186	2,328	2,115	317	211	2,644	1,900	285	190	2,374
2020	1,905	286	190	2,381	2,164	325	216	2,705	1,942	291	194	2,428
2021	1,946	292	195	2,432	2,209	331	221	2,761	1,984	298	198	2,480
2022	1,988	298	199	2,485	2,256	338	226	2,819	2,027	304	203	2,533
2023	2,032	305	203	2,540	2,304	346	230	2,879	2,071	311	207	2,588
2024	2,077	312	208	2,596	2,353	353	235	2,941	2,116	317	212	2,645
2025	2,123	318	212	2,654	2,404	361	240	3,005	2,163	324	216	2,703
2026	2,171	326	217	2,713	2,458	368	246	3,070	2,211	332	221	2,763
2027	2,220	333	222	2,775	2,510	377	251	3,138	2,260	339	226	2,825
2028	2,270	341	227	2,838	2,566	385	257	3,208	2,311	347	231	2,889
2029	2,322	348	232	2,903	2,623	394	262	3,279	2,364	355	236	2,955
2030	2,376	356	238	2,970	2,682	402	268	3,353	2,418	363	242	3,022

Table 2.5-12 O&M Cost per Production of the North Hanoi (2/2)

(VND/m3)

Year	Dong Anh West				Dong Anh East (1)				Dong Anh East (2)			
	Plant	WBE	HO	Total	Plant	WBE	HO	Total	Plant	WBE	HO	Total
1997	(1,063)	(159)	(106)	(1,329)	(1,049)	(157)	(105)	(1,311)	(1,194)	(179)	(119)	(1,492)
1998	(1,090)	(164)	(109)	(1,363)	(1,076)	(161)	(108)	(1,345)	(1,223)	(183)	(122)	(1,529)
1999	(1,119)	(168)	(112)	(1,398)	(1,104)	(166)	(110)	(1,380)	(1,254)	(188)	(125)	(1,568)
2000	(1,149)	(172)	(115)	(1,436)	(1,134)	(170)	(113)	(1,417)	(1,287)	(193)	(129)	(1,609)
2001	(1,181)	(177)	(118)	(1,476)	(1,165)	(175)	(117)	(1,457)	(1,322)	(198)	(132)	(1,652)
2002	(1,214)	(182)	(121)	(1,518)	(1,198)	(180)	(120)	(1,498)	(1,358)	(204)	(136)	(1,698)
2003	(1,249)	(187)	(125)	(1,562)	1,233	185	123	1,542	(1,397)	(210)	(140)	(1,747)
2004	1,287	193	129	1,609	1,270	191	127	1,588	(1,438)	(216)	(144)	(1,798)
2005	1,326	199	133	1,658	1,309	196	131	1,636	(1,482)	(222)	(148)	(1,853)
2006	1,368	205	137	1,710	1,350	203	135	1,688	(1,528)	(229)	(153)	(1,911)
2007	1,412	212	141	1,765	1,393	209	139	1,742	1,578	237	158	1,972
2008	1,458	219	146	1,823	1,439	216	144	1,799	1,630	244	163	2,037
2009	1,507	226	151	1,884	1,487	223	149	1,859	1,685	253	168	2,106
2010	1,559	234	156	1,949	1,538	231	154	1,923	1,744	262	174	2,180
2011	1,591	239	159	1,989	1,570	236	157	1,963	1,780	267	178	2,224
2012	1,624	244	162	2,030	1,603	240	160	2,003	1,817	273	182	2,271
2013	1,658	249	166	2,073	1,636	245	164	2,045	1,855	278	186	2,319
2014	1,694	254	169	2,117	1,671	251	167	2,089	1,895	284	189	2,368
2015	1,730	260	173	2,163	1,707	256	171	2,134	1,936	290	194	2,420
2016	1,768	265	177	2,210	1,744	262	174	2,180	1,978	297	198	2,473
2017	1,807	271	181	2,259	1,782	267	178	2,228	2,022	303	202	2,528
2018	1,847	277	185	2,309	1,822	273	182	2,277	2,068	310	207	2,585
2019	1,889	283	189	2,361	1,863	279	186	2,328	2,115	317	211	2,644
2020	1,931	290	193	2,414	1,905	286	190	2,381	2,164	325	216	2,705
2021	1,973	296	197	2,466	1,946	292	195	2,432	2,209	331	221	2,761
2022	2,016	302	202	2,520	1,988	298	199	2,485	2,256	338	226	2,819
2023	2,060	309	206	2,575	2,032	305	203	2,540	2,304	346	230	2,879
2024	2,105	316	211	2,632	2,077	312	208	2,596	2,353	353	235	2,941
2025	2,152	323	215	2,690	2,123	318	212	2,654	2,404	361	240	3,005
2026	2,200	330	220	2,750	2,171	326	217	2,713	2,456	368	246	3,070
2027	2,250	337	225	2,812	2,220	333	222	2,775	2,510	377	251	3,138
2028	2,301	345	230	2,876	2,270	341	227	2,838	2,566	385	257	3,208
2029	2,354	353	235	2,942	2,322	348	232	2,903	2,623	394	262	3,279
2030	2,408	361	241	3,010	2,376	356	238	2,970	2,682	402	268	3,353

(Notes)

Plant : New Plant O&M

WBE : Water Business Enterprise O&M

HO : Head Office O&M

Total O&M Costs by New Plant extensions are calculated in Table 2.5-13.

Table 2.5-13 Annual O&M Cost of the North Hanoi

	O&M per production						Average (VND/m ³)	Incremental ADD (m ³ /day)	Total O&M (VND/year)
	Gia Lam(1) (VND/m ³)	Gia Lam(2) (VND/m ³)	Soc Son (VND/m ³)	Dong Anh West (VND/m ³)	Dong Anh East(1) (VND/m ³)	Dong Anh East(2) (VND/m ³)			
1997	(1,311)	(1,492)	(1,345)	(1,329)	(1,311)	(1,492)			
1998	(1,345)	(1,529)	(1,379)	(1,363)	(1,345)	(1,529)			
1999	(1,380)	(1,568)	(1,415)	(1,398)	(1,380)	(1,568)			
2000	(1,417)	(1,609)	(1,452)	(1,436)	(1,417)	(1,609)			
2001	(1,457)	(1,652)	(1,492)	(1,476)	(1,457)	(1,652)			
2002	(1,498)	(1,698)	(1,534)	(1,518)	(1,498)	(1,698)			
2003	1,542	(1,747)	(1,578)	(1,562)	1,542	(1,747)	1,542	164,347	64,734,064,289
2004	1,583	(1,798)	1,624	1,609	1,583	(1,798)	1,602	181,438	74,268,623,394
2005	1,636	(1,853)	1,674	1,658	1,636	(1,853)	1,651	198,531	83,745,169,408
2006	1,688	1,911	1,725	1,710	1,688	(1,911)	1,744	214,493	95,588,146,710
2007	1,742	1,972	1,780	1,765	1,742	1,972	1,829	230,455	107,676,371,198
2008	1,799	2,037	1,838	1,823	1,799	2,037	1,889	246,417	118,917,536,021
2009	1,859	2,106	1,899	1,884	1,859	2,106	1,952	262,379	130,883,462,177
2010	1,923	2,180	1,964	1,949	1,923	2,180	2,020	278,340	143,632,427,799
2011	1,963	2,224	2,004	1,989	1,963	2,224	2,061	278,340	146,560,046,660
2012	2,003	2,271	2,045	2,030	2,003	2,271	2,104	278,340	149,625,477,512
2013	2,045	2,319	2,088	2,073	2,045	2,319	2,148	278,340	152,772,123,866
2014	2,089	2,368	2,132	2,117	2,089	2,368	2,194	278,340	156,023,514,878
2015	2,134	2,420	2,177	2,163	2,134	2,420	2,241	278,340	159,383,310,089
2016	2,180	2,473	2,224	2,210	2,180	2,473	2,290	278,340	162,855,304,767
2017	2,228	2,528	2,273	2,259	2,228	2,528	2,340	278,340	166,443,435,180
2018	2,277	2,585	2,323	2,309	2,277	2,585	2,393	278,340	170,151,764,192
2019	2,328	2,644	2,374	2,361	2,328	2,644	2,446	278,340	173,984,587,097
2020	2,381	2,705	2,428	2,414	2,381	2,705	2,502	278,340	177,946,237,682
2021	2,432	2,761	2,480	2,466	2,432	2,761	2,555	278,340	181,735,602,328
2022	2,485	2,819	2,533	2,520	2,485	2,819	2,610	278,340	185,635,647,912
2023	2,540	2,879	2,583	2,575	2,540	2,879	2,667	278,340	189,659,784,865
2024	2,596	2,941	2,645	2,632	2,596	2,941	2,725	278,340	193,799,525,925
2025	2,654	3,005	2,703	2,690	2,654	3,005	2,785	278,340	198,064,489,218
2026	2,713	3,070	2,763	2,750	2,713	3,070	2,847	278,340	202,457,401,409
2027	2,775	3,138	2,825	2,812	2,775	3,138	2,910	278,340	206,982,100,966
2028	2,838	3,208	2,889	2,876	2,838	3,208	2,976	278,340	211,642,541,510
2029	2,903	3,279	2,955	2,942	2,903	3,279	3,044	278,340	216,442,795,270
2030	2,970	3,353	3,022	3,010	2,970	3,353	3,113	278,340	221,387,056,643

(Note)

[Total O&M by New Plants] = [Average O&M per production] x [Incremental ADD] x [AFW ratio : 0.7]

2) Investment (Construction) Related Costs

The calculation of Investment Costs in the north Hanoi is presented in Table 2.5-14.

