

SOCIALIST REPUBLIC OF VIET NAM
Independent – Freedom - Happiness

CONSTRUCTION INVESTMENT PROJECT

**THE WATER SUPPLY SYSTEM OF VINH LONG
AND VINH HA COMMUNES-VINH LINH DISTRICT
- QUANG TRI PROVINCE**

QUANG TRI, OCTOBER 21, 2013

PROJECT SUMMARY

1. PROJECT DESCRIPTION, PROPOSED AGENCY, PROJECT IMPLEMENTATION AGENCY AND OPERATION AGENCIES

1.1 PROJECT DESCRIPTION.

1.1.1 Objectives of the project.

- ✓ Construct adequately water supply system to meet the water supply demand for the entire Vinh Long, Vinh Ha, and Vinh Linh district.
- ✓ Improve the quality of life of people in the project area.
- ✓ Reduce diseases caused by water
- ✓ Empowering the role of the project area, and in particular Vinh Linh district and overall Quang Tri province in general.
- ✓ Promote economic development and attract investment

1.1.2 Synthesis of technical proposals for the project.

Table 1: Synthesis of technical proposals for centralized water supply system.

Items	Technical solutions (according to the plan selected)
Location	Vinh Linh District – Quang Tri province
Diagram of water supply	Renovate and expand Ben Quan water supply system from Q = 2.000 m ³ /ngđ up to Q = 4.000m ³ /ngđ. Sa Lung surface source → Raw water pipeline → Treatment Plant → water tower → distribution pipeline networks and services
Water supply capacity	Water supply system capacity to 2020 : Q=2.000m ³ /ngđ
Intake works – TB1	Install 2 centrifugal pumps horizontal axis Q = 83m ³ / h. II

Items	Technical solutions (according to the plan selected)
	45m to supply water for the Ben Quan Plant.
Raw water pipeline	Using the existing raw water pipeline: Ductile iron pipe DN200 - L = 850m
Treatment plant	Renovate and expand the Ben Quan water treatment plant to raise capacity from $Q = 2.000\text{m}^3/\text{ngd}$ to $Q = 4.000\text{m}^3/\text{ngd}$ - Develop new cluster filtering - Construction of new water tanks - Install 03 water pumps Construct additional capacity $2.000\text{m}^3/\text{ngd}$ at the Ben Quan water plant with the line technology as follows: Raw water → Standing sedimentation tank prevent with center reaction → Quick Filter → Tank.
Transmission pipelines network , distribution / service	Use ductile iron pipe for transmission and distribution pipe with diameter: - DN200-L=14.100m - DN150-L=460m - DN100-L=2.140m Using HDPE pipe for service pipe-PN8: - D90 - L = 615m - D63 - L = 1.974m - D50 - L = 7.040m

1.2 The agency responsible for the project.

1- The project name : The water supply system-Vinh Long Vinh Ha, Vinh Linh district, Quang Tri province.

2- Project owner : People's Committee of Quang Tri Province.

a) Address : 45 Hung Vuong, Dong Ha Quang Tri.

b) Phone number: (053) 3852501

Fax: (053) 3852827

c) Email:

3- The Investors: Quang Tri Water Supply and Construction One Member Limited Company.

a) Address: Số 02 Nguyen Trai, Dong Ha, Quang Tri

b) Phone number: (053) 3555.927

Fax: (053) 3555.291

c) Email: capthoatnuocqt@yahoo.com.vn

4- Implementing Agency: Project Management Unit - Quang Tri Water Supply and Construction One Member Limited company.

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2. PROJECT PROGRESS.

- Establish construction investment project , the basic design: 6/2010

- Design drawings, build estimated total , set up construction bidding documents: 09/2010.
- Bid and approval, select contractors: 12/2010 to 12/2011

PROJECT LOCATION

3. The project is implemented in 02 communes Vinh Long and Vinh Ha of Vinh Linh district, Quang Tri province.

3.1 Project financing source

3.2 Total investment:

The total investment of the project is: 31.679.826.000 VND, equivalent 1.219.000 EURO

3.3 Source of fund for the project:

The project is implemented through the source of aid about the goods of the Italian Government and counterpart funding (Ministry of Finance and the People's Committee of Quang Tri province), in which:

➤ The source of aid of the goods from the **10.213.139.000 VND**
Government of Italy (for Phase 1 of the project) Equivalent: **393.000 EURO**

Rate : 32,2%

➤ Counterpart funds :

Phase 1 :

12.910.690.000 VND

Equivalent **497.000 EURO**

Rate: 40,8%

Phase 2:

8.555.997.000 VND

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Equivalent: **329.000 EURO**

Rate: : 27%

3.4 Financing Mechanisms:

The aid of goods of the Government of Italy: The project owner is financed as the capital budget.

The counterpart funds of the Ministry of Finance and the People's Committee of Quang Tri: The project is financed by the Budget Law.

4. EFFECTIVENESS OF THE PROJECT

4.1 The effectiveness of finance

- ✓ water tariffs for domestic demand: 4,300 VND / 1 m³
- ✓ water tariffs for administrative and public: 5,160 VND / 1 m³
- ✓ water tariffs for production of small, cottage industries: 6,450 VND / 1 m³
- ✓ water tariffs for business needs, services, restaurants: 8,600 VND / 1 m³
- ✓ The average of water tariffs is 4.988 VND/m³
- ✓ The analytical results are as follows:

NPV value:	12.638	(Millions VND)
FIRR coefficient	7.62%	

4.2 The effectiveness of economic

ENPV value	54.004
Rate of revenue per cost (EBCR)	1,27
EIRR coefficient :	12,32%

4.3 The effectiveness of social

The Project is constructed which will bring the socio-economic benefits greatly for Vinh Long, Vinh Ha of Vinh Linh district as well as Vinh Linh entire district, Quang Tri province. The project contributed to improving living standards and living conditions of

the people in the project area and contribute to attracting investors, attracting tourists to VinhLinh.

BACKGROUND AND BASIS OF THE PROJECT

1. PROJECT OVERVIEW

1.1. Overview

Clean water and sanitation has been one of the top listed goals of nation in Vietnam. In 1998, the Viet Nam National Target Program about clean water and sanitation, and rural life was done. To date, the program has brought significant effect. The number of people have access to clean water and safe sanitation has increased significantly.

Vinh Linh district is located on the 17th parallel in Quang Tri province. In the war Vinh Linh is outpost of northern, the immediate post of Southern Revolutionary. Vinh Linh today is becoming better; the rural areas are gradually improving. In recent years, the interest of the Government, ministries, central sectors along with the efforts of the local area. The economic and social of Vinh Linh's District has seen significant development and people's living conditions, infrastructure investment are gradually building. Local party gathered for the investment and development of infrastructure such as electricity, schools, clinics, roads, irrigation projects, However, with limited budgets in which there are many problems to be solved, so in some areas did not meet the essential needs of the people. Especially the problem of water supply, drainage and sanitation haven't been invested completely.

The Provincial People's Committee of Quang Tri Province has assigned the Quang Tri Water Supply Construction and Water Supply One Member Limited Company takes responsibility in water supply for people on the urban and rural areas and surrounding urban near the center of the province. However, until now the water level is only solved at modest levels for a number of urban, suburban and some areas still do not have clean water system or the water plants were first constructed, but not to promote full capacity due to lack of funds to invest in expanding network of distribution pipes. There have been many projects have been calling for investment to provide access to clean water needs of the people in the project including water supply systems Vinh Ha -Vinh Long. Vinh Linh district.

1.2 Introduction to the project

Project Name: Water supply system of Vinh Ha and Long-Vinh commune, Vinh Linh district, Quang Tri province.

Investor: Quang Tri Water supply and Construction One Member Limited Company.

Representative of the investor : Project Management Unit (PMU) - Quang Tri Water supply and Construction One Member Limited Company.

Consulting Unit: Vietnam Environment and Construction Joint Stock Company (Vicen).

Location of the project: Vinh Long, Vinh Ha commune, Vinh Linh District, Quang Tri province.

Expected date of start and completion of the project: Start time of project 03/2010. Complete time of projects 12/2011.

2. The necessity and urgency of the project.

2.1 Macro environment and development policies of the country.

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The financial crisis and the global economic downturn led to dramatic fluctuations in market, rates, investment and trade. Climate change is increasingly making the weather becomes more unfavorable for agriculture, natural disaster appeared with greater frequency, greater destructive power, crop failures, the cost of cultivation increased. Epidemic (eg H1N1) also adversely affects economic growth on a global scale (travel and airline passengers declined).

The changes that have affected the economy of Viet Nam better reveal weaknesses in quality and imbalances in the economy which is continuing to further integration into the global economy. Trying to achieve a high growth rate in such unpredictable conditions that require more effort, the cost-effective relationship is not as expected and also greater risk.

Summary the economic situation in 2009, the government has submitted to the National Assembly the honorable achievement: 5.2% of GDP, above the regional average, but the lowest level for a decade. Inflation is maintained at less than double digits. Poverty reduction down to 11%, faster than the committed roadmap to perform Millennium Development Goals (MDG) which is a surprise because the poverty line is based on old, outdated more than inflation. The international community also praised Viet Nam's achievements in maintaining equality of income through GINI index and the impressive poverty reduction in rural areas, according to the official report of the Government.

2.1.2 Policy and national development

The socio-economic development must go hand in hand with sustainable development, complete infrastructure system and environmental protection. Priority focuses capital investment in the construction of infrastructure facilities such as electricity, roads, schools, stations, especially the water supply and sanitation.

2.2 The conditions and facilities projects

2.2.1 Natural Conditions

a) The project was implemented in 02 communes in the province of Vinh Linh district, Quang Tri province.

b) Geographical Location

Quang Tri is the northern coastal province of central Viet Nam. The geographical position: Located in the East-West Economic Corridor, exchanges between two South - North regions, facilitate development of marine economy.

Geographic coordinates on the land of Quang Tri: North Pole is 17°10 'north latitude, located in Mach Nuoc village, Vinh Thai commune, Vinh Linh district. South Pole is 16 °18 ' North latitude of the A Ngo village, A Ngo Commune, Dakrong district. 107 ° 23'58 easternmost longitude is east of Tham Khe village, Hai Khe Commune, Hai Lang. Pole West is 106028'55 East longitude, located in Cu Bai border posts, Huong Lap commune, Huong Hoa District.

The Quang Tri Province is bounded as follows:

- The North borders with Quang Binh
- The South borders with Thua Thien Hue province
- The West borders with Lao PDR
- The East borders with The East China Sea

Vinh Linh District located in the north of Quang Tri province. The east adjacents to The East China Sea, the west adjacents to Huong Hoa district, the south adjacents to Gio Linh district and the north adjacents to Le Thuy district (Quang Binh). The Vinh Linh District have 3 Towns (Ben Quan, Cua Tung, Ho Xa) and 20 communes (Vinh Thai, Vinh Tu, Vinh Trung, Vinh Chap, Vinh Nam, Vinh Khe, Vinh Long, Vinh Kim, Vinh Hoa, Vinh Thach, Vinh Lam, Vinh Hien, Vinh Thuy, Vinh Thanh, Vinh Ha, Vinh Son, Vinh Tan, Vinh Quang, Vinh Giang, Vinh O). With a natural area of 626.35 km², population of 89 027 people in which 2175 is Van Kieu ethnic minority.

The project area covers the whole of Vinh Long and Vinh Ha commune is limited as follows:

- The north adjacents to Vinh Chap and Vinh Khe, Vinh Linh District.
- The East adjacents to Ho Xa town and Vinh Lam commune, Vinh Linh District
- The south adjacent to Vinh Thuy and Vinh Son commune, Vinh Linh district and Gio Linh district.
- The west adjacents to Vinh O commune and Vinh Linh district
- Figure H-3: The Masterplan of project area

c) Topography

The topography is hills and valleys and basalt plateau. The terrain from the west to the east is quite clear. In the west of the watershed with sloping terrain, being weakly cleaved and the eastern of watershed line moved quickly from the mountain up plain. The level terrain strongly cleaved by dense river network with monitoring of both longitudinal and transverse slope.

d) Climate characteristics

The project area and in particular Vinh Linh district as well as Quang Tri province belongs to the south of the North Central in general, located in the area full of tropical humid monsoon, and the transition zone between the two climates. The Northern has climate with cold winters and the year-round hot and the humid south. In the harsh climate of this region, the consequences of severe dry southwest wind, storms, heavy rainfall, erratic weather changes, so in production and people's life encounter difficulties. Specifically:

- Total annual average hours of sunshine range from 1700-1800 hours. The most hours of sunshine in July (240-250 hours).
- Annual average temperature ranges from 20-25°C, the highest temperature on July and the lowest in January. High temperature in the hot months of the year, in the plains over 40°C and in the lower mountains 34-35 °C. The lowest temperature of the year could drop to 8-10 °C in the delta and 3-5 °C in the highlands.
- Rainfall: Rainy season takes place from September to January next year, rainfall is about 75-85% of the annual rainfall total. The rainy months, mostly 9-11 months (about 600 mm). The lowest rainfall months is from February to July (lowest 40mm/month). The annual rainfall total ranges between 2000-2700 mm, number of rainy days 130-180 days.
- Humidity: average relative humidity, humidity months 85-90%, but usually less than 50% dry months, sometimes down to 30%.

2.2.2 The socio-economic status

a) The economic status.

Implementation of the 135 program set by the Government and People's Party Vinh Linh district has implemented a comprehensive development in all aspects of life. The rural areas have changed very much, the lives of people of ethnic minorities are significantly improved, gradually remove the gap between the plains with reverse domain

After nearly 3 years of this program, though it still gets difficult due to high mountainous terrain, land is less but initially achieved encouraging results. The poverty rate has dropped significantly, the socio-political, defense and security is maintained. The percentage of households using clean water, electricity, school children ... peaked. The district has built 15 buildings, including 3 of the electricity supply, 11 rural road projects and one water supply scheme has solved greatly the difficulty for the people here. By 2008, Vinh Linh reached the production total nearly 32,000 tons of food, economic growth maintains rate 12-13% / year, per capita income reached 9 million / year, the percentage of households poverty reduce to 13.2%. The handicraft industry - industry growth increases with speed 15-18% /year for more than one decade. Typically: key area of rice Lam -Son - Thuy, Industrial plants Region, vegetable plants in red land communes of the eastern; Shrimp Industry Region of the Ben Hai River North, mixed farms in the West; Industrial Cluster of Ho Xa north village, Cua Tung. In particular, development policy "rubber smallholdings" has achieved positive results, with an area of over 6,000 hectares, of which 4,200 ha were put into operation, latex yield 4,100 tons / year and reached a goods value of hundreds of billion / year. Rubber, pepper, peanut, shrimp exports, farming economy has become one of the strengths in the economic development of the district.

b) Social status

o Population:

According to 2008 statistics, the district has 20323 households and a population of 89 027 people in Vinh Linh district, in which 2175 people are Van Kieu ethnic minority and the district has 20 323 households.

As of 2010 the population of Vinh Long and Vinh Ha is 7,922 people in which 6,420 people are from Vinh Long commune and Vinh Ha commune is 1502 people.

○ **Health:**

The district has 22 health care facilities including 01 district health centers, 01 regional clinic and 20 commune health clinics (CHCs) with 150 beds, in which each the CHC has 5 beds.

○ **Education:**

Currently, the district has 68 schools in levels; including 27 schools are recognized standards, accounting for 40%. Professional qualifications of the teaching staff has been gradually improving, the district has 95% qualified teachers, including 44% who achieved the standard.

The education of Vinh Linh district strives to effectively perform the movement, the movements for education quality of district increase continuously.

○ **Culture and society**

Currently, in Vinh Linh area has 68 historical and cultural relics are ranked and typical the relics are ranked nationally as the banks Hien Luong, Vinh Moc Tunnels, Hien Luong Bridge, Ben Hai River, Tung Luat wharf.

Cultural heritage intangible: Vinh Hoang poinsettias.

Natural landscapes: Ru Linh primary forest, Cua Tung beach

2.3 Market, supply and demand analysis

2.3.1 Market.

For water supply projects in general, the market is understood in its own right means that buying and selling goods, business services to serve customers. For this project, the market here is the water supply system for objects using water.

- (i) Water supply: This is the main market for this project. With water rate account for up to 85% of the total of sale water of the project, this is really a potential market profitable for the sellers. The objects use domestic water are households and the high proportion of

beneficiaries as well as the main objectives of this project aims to. The domestic water used by the customer for the purpose of eating, bathing and other daily needs. With a water supply service is fully invested from the primary works to the treatment works, and to distribution pipe network, service and especially the connection points to households. Thus, with the status have no access clean water, when the project is built, it is indeed a potential market for the seller exploits. The exploitation of this market not only stop at the connection and supply in the early stages but also continue to develop and expand the scope of supply as well as the rate provided in the next time. Therefore people support completely in constructing a water supply system, and they are willing to pay the costs to be used supply water services. In financial, this is clearly a market that this market have huge demand and potential for management agencies can upgrade and expand water supply services to serve for the people.

(ii) Financial

(iii) Supply water for public needs: In addition to the demand is the main drinking water supply for the people, some objects are administrative agencies, public buildings, schools, .. Water is also needed to serve for their needs. This market accounts for a small portion, but the water tariff is higher than the domestic water objects. So this is also a potential market that the sellers still need to exploit.

(iv) Supply water for Service Trade : The objects of this market are restaurants, shops, car wash station, .. and this is a potential market due to their huge demand and though the number of the water using objects are not much. On the other hand, the water tariff for this object is greater than the domestic water tariff so this is really a potential market to exploit and expand the services provided. Addition to the objects use domestic water, services and trade are also looking forward to be supplied to clean water to meet their present needs.

(v) Provide water for the demand of smallholder and handicrafts: The small manufacturing facility will be the main object in the water market. This is a rural water supply project, so the water supply for the customer is not greater proportion. However, according to the terms of economic and financial, this is also a potential market to exploit.

2.3.2 Supply - Demand analysis

Once identified the market , supply and demand factors must exist naturally. When there is the Supply and the Demand, there is the market.

Supply:

The supply here is the water supply system to the consumption points in the project area. This project was set up to ensure that there is the supply for this potential market. Supply requirements are confirmed and guaranteed through the water treatment works, water works brought to the consumption points in the project area. In order to determine the supply should study the market demand, this will be expressed in detail in the next chapter of this report. But there is one thing which is very important is that this project be set up to serve the needs of the market described above, thus the demand is understood as a huge and potential thing . After studying demands on the market, the supply is ensured through intake works, processing stations, the network of pipes ... Certainly when you have, the services to bring the supply to the demand being concerned. It is the quality of the service brings, and also is the quality of works in the water supply system.

For this project , it is expected that a completed water supply system will be built to meet the market demand . Clean water is produced to ensure the needs of the people in the period from now to 2020 and expected to expand the development of phase 2 in 2030 . A clean water supply system which will be built to serve the needs of the project area is estimated at 2000 m³ . To be able to develop the supply after constructing, a system of distribution water supply pipe network , services and especially the connection point to the households will be constructed to ensure the supply to the demand . In addition, the service quality during the operational phase is not small decisions on the development of the supply on the water supply market.

Demand:

The evaluation research of the demand on the market is very important. As discussed in Section 1.3.1 above, the demand for the water in the project area is very large because the current situation in the project area does not have a clean water supply system. The

object of the project area is very frustrating and longed to be provided water supply services to improve the quality of their life . The needs on the market are diverse, including the need for clean water, public water demand, offices, small manufacturing and service . All the objects which use the water have in great demand and are willing to pay for the services provided. Thus it can be stated that the demand on the market for a water supply service is great and a lot of potential.

As it can be seen that the demand of the water supply market in project area is very large. Most of the households have a desire to be supplied a better service about clean water, and is used to clean water sanitation, safety, enhance life. Thus, the overall assessment of the demand in project area is very potential and also important base for the project owner can build and meet the demand enough the supply for the demand.

When there is the Supply and the Demand, one of the most important issues of this project is to identify correlations as well as identify the calculation of the supply to meet demand. One of the most important criteria to determine the Supply is the Demand investigation and forecasts for the future as the demand increased and developed. With the researchs and the detailed investigation about the status of the project area, this project will ensure proper and adequate and to ensure future supply are accurately identify and meet the demand

2.4 The base of the project

- Constuction Law , No 16/2003/QH11 dated November 26, 2003.
- Bidding Law , No 61/2005/QH11 dated November 29, 2005 by the Congress of the Socialist Republic of Vietnam on Procurement;
- Law on amending and supplementing a number of articles of the law relating to the construction of basic No.38/2009/QH12 dated June 19, 2009 by the Congress of the Socialist Republic of Vietnam;
- Decree No. 85/2009/ND-CP dated October 15, 2009 of the Government in guiding the implementation of the Bidding Law and the selection of construction contractors under the Construction Law
- Decree 209/2004/ND-CP dated December 16, 2004 of the Government on quality management of construction works;

- Decree 49/2008/NĐ-CP dated April 18, 2008 of the Government amending and supplementing a number of articles of Decree No. 209/2004/NĐ-CP
- Circular No 31/07/2009 dated 27/2009/TT-BXD of the Ministry of Construction guiding the implementation of some of the content on quality management of construction works.
- Decree No. 12/2009/NĐ-CP dated February 10, 2009 of the Government on management of investment projects on construction of works;
- Decree No. 83/2009/NĐ-CP dated October 15, 2009 of the Government amending and supplementing a number of articles of Decree No. 12/2009/NĐ-CP dated February 12, 2009 of the Government on Manage construction investment project.
- Decree No. 112/2009/NĐ-CP dated 14/12/2009 of the Government on management of investment cost and construction works.
- Decide No 957/QĐ-BXD dated September 29, 2009 of the Ministry of Construction announced Norms of project management cost and investment consulting and construction;
- Decree No. 117/2007/NĐ-CP dated 11/07/2007 of the Government on the production, supply and consumption of clean water;
- Circular No. 95/2009/TTLT-BTC-BXD-BNN dated May 19, 2009 by the Ministry of Finance, Ministry of Construction and Ministry of Agriculture and Rural Development guiding principles, methods determined and competent to decide the water tariff in the urban, industrial and rural areas;
- Viet Nam Construction Standards Episode 1, Episode 3, issued by decision No 682/BXD-CSXD dated December 14, 1996 of the Minister of Construction
- Standard TCXDVN - 33:2006, water supply, pipeline networks and structures - Design Standards.
- Regulation QCVN 08:2008 /BTNMT - National Technical Regulation on surface water quality.
- Regulation QCVN 01:2009/BYT - National technical regulation of drinking water quality.
- Other documents provided by investors.

3. OBJECTIVES OF THE PROJECT

3.1 Long-term objectives of the project

- Improve the quality of life of people in the project area
- Reduce diseases caused by water
- Empowering the role of the project area, in particular Vinh Linh district and Quang Tri province in general
- Serves industrial development, trade and services in the area, contributing to transfer economic structure, job creation, poverty reduction and social and economic development of the local area.
- Promote economic development, attracting investment and calls for.

3.2 Specific objectives of the project

- Construct adequately water supply system to ensure meet demand about water supply for the entire Vinh Long, Vinh Ha communes, Vinh Linh district.
- Ensure to supply adequately of clean water for people in the area of Vinh Long and Vinh Ha communes, as well as for the handicraft sector.

4. CONFORMITY WITH THE MASTER PLAN OF THE COUNTRY AND REGIONAL PLANNING

4.1 The conformity with the master plan of the countr

In 1998, the Viet Nam national target program about clean water has been established and done and brought remarkably effective. The number of people have access to clean water and safe sanitation has increased significantly.

In 2000, the Millennium Development Goals (MDG) were signed by members , including Viet Nam. With the goal of No. 7 as of 2015, it will make halve the population have not access to the safe source water.

Implementation of commitments with the international community, Viet Nam has actively implemented and proposed Millennium Development Goals (VDG) consists of the common goal of reducing poverty, improving water supply and sanitation.

- + As of 2010, reduce 40% of the poverty population rate below the international poverty line.
- + As of 2005, the percentage of urban population have access to safe drinking water is 60% and this figure was 85% in 2010
- + As of 2010, treatment wastewater in most towns, townships and municipalities
- + The level of air and water must achieve national standards in 2005

Thus, it can be said that the project is set up fully consistent with policies as well as directions of nation about the clean water and sanitation

4.2 Conformity with the planning.

Since this project is a water supply project with scope for the 02 communes of Vinh Long, Vinh Ha, so the master plan for the project area do not have. However, It can be seen that the policy of Quang Tri province in general and Vinh Linh district in particular, both expressed the effort to achieve the objectives of improving water supply and communicating in rural areas. Thus it can be said that this project is entirely set up to meet the demand as well as the direction and planning of the area.

5. OTHERS PROEJCTS CONCERNED

According to field surveys, we found that Ben Quan town of Vinh Linh district (border with Vinh Long, Vinh Ha) has water supply system. The water supply system project for the Ben Quan town is funded by JIBIC - Japan and counterpart funding of Quang Tri province. The Ben Quan water supply system was built in 2007 and put into operation in April 2008 in order to serve for water supply of the Ben Quan town. Expansion of the Ben Quan water supply system to supply water for Vinh Long and Vinh Ha communes, it would be feasible. Therefore, It is convenient for comparison and selection of water supply schemes for the water supply system of Vinh Long and Vinh Ha communes, Consultant below presents key information on the Ben Quan water supply system.

5.1 Organize and Manage the Ben Quan water supply system

The Ben Quan water supply system with capacity $Q = 2.000\text{m}^3/\text{ngd}$. The Quang Tri Water Supply and Construction One Member Limited Company is investors of this works. After constructing, the works is assigned for the Ben Quan Water Supply Plant to manage and operate.

The Ben Quan Water Supply Plant's duty is operating to ensure water supply for the town, including the following tasks: operation the raw water pump stations, water plants, water supply pipeline network. ... record the meter, collect money and customer development. The total number of staffs and employees of the plant is 8 people:

- Director: 1 person
- Accountant: 1 person
- Treasurer: 1 person
- Worker: 5 persons

5.2 Raw water intake work

Water

The raw water which provides for the Ben Quan water plant is the surface water of Sa Lung River. The water intake work with offshore style in the Sa Lung River, Che Bien pineapple, Ben Quan town, Vinh Linh district, Quang Tri province. According to the survey, the consultant indicated that the water of Sa Lung River in the project area has good water quality and relatively abundant reserves.



