

SAIGON WATER CORPORATION (SAWACO)
PEOPLE'S COMMITTEE OF HO CHI MINH CITY
THE SOCIALIST REPUBLIC OF VIETNAM

THE PREPARATORY SURVEY
ON
WATER SUPPLY IMPROVEMENT
PROJECT
IN HO CHI MINH CITY

Final Report

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JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

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Abbreviation

ADB	Asia Development Bank
BOO	Build Own Operate
BOT	Build Own Transfer
BT	Build Transfer
BTO	Build Transfer Operate
C/P	Counter Part
CAD	Computer Aided Drawing (Design)
Capex	Capital expenditure
COD	Chemical Oxygen Demand
CPC	Commune PC (People's Committee)
CSR	Compensation, Support and Resettlement
DDT	Dichlorodiphenyl-trichloroethane
DI	Ductile Iron (pipe)
DMA	District Metered Area
DO	Dissolved Oxygen
DONRE	Department of Natural Resources and Environment
DPC	District PC (People's Committee)
DOT	Department of Transportation and Public Works
DPI	Department of Planning and Investment
DSCR	Debt Service Coverage Ratio
EIA	Environment Impact Assessment
EIRR	Equity Internal Rate of Return
ENTEC	Environmental Technology Center
EPC	Engineering, Procurement and Construction
EVN	Vietnam Electricity
GDP	Gross Domestic Product
GL	Ground Level
HCMC	Ho Chi Minh City
HDPE	High Density Polyethylene (pipe)
HHWL	High High Water Level
HWL	High Water Level
IEE	Initial Environmental Examination
IMF	International Monetary Fund
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
JSC	Joint Stock Company
LEP	Law on Environmental Protection
LFDC	Land Fund Development Center
LWL	Low Water Level
M/P	Master Plan
MARD	Ministry of Agriculture and Rural Development
MOIT	Ministry of Industry and Trade
MONRE	Ministry of Natural Resources and Environment

NRW	Non-Revenue Water
MPI	Ministry of Planning and Investment
O&M	Operation & Maintenance
ODA	Official Development Assistance
OMWB	Osaka Municipal Waterworks Bureau
PC	People's Committee
PCCP	Prestressed Concrete Cylinder Pipe
PE	Poly-Ethylene (pipe)
PIRR	Project Internal Rate of Return
PMU	Project Management Unit
PPC	Provincial PC
PPP	Public–Private Partnership
PS	Pump Station
SAWACO	Saigon Water Corporation
SCADA	Supervisory Control And Data Acquisition
SPC	Special Purpose Company
STA	Station
TOR	Terms of Reference
uPVC	Unplasticized polyvinyl chloride (pipe)
USD	U.S. Dollar
VFM	Value for Money
VISTA	Vietnam, Indonesia, South-Africa, Turkey and Argentina
VIWASE	Viet Nam Water, Sanitation and Environment Joint Stock Company
VND	Vietnamese Dong
WB	World Bank
WDP	Water Distribution Plant
WHO	World Health Organization
WSC	Water Supply Company
WSMP	Master plan for HCMC water supply system up to 2025 (Ho Chi Minh City, 2012)
WTP	Water Treatment Plant

Chapter 1. Summarized Report of the project

1-1. Project description, project proposing, implementing and operation agencies

1-1-1 Project Description

According to the characteristic landscape and the economic growth such as population growth, and increasing demand for water, Ho Chi Minh City (HCMC) has serious water supply related issues caused by insufficient water distribution network.

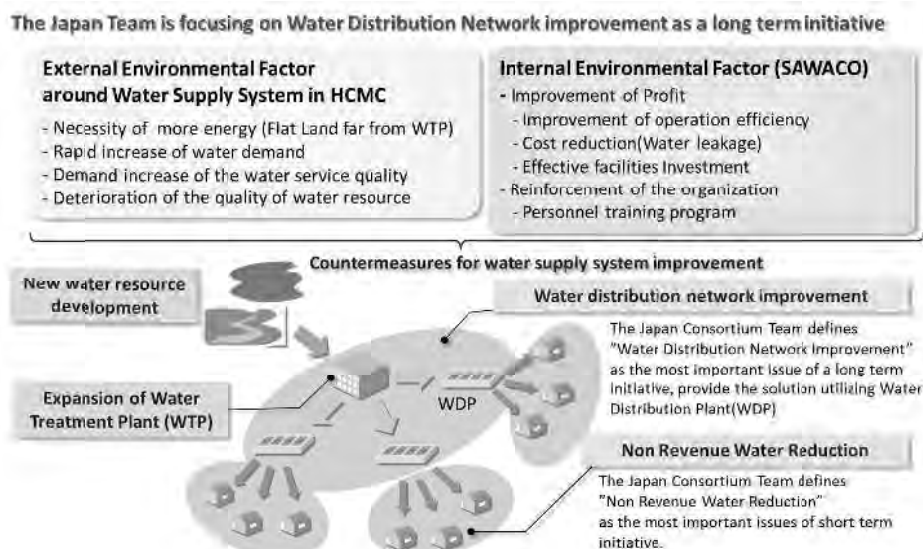


Fig. 1-1 Issues of the Water Sector

JICA study team (the Team) have studied the issues of water sector in HCMC in the previous JICA's study "The Study on Water Supply Improvement in HCMC" and concluded that it is necessary to implement some water distribution reservoirs (WDPs) in whole HCMC.