Table 2.5-14 Disbursement Schedule for New Plants in the North Hanoi

(US\$)

	1999	2000	2001	2002	2003	2004	2005	2006
Gia Lan (1)								
Construction Cost	9,945,000	9,945,000	23,205,000	23,205,000				
Physical Contingency	994,500	994,500	2,320,500	2,320,500				
Subtotal	10,939,500	10,939,500	25,525,500	25,525,500				
Price Contingency F/C	260,754	395,003	1,240,948	1,567,751				
Price Contingency U/C	843,665	1,323,133	4,307,581	5,636,694				
Total Financing Required	12,043,919	12,657,636	31,074,029	32,729,945				
Gia Lan (2)								
Construction Cost				4,125,000	4,125,000	9,625,000	9,625,000	
Physical Contingency				412,500	412,500	962,500	962,500	
Subtotal				4,537,500	4,537,500	10,587,500	10,587,500	
Price Contingency F/C				278,689	337,853	928,873	1,072,546	
Price Contingency U/C				1,001,938	1,259,660	3,594,245	4,308,753	
Total Financing Required				5,818,187	6,135,013	15,110,618	15,968,798	
Soc Son								
Construction Cost		8,130,000	8,130,000	18,970,000	18,970,000			
Physical Contingency		813,000	813,000	1,897,000	1,897,000			
Subtotal		8,943,000	8,943,000	20,867,000	20,867,000			
Price Contingency F/C		322,914	434,773	1,281,630	1,553,715			
Price Contingency U/C		1,081,656	1,509,185	4,607,976	5,792,909			
Total Financing Required		10,347,570	10,886,958	26,756,606	28,213,624			
Dong Anh West								
Construction Cost		9,045,000	9,045,000	21,105,000	21,105,000			
Physical Contingency		904,500	904,500	2,110,500	2,110,500			
Subtotal		9,949,500	9,949,500	23,215,500	23,215,500			
Price Contingency F/C		359,257	483,705	1,425,873	1,728,580			
Price Contingency U/C		1,203,392	1,679,038	5,126,586	6,444,878			
Total Financing Required		11,512,149	12,112,243	29,767,959	31,388,958			
Dong Anh East (1)								
Construction Cost	9,945,000	9,945,000	23,205,000	23,205,000				
Physical Contingency	994,500	994,500	2,320,500	2,320,500				
Subtotal	10,939,500	10,939,500	25,525,500	25,525,500				
Price Contingency F/C	260,754	395,003	1,240,948	1,567,751				
Price Contingency U/C	843,665	1,323,133	4,307,581	5,636,694				
Total Financing Required	12,043,919	12,657,636	31,074,029	32,729,945				
Dong Anh East (2)								
Construction Cost					4,125,000	4,125,000	9,625,000	9,625,000
Physical Contingency					412,500	412,500	962,500	962,500
Subtotal					4,537,500	4,537,500	10,587,500	10,587,500
Price Contingency F/C					337,853	398,088	1,072,546	1,218,717
Price Contingency U/C					1,259,660	1,540,391	4,308,753	5,000,688
Total Financing Required					6,135,013	6,475,979	15,968,798	16,806,905
Ground Water Transmission								
Construction Cost				6,000,000	6,000,000			
Physical Contingency				600,000	600,000			
Subtotal				6,600,000	6,600,000			
Price Contingency F/C				405,365	491,423			
Price Contingency U/C				1,457,452	1,832,233			
Total Financing Required				8,462,817	8,923,655			
Grand Total	24,087,838	47,174,990	85,147,258	136,265,458	80,796,263	21,586,597	31,937,596	16,806,905
	443,805,911							

(2) Determination of Total Financing Required

A. Total Financing Required

Total Financing Required would be US\$443,805,911 equivalent of 4,881,865 million VND.

B. Annual Repayment

The annual Repayment amount would be US\$14,793,530 or 162,729 million VND starting year 1999.

C. Annual Interest Payment

The annual Interest Payment would be US\$10,207,536 or 112,283 million VND starting year 1999.

(3) Financial Analysis

1) Revenue Forecast

Table 2.5-15 Revenue Forecast of the North Hanoi

Year	Incremental ADD (m3/day)	Customer Category of New Plants			Incremental Revenue (million VND)
		Domestic Use (million VND)	State & Public Use (million VND)	Private & Foreign Use (million VND)	
2003	164,347	92,842	45,014	75,583	213,439
2004	181,438	110,910	57,483	90,119	258,513
2005	198,531	125,544	66,023	103,539	295,106
2006	214,493	141,063	74,970	117,388	333,421
2007	230,455	159,333	84,506	132,483	376,322
2008	246,417	178,679	94,893	148,685	422,257
2009	262,379	199,102	106,188	166,401	471,692
2010	278,340	220,601	118,223	185,228	524,053
2011	278,340	231,632	124,134	194,490	550,255
2012	278,340	243,213	130,341	204,214	577,768
2013	278,340	255,374	136,858	214,425	606,657
2014	278,340	268,142	143,701	225,146	636,990
2015	278,340	281,550	150,886	236,404	668,839
2016	278,340	295,627	158,430	248,224	702,281
2017	278,340	310,408	166,352	260,635	737,395
2018	278,340	325,929	174,669	273,657	774,265
2019	278,340	342,225	183,403	287,350	812,978
2020	278,340	359,336	192,573	301,718	853,627
2021	278,340	377,303	202,201	316,803	896,308
2022	278,340	396,168	212,312	332,644	941,124
2023	278,340	415,977	222,927	349,276	988,180
2024	278,340	436,776	234,073	366,740	1,037,589
2025	278,340	458,615	245,777	385,077	1,089,468
2026	278,340	481,545	258,066	404,330	1,143,942
2027	278,340	505,623	270,969	424,547	1,201,139
2028	278,340	530,904	284,518	445,774	1,261,196
2029	278,340	557,449	298,744	468,063	1,324,255
2030	278,340	585,321	313,681	491,466	1,390,468

(Note)

[Incremental Revenue] = [Domestic Use] + [State & Public Use] + [Private & Foreign Use]

While Incremental ADD stops rising after 2010, revenue continues to increase at 5% per annum based on an assumption that water tariff continue to be raised afterward.

2) Free Cash Flow Analysis

Financial projection is made as shown in Table 2.5-16. This trial has resulted in the reasonable IRR of 14.71% for the period of 30 years.

Therefore, Water Tariff of Table 2.5-4 can be justified for the north Hanoi area as well.

Table 2.5-16 Free Cash Flow of the North Hanoi

(million VND)

Year	Cash In Flow	Cash Out Flow		Free Cash Flow
	Total Revenue	Investment	O&M	
1999		218,790		-218,790
2000		407,715		-407,715
2001		699,435		-699,435
2002		1,062,710		-1,062,710
2003	213,439	597,575	64,734	-448,870
2004	258,513	151,250	74,269	32,994
2005	295,106	211,750	83,745	-389
2006	333,421	105,875	95,586	131,960
2007	376,322		107,676	268,645
2008	422,257		118,918	303,340
2009	471,692		130,883	340,808
2010	524,053		143,632	380,420
2011	550,255		146,580	403,675
2012	577,768		149,625	428,143
2013	606,657		152,772	453,885
2014	636,990		156,024	480,966
2015	668,839		159,383	509,456
2016	702,281		162,855	539,426
2017	737,395		166,443	570,952
2018	774,265		170,152	604,113
2019	812,978		173,985	638,993
2020	853,627		177,946	675,681
2021	896,308		181,736	714,573
2022	941,124		185,639	755,485
2023	988,180		189,659	798,521
2024	1,037,589		193,800	843,789
2025	1,089,468		198,064	891,404
2026	1,143,942		202,457	941,484
2027	1,201,139		206,982	994,157
2028	1,261,196		211,643	1,049,553
2029	1,324,255		216,443	1,107,813
2030	1,390,468		221,387	1,169,081

IRR = 14.71%

4) Profit & Loss Statement

Table 2.5-17 means the Profit & Loss statement of the north Hanoi project until year 2030 based on the above calculations. The table shows break-even point is estimated as late as year 2009 largely owing to depreciation caused by huge investments and no grace assumption on interest payments .