Suction of the raw water plant

a) The raw water plant

The pumping station in level 1: was made from reinforced concrete with semi-submersible floating shape, a diameter of 6.3 m. The pumping station in level 1 was installed 2 horizontal centrifugal pumps Pentax, specifications of each pump as follows: $Q = 83\text{m}^3 / \text{h}$, $H = 45\text{m}$.

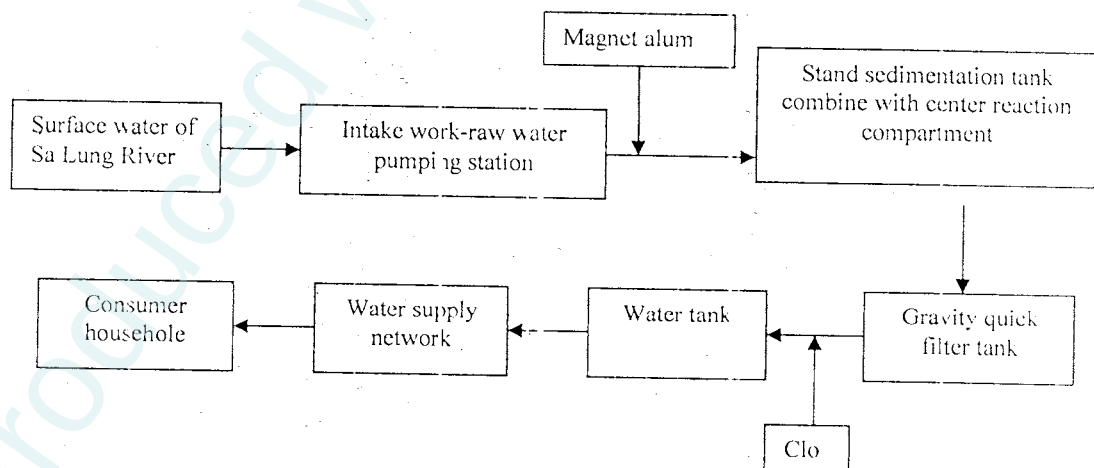


Because the plant is operating at full power yet, the pumping station in level 1 is not continuous operations (3 times / week and each time only operate in 3h30 minutes). The raw water pipeline steel with D200, 850m long.

The raw water plant

b) The Ben Quan water plant

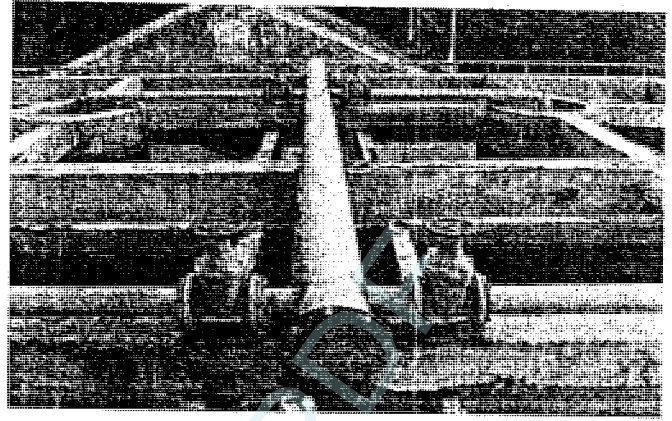
The water plant was built on hills of cluster 7, Ben Quan town. Technology diagram to treatment water for the plant as follows:



- Stand settling tank combine with center reaction compartment

Stand settling tank is made from reinforced concrete in size $B \times L \times H = 4,2 \times 4,2 \times 6,5\text{m}$. Tank quantity $n=4$

Raw water pipeline diameter D200, water distribution pipe in each reaction compartment diameter D100. The pipeline after sedimentation to filtering tank diameter D300. The diameter of sediment discharge pipe D100.

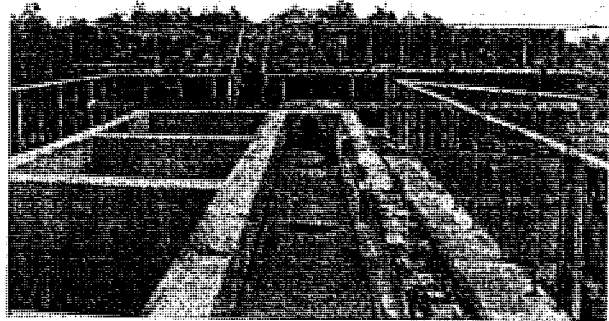


Stand settling tank combine with center

- **Gravity quick filter tank**

The plant have 04 gravity quick filter tank, each filter tank with size $B \times L \times H = 2,0 \times 2,4 \times 4,65\text{m}$ and is made from reinforced concrete

Dieth to distribute water into the filter tank in size $B \times H = 0,6 \times 0,4\text{m}$. The intake pipeline into clean water reservoir with diameter D300.



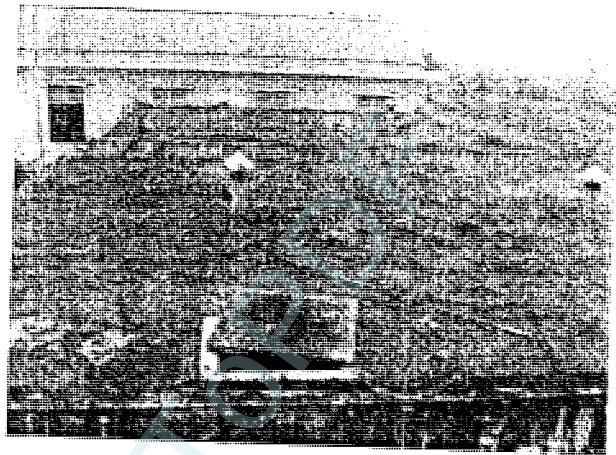
Gravity quick filter tank

Water discharge pipe with diameter D100.

- **Water tank**

Quality: 2 tanks, The capacity of each tank $W=350m^3$. The water tank is made from reinforced concrete rectangular shape with size each tank $B \times L \times H = 7,5 \times 10 \times 5,0m$.

The tank is built semi-submersible in shape with the floating and the sink is 2.5 m



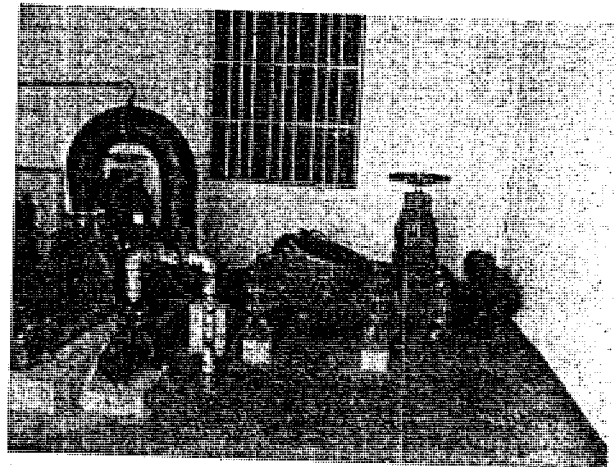
Water tank

On each tank has 02 vents with mesh to prevent insects, vent pipe diameter D150 .

- **Pumping station level 2**

The pumping station level 2 is built with size $B \times H = 18,0 \times 7,0m$.

In the pumping station level 2 is designed filter wash water pump, washing machine air supply filter, water pump to aluminum stirrer, ... Due to differences in elevation topography, water can flow from the

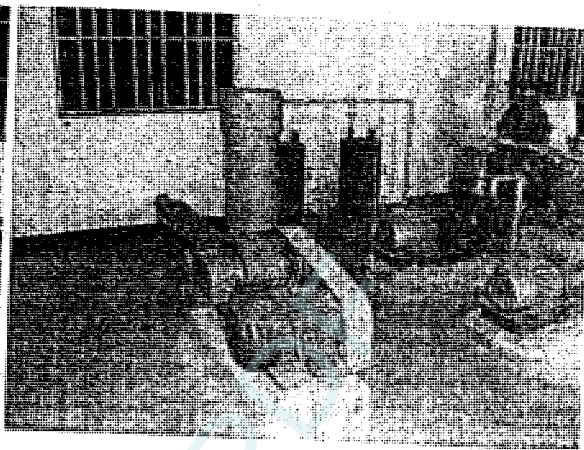


Filter wash water pump

tank to the households in the Ben Quan town , the pumping station level 2 can not arrange the water pump, but still waiting for pedestal installation of water pumps for the later development



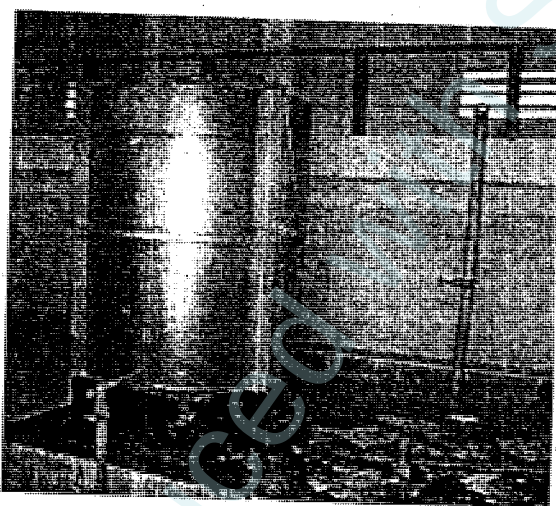
Water pump to chemical house



Water pump to the aluminum stirrer

- The chemical house

The chemical house are built with size: BxH = 12.0 x5, with 3 separate compartments : mixing alum compartment , compartment to prevent chlorine cylinders placed Clorator and reserves.



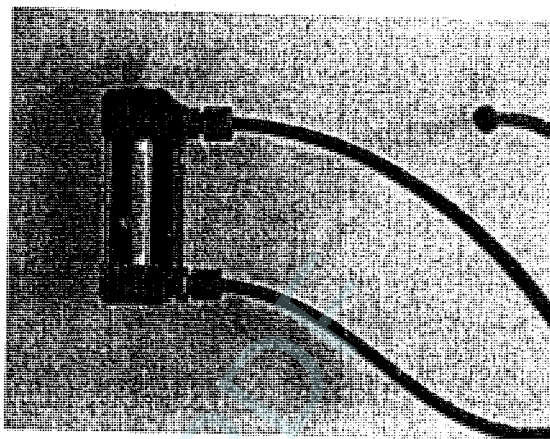
Alum mixing barrel



Clorine



Alum Pump



Chlorine Dosing Equipment

- **The auxiliary works**

In the water plant, there are other ancillary works such as toilets, garage, fence, gate, transformers...

c) **Water supply network**

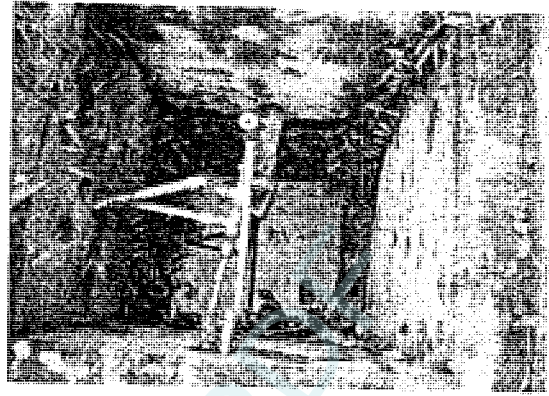
Water treated is focused on the gravity tank and the water supply network.

The total number of the pipe in the Ben Quan town as follows:

- DN250 ductile iron pipe: 276m
- DN200 Ductile Iron Pipe: 2382m
- DN150 Ductile Iron Pipe: 2424m
- DN100 ductile iron pipe: 642m
- Galvanized steel pipe DN150: 38m
- Galvanized steel pipe DN100: 170m
- Galvanized steel pipe DN80: 1544m
- Galvanized steel pipe DN50: 3724m

Currently, the number of households in connection to the water supply system of the Ben Quan town is 214 households.

Water tariff for people for production and service activities are: 4,500 VND/m³ (including environmental costs).



Connection point to specific household

6. PROVE THE NECESSARY FOR INVESTMENT

6.1 The status of the project area

6.1.1 Overview

Survey, collect data and assess the status of the infrastructure system in general and the current status of water supply systems in particular. The status as well as the shortcomings, the pressing issues of water demand in the project area and the whole of Vinh Linh district are understood clearly. The effectiveness and feasibility of the project is guaranteed by the status of the project area.

Consultants conducted a survey on the current status of water supply in the project area, learn and collect useful information from the residents living in the project area, from local authorities and from the agencies involved. The results below provide an overview and is basis for the design of the water supply system of Vinh Ha and Vinh Long communes, Vinh Linh district, Quang Tri province.

6.1.2 Status of Water Supply

Currently, Vinh Long and Vinh Ha communes are not still invested to construct any water supply system. Only 3% of the population of the Vinh Long commune is used clean water from the water supply system of Ho Xa town. People in the communes mainly use spring water, well water, rain water for drinking and domestic activities. The survey showed that the quality of the source water is not good and heavy alum. Since the

area is mountainous with deep stone, drilling wells is shallow depths and dry season without water, some low areas with alun.

6.1.3 Drainage status and sanitation

The drainage system in the project area is not or incomplete. The drainage is completely natural, irregular, unplanned or no specific directions. Rain water, waste water flows out from the edge of the road in the alley and then flows into the pond, lakes and canals. So it causes into serious environmental pollution due to uncollected.

6.1.4 Traffic status

Rural and town transportation network, including internal commune and inter-communal roads is relatively convenient and easy. The road network, motorways in commune level was built reached a rate of 100%, the inter-village road network is gradually being upgraded Hundreds of kilometers have been concreted, asphalted to meet travel demand, commodity exchanges, enhance the rural areas. Currently, the communes has been conducting the concrete rural roads. Specifically, Vinh Long commune has made the State and People programs and together to build the total communal roads with a total length of 82km in which the the inter- communal roads have 18 km length. the remaining of inter-village and inter-clusters roads. In 2009, the Vinh Ha commune has built Khe Ho inter-village road with 458 km length and now the roads of Vinh Ha - Vinh O are quickly constructing and is also a basic trade clue with neighboring regions.

In particular, there are Truong Son road running through the project area. This is the route that it has tremendous historical significance as well as it is advantages for the trade development, contact with the outside and the surrounding areas.

Waterway network has many large and small canals covered up communes with dyke system is very favorable for the irrigation of agricultural production in the commune.

6.1.5 The status of irrigation

With many different sources from the central to the local, many investment projects of irrigation infrastructure across the district. The irrigation works in and out of the

system has been constructed to meet basic water requirements .In order to serve agricultural production activities reached the highest effectiveness, the cooperatives will focus on irrigation and annually mobilize members in cooperative contributing thousands of labors to dredge the canals, pumping stations and actively set up more irrigation field pumps for production Also, investment repair or construct many new irrigation works. Specifically, Vinh Long commune has invested to build canal system for irrigation with a total length $L = 48\text{km}$ and was concreted 25%. Vinh Ha commune also actively promote the construction work of canal irrigation systems , specially Khe Bun (Xom Moi) irrigation works has helped a lot for the irrigation of crops.

6.2 The necessary to invest

In the last years, the Vinh Long and Vinh Ha communes has achieved remarkable achievements in economic and social development of their localities. The economy of 2 communes developes relatively, the public works such as schools, stations, roads, electricity has been invested. However, the problem of clean water and sanitation is still unresolved and there is no centralized water supply system. The water which people use to serve for daily activities is the raw water untreated, does not ensure environmental sanitation. Local people recognized that their current source of water is no guarantee and risk of contamination. So it should be replaced with clean water to ensure quality. Water untreated has causes a lot of diseases related, the life of people becomes hard. There is a clean water supply system in the commune is desire of the local policy and people. On the other hand, one of the top priorities in the development of the construction of infrastructure systems is the construction of water supply systems. This investment have great social significance, directly promote the economic development of the 2 communes of Vinh Long, Vinh Ha.

With all of mentioned reasons above, the construction of Vinh Long and Vinh Ha water supply system, Vinh Linh D strict, Quang Tri province use grant funds of Government of Italia is essential.

I. DESIGN, RESOURCES, RESULTS

1. THE WATER RESOURCES

1.1 Overview

The Water Supply System Project of Vinh Long and Vinh Ha communes, Vinh Linh district, Quang Tri province will build a centralized water supply system to ensure hygiene and food standards according to the regulation. Therefore, the study of water resources is one of the mandatory and significance requirements of the project.

Other water resources are studied and compared by the Consultant.

1.2 The Sources of rainwater

The project area consists of Vinh Linh district in particular and Quang Tri province in general belongs to the south of the North Central, located fully in the tropical moist wind area.

The rainy season takes place from September to January, rainfall of about 75-85% of the total annual rainfall. The rainy months last mostly from September to November (about 600 mm). The lowest rainfall is from February to July (lowest 40mm/month). The total annual rainfall ranges between 2000-2700 mm and the number of rainy days are 130-180 days.

Although the rainwater quality doesn't guarantee absolutely the hygiene standards, this water resource had better the existing water source of the local. It able to use for daily activities because of the high annual rainfall. The source water has capable of meeting the part demand of the local people because it depends on seasons in year.

1.3 Groundwater

According to data collected showed that the geological structure is relatively complex in the project area where associated with potentially hazardous metal sources such as: Sb, As, Cu. Especially, there are radioactive elements. In general, the existing water that people are using haven't been researched and evaluated and it is still lacks of indicators of environmental hygiene, radiation safety thresholds. In many places, for

many reasons that causes the unsanitary water which leads to the hair loss diseases, intestinal disease. The groundwater reserves in the project area is very low. The groundwater is extracted from wells of households is more iron and other impurities. In addition to the basic materials about geological work in small and medium rate (1:100.000; 1:50.000), the hydrological study material doesn't have in these areas. According to local authorities said that the project area is a place where gathers weapons and ammunition for the Southern battlefields in the American war so these chemicals into the ground a long time may affect the risk of groundwater.

The above issues showed that the expectation of using the groundwater to replace the raw water for project it should research and evaluate the groundwater quality and reserves.

1.4 The surface water

The project area has the relatively plentiful surface water , including streams and rivers system , natural lakes and artificial ponds. Sa Lung River is the largest river flowing through the project area, the river is formed from slots, the small streams on the range of the Truong Son Mountain through Gio Linh and Vinh Linh communes and flows Ben Hai River.

Hydrological regime of the Sa Lung river in the project area as follows:

- Maximum water flow $Q_{Max} = 3,16 \text{ m}^3/\text{s}$
- Minimum water flow $Q_{Min} = 0,23 \text{ m}^3/\text{s}$
- The highest water level $H_{Max} = 15\text{m}$
- The lowest water level $H_{Min} = 13,5\text{m}$

Currently, the Ben The water plant is using the water of Sa Lung river the raw water source . The process is working very well, the quality of raw water and treated water will meet the standards and regulations in force.

Bảng 2: The Sa Lung river water quality.

No	Indicators	Unit	results	Standard QCVN 08-2008 (A1)
1	pH		7,33	6.5 - 8.5
2	Temperature	°C	20	23
3	Flavor		Không	
4	Salinity	o/oo	0	400
5	Color	CTU	8	15
6	Oxidation	mg/l - O ₂	1,6	0.5 - 2.0
7	Turbidity	NTU	3.1	< 5
8	Total hardness	mg/l	40	500
9	Fe ²⁺	mg/l	0,15	0.5
10	Pb	µg/l	8,55	20
11	As	µg/l	3,38	10
12	Hg	µg/l	<0,5	1
13	NH ₄ ⁺	mg/l	0,08	0.1
14	DO	mg/l	6,72	>6
15	BOD ₅	mg/l	3,52	4
16	COD	mg/l	7,2	10
17	TSS	mg/l	9,00	20
18	Cl ⁻	mg/l	16,9	250
19	SO ₄ ²⁻	mg/l	2	400
20	NO ₂ ⁻	mg/l	0.001	0.01
21	NO ₃ ⁻	mg/l	0.01	2
22	Total of coliform	MPN/100ml	150	2500

So it can be able to use the Sa Lung river water as the raw water for water supply systems - Vinh Long and Vinh Ha.

1.5 Expansion of the Ben Quan water plant

As the above section of this report (the status of the Ben Quan water plant), the Ben Quan water plant is operating well with capacity $Q=2.000\text{m}^3/\text{ngd}$ now.

Currently, the Ben Quan plant is in the period developing the water supply network and connecting to households and customers with the existing levels of exploitation up to 10 %.

So, it only extend the Ben Quan water plant to supply water for the Vinh Long and Vinh Ha communes.

1.6 Compare to select the water source.

According to the above water information, it can be stated that the water can only be extracted from two sources to supply for the project: The raw water from the Sa Lung river and the clean water in connection with the Ben Quan plant (expansion the Ben Quan water plant). The other water sources such as rainwater, groundwater, ponds, ... are not the water supply source for the project. The table below shows the comparison between two options of water: The raw water from the Sa Lung river and water connection with the Ben Quan water plant (expansion the Ben Quan water plant).

1.7 . Table 3: Compare to select the water source

Content	The surface water of the Sa Lung river	Expasion of the Ben Quan water plant
Advantages	- Large reserves. Good quality. - The raw water plant in the water supply system of Vinh Long and Vinh Ha communes is new completely and independent	- Advantage of the intake works - the existing raw water plant (only need to set up one more pump). - Advantage of the existing water plant and works. Only need to construct one more treatment monad to ensure capacity.

Content	The surface water of the Sa Lung river	Expasion of the Ben Quan water plant
		- Investment costs and costs of operation and maintenance of small systems. - Because the Ben Quan water plant has works from the Ben Quan water enterprise , it is convenient for management and operation stakeholders.
Disadvantages	Need to construct new intake works, raw water plants and plants. Thus large invest costs. - Agreements apply for land, power are very complex.	- Have no a uniform works system and independent for the Vinh Long and Vinh Ha water supply system.
Kết luận	Through analyzing the advantages and disadvantages mentioned above, the surface water scheme from the Sa Lung river is very expensive and inefficient. Therefore, the feasibility and optimal scheme is the clean water source from the Ben Quan water plant. The Consultants suggested to expand the Ben Quan water plant. This will increase the capacity of raw water pumping station and the construction of an additional water treatment plant in order to ensure water supply capacity for Vinh Ha and Vinh Long.	

2. CAPACITY SCOPE

2.1 Scope of the Study

The study scope of design phase up to 2020 (phase 1: 2010-2020, Phase 2: 2020-2030) based on field surveys, the natural boundaries, the boundaries of the planning, development plans and planning, population characteristics and the reference comments from the agencies involved.

According to the research boundaries of the project is overall 2 Vinh Long and Vinh Ha communes of Vinh Linh district with boundaries as follows:

- The north adjacents to Vinh Chap, Vinh Khe of Vinh Linh district.
- The East adjacents to Ho Xa town and Vinh Lam commune of Vinh Linh district.
- The south adjacents to Vinh Thuy and Vinh Son communes of Vinh Linh and Gio Linh districts.
- The west adjacents to Vinh O commune of Vinh Linh district.

2.2 Water supply service area

In principle, the water service area will be determined on (i) the research scope of the project, (ii) the service level of project, (iii) characteristics of population distribution of the project area (iv) the current status of the project area (v) the financial status of the project.

Accordingly, the water supply service area in the first phase will not include some residential areas too far from the center and households scattered away from the center of the project. Accordingly, the rate of water supply up to 2020 will be identified 80%. Phase 2 (2030) when the system was stable in operation will continue to expand the water supply to the entire population of the project area, at this rate is 95% water.

2.3 The population prediction

2.3.1 The rate of population growth

The various sources of information about the rate of population growth as Statistical Yearbook of the Quang Tri Province in 2009, the data on the local population and figures planned is provided by the CPCs in the project area.

Bases to predict the future population identified in the current population and the population growth rate annually.

According to data from the Statistical Yearbook of the Quang Tri province, the commune population is fluctuations and differences between regions in recent years . However, the long term expected rate of population growth will be equal to the overall rate of the district, as follows:

Year period 2010 - 2020:

Population growth rate is 2,2% in Vinh Ha

Population growth rate is 1,0% in Vinh Long.

Year period 2020 - 2030:

Population growth rate is 1,5% in Vinh Ha

Population growth rate is 0,8% in Vinh Long.

2.3.2 The population prediction.

The population forecast is shown in the table below:

Bảng 4: The population prediction in the project area.

No	Location	Pupolatio n in 2010 (person)	The rate of populatio n growth	The populatio n predictio	The rate of populatio n growth	The populatio n predictio
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			(%)	n 2020 (person)	(%)	n 2030 (person)
1	Vinh Ha commune	1.502	2,2%	1.867	1,5%	2.167
2	Vinh Long commune	6.420	1,0%	7.092	0,8%	7.380
3	Total	7.922		8.959		9.547

The population prediction is served clean water, expressed by Consultants in the below table:

Bảng 5: The population prediction is supplied water

No	Location	2010		2020		2030	
		The population rate is supplied water (%)	The number of people is supplied water (person)	The population rate is supplied water (%)	The number of people is supplied water (person)	The population rate is supplied water (%)	The number of people is supplied water (person)
1	Vinh Ha commune	60%	901	80%	1.494	95%	2.059
2	Vinh Long commune	60%	3.852	80%	5.674	95%	7.011
3	Tổng cộng		4.753		7.168		9.069

2.4 The water demand prediction

2.4.1 The water for living Qsh

The water supply standards for project area shall comply with standards TCXDVN 33-2006: Water supply- outside network, works and the Viet Nam Construction Regulations episode 01 water-supply planning. According to the standards for drinking water are determined by 02 basis follows:

- (i) According to TCXDVN 33-2006, the water supply Standard for the urban V, IV and rural population per capita is 60-100 liters/day. Experiences showed that in the early of installation of new water supply systems, the water demand is low lead to the water standards will be taken for the various different stages.
- (ii) Under the Viet Nam Construction Regulation -water supply planning and demand for water for the rural population, the minimum standard of water supply for the domestic demand is 80 liters/person.day night

From the above 2 bases, the Consultant suggested to select the Regulation of using domestic water according to each different phase in the project are as follow:

+ The Phase 1:

In year: 2010-2020: 100 liters/person.day night

+ The Phase 2:

In year: 2020-2030: 120 liters/person.day night

2.4.2 Other services

According to TCXDVN 33-2206, the water supply system for urbans V and IV and the rural population, the water demand for services in addition to daily needs are taken at the rate of percent (%) of the domestic demand at the rate of 10% -15%.