The report of the previous survey was submitted to HCMC People's Committee and the contents were understood. However, the current status is that the effect and feasibility will be evaluated according to the actual execution plan including this survey.

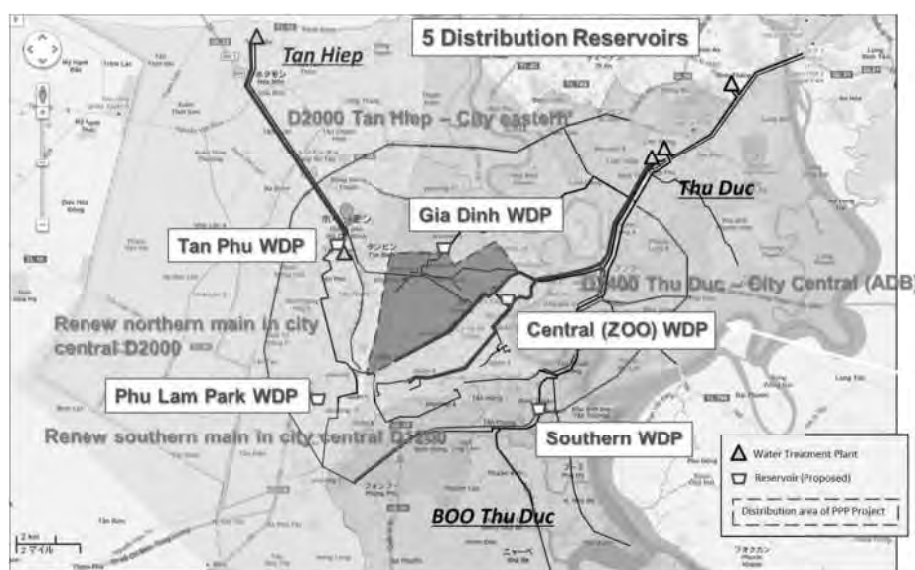


Fig.1-2 Location of 5 WDPs in HCMC (JICA's previous Study)

WDP is the reservoir for treated water which comes from water treatment plants (WTPs), and to distribute water to the target area to satisfy its water demand. The main function of WDP is to adjust time

fluctuation of distribution water, to satisfy water demand and necessary water pressure, and to keep the concentration of residual chlorine in case of dosing chlorine.

With the above function, the WDP can distribute water suitably with enough and even water pressure and residual chlorine.

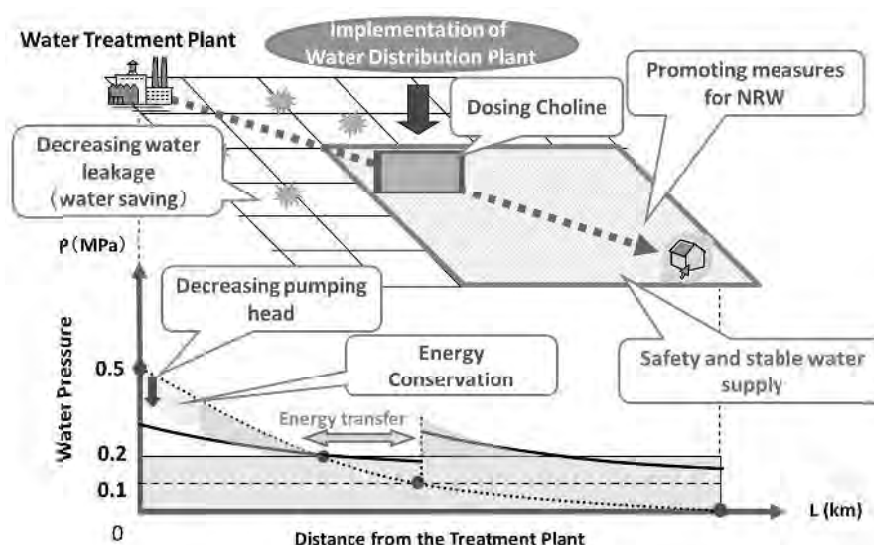


Fig.1-3 Feature of Water Distribution Plant (WDP)

Based on the results of the previous JICA's study, in this preparatory survey (the Survey), the Team conducted a study on business feasibility of 1 WDP as a first step for the future network with 5 WDPs, from the viewpoint of both technical and business aspects.

In the Survey, the Team shared the necessity of WDP early implementation with Saigon Water Corporation (SAWACO) from the point of the following items (The results of calculation is reported in Chapter 7).