Table 2.5-17 Profit & Loss Statement of the North Hanoi

(million VND)					
Year	Total Revenue	Total O&M Costs	Depreciation	Interest Costs	Profit & Loss
1999			10,940	112,283	-123,223
2000			31,325	108,540	-139,865
2001			66,297	104,797	-171,094
2002			139,851	101,055	-240,906
2003	213,439	64,734	210,568	97,312	-159,174
2004	258,513	74,269	238,549	93,569	-147,874
2005	295,106	83,745	249,136	89,826	-127,602
2006	333,421	95,586	254,430	86,084	-102,679
2007	376,322	107,676	254,430	82,341	-68,125
2008	422,257	118,918	254,430	78,598	-29,689
2009	471,692	130,883	254,430	74,855	11,523
2010	524,053	143,632	254,430	71,113	54,878
2011	550,255	146,580	254,430	67,370	81,876
2012	577,768	149,625	254,430	63,627	110,086
2013	606,657	152,772	254,430	59,884	139,570
2014	636,990	156,024	254,430	56,142	170,394
2015	668,839	159,383	254,430	52,399	202,627
2016	702,281	162,855	254,430	48,656	236,340
2017	737,395	166,443	254,430	44,913	271,608
2018	774,265	170,152	254,430	41,170	308,513
2019	812,978	173,985	254,430	37,428	347,136
2020	853,627	177,946	249,136	33,685	392,860
2021	896,308	181,736	238,549	29,942	446,081
2022	941,124	185,639	210,568	26,199	518,718
2023	988,180	189,659	139,851	22,457	636,213
2024	1,037,589	193,800	66,297	18,714	758,778
2025	1,089,468	198,064	31,325	14,971	845,108
2026	1,143,942	202,457	0	11,228	930,255
2027	1,201,139	206,982	0	7,486	986,671
2028	1,261,196	211,643	0	3,743	1,045,810
2029	1,324,255	216,443	0	0	1,107,813
2030	1,390,468	221,387	0	0	1,169,081

4) Application and Sources of Funds

Table 2.5-18 presents the applications and sources of funds until year 2030. The projected fund flows are quite smooth, represented by the positive net cash position throughout the period.

Table 2.5-18 Applications and Sources of Funds of the North Hanoi

(million VND)

Year	Application				Source			Net Cash Position
	Total O&M Costs	Investment	Interest Costs	Loan Repayment	Cash Position from the Previous Year	Water Revenue	Loan Advance	
1999		218,790	112,283	162,729	0		4,881,865	4,388,063
2000		407,715	108,540	162,729	4,388,063		0	3,709,079
2001		699,435	104,797	162,729	3,709,079		0	2,742,117
2002		1,062,710	101,055	162,729	2,742,117		0	1,415,624
2003	64,734	597,575	97,312	162,729	1,415,624	213,439	0	706,713
2004	74,269	151,250	93,569	162,729	706,713	258,513	0	483,409
2005	83,745	211,750	89,826	162,729	483,409	295,106	0	230,464
2006	95,586	105,875	86,084	162,729	230,464	333,421	0	113,611
2007	107,676		82,341	162,729	113,611	376,322	0	137,187
2008	118,918		78,598	162,729	137,187	422,257	0	199,199
2009	130,883		74,855	162,729	199,199	471,692	0	302,423
2010	143,632		71,113	162,729	302,423	524,053	0	449,002
2011	146,580		67,370	162,729	449,002	550,255	0	622,579
2012	149,625		63,627	162,729	622,579	577,768	0	824,365
2013	152,772		59,884	162,729	824,365	606,657	0	1,055,637
2014	156,024		56,142	162,729	1,055,637	636,990	0	1,317,732
2015	159,383		52,399	162,729	1,317,732	668,839	0	1,612,060
2016	162,855		48,656	162,729	1,612,060	702,281	0	1,940,101
2017	166,443		44,913	162,729	1,940,101	737,395	0	2,303,410
2018	170,152		41,170	162,729	2,303,410	774,265	0	2,703,624
2019	173,985		37,428	162,729	2,703,624	812,978	0	3,142,460
2020	177,946		33,685	162,729	3,142,460	853,627	0	3,621,727
2021	181,736		29,942	162,729	3,621,727	896,308	0	4,143,629
2022	185,639		26,199	162,729	4,143,629	941,124	0	4,710,185
2023	189,659		22,457	162,729	4,710,185	988,180	0	5,323,521
2024	193,800		18,714	162,729	5,323,521	1,037,589	0	5,985,867
2025	198,064		14,971	162,729	5,985,867	1,089,468	0	6,699,571
2026	202,457		11,228	162,729	6,699,571	1,143,942	0	7,467,098
2027	206,982		7,486	162,729	7,467,098	1,201,139	0	8,291,040
2028	211,643		3,743	162,729	8,291,040	1,261,196	0	9,174,121
2029	216,443		0	0	9,174,121	1,324,255	0	10,281,934
2030	221,387		0	0	10,281,934	1,390,468	0	11,451,015

2.5.5 Financial Plan for the Rural Hanoi

(1) Determination of the Project Cost

1) O&M Costs

O&M Costs per production for each class can be driven as Table 2.5-19.

Table 2.5-19 O&M Cost per Production by Class

(VND/m3)

	Class A				Class B				Class C			
	Facility	Market	HO	Total	Facility	Market	HO	Total	Facility	Market	HO	Total
1997	(1,321)	(198)	(132)	(1,651)	(1,426)	(214)	(143)	(1,782)	(1,869)	(280)	(187)	(2,337)
1998	(1,388)	(208)	(139)	(1,735)	(1,495)	(224)	(149)	(1,869)	(1,952)	(293)	(195)	(2,440)
1999	1,461	219	146	1,827	1,570	235	157	1,962	2,043	306	204	2,553
2000	1,541	231	154	1,926	1,651	248	165	2,064	2,141	321	214	2,676
2001	1,626	244	163	2,033	1,740	261	174	2,175	2,248	337	225	2,810
2002	1,719	258	172	2,149	1,836	275	184	2,295	2,365	355	236	2,956
2003	1,820	273	182	2,275	1,941	291	194	2,426	2,492	374	249	3,115
2004	1,930	289	193	2,412	2,055	308	206	2,569	2,631	395	263	3,288
2005	2,049	307	205	2,561	2,179	327	218	2,724	2,782	417	278	3,477
2006	2,178	327	218	2,722	2,315	347	231	2,893	2,947	442	295	3,683
2007	2,318	348	232	2,898	2,462	369	246	3,078	3,127	469	313	3,908
2008	2,471	371	247	3,089	2,623	393	262	3,279	3,323	498	332	4,154
2009	2,637	396	264	3,296	2,799	420	280	3,498	3,537	531	354	4,422
2010	2,818	423	282	3,522	2,990	449	299	3,738	3,772	566	377	4,714
2011	2,920	438	292	3,650	3,098	465	310	3,873	3,903	585	390	4,879
2012	3,028	454	303	3,784	3,211	482	321	4,014	4,041	606	404	5,051
2013	3,140	471	314	3,925	3,329	499	333	4,161	4,185	628	419	5,231
2014	3,257	489	326	4,071	3,453	518	345	4,316	4,336	650	434	5,420
2015	3,379	507	338	4,224	3,582	537	358	4,478	4,494	674	449	5,618
2016	3,507	526	351	4,384	3,717	558	372	4,647	4,659	699	466	5,824
2017	3,641	546	364	4,551	3,859	579	386	4,824	4,833	725	483	6,041
2018	3,781	567	378	4,726	4,007	601	401	5,009	5,014	752	501	6,267
2019	3,927	589	393	4,909	4,162	624	416	5,203	5,204	781	520	6,505
2020	4,080	612	408	5,100	4,325	649	432	5,406	5,402	810	540	6,753
2021	4,190	628	419	5,237	4,438	666	444	5,547	5,539	831	554	6,924
2022	4,303	645	430	5,379	4,554	683	455	5,693	5,680	852	568	7,100
2023	4,420	663	442	5,525	4,675	701	467	5,843	5,825	874	583	7,282
2024	4,540	681	454	5,675	4,798	720	480	5,998	5,975	896	597	7,468
2025	4,664	700	466	5,829	4,926	739	493	6,157	6,129	919	613	7,661
2026	4,791	719	479	5,989	5,057	759	506	6,321	6,287	943	629	7,859
2027	4,922	738	492	6,153	5,192	779	519	6,490	6,451	968	645	8,063
2028	5,058	759	506	6,322	5,331	800	533	6,664	6,619	993	662	8,274
2029	5,197	780	520	6,496	5,475	821	547	6,843	6,792	1,019	679	8,490
2030	5,340	801	534	6,675	5,622	843	562	7,028	6,971	1,046	697	8,714

(Notes) Facility : Facility O&M
 Market : Marketing O&M
 HO : Head Office O&M

Supposing the same pace constructions of three type systems each year, Average O&M Cost per Production of three category systems shall be 3,991 VND/m³ for the whole rural area in year 2010, which is substantially higher than figures for urban water supply plans.