From the two factors mentioned above, in order to fit the specialized rules and regulations as well as the nature of a rural water supply project and in accordance with the conditions and needs of actual water use for other objects in addition to their daily

needs in the project area. The Consultant given the water demand for other services as follows: (percentage of other services compare to the living needs met TCXDVN 33-2006, has been determined by experience of similar projects).

2.4.2.1 The water supplies for services, commercial and industrial

The water flow servers for the service , commercial needs is the water which supplys for business and commercial services units in the project area and is determined by % Qsh

According to TCXDVN 33-2006, the water fow supplies for this need

+ The phase 1:

In the years: 2010 - 2020: 5%Qsh

+ The phase 2:

In the years: 2020 - 2030: 10%Qsh

The water supply for small industries: The plant will supply water to Ho Xa North Industrial Zone. The water flow is expected 340m³/day- night ($\approx$ 15ha) Phase I and 544m³/day- night ($\approx$ 25ha) Phase II. The others is supplied from the Ho Xa plant.

2.4.2.2 The water for public

The water flow for the pulic need is calculated by 5%Qsh

2.4.2.3 The water for production and handicraft

The water flow for the production and handicraft need is calculated by 30 %Qsh

2.4.3 Non-revenue water

According to TCXDVN 33-2006, The non-revenue water is determined by the ratio % of the daily average capacity of the system (on average capacity is the domestic and other services water supply capacity).

The rate of non-revenue water of the water supply system proposed : $15\%Q_{th}$

2.4.4 The water used for station itself

The water flow for the treatment plant itself is the washing water and other needs are determined by average capacity : $10\% Q_{TB}$

2.4.5 The total of water demand

Based on the criteria about using water and the total of water demand is calculated according to the following table:

Table 6: The total of the water demand

No	Content	Unit	2010	2020	2030
I	Population is supplied water				
2	The total of population is supplied water	person	901	1.494	2.059
3	The total of population is supplied water of Vinh Long commune	person	3.852	5.674	7.011
II	Water supply standards				
1	The standard of using water for daily needs	liter/person. day night	90	100	120
2	Public water supply standards(% Qsh)	%	5%	5%	5%
3	The standards of services and commercial water supply (% Qsh)	%	5%	5%	10%
5	The standards of water supply for small industries production and handicraft	m3/ha	22	22	22
6	The rate of the non-revenue - % Qtt	%	15%	15%	15%
7	The rate for the station itself % Qtt	%	10%	10%	10%
8	Coefficient of water day max - Kdaymax =		1,4	1,4	1,4
III	The flow				
1	Daily domestic needs (Qsh)				
	Vinh Ha commune	m3/ day night	81	149,5	247
	Vinh Long commune	m3/ day night	347	567,5	841
	The total of water demand	m3/ day night	428	717,0	1.088
2	The water flow for public needs	m3/ day night	21	36	54

3	The water flow for services and commercial needs	m3/ day night	21	36	109
4	The water flow for small industries production and handicraft	m3/ day night	128	340	544
5	The total of the average water demand (Qtt)	m3/ day night	556	1.129	1.691
6	The non-revenue water (%Qtt)	m3/ day night	83	169	254
7	The water for the plant itself (%Qtt)	m3/ day night	56	113	169
8	The total of average daily water(Qtb)	m3/ day night	695	1.411	1.973
9	Coefficient of water day max - Kdaymax =		1,40	1,40	1,40
10	The capacity daymax - Qmax	m3/ day night	970	1.980	2.760
11	The capacity day max - Qmax - rounding	m3/ day night	1.000	2.000	3.000

2.5 Dividing the design phases

Phase to invest the water supply system will be effective and avoid wasteful investment. The project was divided into two phases of investment as follows:

Phase 1: from 2010 to 2020, the capacity of the water supply system is 2.000 m3/day night

Phase 2: from 2020 to 2030: The capacity of the water supply system is 3.000 m3/day night.

The current capacity of the Ben Quan water plant is 2.000m3/day night. The water demand of the Vinh Long and Vinh Ha communes in Phase 1 (2020) is 2.000m3/day night. So it only need to construct a treatment unitary which is sufficient water supply for the Vinh Long and Vinh Ha communes in the Ben Quan water plant (sedimentation tank-

filter tank - reservoir) with capacity 2.000m³/day night. In Phase 2, the expansion of the water plant to ensure the water supply capacity Vinh Long and Vinh Ha is 3.000m³/day night. In the framework of this report will present the technical plans and financial performance of the water supply system for Vinh Long and Vinh Ha in phase 1 with the capacity of **2.000 m³/day night**.

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3. PLANS OF ENGINEERING

3.1 Issues to be studied

The researches includes treatment technology, water supply network plan, the plan of the pipe materials, mode of operation of water supply systems, The selected water source is the clean water in connection with the Ben Quan water plant. The treatment line remains the treatment technology of the Ben Quan water plant, the water network is calculated hydraulic to ensure water supply to the consumption points with excessive pressure at the end of not less than 10m.

The technology solution and reasonable structure to ensure the treated water reached standards and has the lowest cost.

3.2 The specifications and design criteria

3.2.1 The design specifications

Table 7: The design specifications.

No	Items	Design for phase			Technology requirements
		2010	Up to 2020	Up to 2030	
1	The raw water pumping station		x		Take advantage of the existing pumping station. install additionally raw water pump to ensure the design capacity
2	The raw water pipeline		x		Take advantage of the existing raw water is ductile iron DN200
3	The clean water pumping station		x		Taking advantage of the existing pumping station, install additionally the clean water pump
4	Treatment clusters		x		Construction of a processing cluster in reinforced concrete.

No	Items	Design for phase				Technology requirements
		2010	Up to 2020	to Up to 2030		
5	Water tank		x			Construction of a new processing cluster in reinforced concrete.
6	The transmission and distribution pipeline				x	Ductile iron pipe -PN8 (D200-D100)
7	The service pipeline network	x				Plastic pipe HDPE-PN8 (D90-D63-D50)
8	Connection to households, including meter and the small pipeline	x				Service pipeline and the small size pipe front the meter Watches in exact level B, an error limit according to the flow.

3.3 The technical plans

3.3.1 The plan of constructing the intake works - the raw water pumping station

The current intake works - raw water pumping station in Sa Lung riverbank belongs to Che Bien cluster, Ben Quan town, Vinh Linh District, Quang Tri province.

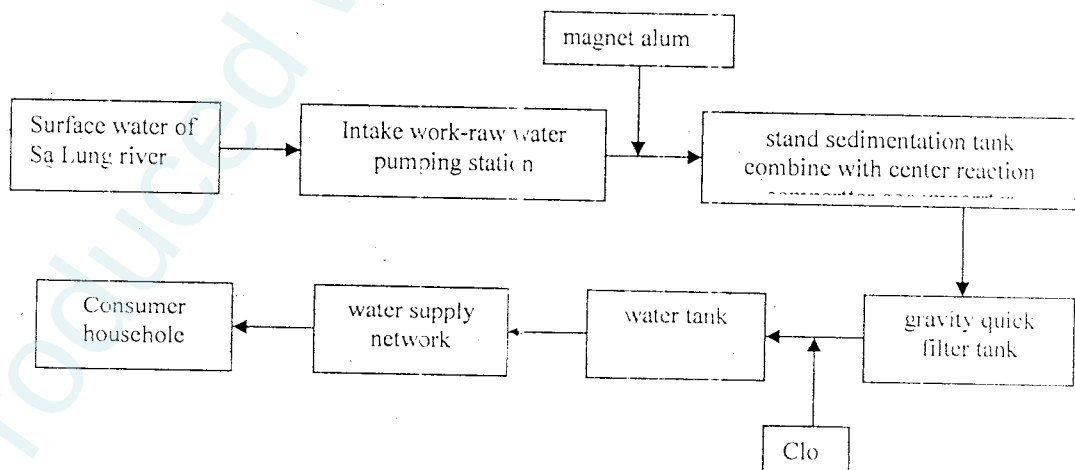
$Q=83\text{m}^3/\text{h}$, $H=45\text{m}$. The raw water pumping station was built of reinforced concrete structures and cylindrical, semi-submersible. Diameter of the raw water pump station is $D = 6,3 \text{ m}$. In the pumping station where installed more 2 submersible pumps, horizontal axis Pentax with parameters: $Q = 83\text{m}^3 / \text{h}$, $H = 45\text{m}$.

The pumping station take water directly from the Sa Lung river by straw D300-I = 30m. The raw water pipe to the water plant is ductile iron pipe with diameter D200

Current capacity of the raw water pump station is $2.000\text{m}^3/\text{day}$ night. So at this stage need only fit more 2 pumps with the pump's parameters: $Q = 83\text{m}^3 / \text{h}$, $H = 45\text{m}$ is to ensure the design capacity.

3.3.2 The plan of the technological chain.

The diagram of technology line of the current Ben Quan water plant as follows:



Currently, this technology chain are operating smoothly and efficiently. So the Consultant recommended that in this phase will build one new treatment unitary with technology line similar to the existing unitary.

Use vertical tank chain combined with center reaction compartment, rapid gravity filter.

3.3.3 Option of water supply materials

The selection about type of water supply pipe for distribution and service network of the project area is considered on the basis of technical features of each type of pipe and economic costs of the installation and in the same works on Quang Tri province.

Currently, materials used for the water supply pipe is very diverse and there are many types such as uPVC plastic pipes, plastic pipes PE / HDPE, steel pipe, cast iron pipe (ductile and gray iron), glass fiber reinforced plastic pipes, ... the selection of appropriate pipe for the project to ensure the highest efficiency, most secure, and most economical.

uPVC plastic pipe: high durability, long life, low pressure loss, ease of construction, low construction costs. However, management is difficult due to the ease of digging pipe.

HDPE Pipe: there are advantages as uPVC pipes. It also has the ability to bend plastic, suitable for all terrains, especially durable, long life. However, construction costs are more expensive than PVC pipes should generally be applied to the water supply pipe with a small diameter.

Ductile iron pipe: high durability, long life, very safe for any terrain, weather conditions. In particular, it may reduce the pipe demolition. However, construction costs are high and high technical demands of the construction and installation.

The steel pipe: There are full advantages of cast iron pipe, beside which is likely to lead the water better than the cast iron pipe. It is suitable for building in the complex terrain areas. However, construction costs are very expensive, need to get measures against corrosion coatings, anti-corrosive.

Through the comparative and study materials mentioned above as well as the actual of the water supply works showed that: the combination of various types depending on the level and features as well as the price of each type is best. Therefore, recommend to choice of materials as follows:

- ✓ The ductile iron pipe will be used for the construction and installation of transmission pipelines (diameter D200, D100).
- ✓ HDPE pipes will be used for the installation of the service pipe networks, water supply to the consumption point of in each project area.

3.3.4 Alternatives to the operating mode of the water supply system.

On the basis of the topography of the project area, two technical options for operation modes and operation of water supply systems were compared in terms of cost of investment and operation.

- Plan (i): Variable-speed pump system.
- Plan (ii): Direct injection system combines radio regulation.

Table 8: Compare to select the plan of water supply system

Content	Option (i)	Option (ii)
Name of the option	The water supply system use inverter pump system	The water supply system pumps directly and combines the regulating station
Discription	The inverter pump system will adjust the pumps level 2 comply with mode of the water consumption of the network	The mode of operation of the pump is simple when it has the regulation station
Advantages	- The mode of the water supply stick the consumption mode. - Flow and pressure on the water supply network is maintained	- The mode of the water supply stick the consumption mode.. - Lower operating costs. - To ensure the quality of water

Content	Option (i)	Option (ii)
	continuously by the continuous operate of the pump system (24/24h), automatic with flow rate and pressure which pre-installed in the inverter control device.	supply services 24/24h. reduce operating costs by limiting the number of water pump hours. can regulate and maintain the pressure on internet.
	- No need to build water towers to regulate and maintain the pressure on the network and reduce the initial investment cost.	- Taking advantage of the terrain by constructing water towers in areas where high terrain. - Energy saving.
	- Consistent with the water supply system in the area, the terrain is flat.	
Disadvantage	- Management and operation of complex systems.	- The initial investment cost is large because of the construction of water tower.
s		- Larger land area for the construction of water towers. - Suitable for gravity water supply system, with high and low terrain change

Selection plans for the operating mode of the water supply system.

Plan (ii) - The water supply mode uses the direct pump combined the regulation tower selected.

3.3.5 Specific technical solutions to the selected plan

a) Technology Solutions.

The intake works and the raw water plant :

Take advantage of the raw water pump station again. Installation of additional 2 the raw water pumps with parameters $Q = 83\text{m}^3 / \text{h}$, $H = 45\text{m}$ and pipeline engineering, related accessories.

Raw water pipeline:

The raw water pipeline leads the water from the raw water pump to the water treatment plant. The existing raw water pipeline uses materials with ductile iron pipe with diameter $D = 200 \text{ mm}$, length $L = 850\text{m}$, enough to meet the current treatment plant with a capacity of $Q = 2000\text{m}^3/\text{day}$ night. When the capacity of the treatment plant up to $4000\text{m}^3/\text{day}$ night, calculated parameters if use the existing raw water pipeline as follows:

Calculation capacity : $Q_{tt} = 166,67\text{m}^3/\text{h}$ or $Q_{tt} = 46,30 \text{ l/s}$

Length of pipeline : $L = 850\text{m}$

Pipe diameter : $\text{DN}200$

Velocity : $V = 1,47\text{m/s}$; $1000i = 17,34\text{m/km}$

Loss of pressure on the line : $H_w = 14,74\text{m}$

Thus, the existing raw water pipeline meets the transmission demand from the raw water pumping station to the treatment station and ensure technical requirements. The Consultants propose to take advantage of the existing raw water pipeline again to bring water from the raw water pumping station to the treatment station.

The water plant:

We propose to expand the Ben Quan water plant to supply water for the Vinh Long and Vinh Ha communes. Need to construct one more treatment unitary with capacity $Q = 2000\text{m}^3/\text{day}$ night.

The technological chain of the new treatment unitary is similar to the existing treatment unitary of the Ben Quan water plant, including the following items: Stand

settling tank combines the center reaction compartment → Rapid gravity filter → Water Tank → Water pumping station.

Can summarize the main building was built at the water plant as follows:

- a) The stand settling tank combines the center reaction compartment
- Construction of 2 new tank, the size of each tank: $6,4 \times 6,4 \times 7,9\text{m}$
 - The settling tank was built with reinforced concrete structure rock 1x2, M250#, the mass with the rapid gravity filtration tank:

b) The rapid gravity filtration tank:

- Construction of 03 new filter tanks with reinforced concrete structure rock 1x2, M250#, the size of each tank: $2,3 \times 2,5 \times 5,0\text{m}$.

c) The tank:

- Construction of 1 the new tank capacity $V=400\text{m}^3$
- The tanks are built in size: $B \times L \times H = 6 \times 14 \times 4,8\text{m}$
- The tank is made from reinforced concrete with stone 1x2, M250#, semi-submersible rectangular shape. The sink is 3.5 m, the supernatant is 1.3 m.

d) The pumping station level 2

The pump station level 2 of the Ben Quan water plant was built by reinforced concrete with ground size $18 \times 7\text{m}$, currently the pumping station were installed the filter wash water pump, wind pumps and accompanying accessories.

So just install 03 new horizontal centrifugal pumps for pumping station level 2 with attached equipments to pump water from the reservoir to the water tower. Specifications of each pump as follows: $Q = 150\text{m}^3 / \text{h}$ $H = 30\text{m}$.

e) The chemical house

- The existing chemical house of the Ben Quan water plant with structural concrete frame wall tiles, size $L \times B = 12 \times 5\text{m}$.

- We suggest to install additional equipment in the chemical house to ensure treatment capacity 4.000m³/day night

The water tower

The water tower takes responsible for conditioning the flow and pressure between the water plant and consumption water of the water supply network. The water tower is built on a hill located in Cluster 7 of Ben Quan town (at gate of Water Factory).

The water tower is built by reinforced concrete structures all 1x2 blocks. M250 #, cylindrical.

- The volume of water tower: $V=200\text{m}^3$
- Diameter of water tower: $D_d=10\text{m}$
- Height of fountain: $H_d=4\text{m}$
- Diamater of the body of fountain: $L=3\text{m}$
- Height of the body of fountain : $H=20\text{m}$

Network of distribution pipelines:

Distribution pipe network is calculated by hour flow which is greatest of the day's biggest water users. The flow rate is determined by calculating the distribution tables of hourly flow of period by 2020.

The hydraulic calculation of program using network Epanet to use a formula to calculate hydraulic-WILLIAM HAZEN, roughness coefficient for cast iron pipe $C=110$.

On the main distribution pipelines with larger diameters DN100 arranged sediment discharge valve at the lowest point . Construction of the bearings, cylindrical at cudgel,elbow...

Average depth of buried pipe to the top of the pipe is 0.7m. Pipe install ditch has 0.8 m average wide.

From the gate of the Ben Quan water plant, a ductile iron pipe DN200 was walking across Ho Chi Minh Street and along Provincial Highway 7 to give Vinh Long commune. The total length of this route is 14,100m.

The water supply of Vinh Ha commune is connected on Provincial Highway 7 (near Quyet Thang secondary school), including 460 m ductile pipe DN150 and 2,140 m ductile pipe DN100.

The entire pipeline designed to go over the existing pavement and road planning. The pipeline is located along Provincial Highway 7 on the sidewalk far 1m from boundary markers. The constructing unit should comply with licenses of traffic units about traffic safety and road structures according to the state regulations in this field during the construction.

Use ductile iron pipe PN8 for transmission and distribution pipes. Total length as follows:

- DN200-L=14.100m

- DN150-L=460m

- DN100-L=2.140m

Services pipeline network

Services pipeline network uses HDPE material-PN8 with tubes and length as follows:

- D90 - L = 615m

- D63 - L = 3.020m

- D50 - L = 7.040m

The pipe services are calculated according to the flow distribution diagram, depending on the number of water supply households. Service tube will mainly lie on the sidewalk and far from residents the average from 0,5-1,5 m. Average depth of 0.5 m pipe.

Connected to household

The number of connections in the tabernacle is 1,017 households. The project will pay with materials of the connection points, including HDPE pipe with diameter PN12.5-D21-D27, flow meters, valves, spam, ...

b) Construction Solutions.

Based on the results of the field surveys, making a reasonable solution for the structural work is needed. This section only describes preliminary solutions for the construction, building detailed solutions which will be presented in the basic design of the project.

The construction of the treatment plant will be built with reinforced concrete, poured in place. On the distribution pipelines, the position of cudgel, elbow... should have concrete bearing. The valve pit, brick clock pit, cap with reinforced concrete.

Construction solution calculated detail are presented in the notes to the basic design.

c) Power Solution

The substation of the raw water pumping station with a capacity of 180KVA. This capacity has been taken to ensure the capacity to the raw water pump to 4000m³/day night.

The existing substation in the water plant with a capacity of 100 kVA. This capacity is also calculated to ensure the Ben Quan water plant capacity up 4000m³/day night

3.3.6 Standardization of equipment and technical requirements

- Distribution Pipe: Use ductile iron pipe (DN $\geq$ 100) ISO 2531-K9, was test pressure 50kg/cm². The accessories such as cudgel, elbow ... accompanied by
- Service pipeline: Use of HDPE pipe ISO 4427-1996 (E), 8kg/cm² pressure test. The accessories such as cudgel, elbow... accompanied by corresponding.
- The parts

- Valve:

Valves are provided for separating a system or device for the purpose of carrying out maintenance and repair. They must be suitable for the continuous working pressure at 70°C for at least 1,25 times the maximum working pressure of the system.

Stop valve is flange gate valves manufactured according to BS 5163 standards. length (two flange distance) according to BS 5163 (ISO 5752 series 3). Flanges and drilling PN 10/16 according to ISO 7005-1. Valve body and valve cover are made of gray cast iron (BS 1452 grade 220/250) or ductile iron (BS 2789 grade 500-7).

The stop valve on the transmission network and the distribution is manually operated gate valve.

- Soft couplings :

The soft couplings must be produced in accordance with ISO 9001. All the details of the coupling must be painted to prevent corrosion at the highest level, including bolts and nuts.

All couplings must be mounted available for quick installation and efficient without lubrication and without any special tools.

- Exhaust valve

It must be single valve which has a wide hole and semi-automatic operation with input by flange according to ISO 7005-2 (EN 1092-2:1997, DIN 2501). The body and the lid of valve must be made of gray cast iron GG-25 according to DIN 1691 and are coated with green epoxy..

They must be suitable for potable water or untreated water (not sewage) and have to ensure good working conditions at minimum pressure of 0.2 bar, the largest pressure is 16 bars and temperature may reach 90°C.

All valves are to be tested the hydraulic at pressure of 1,5 times the nominal pressure.

4. SITE CLEARANCE AND RESETTLEMENT PLAN .

4.1 The purpose of the site clearance plan

The purpose of the compensation and resettlement plan is adequate compensation for local residents when they acquired land. The damage is converted into money, however, it can not be calculated because of its sensitivity, for example relocation, change the way of life, leading to many other changes in both positive and negative direction. These losses can be calculated in money: Land, buildings, crops, ... and damages can not be calculated in money: daily habits diversification, how to make a living, ...

So any project also sought to limit to a minimum the number of households to be relocated. In the case of migration, the project owner must take into account not only the immediate compensation be converted into money but also their livelihoods after resettlement, avoiding the problems of economic, social and environment that may arise in the process of land acquisition by the people. At the same time, the project also aims to create conditions for the affected people to improve or at least restore living standards, income earning capacity and production levels as before the project. Specifically:

- Identify the scope of land acquisition of works.
- The socio-economic characteristics of the affected area.
- Estimate costs and compensation budget and implementation schedule.
- Employment and income for those households directly affected (relocation or acquisition of agricultural land).

4.2 Scope of the research compensation and resettlement plan

As the previous chapters, the Vinh Long and Vinh Ha water supply system will use water from the Ben Quan water plant (expansion of the Ben Quan plant) to provide for the people of Vinh Long and Vinh Ha. So the scope of research of issues of compensation and resettlement of the project will include:

- The area to construct the water tower
- Area to construct the service and distribution pipeline network

However, for projects of the Vinh Ha and Vinh Long water supply system -Vinh Linh district - Quang Tri province does not happen the displacement of people and do not take into account the resettlement plan. On the other hand, the water distribution pipe network was built according the roads, bunds, alleys so the construction process does not compensate and affect the area of agricultural land.

In the project area, there is no effect on the conservation of natural areas, monuments, temples, shrines and other sensitive areas.

Permanently acquired land to build a water tower is hill land to plant perennials under the jurisdiction of the People's Committee of Ben Quan town. Small area leads to the compensation and clearance is relatively simple. Besides, in the process of construction, need to requisition some temporary recovery area (in a short time) for digging ditches for the tube, creating construction layout, ... Land acquisition for the project (permanent acquisition and temporary acquisition) can be summarized as follows:

- Land acquired permanently:

Acquired land to build water tower: 25m²

The total of land area acquired permanently: 25m²

- The total of land area of temporary acquisition (temporary): 1,014m²

4.3 Legal Framework

- Constitution of the Socialist Republic of Viet Nam April 15, 1992.
- Land Law dated November 26, 2003.
- Decree No 181/2004/NĐ-CP dated October 29, 2004 stipulates to implement the land law
- Decree No. 188/2004/NĐ-CP dated November 16, 2004; prescribed price determination methodology and price frame for types of soil.
- Circular No 197/2004/TT-BTC dated November 26, 2004 guiding the implementation of Decree No. 188/2004/NĐ-CP.

- Decree No. 198/2004/NĐ-CP dated December 3, 2004 regulations on the collection of land use fee
- Decree No. 197/2004/NĐ-CP, dated December 3, 2004 of Government regulations on compensation, support and resettlement when the State recovers land.
- Circular No 116/2004/TT-BTC dated December 7, 2004 of the Ministry of Finance guiding the implementation of Decree No. 197/2004/NĐ-CP.
- Decree No 17/2006/NĐ-CP dated February 6, 2006 of the Government on amending and supplementing a number of articles of the decree guiding the implementation of the land law.
- Decree No 84/2007/NĐ-CP dated May 25, 2007 of the Government about additional regulations on the granting of land use right certificates, land acquisition, implementation of land use rights, order and procedures for compensation, support and resettlement when the State recovers land
- Decree No. 123/2007/NĐ-CP July 27, 2007 of the Government amending and supplementing Decree No. 188/2004/NĐ-CP.
- Decree No 69/NĐ - CP dated August 13, 2009 of the Government on additional regulations on land use planning, land prices, land acquisition, compensation and resettlement assistance.
- Decision No 39/2009/QĐ-UBND dated November 31, 2009 of the People's Committee of Quang Tri Province on the issue of land prices, urban and street classification and towns in the Quang Tri province in 2010.
- Decision No. 02/2010/QĐ-UBND dated January 25, 2010 of Quang Tri province on amending and supplementing the provisions on compensation, support and resettlement when the State recovers land in the province of Quang Tri.
- And some other related documents.

4.4 Principles and eligibility for compensation.

4.4.1 General Principles

The compensation plan, and assistance and resettlement (if any) will incorporate the following general principles:

- ✓ Resettlement and land acquisition will be minimized at the lowest level and are taken into account to provide suggestions for the design and construction of water supply systems works ;
- ✓ All households / individuals / group / units affected by the project will be fully compensated and received legal assistance to recover the settlement status and land use
- ✓ The state makes land acquisition of land user for any purpose, they shall be compensated with new land with the same purpose. If the state without the land to compensate, They are compensated by the value of land use rights according land prices at the time of land acquisition decisions;
- ✓ The cost of compensation, rehabilitation assistance and life recovery are in the full cost of replacement or relocation, which excludes amortization;
- ✓ All the affected people live, work, trade or cultivate land will be recovered to the project prior to the expiration of compensation. They are entitled to rehabilitation measures to assist them to improve or at least maintain living standards, income earning capacity and production levels as before the project;
- ✓ Recovery plan and compensation plan, support must be carried out in consultation with households affected by the project, ensuring democracy and the impact is minimal;
- ✓ The households affected by the project will receive financial compensation, support recovery and resettlement (if any) before 30 days from the date is expected to conduct clearance at the corresponding position.

4.4.2 Conditions be entitled to compensation

Those affected by the project will be eligible to receive compensation funding and support recovery, including state agencies, individuals, households must meet one of the following conditions:

- There is a certificate of land use rights in accordance with the laws of the land;
- There is a decision of allocation land of state agency under the law of the land

- Households and individuals who are using the unstable soil are confirmed by the People's Committees of communes with out dispute that there are the following papers: papers on land use rights before October 15th 1993, certificate of temporary land use; certificate lawful inheritance, donation ... certificate of demise, sale, liquidation papers, price of land use rights and assets attached to land;
- Households with land tax receipts or in case of the absence of the above certificates through cadastral profile of the towns or in the list of affected households prior to the completion of the resettlement action plan ;
- Households and individuals who are using the land with permanent in local and produce agricultural directly, forestry, aquaculture or salt ...
- Households and individuals who are using land that the state made decisions to manage in the implementing process the land policies of the State formerly;
- Local communities are using land with works as houses, temples, pagodas, shrines, halls, churches where they are certified as common use land for community and without dispute by People's committee of commune in the are of acquired land;

The impacts of compensation mentioned:

- The area of farmland which is in long - term or temporary impact;
- Buildings,, structures, crops, trees ... in the affected area;
- The temporary impact of the construction process for the production operations, business

4.5 The legal papers to get compensation

4.5.1 The legal papers for land

Residents have the right to use land-based legal certificate of the local People's Committee, this certificate may be long-term, temporary or lease land. Residential or public land is being used for illegal purposes in the population target which no certificate of the local people's Committee. Each type of land use is explained as follows:

The affected households have legal conditions to be entitled to compensation : those who have certificates of land use rights by the competent authorities of the city.

Those affected may have legal conditions for entitlement to the compensation is the property owner in the following areas:

- a. The legal land ownership certificate is issued before October 15, 1993 and without any dispute;
- b. There are certificates of land use rights by inheritance or the old regime but not formalized;
- c. Receipts for land tax
- d. License for construction
- e. Certificate of local residence;

The household / individual / agency / unit affected have no legally condition for entitlement to the compensation: including those owned land since October 15, 1993 (the time of introduction of the Land Law practice) without formal certification, no certificates of land use rights from empower people of the inheritance, no tax receipt or certificate of the local.

Those affected are not entitled to compensation as migrants in the area affected by the project after completion of the resettlement plan.

4.5.2 The legal papers for the structures

Families and individuals have the right to build houses and buildings when the government allows construction, and provide and support for building houses. Construction permits regulates of the legal rights of home, buildings and other assets

Home legal ownership, buildings and other assets, people who have the license of construction of district or commune authorities to build their homes, or who have a certificate of ownership.

Can be legal ownership of houses, buildings and other assets: affected people by the project but do not have the license of construction, or certificate of ownership, but can meet one of the following criteria:

- Own assets first 1993 and do not have any dispute; or

- There is a certificate of land use o
- Can be legitimized the right of land use because they have permanent
- The illegal ownership about buildings, structures and other assets are households that their houses was built after 1993 without the license of construction affected by the project or who do not have the title, land use rights .

4.5.3 The legal papers for agribusinesses

Business includes any type of activity that brings income or profit. Typically, businesses often have to register with local authorities and taxable income. The following businesses are eligible for entitlement to compensation:

- Enterprises with legal rights: the affected registration households has long-term business and pays full taxes for local governments;
- Enterprises may have legal rights to those without business registration, income, family business households affected by the project can be fully taxed or incomplete.

4.6 Support and recovery economic.

Sufficient condition for entitlement costs and support economic recovery is based on residency status of people affected by the project. Those in the latter group will be eligible:

- Legalization: The people affected have permanent registration with local authorities.
- Legal : Those affected have no permanent registration, but temporary registration with local authorities, or have conditions of permanent residence registration.
- Illegal: the affected households do not have permanent registration and any other document, and the conditions for residence registration.

4.7 Benefits Policy.

4.7.1 Compensation for land

Those affected by the project have the legal right or can be legally for damaged land area, they will be compensated 100% of the acquired land under the general regulations of the Government of Viet Nam; The households is compensated with land of similar size with the approval of affected households (focus or disperse resettlement) with full certificate of land use that does not loss any fee.

Those affected by the project, there is no legal right for victims to receive land compensation equal to the remaining investment in the land, not more than 30% of the acquired land in cash. For households affected households are sensitive, the project provide an area for the households in resettlement areas or at the request of the affected households. The project will compensate the affected area with the value of 50% and the households arrange actively accommodation

4.7.2 Compensation for houses and buildings.

The affected households are homeowners, buildings, structures and trees

- All the affected households, including legal status, they can not be legal or illegal, they will receive 100% compensation cost for the entire home and work, and structures recovered . No apply compensation discounts to the material discounts compared with the original value or can be used again.
- The affected people in group have no the legal right to get compensation, they may receive subsidies equal to 60% for the cost of the damages recovered in cash;
- All the households affected by the project, loss of business or manufacture, received compensation for 100% replacement value in cash;
- The affected households will be compensated in cash equal to 100% of the value of the trees as annual crops, perennial crops, fruit trees or other lucrative crops of commercial value , ... affected by land acquisition;

- Compensation for trees and crops on an acquisition area in accordance with the decision of the PPC on compensation value such as crops, crops. However, the affected households have to ensure conditions for compensation, specific support: (i) an area used for annual crops must be continuous within 12 months, (ii) an area of perennial crops, the time for using in 16 months and (iii) the planting forest area has continuous using time during 24 months.
- The compensation level is paid to people who are farming, growing according to the price unit of Quang Tri province compared to market prices for crops or replacement costs for perennial crops, perennial crops;
- The compensation price is based on actual used area, not according to the area of use.

The affected households for renting their house and structures

- The rented house or the structures are affected by the project will be compensated 100% in cash for renovation costs, correction to the legal area of works.
- The tenants who have to move will be supported an amount equal to the value of the remaining lease, but not more than 3 months worth of rent amount and they will be subsidized to relocate, simultaneously they are supported appropriate place to hire

The impact on business / job loss

- All those who suffer in legal status can not be legally and illegal, they will receive compensation in cash for the loss of business by revenue in the previous year;
- All of the legitimate affected households, can legally and illegally, temporarily affected business and production losses will be compensated in the affected period based on tax rates that declaration. In the absence of registration of the business, they will receive a grant of 500,000 VND / month for daily living expenses for a period of 3 months.

Support for stable production and life

- Support policy for the affected households by Decree No 69/2009/NĐ-CP. In addition, based on the actual situation in the locality, the Chairman decided to support other measures to ensure shelter, stabilize life and production for people who are acquired land and in especial cases should submit the Prime Minister's decision.

- The households and individuals directly engaged in agricultural production when the State recovers the agricultural land without compensation, in addition to the monetary compensation they are also supported career transition and job creation in one of the form of cash or land or houses or land in production, non-farm business are as follows:

- Support in cash from 1,5 to 5 times the price of agricultural land to the total area of agricultural land is revoked; the support area does not exceed the limit of agricultural land in the locality;
- Support once by a land portion or an apartment or a portion of production land, non-agricultural business.

Those affected by the project to rebuild the main house on the remaining land, or the displaced people are entitled to:

- (1) Transportation costs is VNĐ 500.000 for those who rebuilds their house in place and from 1.000.000 - 3.000.000 VNĐ for those who have to relocate elsewhere;
- (2) The living allowance in cash equivalent to 30 kg of rice / person / month in 3 months for resettlers in place and in 6 months for the relocation to the new location.
- (3) The bonus is 10% , but not more than 5.000.000 VNĐ for people who dismantle and transfer of land for the project on time as planned by the proposed project;
- (4) The resettlement of people displaced in space or displaced in the disadvantaged group. Currently, those who are receiving social assistance will be supported specially not less than VNĐ 1.000.000;

- The affected person has the right to recover benefits to restore life not lower the level before the project, and the best is better than before the project. The affected people lose more than 20% of agricultural land or the income will be the allowance which is expected VNĐ 3.000.000 / household. This allowance may be adjusted depending on inflation and the real situation in each locality.

4.8 Advantages and disadvantages for compensation and resettlement.

4.8.1 Advantages

- **No houses :** This is the most significant advantage, because there will not be any family which is disturbed by the appearance of the project. Therefore, compensation is not due to displacement, not arranging resettlement, employment and security and order situation after resettlement . This advantage should not get in any project. However, the project owner still have plans to support adequate income for households losing agricultural land (to be presented in detail in the following section)
- **No temples, cemeteries:** This is the most sensitive issue in the clearance because of its spiritual significance.
- **None of the historical, cultural, health, landscapes, parks, schools, hospitals ...:** Costs and procedures to move or tear down one of the buildings above are often complex, sometimes not achieved.
- **No trees or memorial garden store.** The trees are grown mainly crops. It means that the income in this area is the additional income If land acquisition will not affect earnings

4.8.2 Difficulties

The land area permanently acquired . Because the temporary land acquisition is not large, the compensation and ground clearance will not be too difficult.

4.9 Compensation Costs

It should be recalled that the Vinh Long and Vinh Ha water system projects . Vinh Linh district, Quang Tri province, do not have any household to move house . It means

that resettlement issues is mentioned. Thus, the nature of the resettlement is compensation, site clearance, referred to as compensation.

4.10 Organization and implementation of compensation and site clearance and support

This section presents the organizational structure for the implementation of the resettlement plan. The project will be managed by the project management unit (PMU), of Quang Tri Water Supply and Construction One Member Limited Company

People's Committee of Quang Tri Province

- ◆ Issues the price of land compensation and work;
- ◆ Directing the implementation of compensation and ground clearance of projects

Project management unit (PMU).

- ◆ Responsible for the management and administration of projects involving investment in the previous period, such as the elaboration and approval of the project and organize the clearance compensation, receive and hand over construction site : set up, submit for bidding plan approval , bidding documents, bidding organization, bid evaluation, submit bid results

Resettlement Part:

- ◆ Support project area during working with the community to identify issues related to the impact of the project on land, agricultural land and other production services.
- ◆ Develop the necessary support programs to help stabilize the lives of farmers, ensure at least equal to or more than before the project implementation.

District People's Committee (PC) will:

- ◆ Create favorable conditions to make amends through the establishment of the compensation committee ; motivate individuals to ensure effective implementation of the Committee 's functions.

- ◆ Ensure that all agreements between the compensation committee of the affected households are saved in text
- ◆ The District people committee (DPC) will regularly monitor the progress of the compensation plan through the data on the compensation and resettlement resettlement provided. The District People Committee (DPC) will update the report if necessary, and quickly transfer the data to the Provincial People Committee (PPC) and focus on urgent issues.
- ◆ Resolved complaints of the affected households

Other agencies

Department of Finance: Department of Finance is responsible for:

- ◆ Determine the market price of land and buildings in the project area and the area of compensation, site clearance and assistance
- ◆ Evaluate the compensation rate and the level of assistance proposed by the committee of compensation, site clearance and assistance for households affected by the project and
- ◆ Funding and cash for compensation program, site clearance and assistance

Department of Natural Resources and Environment:

- ◆ The Department of Natural Resources and Environment takes responsible for land use management in the province and managed all works owned by the state. The department also takes responsible for combining the compensation plan, and site clearance and assistance in Quang Tri province and manage the programs in overall the province.
- ◆ The Department of Natural Resources and Environment will support current projects by supporting the District People's committee (DPC) about certification for households affected by the project, including all certificates of land use rights and the License of Construction.

Department of Planning and Investment:

♦ The Department of Planning and Investment takes responsible for management overall the short-term and long-term plan and the program of economic- social development of the township. Department of Planning and Investment takes responsible for determining the annual budget plan (including budget for compensation, site clearance and assistant when the project is approved by the Provincial People's Committee.

4.11 Estimated funding

Most of the compensation cost is structures on land, including a single structure, fence, yard, street, shade trees, industrial crops (rubber, tea, coffee , ...)

The cost of compensation and site clearance is estimated as follows:

Order	Content	specifications	Unit	Number	Price Unit (Dong)	Amount (Dong)
A	Assistance Compensation					335.000.000
I	Property and Structures Compensation on land	Provisional about 50.000.000 (Dong)				50.000.000
II	Compensation for crops					285.000.000
1	Perennial	$h \geq 2m;$ $0.1m < D$	Dong/tree	1.000	75.000	75.000.000
2	Crops	$h \leq 2m;$ $0.1m > D$	Dong/m ²	6.000	35.000	210.000.000
B	Cost for site clearance (5% of the total cost of compensation and assistance (BT HT))					16.750.000
	The total cost of site clearance					351.750.000

4.12 The implementation progress about compensation and site clearance.

Compensation Council, site clearance and responsible assistance, documents and surveys of all land and works affected by acquired and for the process of data analysis and drafts land acquisition maps. These steps will make according to the process as follows:

Bảng 9: The compensation implementation and site clearance plan

Number	Explain	Expected time	Note
1	Compensation plan approval and site clearance	05/2010	
2	Information dissemination	05/2010	
3	Detailed investigation (DMS)	06/2010	
4	Compensation planning	06/2010	
5	Payment of compensation costs	07/2010	
6	Site clearance	07/2009	
7	Monitor and review	07/2010-06/2011	

4.13 Monitor

Project Management Unit (PMU) together with the Council of compensation, site clearance and assistance of the District People's Committee (DPC) will takes responsible for internal monitoring activities. The key indicators to be monitored are:

- Assessment of compensation and accuracy
- Payment of compensation under the policy of the State.
- Public information and consultation
- The process of claim
- Provide recovery and training subsidies
- Create jobs.

5. ENVIRONMENTAL ISSUES.

5.1 Introduction

5.1.1 Scope of the Study

The environmental issues are studied for the Vinh Long and Vinh Ha water supply system, including the environmental impact of the project when constructing and commissioning of new works such as treatment cluster, water tower and distribution pipeline network and services.

5.1.2 Technological lines

The chain of water treatment technology research is proposed to study compliance with the water quality. The common and popular treatment plan and is included in the study to provide a most reasonable technology chain, the lowest management operating costs and reasonable solution and cost.

The chain of surface water treatment of the proposed project are as follows:

The raw water → Stand sedimentation tank combines center reaction comparter → Quick filter tank → Water Tank → Chlorine Disinfection → Pump out network

Overall environmental impacts of the entire project are positive and will be an important step in the renovation, improving water supply conditions for 2 areas of Vinh Long and Vinh Ha communes, Vinh Linh District, Quang Tri Province.

5.1.3 The regulations should comply.

a) The law regulations on environment should compliance when project implementation

According to the Decree No. 21/2008/NĐ-CP dated February 28, 2008 amending and supplementing a number of articles of Decree No. 80/2006/NĐ-CP dated August 9, 2006 of the Government on the detailing and guiding the implementation of some articles of the Law on Environmental Protection. The water supply system project of Vinh Long and Vinh Ha communes, Vinh Linh district, Quang Tri province about mining the surface water on a small scale, smaller design capacity 50,000 m³/day, night, short construction time and no major effects on the environment. So no need to set up an environmental impact assessment report (EIA) in details and just have to make a commitment to environmental protection for the project. In this chapter we only present an overview of the issues related to the environmental protection of project, the beneficial effects, the negative impact of the project on the environment and measures to minimize negative impacts. The environmental impact of the project is primarily a positive impact. The works done in the project construction process such as excavation, pipe installation etc due to the small scale of the project and the construction time is short, so it will not cause a large impact on environmental quality. Moreover, the project will contribute to improving the health of local communities through supplying clean and safe water for the people.

b) The legal basis for environmental

- Environmental Protection Law amended in 2005 by the National Assembly of Socialist Republic of Viet Nam passed on November 29, 2005 and officially take effect from dated July 1, 2006.
- Decree No. 80/2006/NĐ-CP on detailed regulations and guidelines for implementation of some articles of the Law on Environmental Protection of the Government dated 09-08-2006 August 9, 2006.
- Decree No. 21/2008/NĐ-CP dated February 28, 2008 amending and supplementing a number of articles of Decree No. 80/2006/NĐ-CP of the Government detailing and guiding the implementation of a number of articles of the law on Environmental Protection.
- Circular: No 05/2008/TT-BTNMT dated December 8, 2008 Guiding about strategic environmental assessment, environmental impact assessment and environmental protection commitment of the Minister of Natural Resources and Environment.

- Strategy for the National Environmental Protection from 2001 to 2010.
- Based on the development of urban drainage of Viet Nam to 2020 issued Decision No. 85/1999/QĐ-TTg dated March 5, 1999 of the Prime Minister.
- Decree No 91/2002 (November 1, 2002) to be responsible for organizing and functioning of the Ministry of Natural Resources and Environment;
- Decision No 45/QĐ-TTg (April 2, 2003) on the establishment of the natural resource and environment facilities
- Decision No: 22/2006/QĐ-BTN & MT on mandatory of Viet Nam standards about Environment;
- Decree No. 149/2004/NĐ-CP (July 27, 2004) of Government dated July 27, 2004 provides for licenses about exploration , exploitation and use of water resources, waste water discharge in the water source.
- The Viet Nam standard of environment
- Standard of ambient air quality: TCVN 5937 - 2005 .
- Air Quality - Allowable maximum concentrations of toxic substances in the ambient air : TCVN 5938-2005.
- Noise in public areas and residential areas - the maximum noise level allowed: TCVN 5949 -1995.

5.1.4 The process of project environmental assessment

The environmental assessment tool is applied to the sub-projects to ensure meeting the requirements of environmental impact assessment of Vietnam including:

Bảng 10: Tools for environmental assessment of the project.

Project	Tools for environmental assessment
- The water supply system project of the surface water with capacity $\geq 50.000 \text{ m}^3/\text{day night}$	Prepare environmental impact evaluation report in details
- The water supply system project , the surface water capacity $< 50.000 \text{ m}^3/\text{day night}$.	A commitment to environmental protection.

Project	Tools for environmental assessment
Sub-project with household scale	No requirements about environmental assessment

In accordance with the above provisions, the Vinh Long and Vinh Ha water supply projects will have to make commitments of Environmental Protection, the commitment will be made separate statements before the project is built

5.2 Environmental impacts and mitigation measures.

This project aims at improving the quality of life through the provision of clean water. The project helps to improve people's living standards, improve public health, contributing to clear the gap in urban and rural areas.

Overall impacts of the entire project are positive and will be an important step in the renovation and improving conditions for water supply in project area.

Construction of water supply infrastructure will provide adequate water thanks to a water supply system is designed correct technical. The project help for the people in the rural communities to improve living conditions through access to clean water and improved sanitation.

As the other constructions, this project will have impacts on the environment according to a positive and negative direct on in 3 periods: Site clearance, construction and system operation

However, with each projects, there will have some of the particular problems to be noted, the problems to be noticed the best are:

- The raw water station
- The water plant
- The water tower
- Service and distribution pipeline network

Content	The surface water of the Sa Lung river	Expasion of the Ben Quan water plant
		- Investment costs and costs of operation and maintenance of small systems. - Because the Ben Quan water plant has works from the Ben Quan water enterprise , it is convenient for management and operation stakeholders.
Disadvantages	Need to construct new intake works, raw water plants and plants. Thus large invest costs. - Agreements apply for land, power are very complex.	- Have no a uniform works system and independent for the Vinh Long and Vinh Ha water supply system.
Kết luận	Through analyzing the advantages and disadvantages mentioned above, the surface water scheme from the Sa Lung river is very expensive and inefficient. Therefore, the feasibility and optimal scheme is the clean water source from the Ben Quan water plant. The Consultants suggested to expand the Ben Quan water plant. This will increase the capacity of raw water pumping station and the construction of an additional water treatment plant in order to ensure water supply capacity for Vinh Ha and Vinh Long.	

2. CAPACITY SCOPE

2.1 Scope of the Study

The study scope of design phase up to 2020 (phase 1: 2010-2020, Phase 2: 2020-2030) based on field surveys, the natural boundaries, the boundaries of the planning, development plans and planning, population characteristics and the reference comments from the agencies involved.

According to the research boundaries of the project is overall 2 Vinh Long and Vinh Ha communes of Vinh Linh district with boundaries as follows:

- The north adjacents to Vinh Chap, Vinh Khe of Vinh Linh district.
- The East adjacents to Ho Xa town and Vinh Lam commune of Vinh Linh district.
- The south adjacents to Vinh Thuy and Vinh Son communes of Vinh Linh and Gio Linh districts.
- The west adjacents to Vinh O commune of Vinh Linh district.

2.2 Water supply service area

In principle, the water service area will be determined on (i) the research scope of the project, (ii) the service level of project, (iii) characteristics of population distribution of the project area (iv) the current status of the project area (v) the financial status of the project.

Accordingly, the water supply service area in the first phase will not include some residential areas too far from the center and households scattered away from the center of the project. Accordingly, the rate of water supply up to 2020 will be identified 80%. Phase 2 (2030) when the system was stable in operation will continue to expand the water supply to the entire population of the project area, at this rate is 95% water.

2.3 The population prediction

2.3.1 The rate of population growth

The various sources of information about the rate of population growth as Statistical Yearbook of the Quang Tri Province in 2009, the data on the local population and figures planned is provided by the CPCs in the project area.

Bases to predict the future population identified in the current population and the population growth rate annually.

According to data from the Statistical Yearbook of the Quang Tri province, the commune population is fluctuations and differences between regions in recent years . However, the long term expected rate of population growth will be equal to the overall rate of the district, as follows:

Year period 2010 - 2020:

Population growth rate is 2,2% in Vinh Ha

Population growth rate is 1,0% in Vinh Long.

Year period 2020 - 2030:

Population growth rate is 1,5% in Vinh Ha

Population growth rate is 0,8% in Vinh Long.

2.3.2 The population prediction.

The population forecast is shown in the table below:

Bảng 4: The population prediction in the project area.

No	Location	Pupolatio n in 2010 (person)	The rate of populatio n growth	The populatio n predictio	The rate of populatio n growth	The populatio n predictio
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			(%)	n 2020 (person)	(%)	n 2030 (person)
1	Vinh Ha commune	1.502	2,2%	1.867	1,5%	2.167
2	Vinh Long commune	6.420	1,0%	7.092	0,8%	7.380
3	Total	7.922		8.959		9.547

The population prediction is served clean water, expressed by Consultants in the below table:

Bảng 5: The population prediction is supplied water

No	Location	2010		2020		2030	
		The population rate is supplied water (%)	The number of people is supplied water (person)	The population rate is supplied water (%)	The number of people is supplied water (person)	The population rate is supplied water (%)	The number of people is supplied water (person)
1	Vinh Ha commune	60%	901	80%	1.494	95%	2.059
2	Vinh Long commune	60%	3.852	80%	5.674	95%	7.011
3	Tổng cộng		4.753		7.168		9.069

2.4 The water demand prediction

2.4.1 The water for living Qsh

The water supply standards for project area shall comply with standards TCXDVN 33-2006: Water supply- outside network, works and the Viet Nam Construction Regulations episode 01 water-supply planning. According to the standards for drinking water are determined by 02 basis follows:

- (i) According to TCXDVN 33-2006, the water supply Standard for the urban V, IV and rural population per capita is 60-100 liters/day. Experiences showed that in the early of installation of new water supply systems, the water demand is low lead to the water standards will be taken for the various different stages.
- (ii) Under the Viet Nam Construction Regulation -water supply planning and demand for water for the rural population, the minimum standard of water supply for the domestic demand is 80 liters/person.day night

From the above 2 bases, the Consultant suggested to select the Regulation of using domestic water according to each different phase in the project are as follow:

+ The Phase 1:

In year: 2010-2020: 100 liters/person.day night

+ The Phase 2:

In year: 2020-2030: 120 liters/person.day night

2.4.2 Other services

According to TCXDVN 33-2206, the water supply system for urbans V and IV and the rural population, the water demand for services in addition to daily needs are taken at the rate of percent (%) of the domestic demand at the rate of 10% -15%.

From the two factors mentioned above, in order to fit the specialized rules and regulations as well as the nature of a rural water supply project and in accordance with the conditions and needs of actual water use for other objects in addition to their daily

needs in the project area. The Consultant given the water demand for other services as follows: (percentage of other services compare to the living needs met TCXDVN 33-2006, has been determined by experience of similar projects).

2.4.2.1 The water supplies for services, commercial and industrial

The water flow servers for the service , commercial needs is the water which supplys for business and commercial services units in the project area and is determined by % Qsh

According to TCXDVN 33-2006, the water fow supplies for this need

+ The phase 1:

In the years: 2010 - 2020: 5%Qsh

+ The phase 2:

In the years: 2020 - 2030: 10%Qsh

The water supply for small industries: The plant will supply water to Ho Xa North Industrial Zone. The water flow is expected 340m³/day- night ($\approx$ 15ha) Phase I and 544m³/day- night ($\approx$ 25ha) Phase II. The others is supplied from the Ho Xa plant.

2.4.2.2 The water for public

The water flow for the pulic need is calculated by 5%Qsh

2.4.2.3 The water for production and handicraft

The water flow for the production and handicraft need is calculated by 30 %Qsh

2.4.3 Non-revenue water

According to TCXDVN 33-2006, The non-revenue water is determined by the ratio % of the daily average capacity of the system (on average capacity is the domestic and other services water supply capacity).