In this case, the Annualized Water Price will become as high as 6,471 VND/m³ in the year 2010 for example (the calculation base is explained in 2.5.2). As will be discussed in the Affordability Analysis of Chapter 2.5.6, this amount exceeds the affordability cap of 4% of monthly income for Low Income Households which is estimated to be 5,360 VND/m³ in 2010.

Facing this situation, two counter-measures should be taken to solve the problem.

- (a) to adjust the water tariffs lower than Annualized Prices to set the Tariffs within the affordable range for Low Income Households which shall be main customer criteria in the rural Hanoi. (In doing this, principle of equality shall be also considered.)
- (b) subsidies from the central or municipal government of Vietnam would be justified, given the big social meaning of the piped water supply for the rural area.

The principle of equality leads to the maximum downside adjustment of water tariffs in the rural to the level of the urban area, if affordable. As such, projected water tariff of Table 2.5-4 will be tested.

As for subsidies, after several alternatives have been tried, half (1/2) subsidized Investment (Construction) costs, i.e. the other half (1/2) of Investment Cost born by the management body can be proposed.

Financial calculations for rural Hanoi were based on the above adjustments.

Annual O&M costs are calculated in Table 2.5-20

Table 2.5-20 Annual O&M Costs of the Rural Hanoi

Year	O&M per production				Incremental ADD (m3/day)	Annual O&M (VND/year)
	Class A (VND/m3)	Class B (VND/m3)	Class C (VND/m3)	Average O&M (VND/m3)		
1997	(1,651)	(1,782)	(2,337)			
1998	(1,735)	(1,869)	(2,440)			
1999	1,827	1,962	2,553	2,114	25,905	13,992,833,393
2000	1,926	2,064	2,676	2,222	27,128	15,401,207,514
2001	2,033	2,175	2,810	2,339	28,981	17,321,237,652
2002	2,149	2,295	2,956	2,467	30,834	19,433,241,186
2003	2,275	2,426	3,115	2,605	32,687	21,759,481,092
2004	2,412	2,569	3,288	2,756	34,540	24,325,053,643
2005	2,561	2,724	3,477	2,921	36,391	27,156,766,779
2006	2,722	2,893	3,683	3,100	38,463	30,461,618,362
2007	2,898	3,078	3,908	3,295	40,535	34,121,708,565
2008	3,089	3,279	4,154	3,507	42,607	38,178,852,477
2009	3,296	3,498	4,422	3,739	44,679	42,679,719,741
2010	3,522	3,738	4,714	3,991	46,749	47,674,352,557
2011	3,650	3,873	4,879	4,134	46,749	49,377,742,898
2012	3,784	4,014	5,051	4,283	46,749	51,159,388,965
2013	3,925	4,161	5,231	4,439	46,749	53,022,996,128
2014	4,071	4,316	5,420	4,602	46,749	54,972,448,808
2015	4,224	4,478	5,618	4,773	46,749	57,011,819,234
2016	4,384	4,647	5,824	4,952	46,749	59,145,376,648
2017	4,551	4,824	6,041	5,139	46,749	61,377,596,952
2018	4,726	5,009	6,267	5,334	46,749	63,713,172,842
2019	4,909	5,203	6,505	5,539	46,749	66,157,024,435
2020	5,100	5,406	6,753	5,753	46,749	68,714,310,422
2021	5,237	5,547	6,924	5,903	46,749	70,505,819,205
2022	5,379	5,693	7,100	6,057	46,749	72,351,073,252
2023	5,525	5,843	7,282	6,216	46,749	74,251,684,920
2024	5,675	5,998	7,468	6,380	46,749	76,209,314,939
2025	5,829	6,157	7,661	6,549	46,749	78,225,673,858
2026	5,989	6,321	7,859	6,723	46,749	80,302,523,544
2027	6,153	6,490	8,063	6,902	46,749	82,441,678,722
2028	6,322	6,664	8,274	7,087	46,749	84,645,008,554
2029	6,496	6,843	8,490	7,277	46,749	86,914,438,282
2030	6,675	7,028	8,714	7,472	46,749	89,251,950,901

(Note)

[Average O&M] = [Average O&M among Classes]

[Annual O&M] = [Average O&M per production] x [Incremental ADD] x [AFW ratio : 0.7]

2) Investment (Construction) Related Costs

Based on the above, Table 2.5-21 presents the calculation of Investment Costs in the rural Hanoi area from year 1998 to 2003.

Table 2.5-21 Disbursement Schedule for New Facilities in Rural Hanoi

	(US\$)					
	1998	1999	2000	2001	2002	2003
Construction Cost	5,581,000	5,581,000	5,581,000	5,581,000	5,581,000	5,581,000
Physical Contingency	558,100	558,100	558,100	558,100	558,100	558,100
Subtotal	6,139,100	6,139,100	6,139,100	6,139,100	6,139,100	6,139,100
Price Contingency F/C	72,441	146,332	221,671	298,458	377,057	457,105
Price Contingency L/C	226,533	473,454	742,524	1,036,010	1,355,673	1,704,282
Total Financing Required	6,438,074	6,758,885	7,103,295	7,473,568	7,871,830	8,300,487
Grand Total	43,946,140					

(2) Determination of Total Financing Required

A. Total Financing Required

Based on the aforementioned assumption that half (1/2) of the total investment cost be subsidized, the total Financing Required would be US\$21,973,070 equivalent of 241,704 million VND.

B. Annual Repayment

This results in the annual Repayment amount of US\$732,436 or 8,057 million VND starting year 1998.

C. Annual Interest Payment

The annual Interest Payment of US\$505,381 or 5,559 million VND starting year 1998.

(3) Financial Analysis

1) Cash Flow Analysis

Based on the projected tariffs, annual water revenue is calculated in Table 2.5-22. This has resulted in the somewhat low IRR of 6.76% for the period of 30 years.

Table 2.5-22 Revenue Forecast and Free Cash Flow of the Rural Hanoi

	Annual Revenue		Free Cash Flow			(million VND)
	ADD	Revenue	Cash In Flow	Cash Out Flow		Free Cash Flow
	(m3/day)	(million VND)	Total Revenue	Investment	O&M	
1998	(24,681)			30,696		-30,696
1999	25,905	13,237	13,237	30,696	13,993	-31,451
2000	27,128	16,808	16,808	30,696	15,401	-29,289
2001	28,981	20,548	20,548	30,696	17,321	-27,469
2002	30,834	24,028	24,028	30,696	19,433	-26,101
2003	32,687	27,977	27,977	30,696	21,759	-24,478
2004	34,540	31,990	31,990		24,325	7,665
2005	36,391	34,867	34,867		27,157	7,710
2006	38,463	38,326	38,326		30,462	7,865
2007	40,535	42,462	42,462		34,122	8,341
2008	42,607	46,810	46,810		38,179	8,631
2009	44,679	51,370	51,370		42,680	8,690
2010	46,749	56,139	56,139		47,674	8,464
2011	46,749	58,945	58,945		49,378	9,568
2012	46,749	61,893	61,893		51,159	10,733
2013	46,749	64,987	64,987		53,023	11,964
2014	46,749	68,237	68,237		54,972	13,264
2015	46,749	71,649	71,649		57,012	14,637
2016	46,749	75,231	75,231		59,145	16,086
2017	46,749	78,993	78,993		61,378	17,615
2018	46,749	82,942	82,942		63,713	19,229
2019	46,749	87,089	87,089		66,157	20,932
2020	46,749	91,444	91,444		68,714	22,729
2021	46,749	96,016	96,016		70,506	25,510
2022	46,749	100,817	100,817		72,351	28,466
2023	46,749	105,858	105,858		74,252	31,606
2024	46,749	111,150	111,150		76,209	34,941
2025	46,749	116,708	116,708		78,226	38,482
2026	46,749	122,543	122,543		80,303	42,241
2027	46,749	128,671	128,671		82,442	46,229
2028	46,749	135,104	135,104		84,645	50,459
2029	46,749	141,859	141,859		86,914	54,945
2030	46,749	148,952	148,952		89,252	59,700

IRR = 6.76%

2) Profit & Loss Statement

Table 2.5-23 is the Profit & Loss statement of the rural Hanoi until year 2030. The result shows break-even point is estimated as late as year 2018 largely owing to rather high O&M costs and depreciation.