The rate of non-revenue water of the water supply system proposed : $15\%Q_{th}$

2.4.4 The water used for station itself

The water flow for the treatment plant itself is the washing water and other needs are determined by average capacity : $10\% Q_{TB}$

2.4.5 The total of water demand

Based on the criteria about using water and the total of water demand is calculated according to the following table:

Table 6: The total of the water demand

No	Content	Unit	2010	2020	2030
I	Population is supplied water				
2	The total of population is supplied water	person	901	1.494	2.059
3	The total of population is supplied water of Vinh Long commune	person	3.852	5.674	7.011
II	Water supply standards				
1	The standard of using water for daily needs	liter/person. day night	90	100	120
2	Public water supply standards(% Qsh)	%	5%	5%	5%
3	The standards of services and commercial water supply (% Qsh)	%	5%	5%	10%
5	The standards of water supply for small industries production and handicraft	m3/ha	22	22	22
6	The rate of the non-revenue - % Qtt	%	15%	15%	15%
7	The rate for the station itself % Qtt	%	10%	10%	10%
8	Coefficient of water day max - Kdaymax =		1,4	1,4	1,4
III	The flow				
1	Daily domestic needs (Qsh)				
	Vinh Ha commune	m3/ day night	81	149,5	247
	Vinh Long commune	m3/ day night	347	567,5	841
	The total of water demand	m3/ day night	428	717,0	1.088
2	The water flow for public needs	m3/ day night	21	36	54

3	The water flow for services and commercial needs	m3/ day night	21	36	109
4	The water flow for small industries production and handicraft	m3/ day night	128	340	544
5	The total of the average water demand (Qtt)	m3/ day night	556	1.129	1.691
6	The non-revenue water (%Qtt)	m3/ day night	83	169	254
7	The water for the plant itself (%Qtt)	m3/ day night	56	113	169
8	The total of average daily water(Qtb)	m3/ day night	695	1.411	1.973
9	Coefficient of water day max - Kdaymax =		1,40	1,40	1,40
10	The capacity daymax - Qmax	m3/ day night	970	1.980	2.760
11	The capacity day max - Qmax - rounding	m3/ day night	1.000	2.000	3.000

2.5 Dividing the design phases

Phase to invest the water supply system will be effective and avoid wasteful investment. The project was divided into two phases of investment as follows:

Phase 1: from 2010 to 2020, the capacity of the water supply system is 2.000 m3/day night

Phase 2: from 2020 to 2030: The capacity of the water supply system is 3.000 m3/day night.

The current capacity of the Ben Quan water plant is 2.000m3/day night. The water demand of the Vinh Long and Vinh Ha communes in Phase 1 (2020) is 2.000m3/day night. So it only need to construct a treatment unitary which is sufficient water supply for the Vinh Long and Vinh Ha communes in the Ben Quan water plant (sedimentation tank-

filter tank - reservoir) with capacity 2.000m³/day night. In Phase 2, the expansion of the water plant to ensure the water supply capacity Vinh Long and Vinh Ha is 3.000m³/day night. In the framework of this report will present the technical plans and financial performance of the water supply system for Vinh Long and Vinh Ha in phase 1 with the capacity of **2.000 m³/day night**.

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3. PLANS OF ENGINEERING

3.1 Issues to be studied

The researches includes treatment technology, water supply network plan, the plan of the pipe materials, mode of operation of water supply systems, The selected water source is the clean water in connection with the Ben Quan water plant. The treatment line remains the treatment technology of the Ben Quan water plant, the water network is calculated hydraulic to ensure water supply to the consumption points with excessive pressure at the end of not less than 10m.

The technology solution and reasonable structure to ensure the treated water reached standards and has the lowest cost.

3.2 The specifications and design criteria

3.2.1 The design specifications

Table 7: The design specifications.

No	Items	Design for phase			Technology requirements
		2010	Up to 2020	Up to 2030	
1	The raw water pumping station		x		Take advantage of the existing pumping station. install additionally raw water pump to ensure the design capacity
2	The raw water pipeline		x		Take advantage of the existing raw water is ductile iron DN200
3	The clean water pumping station		x		Taking advantage of the existing pumping station, install additionally the clean water pump
4	Treatment clusters		x		Construction of a processing cluster in reinforced concrete.

No	Items	Design for phase				Technology requirements
		2010	Up to 2020	to Up to 2030		
5	Water tank		x			Construction of a new processing cluster in reinforced concrete.
6	The transmission and distribution pipeline				x	Ductile iron pipe -PN8 (D200-D100)
7	The service pipeline network	x				Plastic pipe HDPE-PN8 (D90-D63-D50)
8	Connection to households, including meter and the small pipeline	x				Service pipeline and the small size pipe front the meter Watches in exact level B, an error limit according to the flow.

3.3 The technical plans

3.3.1 The plan of constructing the intake works - the raw water pumping station

The current intake works - raw water pumping station in Sa Lung riverbank belongs to Che Bien cluster, Ben Quan town, Vinh Linh District, Quang Tri province.

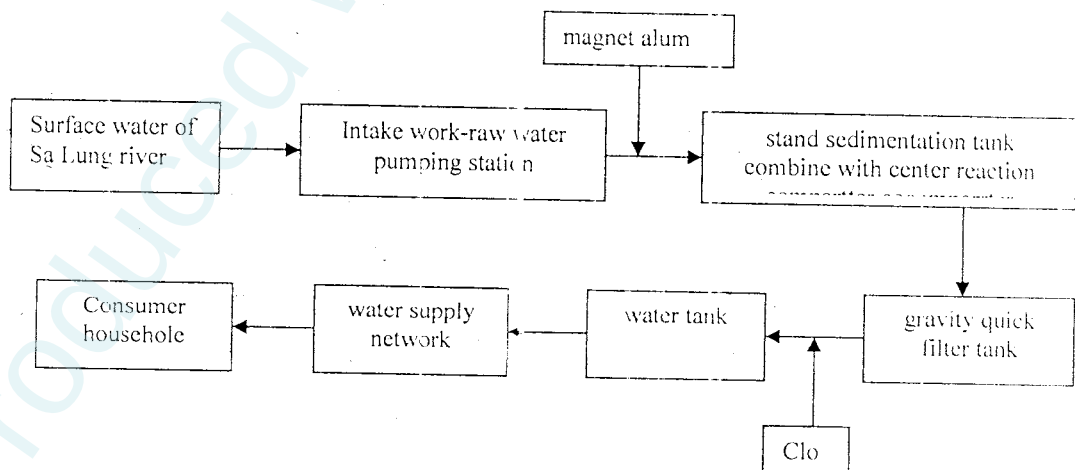
$Q=83\text{m}^3/\text{h}$, $H=45\text{m}$. The raw water pumping station was built of reinforced concrete structures and cylindrical, semi-submersible. Diameter of the raw water pump station is $D = 6,3 \text{ m}$. In the pumping station where installed more 2 submersible pumps, horizontal axis Pentax with parameters: $Q = 83\text{m}^3 / \text{h}$, $H = 45\text{m}$.

The pumping station take water directly from the Sa Lung river by straw D300-I = 30m. The raw water pipe to the water plant is ductile iron pipe with diameter D200

Current capacity of the raw water pump station is $2.000\text{m}^3/\text{day}$ night. So at this stage need only fit more 2 pumps with the pump's parameters: $Q = 83\text{m}^3 / \text{h}$, $H = 45\text{m}$ is to ensure the design capacity.

3.3.2 The plan of the technological chain.

The diagram of technology line of the current Ben Quan water plant as follows:



Currently, this technology chain are operating smoothly and efficiently. So the Consultant recommended that in this phase will build one new treatment unitary with technology line similar to the existing unitary.

Use vertical tank chain combined with center reaction compartment, rapid gravity filter.

3.3.3 Option of water supply materials

The selection about type of water supply pipe for distribution and service network of the project area is considered on the basis of technical features of each type of pipe and economic costs of the installation and in the same works on Quang Tri province.

Currently, materials used for the water supply pipe is very diverse and there are many types such as uPVC plastic pipes, plastic pipes PE / HDPE, steel pipe, cast iron pipe (ductile and gray iron), glass fiber reinforced plastic pipes, ... the selection of appropriate pipe for the project to ensure the highest efficiency, most secure, and most economical.

uPVC plastic pipe: high durability, long life, low pressure loss, ease of construction, low construction costs. However, management is difficult due to the ease of digging pipe.

HDPE Pipe: there are advantages as uPVC pipes. It also has the ability to bend plastic, suitable for all terrains, especially durable, long life. However, construction costs are more expensive than PVC pipes should generally be applied to the water supply pipe with a small diameter.

Ductile iron pipe: high durability, long life, very safe for any terrain, weather conditions. In particular, it may reduce the pipe demolition. However, construction costs are high and high technical demands of the construction and installation.

The steel pipe: There are full advantages of cast iron pipe, beside which is likely to lead the water better than the cast iron pipe. It is suitable for building in the complex terrain areas. However, construction costs are very expensive, need to get measures against corrosion coatings, anti-corrosive.

Through the comparative and study materials mentioned above as well as the actual of the water supply works showed that: the combination of various types depending on the level and features as well as the price of each type is best. Therefore, recommend to choice of materials as follows:

- ✓ The ductile iron pipe will be used for the construction and installation of transmission pipelines (diameter D200, D100).
- ✓ HDPE pipes will be used for the installation of the service pipe networks, water supply to the consumption point of in each project area.

3.3.4 Alternatives to the operating mode of the water supply system.

On the basis of the topography of the project area, two technical options for operation modes and operation of water supply systems were compared in terms of cost of investment and operation.

- Plan (i): Variable-speed pump system.
- Plan (ii): Direct injection system combines radio regulation.

Table 8: Compare to select the plan of water supply system

Content	Option (i)	Option (ii)
Name of the option	The water supply system use inverter pump system	The water supply system pumps directly and combines the regulating station
Discription	The inverter pump system will adjust the pumps level 2 comply with mode of the water consumption of the network	The mode of operation of the pump is simple when it has the regulation station
Advantages	- The mode of the water supply stick the consumption mode. - Flow and pressure on the water supply network is maintained	- The mode of the water supply stick the consumption mode.. - Lower operating costs. - To ensure the quality of water

Content	Option (i)	Option (ii)
	continuously by the continuous operate of the pump system (24/24h), automatic with flow rate and pressure which pre-installed in the inverter control device.	supply services 24/24h. reduce operating costs by limiting the number of water pump hours. can regulate and maintain the pressure on internet.
	- No need to build water towers to regulate and maintain the pressure on the network and reduce the initial investment cost.	- Taking advantage of the terrain by constructing water towers in areas where high terrain.
	- Consistent with the water supply system in the area, the terrain is flat.	- Energy saving.
Disadvantage	- Management and operation of complex systems.	- The initial investment cost is large because of the construction of water tower.
s		- Larger land area for the construction of water towers.
		- Suitable for gravity water supply system, with high and low terrain change

Selection plans for the operating mode of the water supply system.

Plan (ii) - The water supply mode uses the direct pump combined the regulation tower selected.

3.3.5 Specific technical solutions to the selected plan

a) Technology Solutions.

The intake works and the raw water plant :

Take advantage of the raw water pump station again. Installation of additional 2 the raw water pumps with parameters $Q = 83\text{m}^3 / \text{h}$, $H = 45\text{m}$ and pipeline engineering, related accessories.

Raw water pipeline:

The raw water pipeline leads the water from the raw water pump to the water treatment plant. The existing raw water pipeline uses materials with ductile iron pipe with diameter $D = 200 \text{ mm}$, length $L = 850\text{m}$, enough to meet the current treatment plant with a capacity of $Q = 2000\text{m}^3/\text{day}$ night. When the capacity of the treatment plant up to $4000\text{m}^3/\text{day}$ night, calculated parameters if use the existing raw water pipeline as follows:

Calculation capacity : $Q_{tt} = 166,67\text{m}^3/\text{h}$ or $Q_{tt} = 46,30 \text{ l/s}$

Length of pipeline : $L = 850\text{m}$

Pipe diameter : $\text{DN}200$

Velocity : $V = 1,47\text{m/s}$; $1000i = 17,34\text{m/km}$

Loss of pressure on the line : $H_w = 14,74\text{m}$

Thus, the existing raw water pipeline meets the transmission demand from the raw water pumping station to the treatment station and ensure technical requirements. The Consultants propose to take advantage of the existing raw water pipeline again to bring water from the raw water pumping station to the treatment station.

The water plant:

We propose to expand the Ben Quan water plant to supply water for the Vinh Long and Vinh Ha communes. Need to construct one more treatment unitary with capacity $Q = 2000\text{m}^3/\text{day}$ night.

The technological chain of the new treatment unitary is similar to the existing treatment unitary of the Ben Quan water plant, including the following items: Stand

settling tank combines the center reaction compartment → Rapid gravity filter → Water Tank → Water pumping station.

Can summarize the main building was built at the water plant as follows:

- a) The stand settling tank combines the center reaction compartment
- Construction of 2 new tank, the size of each tank: $6,4 \times 6,4 \times 7,9\text{m}$
 - The settling tank was built with reinforced concrete structure rock 1x2, M250#, the mass with the rapid gravity filtration tank:

b) The rapid gravity filtration tank:

- Construction of 03 new filter tanks with reinforced concrete structure rock 1x2, M250#, the size of each tank: $2,3 \times 2,5 \times 5,0\text{m}$.

c) The tank:

- Construction of 1 the new tank capacity $V=400\text{m}^3$
- The tanks are built in size: $B \times L \times H = 6 \times 14 \times 4,8\text{m}$
- The tank is made from reinforced concrete with stone 1x2, M250#, semi-submersible rectangular shape. The sink is 3.5 m, the supernatant is 1.3 m.

d) The pumping station level 2

The pump station level 2 of the Ben Quan water plant was built by reinforced concrete with ground size $18 \times 7\text{m}$, currently the pumping station were installed the filter wash water pump, wind pumps and accompanying accessories.

So just install 03 new horizontal centrifugal pumps for pumping station level 2 with attached equipments to pump water from the reservoir to the water tower. Specifications of each pump as follows: $Q = 150\text{m}^3 / \text{h}$ $H = 30\text{m}$.

e) The chemical house

- The existing chemical house of the Ben Quan water plant with structural concrete frame wall tiles, size $L \times B = 12 \times 5\text{m}$.

- We suggest to install additional equipment in the chemical house to ensure treatment capacity 4.000m³/day night

The water tower

The water tower takes responsible for conditioning the flow and pressure between the water plant and consumption water of the water supply network. The water tower is built on a hill located in Cluster 7 of Ben Quan town (at gate of Water Factory).

The water tower is built by reinforced concrete structures all 1x2 blocks. M250 #, cylindrical.

- The volume of water tower: $V=200\text{m}^3$
- Diameter of water tower: $D_d=10\text{m}$
- Height of fountain: $H_d=4\text{m}$
- Diamater of the body of fountain: $L=3\text{m}$
- Height of the body of fountain : $H=20\text{m}$

Network of distribution pipelines:

Distribution pipe network is calculated by hour flow which is greatest of the day's biggest water users. The flow rate is determined by calculating the distribution tables of hourly flow of period by 2020.

The hydraulic calculation of program using network Epanet to use a formula to calculate hydraulic-WILLIAM HAZEN, roughness coefficient for cast iron pipe $C=110$.

On the main distribution pipelines with larger diameters DN100 arranged sediment discharge valve at the lowest point . Construction of the bearings, cylindrical at cudgel,elbow...

Average depth of buried pipe to the top of the pipe is 0.7m. Pipe install ditch has 0.8 m average wide.

From the gate of the Ben Quan water plant, a ductile iron pipe DN200 was walking across Ho Chi Minh Street and along Provincial Highway 7 to give Vinh Long commune. The total length of this route is 14,100m.

The water supply of Vinh Ha commune is connected on Provincial Highway 7 (near Quyet Thang secondary school), including 460 m ductile pipe DN150 and 2,140 m ductile pipe DN100.

The entire pipeline designed to go over the existing pavement and road planning. The pipeline is located along Provincial Highway 7 on the sidewalk far 1m from boundary markers. The constructing unit should comply with licenses of traffic units about traffic safety and road structures according to the state regulations in this field during the construction.

Use ductile iron pipe PN8 for transmission and distribution pipes. Total length as follows:

- DN200-L=14.100m

- DN150-L=460m

- DN100-L=2.140m

Services pipeline network

Services pipeline network uses HDPE material-PN8 with tubes and length as follows:

- D90 - L = 615m

- D63 - L = 3.020m

- D50 - L = 7.040m

The pipe services are calculated according to the flow distribution diagram, depending on the number of water supply households. Service tube will mainly lie on the sidewalk and far from residents the average from 0,5-1,5 m. Average depth of 0.5 m pipe.

Connected to household

The number of connections in the tabernacle is 1,017 households. The project will pay with materials of the connection points, including HDPE pipe with diameter PN12.5-D21-D27, flow meters, valves, spam, ...

b) Construction Solutions.

Based on the results of the field surveys, making a reasonable solution for the structural work is needed. This section only describes preliminary solutions for the construction, building detailed solutions which will be presented in the basic design of the project.

The construction of the treatment plant will be built with reinforced concrete, poured in place. On the distribution pipelines, the position of cudgel, elbow... should have concrete bearing. The valve pit, brick clock pit, cap with reinforced concrete.

Construction solution calculated detail are presented in the notes to the basic design.

c) Power Solution

The substation of the raw water pumping station with a capacity of 180KVA. This capacity has been taken to ensure the capacity to the raw water pump to 4000m³/day night.

The existing substation in the water plant with a capacity of 100 kVA. This capacity is also calculated to ensure the Ben Quan water plant capacity up 4000m³/day night

3.3.6 Standardization of equipment and technical requirements

- Distribution Pipe: Use ductile iron pipe (DN $\geq$ 100) ISO 2531-K9, was test pressure 50kg/cm². The accessories such as cudgel, elbow ... accompanied by
- Service pipeline: Use of HDPE pipe ISO 4427-1996 (E), 8kg/cm² pressure test. The accessories such as cudgel, elbow... accompanied by corresponding.
- The parts

- Valve:

Valves are provided for separating a system or device for the purpose of carrying out maintenance and repair. They must be suitable for the continuous working pressure at 70°C for at least 1,25 times the maximum working pressure of the system.

Stop valve is flange gate valves manufactured according to BS 5163 standards. length (two flange distance) according to BS 5163 (ISO 5752 series 3). Flanges and drilling PN 10/16 according to ISO 7005-1. Valve body and valve cover are made of gray cast iron (BS 1452 grade 220/250) or ductile iron (BS 2789 grade 500-7).

The stop valve on the transmission network and the distribution is manually operated gate valve.

- Soft couplings :

The soft couplings must be produced in accordance with ISO 9001. All the details of the coupling must be painted to prevent corrosion at the highest level, including bolts and nuts.

All couplings must be mounted available for quick installation and efficient without lubrication and without any special tools.

- Exhaust valve

It must be single valve which has a wide hole and semi-automatic operation with input by flange according to ISO 7005-2 (EN 1092-2:1997, DIN 2501). The body and the lid of valve must be made of gray cast iron GG-25 according to DIN 1691 and are coated with green epoxy..

They must be suitable for potable water or untreated water (not sewage) and have to ensure good working conditions at minimum pressure of 0.2 bar, the largest pressure is 16 bars and temperature may reach 90°C.

All valves are to be tested the hydraulic at pressure of 1,5 times the nominal pressure.

4. SITE CLEARANCE AND RESETTLEMENT PLAN .

4.1 The purpose of the site clearance plan

The purpose of the compensation and resettlement plan is adequate compensation for local residents when they acquired land. The damage is converted into money, however, it can not be calculated because of its sensitivity, for example relocation, change the way of life, leading to many other changes in both positive and negative direction. These losses can be calculated in money: Land, buildings, crops, ... and damages can not be calculated in money: daily habits diversification, how to make a living, ...

So any project also sought to limit to a minimum the number of households to be relocated. In the case of migration, the project owner must take into account not only the immediate compensation be converted into money but also their livelihoods after resettlement, avoiding the problems of economic, social and environment that may arise in the process of land acquisition by the people. At the same time, the project also aims to create conditions for the affected people to improve or at least restore living standards, income earning capacity and production levels as before the project. Specifically:

- Identify the scope of land acquisition of works.
- The socio-economic characteristics of the affected area.
- Estimate costs and compensation budget and implementation schedule.
- Employment and income for those households directly affected (relocation or acquisition of agricultural land).

4.2 Scope of the research compensation and resettlement plan

As the previous chapters, the Vinh Long and Vinh Ha water supply system will use water from the Ben Quan water plant (expansion of the Ben Quan plant) to provide for the people of Vinh Long and Vinh Ha. So the scope of research of issues of compensation and resettlement of the project will include:

- The area to construct the water tower
- Area to construct the service and distribution pipeline network

However, for projects of the Vinh Ha and Vinh Long water supply system -Vinh Linh district - Quang Tri province does not happen the displacement of people and do not take into account the resettlement plan. On the other hand, the water distribution pipe network was built according the roads, bunds, alleys so the construction process does not compensate and affect the area of agricultural land.

In the project area, there is no effect on the conservation of natural areas, monuments, temples, shrines and other sensitive areas.

Permanently acquired land to build a water tower is hill land to plant perennials under the jurisdiction of the People's Committee of Ben Quan town. Small area leads to the compensation and clearance is relatively simple. Besides, in the process of construction, need to requisition some temporary recovery area (in a short time) for digging ditches for the tube, creating construction layout, ... Land acquisition for the project (permanent acquisition and temporary acquisition) can be summarized as follows:

- Land acquired permanently:

Acquired land to build water tower: 25m²

The total of land area acquired permanently: 25m²

- The total of land area of temporary acquisition (temporary): 1,014m²

4.3 Legal Framework

- Constitution of the Socialist Republic of Viet Nam April 15, 1992.
- Land Law dated November 26, 2003.
- Decree No 181/2004/NĐ-CP dated October 29, 2004 stipulates to implement the land law
- Decree No. 188/2004/NĐ-CP dated November 16, 2004; prescribed price determination methodology and price frame for types of soil.
- Circular No 197/2004/TT-BTC dated November 26, 2004 guiding the implementation of Decree No. 188/2004/NĐ-CP.

- Decree No. 198/2004/NĐ-CP dated December 3, 2004 regulations on the collection of land use fee
- Decree No. 197/2004/NĐ-CP, dated December 3, 2004 of Government regulations on compensation, support and resettlement when the State recovers land.
- Circular No 116/2004/TT-BTC dated December 7, 2004 of the Ministry of Finance guiding the implementation of Decree No. 197/2004/NĐ-CP.
- Decree No 17/2006/NĐ-CP dated February 6, 2006 of the Government on amending and supplementing a number of articles of the decree guiding the implementation of the land law.
- Decree No 84/2007/NĐ-CP dated May 25, 2007 of the Government about additional regulations on the granting of land use right certificates, land acquisition, implementation of land use rights, order and procedures for compensation, support and resettlement when the State recovers land
- Decree No. 123/2007/NĐ-CP July 27, 2007 of the Government amending and supplementing Decree No. 188/2004/NĐ-CP.
- Decree No 69/NĐ - CP dated August 13, 2009 of the Government on additional regulations on land use planning, land prices, land acquisition, compensation and resettlement assistance.
- Decision No 39/2009/QĐ-UBND dated November 31, 2009 of the People's Committee of Quang Tri Province on the issue of land prices, urban and street classification and towns in the Quang Tri province in 2010.
- Decision No. 02/2010/QĐ-UBND dated January 25, 2010 of Quang Tri province on amending and supplementing the provisions on compensation, support and resettlement when the State recovers land in the province of Quang Tri.
- And some other related documents.

4.4 Principles and eligibility for compensation.

4.4.1 General Principles

The compensation plan, and assistance and resettlement (if any) will incorporate the following general principles:

- ✓ Resettlement and land acquisition will be minimized at the lowest level and are taken into account to provide suggestions for the design and construction of water supply systems works ;
- ✓ All households / individuals / group / units affected by the project will be fully compensated and received legal assistance to recover the settlement status and land use
- ✓ The state makes land acquisition of land user for any purpose, they shall be compensated with new land with the same purpose. If the state without the land to compensate, They are compensated by the value of land use rights according land prices at the time of land acquisition decisions;
- ✓ The cost of compensation, rehabilitation assistance and life recovery are in the full cost of replacement or relocation, which excludes amortization;
- ✓ All the affected people live, work, trade or cultivate land will be recovered to the project prior to the expiration of compensation. They are entitled to rehabilitation measures to assist them to improve or at least maintain living standards, income earning capacity and production levels as before the project;
- ✓ Recovery plan and compensation plan, support must be carried out in consultation with households affected by the project, ensuring democracy and the impact is minimal;
- ✓ The households affected by the project will receive financial compensation, support recovery and resettlement (if any) before 30 days from the date is expected to conduct clearance at the corresponding position.

4.4.2 Conditions be entitled to compensation

Those affected by the project will be eligible to receive compensation funding and support recovery, including state agencies, individuals, households must meet one of the following conditions:

- There is a certificate of land use rights in accordance with the laws of the land;
- There is a decision of allocation land of state agency under the law of the land

- Households and individuals who are using the unstable soil are confirmed by the People's Committees of communes with out dispute that there are the following papers: papers on land use rights before October 15th 1993, certificate of temporary land use; certificate lawful inheritance, donation ... certificate of demise, sale, liquidation papers, price of land use rights and assets attached to land;
- Households with land tax receipts or in case of the absence of the above certificates through cadastral profile of the towns or in the list of affected households prior to the completion of the resettlement action plan ;
- Households and individuals who are using the land with permanent in local and produce agricultural directly, forestry, aquaculture or salt ...
- Households and individuals who are using land that the state made decisions to manage in the implementing process the land policies of the State formerly;
- Local communities are using land with works as houses, temples, pagodas, shrines, halls, churches where they are certified as common use land for community and without dispute by People's committee of commune in the are of acquired land;

The impacts of compensation mentioned:

- The area of farmland which is in long - term or temporary impact;
- Buildings,, structures, crops, trees ... in the affected area;
- The temporary impact of the construction process for the production operations, business

4.5 The legal papers to get compensation

4.5.1 The legal papers for land

Residents have the right to use land-based legal certificate of the local People's Committee, this certificate may be long-term, temporary or lease land. Residential or public land is being used for illegal purposes in the population target which no certificate of the local people's Committee. Each type of land use is explained as follows:

The affected households have legal conditions to be entitled to compensation : those who have certificates of land use rights by the competent authorities of the city.

Those affected may have legal conditions for entitlement to the compensation is the property owner in the following areas:

- a. The legal land ownership certificate is issued before October 15, 1993 and without any dispute;
- b. There are certificates of land use rights by inheritance or the old regime but not formalized;
- c. Receipts for land tax
- d. License for construction
- e. Certificate of local residence;

The household / individual / agency / unit affected have no legally condition for entitlement to the compensation: including those owned land since October 15, 1993 (the time of introduction of the Land Law practice) without formal certification, no certificates of land use rights from empower people of the inheritance, no tax receipt or certificate of the local.

Those affected are not entitled to compensation as migrants in the area affected by the project after completion of the resettlement plan.

4.5.2 The legal papers for the structures

Families and individuals have the right to build houses and buildings when the government allows construction, and provide and support for building houses. Construction permits regulates of the legal rights of home, buildings and other assets

Home legal ownership, buildings and other assets, people who have the license of construction of district or commune authorities to build their homes, or who have a certificate of ownership.

Can be legal ownership of houses, buildings and other assets: affected people by the project but do not have the license of construction, or certificate of ownership, but can meet one of the following criteria:

- Own assets first 1993 and do not have any dispute; or

- There is a certificate of land use o
- Can be legitimized the right of land use because they have permanent
- The illegal ownership about buildings, structures and other assets are households that their houses was built after 1993 without the license of construction affected by the project or who do not have the title, land use rights .

4.5.3 The legal papers for agribusinesses

Business includes any type of activity that brings income or profit. Typically, businesses often have to register with local authorities and taxable income. The following businesses are eligible for entitlement to compensation:

- Enterprises with legal rights: the affected registration households has long-term business and pays full taxes for local governments;
- Enterprises may have legal rights to those without business registration, income, family business households affected by the project can be fully taxed or incomplete.

4.6 Support and recovery economic.

Sufficient condition for entitlement costs and support economic recovery is based on residency status of people affected by the project. Those in the latter group will be eligible:

- Legalization: The people affected have permanent registration with local authorities.
- Legal : Those affected have no permanent registration, but temporary registration with local authorities, or have conditions of permanent residence registration.
- Illegal: the affected households do not have permanent registration and any other document, and the conditions for residence registration.

4.7 Benefits Policy.

4.7.1 Compensation for land

Those affected by the project have the legal right or can be legally for damaged land area, they will be compensated 100% of the acquired land under the general regulations of the Government of Viet Nam; The households is compensated with land of similar size with the approval of affected households (focus or disperse resettlement) with full certificate of land use that does not loss any fee.

Those affected by the project, there is no legal right for victims to receive land compensation equal to the remaining investment in the land, not more than 30% of the acquired land in cash. For households affected households are sensitive, the project provide an area for the households in resettlement areas or at the request of the affected households. The project will compensate the affected area with the value of 50% and the households arrange actively accommodation

4.7.2 Compensation for houses and buildings.

The affected households are homeowners, buildings, structures and trees

- All the affected households, including legal status, they can not be legal or illegal, they will receive 100% compensation cost for the entire home and work, and structures recovered . No apply compensation discounts to the material discounts compared with the original value or can be used again.
- The affected people in group have no the legal right to get compensation, they may receive subsidies equal to 60% for the cost of the damages recovered in cash;
- All the households affected by the project, loss of business or manufacture, received compensation for 100% replacement value in cash;
- The affected households will be compensated in cash equal to 100% of the value of the trees as annual crops, perennial crops, fruit trees or other lucrative crops of commercial value , ... affected by land acquisition;

- Compensation for trees and crops on an acquisition area in accordance with the decision of the PPC on compensation value such as crops, crops. However, the affected households have to ensure conditions for compensation, specific support: (i) an area used for annual crops must be continuous within 12 months, (ii) an area of perennial crops, the time for using in 16 months and (iii) the planting forest area has continuous using time during 24 months.
- The compensation level is paid to people who are farming, growing according to the price unit of Quang Tri province compared to market prices for crops or replacement costs for perennial crops, perennial crops;
- The compensation price is based on actual used area, not according to the area of use.

The affected households for renting their house and structures

- The rented house or the structures are affected by the project will be compensated 100% in cash for renovation costs, correction to the legal area of works.
- The tenants who have to move will be supported an amount equal to the value of the remaining lease, but not more than 3 months worth of rent amount and they will be subsidized to relocate, simultaneously they are supported appropriate place to hire

The impact on business / job loss

- All those who suffer in legal status can not be legally and illegal, they will receive compensation in cash for the loss of business by revenue in the previous year;
- All of the legitimate affected households, can legally and illegally, temporarily affected business and production losses will be compensated in the affected period based on tax rates that declaration. In the absence of registration of the business, they will receive a grant of 500,000 VND / month for daily living expenses for a period of 3 months.

Support for stable production and life

- Support policy for the affected households by Decree No 69/2009/NĐ-CP. In addition, based on the actual situation in the locality, the Chairman decided to support other measures to ensure shelter, stabilize life and production for people who are acquired land and in especial cases should submit the Prime Minister's decision.

- The households and individuals directly engaged in agricultural production when the State recovers the agricultural land without compensation, in addition to the monetary compensation they are also supported career transition and job creation in one of the form of cash or land or houses or land in production, non-farm business are as follows:

- Support in cash from 1,5 to 5 times the price of agricultural land to the total area of agricultural land is revoked; the support area does not exceed the limit of agricultural land in the locality;
- Support once by a land portion or an apartment or a portion of production land, non-agricultural business.

Those affected by the project to rebuild the main house on the remaining land, or the displaced people are entitled to:

- (1) Transportation costs is VNĐ 500.000 for those who rebuilds their house in place and from 1.000.000 - 3.000.000 VNĐ for those who have to relocate elsewhere;
- (2) The living allowance in cash equivalent to 30 kg of rice / person / month in 3 months for resettlers in place and in 6 months for the relocation to the new location.
- (3) The bonus is 10% , but not more than 5.000.000 VNĐ for people who dismantle and transfer of land for the project on time as planned by the proposed project;
- (4) The resettlement of people displaced in space or displaced in the disadvantaged group. Currently, those who are receiving social assistance will be supported specially not less than VNĐ 1.000.000;

- The affected person has the right to recover benefits to restore life not lower the level before the project, and the best is better than before the project. The affected people lose more than 20% of agricultural land or the income will be the allowance which is expected VNĐ 3.000.000 / household. This allowance may be adjusted depending on inflation and the real situation in each locality.

4.8 Advantages and disadvantages for compensation and resettlement.

4.8.1 Advantages

- **No houses :** This is the most significant advantage, because there will not be any family which is disturbed by the appearance of the project. Therefore, compensation is not due to displacement, not arranging resettlement, employment and security and order situation after resettlement . This advantage should not get in any project. However, the project owner still have plans to support adequate income for households losing agricultural land (to be presented in detail in the following section)
- **No temples, cemeteries:** This is the most sensitive issue in the clearance because of its spiritual significance.
- **None of the historical, cultural, health, landscapes, parks, schools, hospitals ...:** Costs and procedures to move or tear down one of the buildings above are often complex, sometimes not achieved.
- **No trees or memorial garden store.** The trees are grown mainly crops. It means that the income in this area is the additional income If land acquisition will not affect earnings

4.8.2 Difficulties

The land area permanently acquired . Because the temporary land acquisition is not large, the compensation and ground clearance will not be too difficult.

4.9 Compensation Costs

It should be recalled that the Vinh Long and Vinh Ha water system projects . Vinh Linh district, Quang Tri province, do not have any household to move house . It means

that resettlement issues is mentioned. Thus, the nature of the resettlement is compensation, site clearance, referred to as compensation.

4.10 Organization and implementation of compensation and site clearance and support

This section presents the organizational structure for the implementation of the resettlement plan. The project will be managed by the project management unit (PMU), of Quang Tri Water Supply and Construction One Member Limited Company

People's Committee of Quang Tri Province

- ◆ Issues the price of land compensation and work;
- ◆ Directing the implementation of compensation and ground clearance of projects

Project management unit (PMU).

- ◆ Responsible for the management and administration of projects involving investment in the previous period, such as the elaboration and approval of the project and organize the clearance compensation, receive and hand over construction site : set up, submit for bidding plan approval , bidding documents, bidding organization, bid evaluation, submit bid results

Resettlement Part:

- ◆ Support project area during working with the community to identify issues related to the impact of the project on land, agricultural land and other production services.
- ◆ Develop the necessary support programs to help stabilize the lives of farmers, ensure at least equal to or more than before the project implementation.

District People's Committee (PC) will:

- ◆ Create favorable conditions to make amends through the establishment of the compensation committee ; motivate individuals to ensure effective implementation of the Committee 's functions.

- ◆ Ensure that all agreements between the compensation committee of the affected households are saved in text
- ◆ The District people committee (DPC) will regularly monitor the progress of the compensation plan through the data on the compensation and resettlement resettlement provided. The District People Committee (DPC) will update the report if necessary, and quickly transfer the data to the Provincial People Committee (PPC) and focus on urgent issues.
- ◆ Resolved complaints of the affected households

Other agencies

Department of Finance: Department of Finance is responsible for:

- ◆ Determine the market price of land and buildings in the project area and the area of compensation, site clearance and assistance
- ◆ Evaluate the compensation rate and the level of assistance proposed by the committee of compensation, site clearance and assistance for households affected by the project and
- ◆ Funding and cash for compensation program, site clearance and assistance

Department of Natural Resources and Environment:

- ◆ The Department of Natural Resources and Environment takes responsible for land use management in the province and managed all works owned by the state. The department also takes responsible for combining the compensation plan, and site clearance and assistance in Quang Tri province and manage the programs in overall the province.
- ◆ The Department of Natural Resources and Environment will support current projects by supporting the District People's committee (DPC) about certification for households affected by the project, including all certificates of land use rights and the License of Construction.

Department of Planning and Investment:

♦ The Department of Planning and Investment takes responsible for management overall the short-term and long-term plan and the program of economic- social development of the township. Department of Planning and Investment takes responsible for determining the annual budget plan (including budget for compensation, site clearance and assistant when the project is approved by the Provincial People's Committee.

4.11 Estimated funding

Most of the compensation cost is structures on land, including a single structure, fence, yard, street, shade trees, industrial crops (rubber, tea, coffee , ...)

The cost of compensation and site clearance is estimated as follows:

Order	Content	specifications	Unit	Number	Price Unit (Dong)	Amount (Dong)
A	Assistance Compensation					335.000.000
I	Property and Structures Compensation on land	Provisional about 50.000.000 (Dong)				50.000.000
II	Compensation for crops					285.000.000
1	Perennial	$h \geq 2m;$ $0.1m < D$	Dong/tree	1.000	75.000	75.000.000
2	Crops	$h \leq 2m;$ $0.1m > D$	Dong/m ²	6.000	35.000	210.000.000
B	Cost for site clearance (5% of the total cost of compensation and assistance (BT HT))					16.750.000
	The total cost of site clearance					351.750.000

4.12 The implementation progress about compensation and site clearance.

Compensation Council, site clearance and responsible assistance, documents and surveys of all land and works affected by acquired and for the process of data analysis and drafts land acquisition maps. These steps will make according to the process as follows:

Bảng 9: The compensation implementation and site clearance plan

Number	Explain	Expected time	Note
1	Compensation plan approval and site clearance	05/2010	
2	Information dissemination	05/2010	
3	Detailed investigation (DMS)	06/2010	
4	Compensation planning	06/2010	
5	Payment of compensation costs	07/2010	
6	Site clearance	07/2009	
7	Monitor and review	07/2010-06/2011	

4.13 Monitor

Project Management Unit (PMU) together with the Council of compensation, site clearance and assistance of the District People's Committee (DPC) will takes responsible for internal monitoring activities. The key indicators to be monitored are:

- Assessment of compensation and accuracy
- Payment of compensation under the policy of the State.
- Public information and consultation
- The process of claim
- Provide recovery and training subsidies
- Create jobs.

5. ENVIRONMENTAL ISSUES.

5.1 Introduction

5.1.1 Scope of the Study

The environmental issues are studied for the Vinh Long and Vinh Ha water supply system , including the environmental impact of the project when constructing and and commissioning of new works such as : treatment cluster, water tower and distribution pipeline network and services.

5.1.2 Technological lines

The chain of water treatment technology research is proposed to study compliance with the water quality. The common and popular treatment plan and is included in the study to provide a most reasonable technology chain , the lowest management operating costs and reasonable solution and cost.

The chain of surface water treatment of the proposed project are as follows:

The raw water → Stand sedimentation tank combines center reaction comparter → Quick filter tank → Water Tank → Chlorine Disinfection → Pump out network

Overall environmental impacts of the entire project are positive and will be an important step in the renovation, improving water supply conditions for 2 areas of Vinh Long and Vinh Ha communes, Vinh Linh District, Quang Tri Province .

5.1.3 The regulations should comply.

a) The law regulations on environment should compliance when project implementation

According to the Decree No. 21/2008/NĐ-CP dated February 28, 2008 amending and supplementing a number of articles of Decree No. 80/2006/NĐ-CP dated August 9, 2006 of the Government on the detailing and guiding the implementation of some articles of the Law on Environmental Protection. The water supply system project of Vinh Long and Vinh Ha communes, Vinh Linh district, Quang Tri province about mining the surface water on a small scale, smaller design capacity 50,000 m³/day, night, short construction time and no major effects on the environment. So no need to set up an environmental impact assessment report (EIA) in details and just have to make a commitment to environmental protection for the project. In this chapter we only present an overview of the issues related to the environmental protection of project, the beneficial effects, the negative impact of the project on the environment and measures to minimize negative impacts. The environmental impact of the project is primarily a positive impact. The works done in the project construction process such as excavation, pipe installation etc due to the small scale of the project and the construction time is short, so it will not cause a large impact on environmental quality. Moreover, the project will contribute to improving the health of local communities through supplying clean and safe water for the people.

b) The legal basis for environmental

- Environmental Protection Law amended in 2005 by the National Assembly of Socialist Republic of Viet Nam passed on November 29, 2005 and officially take effect from dated July 1, 2006.
- Decree No. 80/2006/NĐ-CP on detailed regulations and guidelines for implementation of some articles of the Law on Environmental Protection of the Government dated 09-08-2006 August 9, 2006.
- Decree No. 21/2008/NĐ-CP dated February 28, 2008 amending and supplementing a number of articles of Decree No. 80/2006/NĐ-CP of the Government detailing and guiding the implementation of a number of articles of the law on Environmental Protection.
- Circular: No 05/2008/TT-BTNMT dated December 8, 2008 Guiding about strategic environmental assessment, environmental impact assessment and environmental protection commitment of the Minister of Natural Resources and Environment.

- Strategy for the National Environmental Protection from 2001 to 2010.
- Based on the development of urban drainage of Viet Nam to 2020 issued Decision No. 85/1999/QĐ-TTg dated March 5, 1999 of the Prime Minister.
- Decree No 91/2002 (November 1, 2002) to be responsible for organizing and functioning of the Ministry of Natural Resources and Environment;
- Decision No 45/QĐ-TTg (April 2, 2003) on the establishment of the natural resource and environment facilities
- Decision No: 22/2006/QĐ-BTN & MT on mandatory of Viet Nam standards about Environment;
- Decree No. 149/2004/NĐ-CP (July 27, 2004) of Government dated July 27, 2004 provides for licenses about exploration , exploitation and use of water resources, waste water discharge in the water source.
- The Viet Nam standard of environment
- Standard of ambient air quality: TCVN 5937 - 2005 .
- Air Quality - Allowable maximum concentrations of toxic substances in the ambient air : TCVN 5938-2005.
- Noise in public areas and residential areas - the maximum noise level allowed: TCVN 5949 -1995.

5.1.4 The process of project environmental assessment

The environmental assessment tool is applied to the sub-projects to ensure meeting the requirements of environmental impact assessment of Vietnam including:

Bảng 10: Tools for environmental assessment of the project.

Project	Tools for environmental assessment
- The water supply system project of the surface water with capacity $\geq 50.000 \text{ m}^3/\text{day night}$	Prepare environmental impact evaluation report in details
- The water supply system project , the surface water capacity $< 50.000 \text{ m}^3/\text{day night}$.	A commitment to environmental protection.

Project	Tools for environmental assessment
Sub-project with household scale	No requirements about environmental assessment

In accordance with the above provisions, the Vinh Long and Vinh Ha water supply projects will have to make commitments of Environmental Protection, the commitment will be made separate statements before the project is built

5.2 Environmental impacts and mitigation measures.

This project aims at improving the quality of life through the provision of clean water. The project helps to improve people's living standards, improve public health, contributing to clear the gap in urban and rural areas.

Overall impacts of the entire project are positive and will be an important step in the renovation and improving conditions for water supply in project area.

Construction of water supply infrastructure will provide adequate water thanks to a water supply system is designed correct technical. The project help for the people in the rural communities to improve living conditions through access to clean water and improved sanitation.

As the other constructions, this project will have impacts on the environment according to a positive and negative direct on in 3 periods: Site clearance, construction and system operation

However, with each projects, there will have some of the particular problems to be noted, the problems to be noticed the best are:

- The raw water station
- The water plant
- The water tower
- Service and distribution pipeline network

5.2.1 The environmental impact during clearance and mitigation measures.

a) The impact assesment

This phase will primarily perform work for compensation and land requisition. In general, due to the area of land used for the project is not large and are suitable for demand so compensation and land requisition will be smoothly. The implementation was carried out in accordance with the provisions of Viet Nam unified by affected government and communities. The main impact is the loss of land use rights.

The main transmission pipeline will be placed along the current route, only temporarily requisition about land during construction.

Some areas in the site clearance will cause loss of power, some demolition work related, destroying vegetation. This work takes place in a short time with small scale and the notice should not be a significant impact.

b) The mitigation measure:

During project planning , the land requisition is minimized and must be consistent with the planning of social development. In order to minimize the impact, this job should make arrangements after the harvest in order to avoid the influence of land use and cultivation of people and limit compensation costs. On the other hand, need to calculate exactly amount of compensation and policies about the adequate compensation for crops to farmers.

5.2.2 The environmental impact of the construction phase and the mitigation measures.

a) The other impacts are

The system of service and water distribution pipelines are approximately 20 km . However, the affected time is not long-term and major pipeline along the provincial highway No. 7 and some land routes and traffic density is not great so this problem can totally overcome.

The construction of the services pipeline will have to go through the yard, fence demolition of households. Issues need to note are:

- If there is no suitable construction solution, it will impede traffic or cause pollution of air, water, lost beauty, order and security across the entire construction route
- If there is no discussion and uniform the cooperation between users and providers will arise conflicts even among household;

It should be noted that the land need to be temporarily acquired for constructing the quite large transmission and distribution systems. Because the land area is relatively large, the impact on the environment is significant unless the clearance and construction happens at the same time.

Other affects

- Causing noise during construction
- Dust pollution: due to the amount of soil, sand and rocks during pipe excavation and installation.
- Air pollution, noise, vibration: due to the operation of construction equipment in the area and along transport routes of rock and materials. Dust and emissions is arising from construction machinery.
- Causing local flooding when the water pump is constructing or digging.
- The phenomenon of land subsidence, works during digging ditches process and the tube
- Garbage activities of workers engaged in construction work
- caused by construction and activities waste water during the construction
- The breakdown of labor.

The impact is not too great because:

- Main water pipeline along the road, bushes,
- No land acquisition (only temporarily requisitioned land during the construction phase of the pipeline).

- Construction process takes place in a short time so the impact on the environment and social economy is at a low level.

b) The mitigation measures:

Because the temporary land acquisition was agreed and supported of local authorities and local people, compensation and site clearance will take place relatively smoothly. The necessary condition is to have unity of time and compensation procedures conducted between residents and local authorities in accordance with the provisions of law.

The specific measures are as follows:

On the issue of compensation and site clearance:

- There are meetings between local leaders and each residents cluster, need to analyze and resolve any questions before proceeding for civil compensation.
- A notice in writing or on the news or through the meeting to each household about compensation, site clearance plan.
- The clearance work should be taken after the harvest in order to avoid the influence of land use and cultivation of people and limit compensation costs.
- Calculate exactly about the amount of adequate compensation policies for crops.
- Release part, where construction to release it. This is necessary to avoid the waste for people to avoid traffic congestion.

On the issue of construction

In each phase, the construction will follow a rolling type (the length of each segment need to the construction depends on the actual terrain, an average of 2 km for a round).

- Prior to construction, to notify specifically for people in writing or through meetings, the mass media in order to get sympathy and support.
- Need to revert the status as soon as the construction each stage
- The rock transporting have to use cloth cover to prevent dust.
- Collect garbage and daily solid waste

- Safety issues, risks mitigation during the construction or the bad weather is limited by implementing good safety regime on the construction site.
- Apply the rules on labor safety, hygiene and environmental protection for the employees and workers in the project area
- Build the instructions tables, signage at appropriate locations to coordinate traffic, avoid congestion and accidents.
- All works is done to comply with the standards and technical criteria by Vietnam government regulations.
- Inform people of the surrounding area about the building plan.

5.2.3 The environmental impact during operation and mitigation measures.

a) The impacts:

- Water pollution caused by dirty water penetrates the pipe.
- Loss of water due to leaks caused by burst pipes or acts of vandalism, stealing water.
- Effect of sludge from cleaning and filter waste water
- Leakage of chemical and operational accidents

b) The mitigation measures

- Regular maintenance of treatment facilities, water supply pipelines.
- There are clear sanctions regime in the case of violations.
- Regularly check the water quality prior to distribution.
- Establish checkpoints with installed equipment.
- Install safe clock and protective barrier around the pump stations, water plants.
- Apply the rules of labor safety.

5.2.4 Incidents caused by activities of the project.

a) Cause arises

- Fire: Due to the processing technology which uses chemicals, combined with all the conditions may arise explosion, especially the chlorine tank explosion incident

- Fire caused by electricity: water plant, raw water pumping station for devices which use more electricity using equipments (pumps, agitators, ...) in water with harmful ingredients that can cause electric shock, fire and explosion.

b) Scale of impact:

- Fire: If the fire occurs in the area of the treatment plant, it can cause damage to work items, accidents to operating workers: ...
- Leaks, untreated water spill: The spills make suspended operations of the system, directly influence the production activities of enterprises, use water resources of the plant.

5.2.5 Measures to prevent fire and environmental incidents

To ensure safe operation of the water plant, design drawings and construction works, the contractors pay attention to the issue of fire and environmental incidents (self-interrupt devices, gas masks ..). The operation workers must be trained to rescue incidents.

5.3 Management plan, monitor and the environmental control report

According to the Environmental Protection Law of Viet Nam, during the construction and operation phase, the project management unit (PMU) along with the winning bidders to build and operate the environmental management program.

The goal of the environmental management program is that it provides guidances to the project and can be assured about the environment. The environmental management program includes management, monitoring and reporting program in order to minimize environmental impacts, organization and implementation structure of measures the environmental management program and emergency measures about incidents occurred.

5.3.1 The environmental monitoring program and environmental monitoring reports

The objective of the monitoring program and environmental control report of the Vinh Long and Vinh Ha water supply project is a continuous collection of information on environmental quality change due to the implementation of the project caused and timely

detection of environmental bad impacts of the project to propose environmental mitigation measures. On the other hand, the environmental quality monitoring aims at ensuring the safe operation of the Project. The parameters are proposed for assessment in environmental monitoring program and environmental monitoring reports as follows:

- During the construction phase of the project: noise and dust, waste collection and earthwork construction, soil erosion and measures to ensure safety;
- During the operational phase of the project: noise, air quality, water quality (raw water and treated water), the settlement of the works

5.3.2 Construction phase

Construction time in the project area is expected in about 6 months. the environmental monitoring will be conducted in this phase as follows:

- The parameters of noise, dust will be monitored at 2 locations which is considered most affected (the construction area in the water plant and the area along the main road where transmission pipelines flow through with crowded population density). with frequency 1month/1times for 6 months of the construction period.
- The waste collection and landfill, soil erosion and measures to ensure safety are supervised 1month/1times for 6 months of the construction period. The wastes of construction workers also need to be monitored to collect and process hygiene.

Environmental control report in construction phase is prepared by the construction company and submitted quarterly for the local environmental management agency or as required in each specific moment.

5.3.3 The management and operation phase

- Monitor the quality of raw water and treated water during the operational phase: analysis once a month with regular targets, the water quality were analyzed by Vietnam regulations 01:2009 / BYT issued by Circular 04/2009/TT-BYT dated June 17, 2009 of the Ministry of Health. The location to take the raw water samples at collected works, water sampling locations after treatment at water storage tank at the treatment plant and at consumers taps.

- Monitor of subsidence in the region and around the water plant, water stations every year aim at ensuring the quality of the structure.
- Monitor of noise targets will be performed at the pumping station with monitoring frequency is 3months/times,
- Monitor waste targets in operational processes includes: the collection focused sludge, filter wash water discharge of the water plant will be monitored 6 months/times.
- Air quality is checked monthly in the area of the chemical house to handle emergency in cases when there is a leak of chemicals. The pipeline network is being monitored regularly to limit water leakage or non-revenue

The environmental control report in the operation phase are prepared and submitted by the project operating agency to submit for and annual local environment management agency or as required in each specific moment.

5.3.4 Implementation agency

Responsibilities of organizations and units involved in the assessment and implementing process and environmental controls are presented in following table:

Bảng 11: The role and function of the environmental units involved in the project..