Table 2.5-23 Profit & Loss Statement of the Rural Hanoi

(million VND)					
Year	Total Revenue	Total O&M Costs	Depreciation	Interest Costs	Profit & Loss
1998			3,070	5,559	-8,629
1999	13,237	13,993	6,139	5,374	-12,268
2000	16,808	15,401	9,209	5,188	-12,990
2001	20,548	17,321	12,278	5,003	-14,055
2002	24,028	19,433	15,348	4,818	-15,571
2003	27,977	21,759	18,417	4,633	-16,832
2004	31,990	24,325	18,417	4,447	-15,199
2005	34,867	27,157	18,417	4,262	-14,969
2006	38,326	30,462	18,417	4,077	-14,629
2007	42,462	34,122	18,417	3,891	-13,968
2008	46,810	38,179	18,417	3,706	-13,492
2009	51,370	42,680	18,417	3,521	-13,248
2010	56,139	47,674	18,417	3,335	-13,289
2011	58,945	49,378	18,417	3,150	-12,000
2012	61,893	51,159	18,417	2,965	-10,649
2013	64,987	53,023	18,417	2,780	-9,232
2014	68,237	54,972	18,417	2,594	-7,747
2015	71,649	57,012	18,417	2,409	-6,189
2016	75,231	59,145	18,417	2,224	-4,555
2017	78,993	61,378	18,417	2,038	-2,841
2018	82,942	63,713	15,348	1,853	2,028
2019	87,089	66,157	12,278	1,668	6,987
2020	91,444	68,714	9,209	1,482	12,038
2021	96,016	70,506	6,139	1,297	18,074
2022	100,817	72,351	3,070	1,112	24,284
2023	105,858	74,252	0	927	30,679
2024	111,150	76,209	0	741	34,200
2025	116,708	78,226	0	556	37,926
2026	122,543	80,303	0	371	41,870
2027	128,671	82,442	0	185	46,044
2028	135,104	84,645	0	0	50,459
2029	141,859	86,914	0	0	54,945
2030	148,952	89,252	0	0	59,700

3) Applications and Sources of Funds

Table 2.5-24 presents the applications and sources of funds until year 2030. The projected fund flows statement demonstrates positive net cash positions.

Table 2.5-24 Applications and Sources of Funds of the Rural Hanoi

(million VND)

Year	Application				Source			Net Cash Position
	Total O&M Costs	Investment	Interest Costs	Loan Repayment	Cash Position from the Previous Year	Water Revenue	Loan Advance	
1998		30,696	5,559	8,057	0		483,408	439,097
1999	13,993	30,696	5,374	8,057	439,097	13,237	0	394,215
2000	15,401	30,696	5,188	8,057	394,215	16,808	0	351,681
2001	17,321	30,696	5,003	8,057	351,681	20,548	0	311,152
2002	19,433	30,696	4,818	8,057	311,152	24,028	0	272,176
2003	21,759	30,696	4,633	8,057	272,176	27,977	0	235,009
2004	24,325		4,447	8,057	235,009	31,990	0	230,170
2005	27,157		4,262	8,057	230,170	34,867	0	225,561
2006	30,462		4,077	8,057	225,561	38,326	0	221,292
2007	34,122		3,891	8,057	221,292	42,462	0	217,685
2008	38,179		3,706	8,057	217,685	46,810	0	214,553
2009	42,680		3,521	8,057	214,553	51,370	0	211,665
2010	47,674		3,335	8,057	211,665	56,139	0	208,737
2011	49,378		3,150	8,057	208,737	58,945	0	207,098
2012	51,159		2,965	8,057	207,098	61,893	0	206,809
2013	53,023		2,780	8,057	206,809	64,987	0	207,937
2014	54,972		2,594	8,057	207,937	68,237	0	210,550
2015	57,012		2,409	8,057	210,550	71,649	0	214,721
2016	59,145		2,224	8,057	214,721	75,231	0	220,526
2017	61,378		2,038	8,057	220,526	78,993	0	228,046
2018	63,713		1,853	8,057	228,046	82,942	0	237,365
2019	66,157		1,668	8,057	237,365	87,089	0	248,573
2020	68,714		1,482	8,057	248,573	91,444	0	261,763
2021	70,506		1,297	8,057	261,763	96,016	0	277,919
2022	72,351		1,112	8,057	277,919	100,817	0	297,215
2023	74,252		927	8,057	297,215	105,858	0	319,838
2024	76,209		741	8,057	319,838	111,150	0	345,981
2025	78,226		556	8,057	345,981	116,708	0	375,850
2026	80,303		371	8,057	375,850	122,543	0	409,664
2027	82,442		185	8,057	409,664	128,671	0	447,650
2028	84,645		0	0	447,650	135,104	0	498,109
2029	86,914		0	0	498,109	141,859	0	553,054
2030	89,252		0	0	553,054	148,952	0	612,754

2.5.6 Financial Evaluation

(1) Financial Evaluation on the Master Plan

1) Drawbacks

Overall estimated FIRR of the Master Plan in the study area are reasonable until year 2030 (14.12% in the South Hanoi, 14.71% in the North Hanoi), but FIRR of Rural Hanoi is expected rather low criteria of 6.76% even after the half of the investment cost subsidies.

Considering the present financial status of HWBC, fund raising ability in the three areas remains vulnerable at least until target year of 2010.

2) Mitigation

Stable water supply is definitely required to meet the Basic Human Needs (BHN), especially for Low Income Household such as rural Hanoi people.

Estimated FIRRs are at least higher than the anticipated financing cost of 2.30%. Assumptions in the calculations are fairly conservative, like 15% administration loss even for the brand new water supply systems.

Because of its primitive financial market in Vietnam, the yield curve is inverted, as such low FIRR for the long term project can be justified.

(2) Selected Sensitivity Tests

Regarding items to be reviewed, (a) O&M Costs, (b) UFW and (c) Water Tariffs are selected as the most influential parameter.

Table 2.5-25 shows the calculation outcomes.

Naturally, Water Tariff change has the biggest impact on IRR of the project. The table points out that in order to achieve high IRR, drastic jump up of Water Tariff is required.

Table 2.5-25 Sensitivity Analysis

O & M Costs

Factor	IRR		
	South	North	Rural
0.90	15.02	15.73	8.12
0.95	14.56	15.27	7.69
1.00	14.12	14.71	6.76
1.05	13.02	13.75	6.05
1.10	12.05	13.16	5.22

UFW

Factor	IRR		
	South	North	Rural
0.80	15.02	15.65	7.93
0.90	14.58	15.18	7.25
1.00	14.12	14.71	6.76
1.10	13.44	14.39	5.95
1.20	13.00	14.06	5.31

Tariffs

Factor	IRR		
	South	North	Rural
1.20	16.59	17.21	9.64
1.10	15.36	15.93	8.11
1.00	14.12	14.71	6.76
0.90	12.78	13.40	5.08
0.80	11.43	12.14	3.27

(3) Affordability Analysis

1) Calculation Base and Main Assumptions

As stated in 2.5.1, water tariff level should be kept low enough for even low income households to meet its social objective.

In calculating the affordability analysis, main assumptions and calculation base are :

- (a) It is generally very difficult in Vietnam to grasp the actual figure of disposable incomes. Although World Bank Final Report assumed some 1,300,000 VND household income/month for average income households and 800,000 VND household income/month for low income households as of 1996, JICA Study Team's Field Water Consumption Survey suggests lower incomes. In this report, 900,000 VND/month for average income households and 500,000 VND/month for low income households are assumed as of 1996. Regarding growth of household incomes, annual 10% is applied until year 2010. (c.f. Recent State Bank of Vietnam reported real GDP growth annual 11.4% until 2005, 12.1% until 2010 in 5 years term).
- (b) As for the unit water demand, domestic water demand forecast in Chapter 1.5 is referred. As such, water consumption for average income households is estimated 180 l/c/d, for low income households; 90 l/c/d in 2010.
- (c) Water Tariff Table 2.5-4 is applied.

Based on those above factors, affordability projection is conducted as shown in Table 2.5-26 and Table 2.5-27.