Roles	Functions
<i>The implemating agency</i>	
The Quang Tri water supply and implementation, including guidance and supervision of Construction One Member Limited Company – The investor.	Coordination and management of project and implementation, including guidance and supervision of the project.
Project Management Unit (PMU) -The Quang Tri water supply and Construction One Member Limited	To be responsible for the comprehensive implementation of Environmet management plan (EMP) implementation management

Roles	Functions
Company Representative	The investor
Environmental Staffs of the project	Takes responsible for training and support for building contractors about environmental issues as well as inspection and monitoring of the project implementation to ensure full and proper compliance of procedures outlined
Environmental Consultant	Prepare environmental management plan
Construction Contractors	Construction according to measures - Apply mitigation measures during construction - Ensure safety measures for workers and local people during construction - Compliance with security policies of Viet Nam.
Projects operation unit	Operate and implement of project management practices, monitor environment and report the results for management unit

Monitoring agencies

Environmental Management Division - Department of Natural Resources and Environment of Quang Tri Province	Takes responsible for ensuring the compliance of the management and protection of the environment by the Environmental Protection Law, Decree 80/2006/ND-CP, Decree 21 2008/ND-CP of the Government and Circular 08 / TT-BTN&MT. For the Vinh Long and Vinh Ha water supply projects in project group II. The monitoring and environmental management plan implement reports will be evaluated and approved by EMP Environmental Management Division in accordance with the institutional framework for
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Roles	Functions
	environmental management and protection
Internal Monitoring	Monitor contractors during the construction process, including the implementation of environmental management activities in the environmental action plan.
Independent monitoring	Independent monitoring of the implementation of environmental management plans

5.4 Conclusion.

From the process of environmental impact assessment of the water supply system project of Vinh Long and Vinh Ha, concluded:

- The water supply system project of Vinh Long and Vinh Ha communes is a project to improve the environment in a positive way, bringing clean water to every household and to help ease the gap between urban and rural areas.
- Overall environmental impact of the entire project is positive and will be an important step in improving the conditions of water supply and sanitation, improving the health of communities in the region, helping to prevent and eliminate the disease. This is the most important thing to local people;
- Economic - social, the project helps people in daily life and assured production, create conditions for development activities in the project area.
- The negative impact of the project is primarily topical or local scale. These effects will be limited by technological measures and management and supervision

6. FIRE PREVENTION AND SAFETY

The explosion prevention and the environmental protection are one of the mandatory requirement for all projects, it must ensure that there are not any problems in the construction process, as well as in operation. When conducting research to set up construction investment projects, it need to build the fire prevention measures, environmental protection. The analysis of the possible causes, provide preventing solutions , minimize environmental impact on the environment and people are very

essential. From the above, it is stated that there should be specific requirements for each phase of the project as follows:

- In stage of construction investment projects establishment, technical design must follow the correct procedures, standards and regulations in the construction sector.
- During construction, the contractor should have adequate measures, construction progress as well as strictly compliance safety regulations and environmental protection, the ones are required. The construction of management process, monitoring and coordination between the parties from the investor, consulting unit, monitoring unit, construction units and localities must be very tight and uniform. The works which arise out of the construction measures were included in the tender should be adopted by the responsible parties.
- When commissioning work must have sufficient safety measures and operational documentation needed. This process must be closely monitored by the stakeholders and especially the management unit and later operating systems.
- When handing over the project to the management unit to use and manage, the contractor shall hand over all the operational guide documentation and need to have operate and technology transfer programs and the operating instructions for worker as well as the materials used for the operation must be approved by design Consultant
- Management and use unit of the receipt of the proper have to operate according to the guide document. During the warranty period of the contractor, if there is incidents not included in the guide document should be reported immediately to the contractor for processing.

II. THE TOTAL INVESTMENT, CAPITAL STRUCTURE, FINANCIAL PLANNING

1. The total investment

1.1 Overview

Determine the total investment, identify the project's financial mechanism is one of the very important stage. Based on the volume of work proposed in the technical program to calculate the total investment. Besides determination of financial mechanism for the project is one of the significant problems which decides to the effectiveness of the project in terms of finance and economics.

1.2 Basis of the total investment.

Monetary and exchange rate: The total investment will calculate with the Viet Nam Dong then converted into Euro with the exchange rate by the State Bank of Viet Nam issued the moment in the first quarter of 2010 is : 1EURO = 26.000 VND.

The fluctuation of price : The total investment is calculated based on the time of the first year of 2010 when the completion construction operates, with an annual average inflation rate of 5% for the Viet Nam Dong.

Time for investment and construction: the construction duration from June 2009 to the end of 2011. The payable loans , determined on the basis of the progress of construction and use of the respective capital.

Tax and financial obligations: The project was funded by commodity aid of Italia Government (ODA) and domestic counterpart funds, so the project must comply with the rules, regulations and policies on taxes , the current financial obligations of the State for projects using ODA (official development assistance) fund.

Provisions: Includes provision for work which arises in the project implementation process, and errors and inflation. The provision is calculated at the rate of 10% for all expense items.

Other law provisions

- Unit Price of Construction - Construction Section No 62/2006/QĐ-UBND, Installation part No 63/2006/QĐ-UBND, Survey of Construction No 65/2006/QĐ-UBND dated August 3, 2006 of People's committee of Quang Tri province.
- Pursuant to Decree No. 112/2009/NĐ-CP dated December 14, 2009 of the Government on management of the construction cost of the project.
- Decision No 957/QĐ-BXD dated September 29, 2009 of the Ministry of Construction announced project management cost Norms and construction consultant.
- Pursuant to the Circular No 05/2009/TT-BXD dated April 15, 2008 of the Ministry of Construction guiding about adjustment of construction estimates

1.3 The total investment

The total investment for the project will be presented in the appendix of the report.

2. RESOURCES OF FUND

The capital structure of the project is determined based on the current provisions of the Viet Nam government, the principles of project finance and general principles of the donor, as follows:

- The fund of commodity aid of Government of Italy for the main materials and equipment such as : Raw water pumps, water pumps, supply the ductile iron pipe DN200, DN150, DN100, valve DN200 , DN150, DN100

No	Name of equipment	Unit	Quantity	Unit price	Amount
				Before tax	Before tax
1	Distribution pipeline network				
	Provide ductile iron pipe DN200	m	10.600	748.000	7.928.800.000
	Provide ductile iron pipe DN150	m	460	570.000	262.200.000
	Provide ductile iron pipe DN100	m	2.140	500.000	1.070.000.000
2	Valve on line				
	Provide two-way valve DN200	Piece	25	10.630.800	265.770.000
	Provide two-way valve DN150	Piece	4	7.346.500	29.386.000
	Provide two-way valve DN100	Piece	15	4.435.200	66.528.000

3	Pumping station level 1				
	Provide horizontal centrifugal pump Q=83m ³ /h, H=45m.	Suite	2	99.530.000	199.060.000
4	Pumping station level 2				
	Provide horizontal centrifugal pump Q=150m ³ /h, H=30m	Suite	3	130.465.000	391.395.000
	Total				10.213.139.000

Counterpart fund of the Ministry of Finance and the People's Committee of Quang Tri province for the remaining works (including preparatory works for investment, site clearance, taxes)

Because the counterpart funds are large and the budget is limited, it should be investment allocation for the counterpart funds

Phase 1 : priority of the construction in the plant (filter sedimentation clusters, water tower, water towers, install 10.600m iron pipe DN200, 460M cast iron pipe DN150, 2.140m cast iron pipe DN100 and installation.

Phase 2: Supply and install 3.500m of ductile iron pipe DN200 (water supply for Cau Dien village), provide and install service pipes network and households connection. Specifically, presented in the table below:

The water supply system project of Vinh Long and Vinh Ha commune-Vinh Linh district- Quang Tri Province

7	Services pipeline network includes: Supply and install 615m respectively, 1974m, 1740m HDPE pipe DN90, DN63, DN50 and accessories attached to the pipe	Item	1				1.193.750.288	119.375.029	1.313.125.317
8	Household connection	household	1017				1.813.868.805	181.386.881	1.995.255.686
2	Equipment Costs								
1	Filter sedimentation cluster	Item	1	60.500.000	6.050.000	66.550.000			
2	Chemical house	Item	1	25.000.000	2.500.000	27.500.000			
	Total			35.500.000	3.550.000	39.050.000			
	TOTAL (ROUNDING)					8.443.330.594			6.995.767.069
									15.439.097.663

Table 12: Structure the funds for the project

No	Content	Value (VND)	Value (EURO)	Rate %	
1	Aid from the Government of Italy	10.213.139.000	393.000	32,2%	
2	Domestic capital				
	Phase 1	Phase 1	12.910.690.000	497.000	40,8%
	Phase 2	8.555.997.000	329.000	27,0%	
	Total	31.679.826.000	1.219.000	100,0%	

3. FINANCIAL MECHANISM

The project was implemented through 2 funds:

- The commodity aid of Government of Italia : The investor is used this aid as the State budget.
- The Counterpart funds of the Ministry of Finance and the People's Committee of Quang Tri: For the counterpart funds will be made applicable by the Budget Law.

Thus it can be seen a financial mechanism of the project as the allocation mechanism of the state budget.

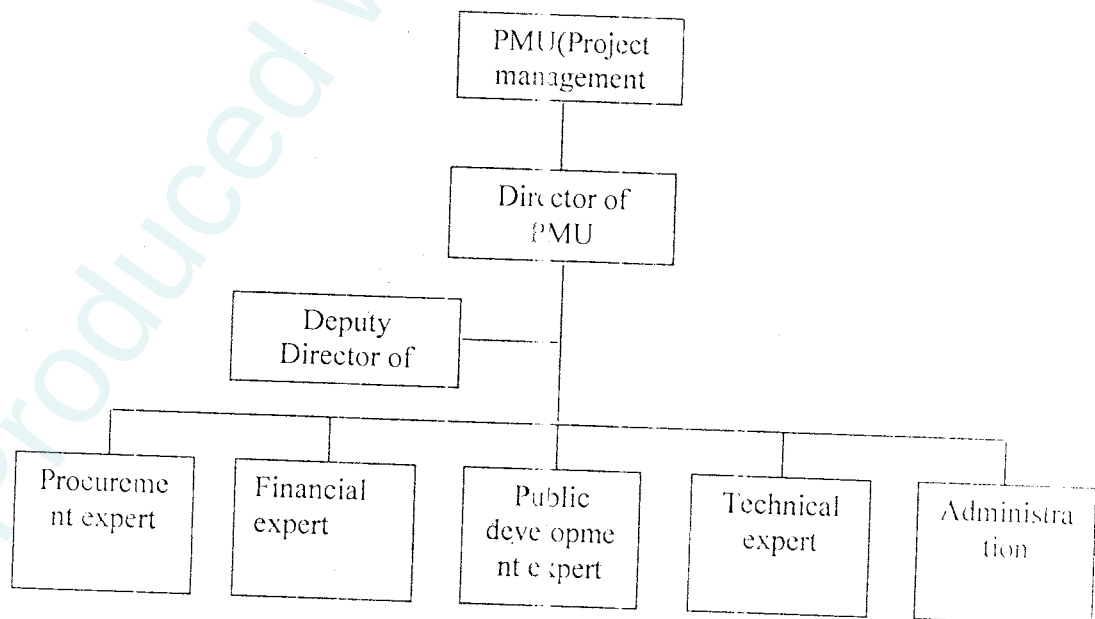
III. PERFORMANCE MANAGEMENT AND PROJECT OPERATION

1. THE MAIN DATA ON THE PROJECT IMPLEMENTATION AGENCY

1.1 Institutions

The method implemented by the Decree No. 12/2009/ND-CP dated February 10, 2009 of the Government on management of construction investment projects. The Government after considering the investment demand and construction, the Government has authorized investment decisions for Provincial People's Committee (PPC). Provincial People's Committee (PPC) will authorize in management and use capital for the investor to invest in construction

The investor of the project is the Quang Tri Water Supply and Construction One Member Limited Company. For its role, the investor has assigned Project Management Unit(PMU) of the Quang Tri Water Supply and Construction One Member Limited Company Tri is the investor's representative, on behalf of the investor to conduct works such as organizing project planning, submitting and approval of the project, and the project approval process, establishment, and the approval of bidding documents, bid evaluation, organization of land acquisition, compensation and resettlement; The organizational structure of the project management unit as follows:



1.2 Business, financial Aspects

- Project Implementing Agency (The Quang Tri Water Supply and Construction One Member Limited Company) is the state-owned enterprises which operates in the clean water manufacturing sector to provide for the people. Products of the enterprise is the clean water to supply for the households in the region in the province of Quang Tri
- According to the latest report of the Company, the monthly revenue which the company obtains from the clean water business activities about 7 billion VND/ month.
- The current water tariff is applied by the company depending on the province. For example, the clean water tariff is 4.500 VND/1m³ in the district of Vinh Linh.
- Vehicles and tools of the company are mainly cars, machinery and equipment in the water sector such as pumps, valves, piping, ...

2. PROJECT IMPLEMENTING MANAGEMENT

2.1 Organize and manage of project operation

Organize and manage of project operation is divided into 03 stages:

- The preparation stage for investment
- The implementation phase of investment
- The operation stage

2.1.1 The preparation stage for investment.

The investors (the Quang Tri Water Supply and Construction One Member Limited Company) assigned to the investor's representative is Project Management Unit (PMU) of the Quang Tri Water Supply and Construction One Member Limited Company to conduct the works for the investments preparation such as the project planning organization, and approval and submit the project, establish, submit and approve the bidding documents, the bid evaluation, organization of land acquisition, compensation and resettlement;

2.1.2 The construction investment phase

The Project Management Unit (PMU) is the Quang Tri Water Supply and Construction One Member Limited Company continued the works, including negotiations organization, contracts with winning bidders; implementation organization of the works completed contracts, organize the bidding or specify implementation unit about supervision of construction work, settlement construction, handing over the project to the investor, operation.

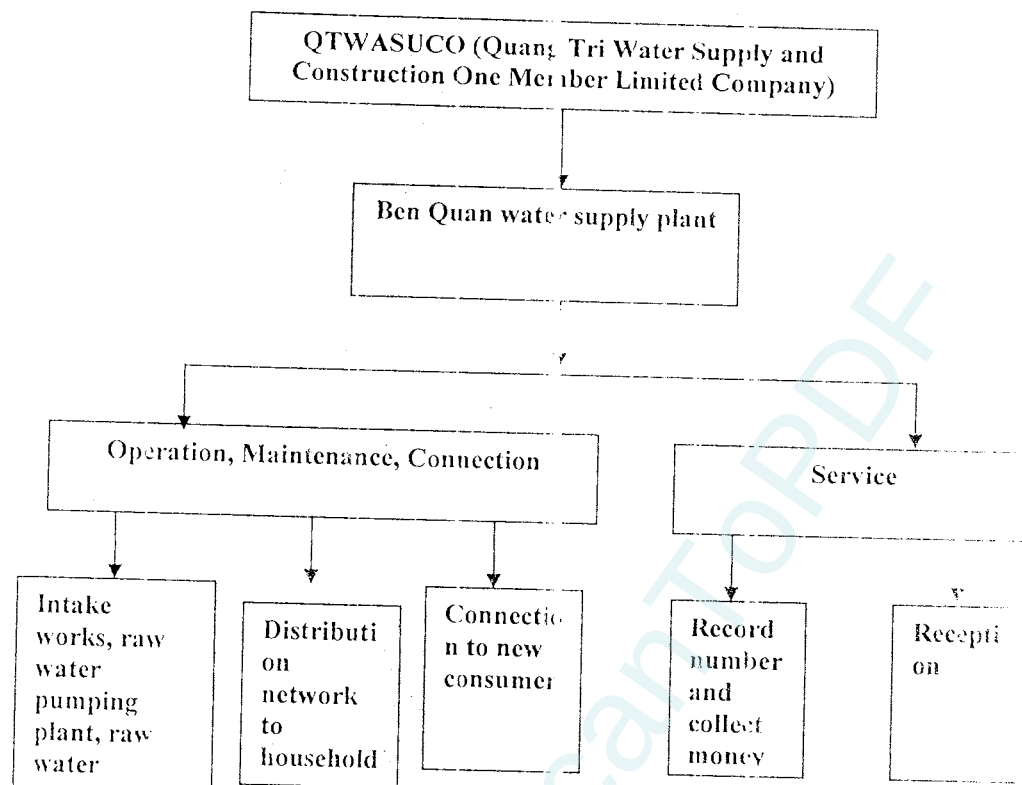
After completion of construction, the PMU will hand over to the owner of the water system, the owner will organize operation and exploitation.

2.1.3 Management and operation phase

The operation is extremely important phase of a project's life. Therefore, the selection of methods and operation management forms is essential and great significance.

Currently, the Quang Tri Water Supply and Construction One Member Limited Company assigns to the Ben Quan water supply plant to manage and operate the Ben Quan water supply system. With the current ability and experience, we propose about the operating management organization of the Vinh Long and Vinh Ha water supply systems after the construction will be finished. The main activities of the water supply plants are: operation management, and maintenance of water supply systems, raw water pumping stations, treatment plants, water connection points to the households, record and collect water bills monthly.

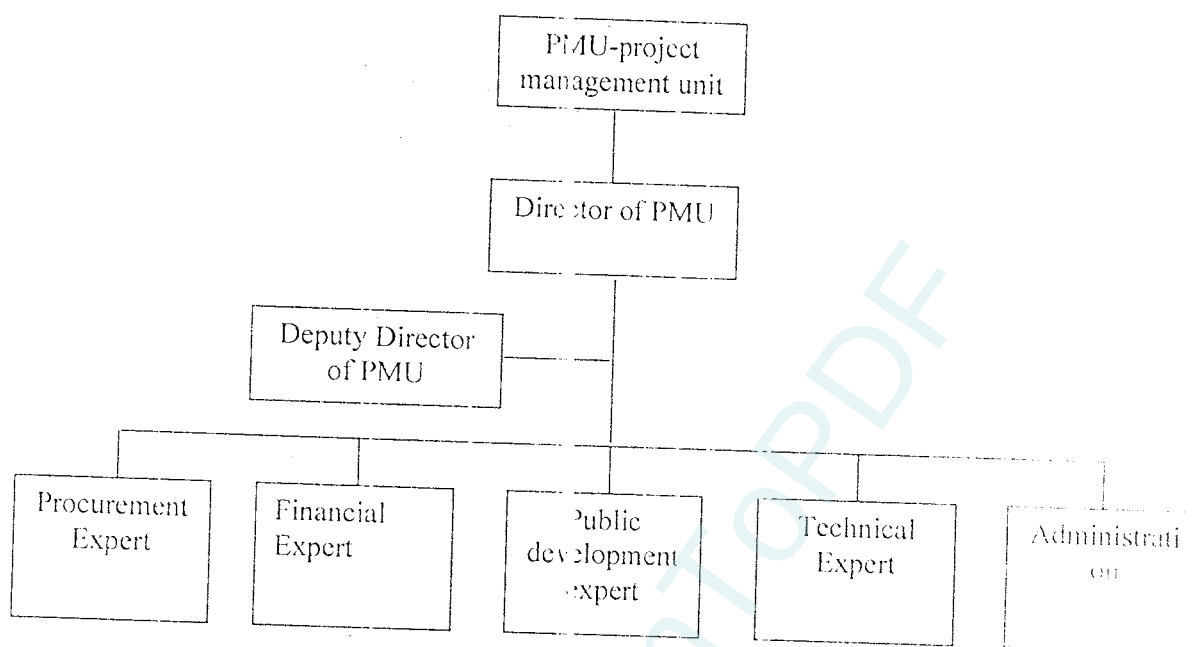
The organizational structure of the enterprise as follows:



2.2 Management and personnel for the project

As stated above, to make this project the Quang Tri Water Supply and Construction One Member Limited Company (the investors) have assigned Project Management Unit (PMU) to perform the project management, staff and prepare investment. The main functions of the PMU in the investments preparation stage such as the project planning organization, project approval process, establishment organizations bidding documents, approved procurement plan, ...

The staffing of the PMU to implement project is important and decision to the effectiveness and progress of the project. In order to implement the project, the personnel are located in the following diagram:



2.3 The role of contractors

In order to make the project works, beside the role of the PMU, the other departments and authorities, the contractors perform the work of the project have an important role and importance significance to the quality of the project progress. In each the phase, the contractors and their roles are shown as follows:

Consultant contractors prepare investment: Provide technical services, the personnel to carry out the surveys, set up investment projects, tender documentation, the basic design for the project approved by the competent authority. This is a very important part in the entire process of project implementation. The role and nature of work of the contractor is crucial to the quality of the work, the progress of the project, the economic and technical performance, finance and society.

The design and construction contractor: This is contractors who were selected through public bidding, the contractor have to ensure the 2 main tasks: (i) to provide technical services and personnel to carry out the survey works, detailed design of the items under the base design profile of the investment projects approved, (ii) supply, install, construct works on detailed design documents are approved by PMU. The role of the contractor is also important, direct impact on the quality of construction, the longevity, durability, aesthetic and technical work.

Construction supervision contractor: Provide the personnel to perform the supervision of construction of civil works contractors. This is an important work, the nature of the objective of monitoring the quality of construction contractors. On behalf of PMU, the contractors perform the testing, evaluation, supervision of construction work on site. The contractor ensures that the construction works are properly designed to ensure safety, compliance with laws and regulations and rules of construction.

2.4 The role of Consultant

In order to make the investment preparation work, PMU (project management unit) can perform the job or hire the consulting organization with experience, and professional knowledge to support the project management unit (PMU) to perform work before

investing. The consultants help the investors in the job: support the PMU to monitor the activities of the Contractor; quality control, product schedule of the Consultant contractors who prepares for the investment, supporting the PMU in the bidding process, bid evaluation construction; the legal procedures to implement this project.

This is a technical assistance (TA) consulting organization which has an important role in helping the PMU evaluation and implementation of project work.

2.5 The role of institutions involved in the project

The project implementation is decentralized from central to local levels.

- 1) The Government: Considering the framework agreement is signed between the Government of Vietnam and the Government of Italy. Macro Operations in the management and use of ODA
- 2) Ministry of Planning and Investment: Focal Agency, the agency in charge of the work on the implementation of ODA-funded projects such as guidelines the implementing agency about program list construction agency, requirement of the ODA (official development assistant) fund of each agency to synthesize the list for the requirements of the ODA fund for approval of the Prime Minister.
- 3) Ministry of Finance: an official representative for the "borrower" is the State or Government of the Socialist Republic of Vietnam in the specific international treaties on ODA loans. The ministry of Finance is the chair of the affairs of the financial sector, such as promulgating regulations on lending, distribution, financial condition, financial mechanisms, ..
- 4) The relevant ministries shall coordinate with the Ministry of Planning and Investment and make comments the work related to public policy for projects which use ODA capital. Implementing state management functions for programs and projects in accordance with the law. Upon request, the relevant ministries shall review and comment in writing on issues related to programs and projects in the stipulated time.
- 5) The People's Committee of Quang Tri province: Coordinate with the Ministry of Planning and Investment to the signing of specific international agreements on ODA (official development assistance) for programs and projects in the field of charge under the provisions of this Regulation; ensure the quality and efficiency of using ODA fund

managed and implemented by the local; takes responsible for land acquisition, site clearance and implementation of policies for compensation and resettlement for program in the area in accordance with the law.

6) The Quang Tri Water Supply and Construction One Member Limited Company - the investor

- ✓ Set up, submit for the project approval; compensation and site clearance, delivery of construction site; establish, submit the bidding results for the approval of the People's Committee of Quang Tri province.
- ✓ Sign and implement the contract with the winning bidder according to the current regulations
- ✓ Prepare the delivery record or land record for the constructions of the project
- ✓ Coordinate with local authorities to implement the compensation land, crops ... site clearance and hand over the site according to the building progress.
- ✓ Coordinate with relevant agencies to resolve promptly the necessary works in the implementing process.
- ✓ Organization of settlement, the settlement browser.

7) PMU of the Quang Tri Supply and Construction One Member Limited Company - the investor's representative

- ✓ On behalf of the investor, PMU (Project Management Unit) carries out all the surveys, compensation, resettlement, preparing the tender documents, bids evaluation,

8) Responsibility of the Consultant

- ✓ Perform the pre-investment works (construction surveys, surveys of socio-economic, establish construction investment projects, basic design, ...).
- ✓ Help or perform works related to the bidding documents, bid evaluation.
- ✓ Help the investors in the process of selecting, negotiating, and contracting with the party. The Consultant assistances the the upper level in every step taken.
- ✓ Provide for the contractor the necessary information, perform their responsibilities in the construction process.

- ✓ Takes part in considering the plans the plan submitted by the Contractor. Proposal measures for the investor in favor of the project.
- ✓ Help the investors to check and certify the quantity and quality of items of construction works. Timely notify to the investor any problem related to the quality of works.
- ✓ Prepare data, technical documentation, finance ... as a legal basis for the completion of construction, hand over and putting it into operation.

9) The relevant agencies: In order to implement the project as planned, the investors should be coordinated closely with other agencies and departments such as Provincial People's Committee (PPC), Department of Planning and Investment, Department of Construction, Department of Finance Department of Natural Resources and Environment, the commune people's committee (CPCs) concerned, ... to solve tasks timely such as financing, construction certificate, compensation, underground processing, settlement, ...

2.6 The role of donor organizations

This project is funded by grants to the Government of Italy and the counterpart fund. So the role of the donors of Italia is also important. The Government of Italia will review and approve the project after the project was approved in Quang Tri province. The form of examination, evaluation and monitoring of the implementation of the projects were funded during the implementation of the project.

3. THE PLAN OF PROJECT IMPLEMENTATION

The agencies concerned have to participate and take responsibilities for the project to implement the project's works

Under the provisions of the law of Viet Nam, the project manager and the project implement will comply with the Decree No. 2/2009/ND-CP dated February 12, 2009 of the Government on management of the investment project and works construction.

The project implementation can be divided into 3 stages: investment preparation stage, investment stage and operation management stage. For each stage, the

responsibilities of the parties involved are various, but generally agree on the content of work to do.

Bảng 12: Progress of the project

No	Content	Completion
1	Make an investment project, construction, basic design	06/2010
2	Design drawing-up, cost estimates, construction bidding documents	09/2010
3	Bid evaluation and approval of tender results, negotiate contracts	11/2010
4	Construct and installwork	12/2010
5	Train, guide operation, test, and handover of projects	12/2011

4. THE BIDDING PLAN

4.1 Overview

The bidding will be made pursuant to the Bidding Law 61/2005/QH11 November 29, 2005 of the National Assembly of the Socialist Republic of Vietnam and the Decree No 85/2009/NĐ - CP October 15, 2009 of the Government guiding the implementation of the Bidding Law and the selection of construction contractors under the Construction Law.