Table 2.5-26 Affordability Projection for Average Income Households

Year	Household Income/month (VND)	Unit Water Consumption (liters/day)	Monthly Water Consumption per Household (m3/month)	Water Tariff (with 10% surcharge) (VND/m3)	Water Charge (with 10% surcharge) (VND)	Rate of Water Charge to Income (%)
1996	900,000	120	16.2	1,100	17,800	2.0
1997	990,000	125	16.8	1,375	23,100	2.3
1998	1,089,000	130	17.5	1,650	28,900	2.7
1999	1,198,000	135	18.2	2,000	36,400	3.0
2000	1,318,000	140	18.9	2,425	45,800	3.5
2001	1,450,000	145	19.5	2,775	54,300	3.7
2002	1,595,000	150	20.3	3,050	61,900	3.9
2003	1,755,000	155	20.9	3,350	70,000	3.9
2004	1,930,000	158	21.3	3,625	77,200	4.0
2005	2,123,000	160	21.6	3,750	81,000	3.8
2006	2,335,000	165	22.2	3,900	86,600	3.7
2007	2,569,000	170	22.9	4,100	93,900	3.7
2008	2,825,000	175	23.6	4,300	101,500	3.6
2009	3,108,000	178	24	4,500	108,000	3.5
2010	3,419,000	180	24.3	4,700	114,200	3.7

Table 2.5-27 Affordability Projection for Low Income Households

Year	Household Income/month (VND)	Unit Water Consumption (liters/day)	Monthly Water Consumption per Household (m3/month)	Water Tariff (with 10% surcharge) (VND/m3)	Water Charge (with 10% surcharge) (VND)	Rate of Water Charge to Income (%)
1996	550,000	50	7.5	1,100	8,300	1.8
1997	550,000	52	7.8	1,375	10,700	1.9
1998	605,000	55	8.3	1,650	13,700	2.3
1999	665,000	58	8.7	2,000	17,400	2.6
2000	732,000	60	9.0	2,425	21,800	3.0
2001	805,000	63	9.4	2,775	26,100	3.2
2002	886,000	66	9.9	3,050	30,200	3.4
2003	975,000	69	10.3	3,350	34,500	3.5
2004	1,072,000	72	10.8	3,625	39,100	3.8
2005	1,179,000	75	11.2	3,750	42,000	3.6
2006	1,297,000	78	11.7	3,900	45,600	3.5
2007	1,427,000	81	12.1	4,100	49,600	3.5
2008	1,570,000	84	12.6	4,300	54,200	3.5
2009	1,727,000	87	13.1	4,500	58,900	3.4
2010	1,900,000	90	13.5	4,700	63,500	3.3

2) Projection Analysis

Generally speaking, it is arguable what should be the maximum affordable level of water charge costs to incomes because it could vary depending on social circumstances.

For Hanoi, both World Bank and Asian Development Bank use 4% of Monthly Household Income as a cap rate. Adopting this standard, projection analysis in Table 2.5-26 & -27 shows that water charge level will be within the cap rate until 2010.

(4) Conclusions

Due to big investment plan and water charge increase strain owing to social conditions, projected FIRRs for three study areas in Hanoi are moderate, at best. But taking the social purpose of the plan, financial environment in Vietnam, and fairly conservative assumptions into account, those figures are considered acceptable.

Affordability does not seem the problem by the projection until year 2010.

Therefore from the point of financial aspect, the Master Plan is considered viable.

2.6 INITIAL ENVIRONMENTAL EXAMINATION (IEE)

The IEE study was conducted following the requirement outlined in implementing the Article 18 of the Law on Environmental Protection. The IEE could be one of important performance needed for consideration and approval of the next development stage of the project. EIA (Environmental Impact Assessment) should be carried out in the next stage of feasibility study based on the results of IEE. Sensitive environmental aspects as well as exact degree of impacts will be determined and possible measures including monitoring will be proposed to mitigate negative impacts on natural, physical, ecological and socio-economic environment.

2.6.1 Environmental Impact

A construction of new water supply facilities as well as upgrading of existing ones, is certain to cause some effects on the environment. In general, most impacts are considered to be positive, but some might be negative and monitoring and special mitigation measures would be required.

Environmental impacts caused by the projects were identified according to the relations with existing environmental conditions at the sites proposed. Then the extent of impacts was examined using an impact matrix table as shown in Table 2.6-1, and the master plan in this study was comprehensively evaluated.

(1) Preconstruction Stage

- Planning of water supply projects will generally bring beneficial effects on social environment such as economic activities, land use and living conditions. Especially, the project for stable supply of good quantity/quality of water would strongly lead residential, industrial and commercial development.
- If the facilities for water supply are designed without careful consideration, they may cross the reserved/restricted area, divide communities, affect land use, damage river dikes, affect scenic views, excessively discharge groundwater resulting in land subsidence, or cause the problems of noise, vibration and

offensive odor to adjacent houses.

- Site acquisition would displace inhabitants at the project sites, reduce an agricultural potential, and affect living conditions, cultural/historical sites and land use.
- However, the sites to be acquired would be limited, therefore the extent of loss would be minor.
- Site clearing and demolition may affect living facilities, topography and geology, soil erosion and wildlife.
- However, the area of the site and the extent of demolition would be limited, therefore the extent of damage would be minor.

(2) Construction Stage

- Construction works of intake facilities such as production wells may interfere water use and traffic in an adjacent area, damage flood control facilities or historical/cultural relics, change natural conditions of groundwater, surface water, wildlife and scenic views, affect air quality or groundwater quality, and cause noise and vibration. Construction wastes may be illegally dumped around the construction sites.
- Construction works of transmission facilities may damage historical/cultural relics, interfere traffic near the sites, change conditions of wildlife and scenic views at the sites, affect air quality or groundwater quality, and cause noise and vibration. Construction wastes may be illegally dumped around the construction sites.
- Construction works of water treatment facilities may damage historical or cultural relics, interfere traffic near the sites, change conditions of wildlife and scenic views at the sites, affect air quality or groundwater quality, and cause noise and vibration. Construction wastes may be illegally dumped around the construction sites.

- Construction works of distribution facilities may damage living facilities, damage historical/cultural relics, interfere traffic near the sites, change conditions of scenic views at the sites, affect air quality or groundwater quality, and cause noise and vibration. Construction wastes may be illegally dumped around the construction sites.

(3) Operation Stage

- Excessive discharge of groundwater caused by poor management may seriously lower the groundwater level resulting in land subsidence and increase of inundation risk, and deteriorate ground water quality. Water intake facilities such as pump may cause problems of noise and vibration to an adjacent area.
- Transmission facilities would cause very little negative impacts, because all transmission pipes are to be installed underground.
- Treatment facilities will supply good quantity/quality of water to domestic and industrial customers, which would improve living conditions and accelerate economic activities in Hanoi. Transportation of dried sludge to dump would not affect traffic condition near the water treatment plant, because the volume of dried sludge would not be so big. A treatment plant will be constructed and stand out in vast and flat areas such as rice fields, and would affect scenic views in the suburbs. Dried sludge disposal without proper control may cause soil contamination. Operation of facilities may cause noise to adjacent areas.
- Distribution facilities will make it easier to use safe and stable water, which would improve living conditions, accelerate economic activities and widen a possibility of land use. However, if drainage/sewerage systems will not be prepared in parallel with water supply systems, the increase of wastewater would affect groundwater, surface water and urban scenic views, and cause water pollution or offensive odor.

2.6.2 Measures against the Negative Impact

(1) Preconstruction Stage

- Locations, capacities and sizes of all facilities will be designed paying attention to the existence of the residential areas, the reserved/restricted areas, communities and structures, and the features of land use, scenic views, not to cause problems of environmental pollution, or not to affect or damage them.
- Although the extent of loss caused by site acquisition or site clearing/demolition would be limited in this project, an appropriate compensation will be made for the affected persons according to the governmental decision.
- Locations and capacities of the production wells will be planned paying special attention to the present groundwater level or the predicted exploitable discharge volume not to cause land subsidence.

(2) Construction Stage

- Construction works in the residential areas will be managed not to cause the residents a great deal of inconvenience. Alternative ways will be prepared if construction work seriously affect the living conditions.
- Although any historical relics or cultural sites will not overlapped with the sites of the proposed facilities, construction areas will be set up not to touch those historical or cultural sites.
- Slurry or muddy wastewater generated by the work of drilling wells will be controlled at the sites not to affect water quality of water bodies or water use in the adjacent areas, and the wells will be drilled not to disturb hydraulic conditions of aquifers or not to contaminate groundwater.
- During the construction period of the facilities, watchman will be put at the site to control the traffic and construction material will be supplied through several routes by well-controlled operation not to cause a traffic jam.

- Construction wastes will be dumped to the designated landfills and controlled not to be scattered around the sites.
- Construction works will be managed not to gather equipment at the same place in order to avoid an accumulation of air/water pollutants or noise/vibration generated by the equipment.
- As a rule, construction works which generate noise and vibration will not be done in the nighttime nor on a holiday.

(3) Operation Stage

- Groundwater level will be periodically monitored, and the discharge volume will be controlled not to cause serious depression of groundwater level that result in land subsidence, increase of inundation and deterioration of groundwater quality.
- Water intake facilities such as pump will be installed in a pump shed, and the problems of noise and vibration to an adjacent area would be limited.
- Water treatment plant will be designed taking the distance from the adjacent area and the appearance into account in order to mitigate the problem of noise and scenic views.
- New water treatment plant proposed in this study will have sludge treatment process and backwash water will not be discharged directly to a drain. At the final process of sludge drying bed, water in sludge will be filtered and discharged to a drain. Remained sludge will be dried and dumped to a designated landfill.

2.6.3 General Assessment

(1) Without Project

Whether public water supply systems are developed or not, Hanoi will rapidly grow and develop because of its economic development which has already begun to run. However, Hanoi would not soundly develop if this water supply master plan would not be implemented.

People, industry or business would concentrate too much in the urban area demanding access to the existing urban water supply systems, or they would uncontrollably drill their own wells wherever they want. They would draw groundwater as much as they want paying no attention to serious depression of groundwater level, which might cause land subsidence. Land subsidence will not only damage public and personal property but also increase a threat of inundation. People would draw water from shallow wells which are easy to be polluted or install private water tanks in their houses to provide against insufficient and intermittent water supply, which might cause hygienic problems.

On the other hand, suburban area or rural area would be depopulated and the community or its local economy might collapse.

(2) With Project

In general, most impacts caused by the implementation of the master plan are considered to be positive and negative impacts seem to be small. Most negative impacts will be controlled or mitigated if the measures proposed in this study are taken appropriately.

Among the facilities for water supply systems, main facility that needs land acquisition to some extent is water treatment plant. However, it is not necessary to construct a water treatment plant in a densely populated area, or transmission mains or distribution pipes are generally laid under/along the existing roads. Therefore, number of houses or residents that should be relocated or displaced is considered to be limited.

The total volume of groundwater discharge proposed in this master plan falls within the limited exploitable capacity that was predicted by the Vietnamese Geological Survey and has been accepted in Hanoi. However, land subsidence and deterioration of groundwater quality caused by excessive discharge of groundwater seems to be the most sensitive impact among all environmental factors. Therefore, all possible measures should be taken against those problems of groundwater, even if a risk of such environmental impacts is not predicted.

Urban drainage and sewerage systems should be prepared in parallel with the development of water supply systems. The development of urban drainage and sewerage systems has been already started according to the master plan. Therefore, it is desired to arrange the original implementation schedule of urban drainage and sewerage systems and accelerate the implementation.

Table 2.6-1 Potential Environmental Impacts resulting from Master Plan for Hanoi Water Supply Systems

Phase	Items	Environmental Factors																				
		Social Environment						Natural Environment						Pollution								
		Displacement of people	Economic activities	Living conditions	Division of community	Historical or cultural site	Land and resources use	Traffic	Risk of disaster	Topography and geolog	Soil erosion	Ground water	Surface water	Wildlife	Aesthetics and landscap	Air Quality	Water Quality	Soil contamination	Noise and vibration	Land subsidence	Offensive odors	
Preconstruction	Planning		00	00			00	00														
	Design				X	XX	XX		XX			XX			XX				XX	XX		X
	Site acquisition	X	X	X		X	X															
	Site clearing and demolition			X						X	X											
	Intake			X		XX	X	XX	XX			X		X	X	XX	XX	XX	XX			
Construction	Raw Water Transmission			X		XX		XX						X	X	XX	XX		XX			
	Treatment			X		XX		XX						X	X	XX	XX		XX			
	Transmission			XX		XX		XX						X	X	XX	XX		XX			
	Distribution			XX		XX		XX							X	XX	XX		XX			
Operation	Intake								XXX			XXX					X		X	XXX		
	Raw Water Transmission																					
	Treatment		000	000				X							XX			X	XX			
	Transmission																					
	Distribution		000	000			00					XX	XX		X		XX					X

Note:
 000 : major positive impact
 00 : moderate positive impact
 0 : minor positive impact
 XXX : major negative impact
 XX : moderate negative impact
 X : minor negative impact

I

CHAPTER 3 SELECTION OF THE PRIORITY PROJECT

I

3 SELECTION OF THE PRIORITY PROJECT

3.1 OBJECTIVES OF THE PRIORITY PROJECT

For development of the Hanoi water supply systems, a priority project is to be selected for the Feasibility Study. The priority project should be qualified in considering the following objectives:

(a) Urgent necessity

The project should have urgent necessity.

(b) Commercialization

The project should contribute to commercialization of HWBC.

(c) Population Served

The project should contribute to the increase of rate of population served.

(d) Living Standard and Socio-economy

The project should contribute to improvement of living standards and to promotion of healthy socio-economic activities.

(e) Environment

The project should satisfy the environmental aspects.

3.2 PROJECT PROPOSAL

3.2.1 General Conditions

In the M/P, the study area is categorized into the following three groups:

(1) Group U

This area covers the existing service area and its surroundings. The water supply system will be improved by the FINNIDA programs and the World Bank projects until the year 2000.

In the meanwhile, decline in groundwater level has been pointed out recently at the wellfields in the southern area. From environmental consideration, it is necessary to restrict groundwater intake from these wellfields.

(2) Group D

According to the population forecast and the urban development plan, the areas in group D will be rapidly developed and urbanized in future.

In spite of the high water demand in the areas, the present water supply conditions in the areas are poor. Nevertheless, no substantial water supply projects are coming into operation at present.

(3) Group R

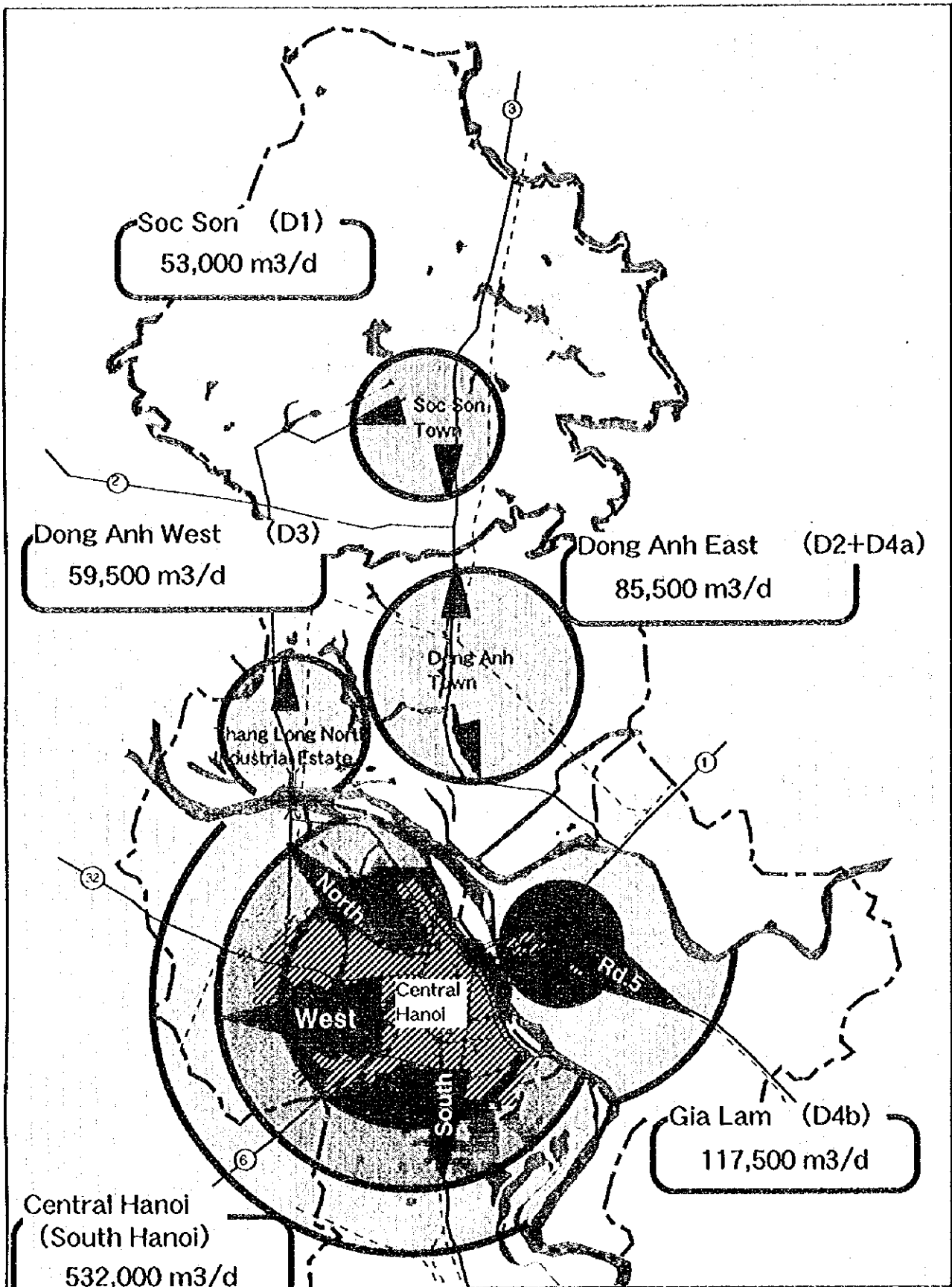
Group R is constituted of 60 rural communes where the population is smaller and the living condition is lower than the other groups. Every commune is planned to have individual water supply system with financial assistance and organizational control by Hanoi city.

Although to construct the rural water supply system has urgent necessity, it seems that contribution to the rate of population served would be lower than the other groups because the population are small even in total of 60 communes.