4.2 Requirements.

Priorities: Have no form of preference for the bidders.

Advertise the bidding: Notice tender must be published in the newspaper on 3 consecutive tender and information on electronic about the bidding and can advertise on the mass media to facilitate in the approach of the organization and individuals concerned.

Opening and evaluation of bids: Bidding Documents will be opened in public and the guidelines have been notified in advance. The bid evaluation will comply with the criteria

stated in the tender documents and the contracts will be awarded to the contractors are evaluated with the lowest cost. The participation contractor will not ripped out the detailed review and due to the small deviations and not significant.

Bidding Capacity Assessment: To achieve the results of evaluation capacity, the contractor will have to meet predetermined requirements

Standard Profile: Standard Documentation for capacity prequalification - capability evaluation of the contractors will be used.

4.3 The form and methods and distribution of bidding packages

4.3.1 The bidding forms

The procurement work for items of the works, equipment and services for the project must comply with the general guidelines for procurement of donors and the government of Viet Nam. Depending on the value of the package, can refer to the following forms:

- (a) International Competitive Bidding (ICB): With the construction contracts worth more than \$ 2 million or the value of equipment exceeds USD \$ 500,000 the bidding process was held for Viet Nam and international contractors.
- (b) National Competitive Bidding (LCB): With the construction contract value in the range from \$100,000 to \$2 million, the bidding process only organizes for the contractors in Viet Nam.
- (c) International Procurement (IS): With these equipment contract with a value in the range of USD \$100,000 to USD \$ 500,000, the bidding process is done by taking the quotes of the supplier have sufficient capacity in the country and abroad.
- (d) Direct Procurement (DP): For work items, equipment and services with an estimated value of less than USD \$ 100,000, the bidding process is done by obtaining quotes of qualified companies.

4.3.2 The bidding method

Tender with 1 envelope.

4.3.3 Distribution of package

With the nature of the work and follow the rules of the stakeholders, especially to ensure the progress of the project and soon put to work, the project will be divided into packages such as follows:

- (i) The tender package offers materials and equipment belonging to the Italian capital. Includes the main materials and equipment of the Italian capital.
- (ii) The tender package offers materials and equipment in the domestic capital: Includes materials and equipment in the country (the remaining materials and equipment which is not in Italy capital).
- (iii) The tender package about constructing for works in the factory: Includes works such as treatment units, water tanks, water towers,...
- (iv) The package for construction and installation of pipeline and technology in the water plant and water supply networks: Includes the water supply pipe in the water plant, water tower and distribution and the water supply pipe network, water supply services, connected to the scope of the project.

4.4 The procurement / tendering plan

Base on the tender methods, package distribution and the value of each package, we expected to propose the procurement plan table as follows:

Table 13: The plan of Procurement

Quantity	Package's name	Type of contract	Contract value	Contract value	Timeline		
			EUR (*)	(VN Đ) (*)	Open the tender	Award of contract	Completion
QT/01	The tender package offers materials and equipment belonging to the capital of Italia	NCB			10/2010	12/2011	6/2011

QT/02	The tender package offers materials and equipment belonging to the domestic capital	NCB	10/2010	12/2011	6/2011
QT/03	The tender package for construction of the work items in the water plant	NCB	10/2010	12/2011	6/2011
QT/04	The tender package for construction and installation of the technical pipes for the water plants and water supply network	NCB	10/2010	12/2011	6/2011

(*): Not include provisional of charge and VAT

5. PROJECT OPERATION

5.1 The agency responsible for the project operation.

As stated in section 2 of this chapter, the organization and implementation of the project is the Quang Tri Water Supply and Construction One Member Limited Company, and the operational phase of the project, The company will assign to the Ben Quan water supply plant for receiving and implementing the management, operation and maintenance of the project works.

5.2 Institutional Development.

5.2.1 Principles.

The institutional development component will strengthen the capacity of the management agency is the Ben Quan water supply plant so that they can manage a water supply system effectively.

Build capacity for these units to help them to effectively manage the existing water supply system through projects and build new constructions. The institutional

development component will support the development of systems, the skills and the face of agency.

Construction methods of revenue from water supply charges. Managers and staffs are qualified and dedicated. The effective and durable operation of infrastructures and equipments. Improve service levels, separate other profitable services, build capacity aim at applying for principles of market economic

5.2.2 Increase the capacity of the project management unit.

The capacity building training for PMU: This project related to multiple units, organizations, so the capacity building for PMU is necessary with them to implement projects effectively.

The management equipments serve as office work, computer in preparing for the project. In order to achieve the above objectives, the following activities will be implemented in a number of areas:

Management, equipment and system

Computers and appropriate office equipments to manage information on active situations, accounting, billing, storage, operation and maintenance other routine activities.

Accounting system on your computer in order to support application of the method "cost focus" in financial management.

Information Management System, and plan / control activities

The system management of the macro,

The management and maintenance of the drainage system,

The management and maintenance of the collection system and wastewater treatment,

Monitor and control systems.

Training

Training is a key strategy to develop the knowledge and skills of managers and employees in the field of water supply.

The training program will be implemented in the following fields

- + Training for staffs
- + Business objectives, performance monitoring and development planning
- + Management and Financial Planning
- + Management and Customer Service
- + Manage and develop human resources
- + Monitoring and construction methods
- + Information system of water supply works.
- + Field method for the operation of water supply.
- + Management of water quality and the environment.
- + English, computer and many other business skills.

The special activities

Along with providing systems, equipment and training courses, the institutional development component also supports a number of other activities through seminars, group discussions and / or directly advise, including:

- + Human Resource Planning
- + Develop a financial plan to develop long-term business
- + Design the proposed tariffs to achieve financial autonomy
- + Survey household on attitudes, expectations and opinions of clients
- + Compose the documents on relations with the community to support direct communication links with the community
- + Plan tours to exchange experiences and ideas and as well as consider the fact the effective business models.

5.3 Operation and maintenance

After the project was completed and handed over to the owner, the contractor will assign to the Project Owners (PO) a document (or manual) of management guidelines to guide the ways as well as management measures and operation of the project works.

The operation and maintenance should be done well in order to protect the value of technical infrastructure and the efficient operation of the works, protect environment as well as maintain the level of service satisfactorily.

For the water supply network, one of the main activities is to check the level of non-revenue, leakage on pipes to maintain hydraulic capacity and water capacity.

The water pumping station level 1, the water plant should be checked daily. Estimate the operation and maintenance of pumping stations, treatment will be provided by staff trained by Ben Quan Water Supply Enterprise.

By the available capacity and experience, the operation and maintenance of Vinh Long and Vinh Ha water supply system will be done well by Ben Quan Water Supply Enterprise.

IV. RESULTS AND IMPACTS OF THE PROJECT

1. INVESTMENT PERFORMANCE

1.1 Financial Analysis.

1.1.1 Determine the water tariff

a) The plan for collection of water tariff.

The plan for collection of water tariff will be calculated according to the cost structure of water supply services. Accordingly, the determination of water tariff towards cost recovery, enough to pay for the management and operation of water supply systems and there is a section for the construction, major repair works on the system.

b) The depreciation of fixed assets in the water supply

According to Decision No.206/2003/QĐ-BTC stated that all fixed assets consist of fixed assets of the state have also to calculate depreciation on business expenses. The depreciation is calculated for the upgrade and the major repair over the life of the project.

According to regulations in this Decision, frame of time to calculate the depreciation is different and the variation is relatively long, in which :

+ Machinery and equipment:	5-12 years
+ Storage tank and yard and road:	5-20 years
+ Buildings:	25-50 years
+ Pipeline, canal:	6-30 years

The more the time of depreciation is short, the more the price is high, but depends on the actual quality of the works to calculate the depreciation appropriately. So for this project we divides into 3 kinds of fixed assets and the time to calculate the depreciation as follows:

Construction works (buildings, the cover of works, items related to building, ...)	25 years
The items related to pipelines, canals, ...	20 years
The machine, equipment, ...	10 years

Thus, the depreciation calculation of the works is mandatory and must be calculated according to the tariff of clean water.

c) Cost of management, operation and maintenance

Determine the cost of management, operation and maintenance is very important because it relates to the determination of water tariff.

Bảng 14: Cost of management and operation

No	Work items	Unit	Amount
Vicen Consultant - The construction and investment project			

1	The cost of electricity in 1 year		744.600.000
	The power cost of the pumping station level 1	Kw	394.200.000
	The power cost of the treatment station	Kw	350.400.000
2	The cost of chemicals		
	Chlorine disinfection, Rate 1,6 g/m ³	kg	9.928.000
	The cost of alum (dose is 50g 1m ³ with purity alum concentration is 50%)	kg	492.750.000
3	The cost of minor repairs in 1 year (5% of the value of depreciation)	Item	58.458.696
4	Workers salary in 1 year	Labour	324.000.000
	Total (1+2+3+4):		1.629.736.696
	The cost of general administration in 1 year	Item	81.486.835
	The total cost (rounding)		1.711.224.000
	The cost of management and operation for 1m ³ of water(VND)		2.344

Thus, the cost to produce 1 m³ of water (for the daily needs) need VND 2.344, this is the important basis for determining the tariff of clean water.

d) Calculate the water tariff

Elements constitutes the water tariff

- Operating Expenses
- The expense of depreciation

The general principles to determine the water tariff

- The calculation must be proper and adequate to ensure repaid loans and the cost of operation & maintenance, including norm interest
- It is based on the affordability of consumers. The affordability is often evaluated based on the percentage of household income. The fee paid for the use of water accounts

for 3-5% of income is reasonable and the rate is usually applied by the international lending institutions.

- The water tariff will be adjusted to bring the financial effectiveness, and to ensure that the project owner can be a balance between revenue and expenditure. In theory, each year the cost of production and operation will vary (usually increase), inflation may be different. Therefore in this project, the water tariff is proposed to increase 3 years 1 times. Of course, the actual water tariff to be determined by the Provincial People's Committee and the Provincial People's Council, but to ensure that the project is beneficial and feasible about finance, we will reveal the expected increase water roadmap 3 years 1 times
- It is approved by the Provincial People's Committee and it matches the water tariff frame issued by Ministry of Finance
- The items which constitutes the water tariff is determined as follows:

Table 15: The elements constitutes the water tariff

The tariff of production water	(1) The direct costs	1.1 The cost of power 1.2 The cost of chemical 1.3 The cost of labor 1.4 The cost of minor repair 1.5 The cost of general administration
	(2) Depreciation	Depreciation of the fixed assets
	(3) Taxes and Charge	3.1 VAT 3.2 Income tax of the enterprise
	(4) Norm interest	The norm interest on 1m3 of water sold

From the above grounds, The water tariff are calculated according to the following table (only for the daily needs):

Table 16: The water tariff is calculated

No	Cost item	Unit	Amount
I	The direct cost		
1	The cost of power	VND/m ³	1 020,00
2	The cost of chemical	VND/m ³	688,60
3	The cost of labor	VND/m ³	443,84
4	The cost of maintenance and minor repairs	VND/m ³	80,08
5	The cost of general administration	VND/m ³	111,63
III	Depreciation of the fixed assets		
1	Depreciation	VND/m ³	1.601,61
IV	The total cost		3.945,75
V	The interest norm and the income tax of the enterprise		
1	The interest norm 3% (IV)	VND/m ³	118
2	The income tax of the enterprise (25% lãi định mức)	VND/m ³	30
VI	The water tariff before VAT (IV+ V)	VND/m³	4.094
	VAT (5%)	VND/m ³	205
	The water tariff for daily needs	VND/m³	4.300

Thus, the water tariff is calculated 4.300 VND/1m³ (at the time of 2012 - year put to use).

The water tariff are calculated to satisfy the proper and sufficient criteria, and to ensure adequate costs for management operation, sufficient depreciation costs and costs to pay interest and origin debt. Moreover, the calculation of water tariff is calculated to ensure that the project owner is profitable and obliged to pay taxes to the state. At the same time the clean water tariff must also be consistent with the affordability of the consumer and approved by the consumers. But in fact the water tariff and the roadmap of

increasing the water tariff is decided by the Provincial People's Committee (PPC) and it matches the tariff frame by the Ministry of Finance issued

In order to ensure that the project activities are effective in finance during the project's life, we propose the water tariff and the roadmap of increasing the water tariff is as follows:

- The water tariff of daily activities is 4.300 VND/1m³ (at the time of 2012 - year put to use).
- The roadmap of increasing the water tariff 3 years 1 times.
- Mức tăng giá nước là 2.000đ/1 lần tăng. Increasing in water price is 2.000 VND/1 times

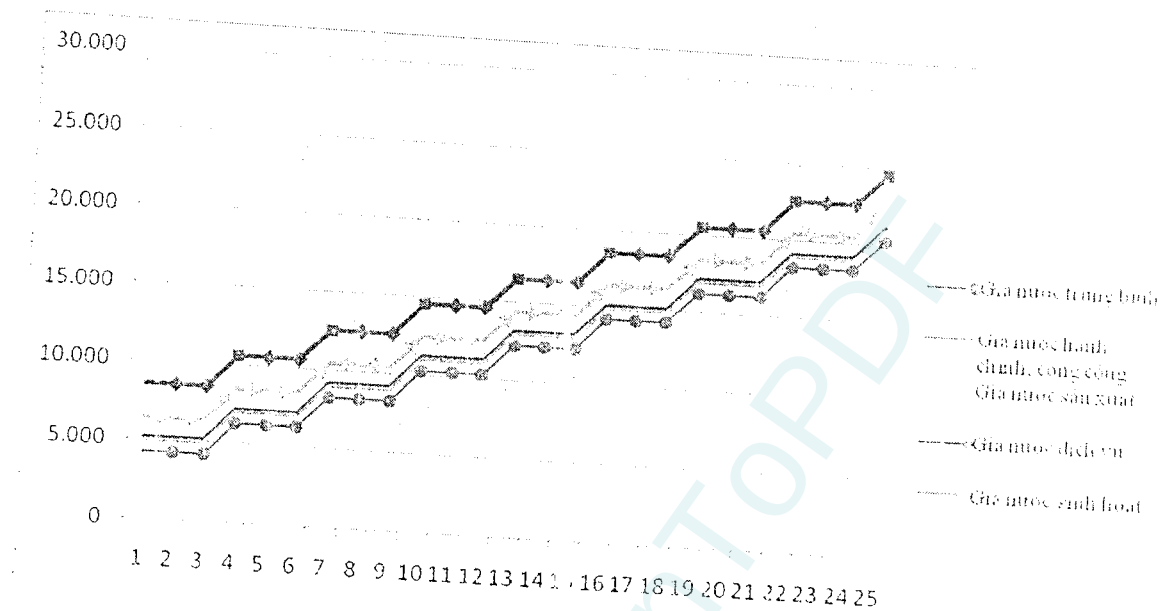
In fact, there are many different water objects and the water tariff for different subjects are different as well. Therefore, based on the actual of consumers as well as proportion of percent (%) for using water in Quang Tri, we consulted and given the table of the water tariff determined for each the various object as follows:

Table 17: The water tariff for the various objects :

No	Water object	Proportion %	The water tariff
1	Daily activities	75,0%	4.300
2	Administrative, public, schools, hospitals, ...	5,0%	5.160
3	Manufacture, construction, business	10,0%	6.450
4	Sales, service, restaurants and other services	10,0%	8.600
	The average of the water tariff		4.988

The roadmap is expected to increase 3 years 1 times and as discussed above, and to provide the water tariff and the roadmap of increasing the water tariff, decided by the Provincial People's Committee.

Figure H-8: Roadmap increase water



1.1.2 Financial Analysis

a) Overview

The financial analysis of the project is an appraisal of the level of financial recovery of the project in which it should be saved, and shall comply with all aspects of project profitability. Input of the project is market evaluation. Therefore, this input is called "financing costs". In this case, it can be said that the financial benefits like the revenue from the operation of the project in terms of collection money of water sold.

Costs and financial benefits through the project life were compared in terms of present value. If the total present value of project costs balance with a financial interest (the interest rate per the cost - $B / C = 1$), the depreciation rate is used to calculate the present value, called the internal rate of return in financial terms (abbreviated FIRR).

The financial costs include direct construction funds, taxes, clearance compensation, risk costs, cost management and cost engineering. However, inflation rate is beyond the financial cost.

FIRR (Economic Internal Rate of Return) is calculated and used as an mainly index to the financial viability of the project with the expected net present value (ENPV) and the ratio B / C. FIRR is determined by the following formula:

$$\sum_{t=1}^{t=T} \frac{Cft}{(1 + Rf)^t} = \sum_{t=1}^{t=T} \frac{Bft}{(1 + Rf)^t}$$

In which:

T is the final year of the project

Cft là dòng chi phí tài chính hàng năm của dự án đang nghiên cứu trong năm t Cft is the annual financial cost of the researching projects in year t.

Bft is the annual benefits in year t

Rf is the ratio of recovery of intransitive capital

In this case, the water supply project life is 40 years as in the economic evaluation of the improvement works.

Then, the capacity of the project owner for the operation and maintenance should be defined by the ratio B / C , using flows from the costs of operating and maintenance and repair costs, and revenue from the above costs when operation. Its maintenance is usually done by the the investor of project. Ratio B / C is determined by the following formula:

$$B/C = \frac{\sum_{t=1}^{t=T} \frac{Bft}{(1 + Rd)^t}}{\sum_{t=1}^{t=T} \frac{Comr}{(1 + Rd)^t}}$$

In which:

T : The final year of the project's life

Comr : The cost of maintenance and operation , repair cost in t year

Bft : The annual revenue in 1 year

Rd : The rate of reduction

b) Results of financial analysis.

The financial analysis is carried out through the following works:

- Determine the depreciation of fixed assets.
- Determine the cost of production, management and operation.
- Determine the water tariff
- Identify revenue from the collection of money from water.
- Calculate the cash flow.

The life cycle of the project is determined 25 year on the basis of the time of depreciation of fixed assets in accordance with current regulations of Viet Nam.

Results of financial analysis:

FIRR coefficient: 7,62%

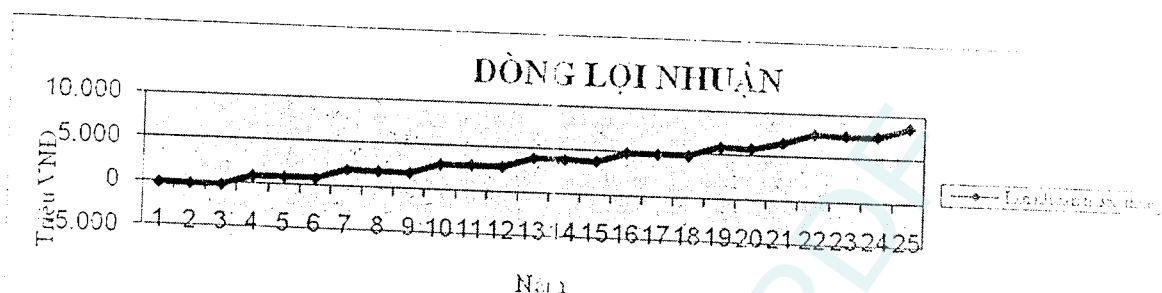
Greater than the rate of inflation is assumed to be 5%

FNPV value: 12.638

(1000 VND)

Thus, the water supply system project of Vinh Long and Vinh Ha is feasible about finance

Figure H-1: Profit line



1.1.3 Sensitivity analysis of financial forecasts.

The sensitivity analysis is able to evaluate the impact of various forecasts about the tariff. The sensitivity analysis will compare this impact with the affordability of the project loan.

Especially, the sensitivity analysis will indicate the project owner various plans about the loan and the repayment duration which will have different results. Obviously, with different financial conditions, the tariff of water will be completely different. The issue was brought to calculate the sensitivity, including:

- The change in total investment: Due to the different causes of the mechanism inflation,
- The change of non-revenue: Due to the capacity of the cost of management and operation of the management agency about water supply system.
- A change in the depreciation rate: The support of the State for the project owner by changing the distribution rate of depreciation which will affect the cost of clean water.

All of these factors changes are presented in the table below:

Table 18: The sensitivity analysis of financial forecast

Plan to change			Value	Original case	Cases in change	
Change	the	total	Rate (%)	(%)	-10%	10%

investment	NPV (million VNĐ)	12.638	14.152	11.121
	IRR (%)	7,62%	8,14%	7,17%
Change in the non-revenue rate	Rate (%)	20%	15%	25%
	NPV (million VNĐ)	12.638	16.659	8.596
	IRR (%)	7,62%	8,37%	6,83%
Change in the rate of depreciation	The rate of depreciation	100%	50%	0%
	NPV (million VNĐ)	12.638	1.788	-12.041
	IRR (%)	7,62%	5,39%	2,18%

1.2 Economic Analysis.

1.2.1 Overview

This project brings greatly economic-social benefits to project areas, the beneficiaries are not only the objects who use the water but also the project owner and the Government. This section presents the performance evaluation of the economic benefits brought by the project.

1.2.2 The economic cost.

Project cost is determined through technical research, including capital costs, maintenance costs and annual operating increase. The price of these costs are calculated on the prices in late 2009

The financial costs were converted into economic costs which use shadow prices and the conversion factors. The conversion factor for unskilled labor is assumed to be 0.7 and for goods and services purchased abroad is 1.31. The economic opportunity cost for the capital is set at 12% the same as the other projects in Viet Nam.

1.2.3 Economic Capital

- Capital investment estimated are adjusted to convert their economic value through the following factors:
- Rate of value added tax (VAT) at 10% a. according to the value-added tax law (Amendment) No. 07/2003/QH11 dated June 17, 2003 for the expenses for the import and the domestic purchase
- The coefficient of domestic price adjustment 1:00 for local investment expenditures from domestic sources in the local currency cost, it is assumed that the socio-economic system has the inflation rate at 5% per year.
- For other projects that there is a calculation to VAT, in calculating the economic model, the VAT purchases of goods, construction and installation is removed.

Table 19: Economic investment capital (Unit: 1000 VND)

No	Item	Financial investment capital		Economic investment capital
		Costs no tax	VAT 10%	
A	The cost of direct investment	13.974.643	1.397.464	13.974.643
B	Charge provisional	2.109.278		2.109.278
C	The cost of indirect investment	2.939.825	241.284	2.939.825
	Total	19.023.747	1.638.700	19.023.747

1.2.4 The cost of economic production

1.2.4 Cost of production economics

The production costs are calculated as in the model of financial analysis. The production costs do not have any account in foreign currency. The Value Added Tax (VAT) is not applicable to the production costs of domestic materials, including energy costs, chemical and maintenance costs annually. The cost of annual allocation includes the depreciation and investment loans to pay

See details in the appendix (the depreciation plan and the costs to produce economic annually).

1.2.5 The economic benefits

The economic benefit of the project is divided into quantified and not quantified measurable and benefits. This depends on the availability and quality of data and information. The benefits can be quantified, including:

- The use of direct benefits, measured by the social welfare from the increased use of water output but lower price
- The consumer surplus benefit is the benefit added to social benefits arising from higher consumption (per capita as well as the number of consumers) at a lower price and selling price without the project.
- The public health benefits, arising from costs for health care, health care, etc. and to increase production by reducing the number of days sick leave.

These benefits are estimated from the period 2010-2036. Here are the results of economic benefit calculation when projects.

The average water consumption

In calculating the economic analysis, the water consumption is applied as in calculating financial analysis of the project.

The applicable water tariff

Similar to models of financial analysis, the business water tariff at average is 5,220 VND/m³ in the first operational year (2012) it is expected to increase the water tariff by the roadmap 5 years 1 times and the end of operation (2036) the average tariff is about 15,220 VND/m³ water. The business income tax applies the tax is 25% for the water, according to the Law on Business Income Tax No 09/2003/QH11 dated June 17, 2003.

The consumer surplus benefit

The annual consumer surplus benefit is estimated with assumptions

- The increase of annual water demand in the absence of the project is approximately 2%.
- The coefficient of annual water tariff increase when no project is 1:05.

Calculation results of the consumer surplus in 25 years of operation (2010-2036) as follows:

Table 20: The consumer surplus value (1'000 VNĐ)

The cost saved A (the savings through revenue when project)	147.470.012
The consumer surplus B (is the benefits of consumer surplus due to the difference between the costs related to the use of water and the impacts of water use causes)	-85.300.506
Add the consumer surplus	62.169.507

1.2.6 Results of Economic Analysis

As economic viability is measured by the expected net present value (ENPV), Economic Internal Rate of Return (EIRR) and Expected Benefit to Cost Ratio (EBCR). The criteria for the feasibility of the project as follows: $NPV > 0$. The EIRR is higher than economic opportunity cost of capital is 12% and The EBCR is greater than 1. The discount rate applied is 12% and the calculations based on a fixed price at the beginning of 2010. The results of the economic analysis of the Vinh Long and Vinh Ha water supply system project as follows:

Expected Net Present Value (ENPV)	54.004
Expected Benefit to Cost Ratio (EBCR)	1,27
Economic Internal Rate of Return (EIRR)	12,32%

The analytical results allocate net benefit of 25 years of operation (2012-2033) for the State, the project owner and the beneficiary are presented in the following table and diagram:

Table 21: Benefit of stakeholders in the project (VNĐ)

No	Item	Government	The Investor	Beneficiaries	Total
I	Benefit				
	Revenue		321.125		321.125
	The consumer surplus			62.170	62.170
	Import tax				-
	VAT	16.901			16.901
	Income tax	75.739			75.739
	Land tax				-
	Subtotal	92.640	321.125	62.170	475.935
II	Cost				
	Investment costs	-	19.024		19.024
	Production costs		148.774		148.774
	Subtotal	-	167.798	-	167.798
III	Net benefit	92.640	153.327	62.170	308.137
	Rate (%)	30,1%	49,8%	20%	100,0%

FigureH-2: Benefit line of the stakeholders in the project