3.2.2 Basic Concept of the Service Extension

Considering the project efficiency, the above examination implies that Group D has the highest priority. Still, preservation of the decline in groundwater level in Group U has high priority as well. Therefore, these two groups are focused on.

The concept of extension of the water supply systems is illustrated in Fig. 3.2-1. Based on the topographical conditions, five core places of the service areas are settled. These service areas would be extended from these cores towards their developing directions.



Note:
The above figures stand for the average daily water demand in 2005.

Fig. 3.2-1
Concept of Extention
of Water Supply Systems

3.2.3 Possible Sites

The possible project sites are nominated in the Table 3.2-1.

The site named Central Hanoi is regarded as the next extension of the existing service area towards west. According to the urban planning, this area is to be developed along the Ring Road No. 3.

Table 3.2-1 The Site Conditions

Site		Soc Son (D1)	Dong Anh East (D2+D4a)	Dong Anh West (D3)	Gia Lam (D4b)	Central Hanoi *1 (D5, U)
District		Soc Son	Dong Anh Gia Lam	Dong Anh	Gia Lam	Tu Liem Cau Giay
Acreage (ha)		4,124	9,720	3,710	4,910	2,554
Population (persons)	Present	44,177	148,181	38,881	157,068	92,077
	2005	89,140	273,351	131,776	277,304	126,542
Development Plan	Type	EPZ *2 Airport	Industrial	Industrial & Institution	Industrial Estate	Commercial & Resident
	Completion	2005	2005	2000	2000	2010
	Investor	Malaysia	Unknown	Japan	Korea	Unknown
Public Water Supply (m3/d)	Present Condition	3,000 (for airport)	2,000	None	35,000	None
	Demand in 2005	46,812	84,068	57,737	121,685	58,221
	Required Design Capacity	43,812	82,068	57,737	86,685	58,221
	Projected Water Supply System	for Industrial Area phase 1 500 m3/h	None	for Industrial Area phase 1 8,400m3/d	for Industrial Area 12,000m3/d	None
Water Source (in 2010)	Source	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
	Capacity	Insufficient	Insufficient	Insufficient	Sufficient	Sufficient
Environmental Impacts		Minor	Minor	Minor	Minor	Minor

Notes

*1 Central Hanoi excludes the existing service area.

*2 EPZ : Export Processing Zone

3.3 SELECTION OF THE PRIORITY PROJECT

3.3.1 Project Evaluation

Table 3.3-1 gives evaluation on the project sites. Based on the evaluation, the project for Central Hanoi is turned out to be as the highest priority project.

Table 3.3-1 Evaluation on the Project Sites

	Soc Son (D1)	Dong Anh East (D2+D4a)	Dong Anh West (D3)	Gia Lam (D4b)	Central Hanoi (D5, U)
Urgent Necessity	4 pt EPZ has started	2 pt Development plan is not clear	4 pt FIS has been prepared	2 pt Development plan is not clear	6 pt Commercial area and Resident area planned
Commercialization	3 pt Revenue from industrial water is large	3 pt Revenue from industrial water is large	3 pt Revenue from industrial water is large	3 pt Revenue from industrial water is large	2 pt Revenue from commercial use is large
Population Served	2 pt 89,149 persons in 2005	3 pt 273,351 persons in 2005	2 pt 131,776 persons in 2005	3 pt 277,304 persons in 2005	2 pt 126,542 persons in 2005
Living Standard	3 pt All domestic users will raise their living condition	3 pt All domestic users will raise their living condition	3 pt All domestic users will raise their living condition	3 pt All domestic users will raise their living condition	3 pt All domestic users will raise their living condition
Environment	2 pt Minor negative environmental impact	2 pt Minor negative environmental impact	2 pt Minor negative environmental impact	2 pt Minor negative environmental impact	3 pt Possible to recover the draw down wellfields
Total Evaluation	14 pt	13 pt	14 pt	13 pt	16 pt The highest priority

Note :

Each item is evaluated by giving three-grade-points. As for the item of urgent necessity, doubled points are given on account of its great importance.

3.3.2 Scope of the Project

In the previous section, Central Hanoi was selected for the priority project area. In addition to supplying water to the project area, it is required to supplement to the Mai Dich plant where the lowering of the groundwater level is observed and to supply water to the new development area adjacent to the project area.

As the water supply conditions are different each other, the scope of water supply should be divided corresponding to the condition. For it, the following three scopes are proposed :

(a) Project Area (Current non-service area)

All domestic users as well as non-domestic users in the area are planned to be supplied with piped water by house connections.

(b) Mai Dich Supplement (Supplement to the existing water supply system)

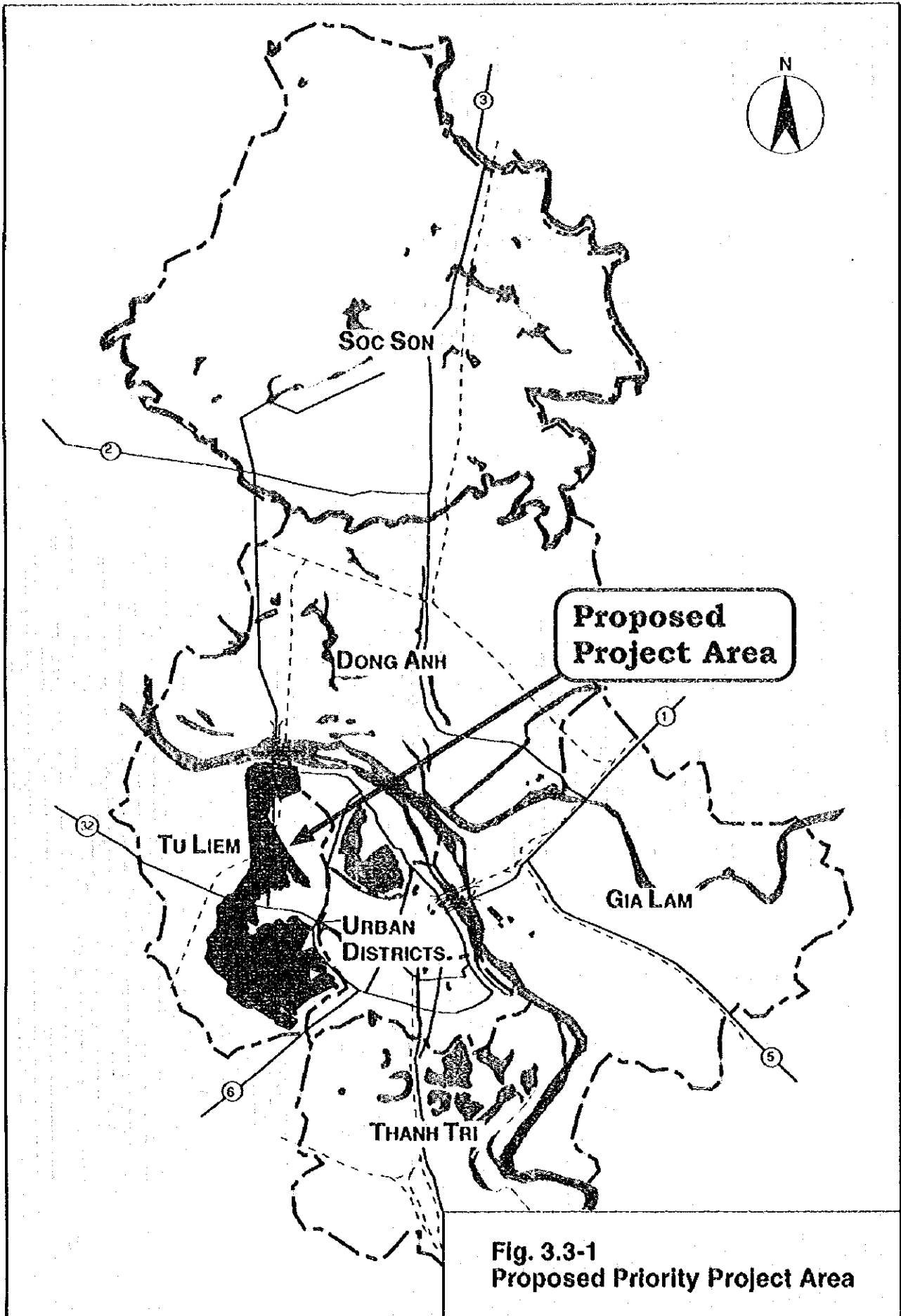
In order to prevent lowering of the groundwater level in the Mai Dich wellfields, it is proposed to supplement treated water to the Mai Dich treatment plant.

(c) New Development Area (Commercial and Residential area in D5)

Since a clear plan on the new development area adjacent to the project area has not been established yet, the bulk water supply system is proposed for this area.

3.3.3 Project Site

The proposed project site is shown in the following map.



**Fig. 3.3-1
Proposed Priority Project Area**