■ Realization of WSMP up to 2025

WDPs are indispensable facilities to secure the suitable amount of water, water pressure, and water quality, etc. for increasing water demand in HCMC where the geological conditions are almost flat.

Furthermore, to fit the future demand forecast for 2025 described in Water Supply Master Plan (WSMP), it is important to implement WDP in accordance with the installation of pipelines and expansion of WTPs

■ Reduction of total investment costs

The costs of optimum WDP implementation for the future water demand in WSMP with the maximum use of existing pipeline network can be reduced in comparison with the costs of network implementation with pipeline only.

■ Promotion of smooth water tariff increase

Implementation of WDP enables HCMC citizens to reduce maintenance and operation costs such as receiving tank(s), pumps of each household because WDP can distribute water directly to the tap with enough amount of water, water pressure, and water quality.

WDP can also reduce HCMC citizens' costs for buying bottled water because the water quality improvement enables them to use tap water.

From the view of climate change, the operational optimization of WTP and WDP pumps can save

the energy, and can also reduce the energy of pumps at each households and CO2 from conveying bottled water.

In terms of public healthcare, WDP can contribute to the public healthcare improvement by securing the concentration of residual chlorine suitable and even in whole HCMC

These effects hereinabove improves water supply service levels and it enables HCMC citizens to accept the tariff increase.

■ Profit increase

To optimize the operation of WTP and WDP enables to reduce energy costs. Furthermore, to secure the suitable and even water pressure in whole HCMC can promote water leakage detection and reduction, and then it enables sales increase.

1-1-2 Project responsible agencies

The Survey, supported by JICA, was conducted by Japan Consortium Team which consists of Toyo Engineering Corporation, Osaka Municipal Waterworks Bureau, Pricewaterhousecoopers Co, LTD., and Panasonic Environmental and System Co. LTD,

Toyo Engineering, on behalf of the Japan Consortium Team, is in charge of “Project Management” of the Survey, engineering of the facilities, and consideration of business development. Osaka Municipal Waterworks Bureau is in charge of studying technical issues such as optimum water distribution network design, business operation, etc. Pricewaterhousecoopers is in charge of considering business scheme, business relating issues. Panasonic Environment & System Engineering is in charge of designing control system.

1-2. Project Implementation Schedule

At the end of the Survey, the Team will submit the report to Ho Chi Minh City People’s Committee (HCMC-PC). After the approval of HCMC-PC, the project will move to the next “Execution Phase”.

According to the necessity of early implementation of WDP which is described in the previous section, it is desirable to start the operation in 2017. However, in actual, 2 types of the application procedure for execution (direct appointment or tender process) will be selected according to HCMC side’s judgment. Therefore these 2 types of schedules shown in Fig.1-4 can be assumed.

As of July, 2015, SAWACO is planning to reconsider total distribution network after the Survey, and as a result, SAWACO will discuss with HCMC-PC and create an actual plan for execution

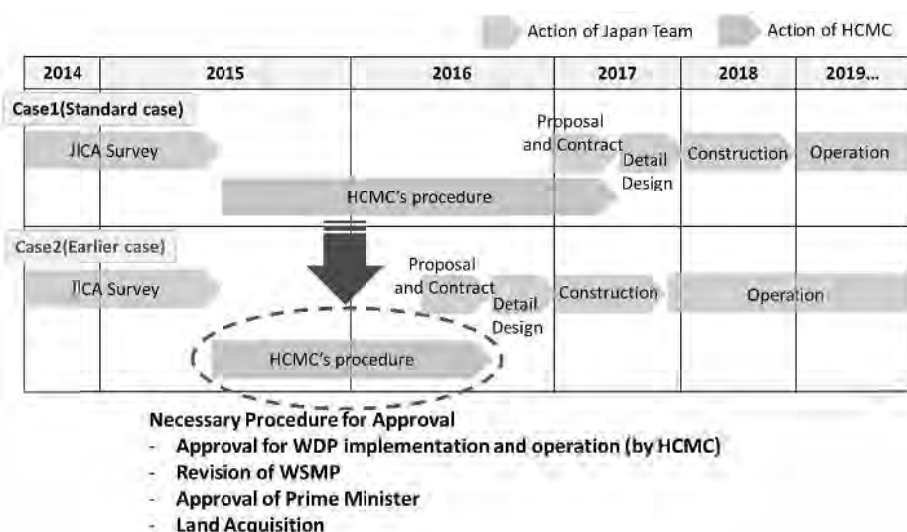


Fig.1-4 Project Implementation Schedule

1-3. Project Site

Basically, WDP will secure the amount of water, water pressure and water quality. Therefore, utilization of WDP can improve water distribution pressure and insufficient water at the end of the water distribution network.

Therefore, in the Survey, we choose 1 WDP based on the previous JICA's study, and analyze the effects.

Fig.1-5 shows location and distribution area of Gia Dinh WDP, which is prioritized in the previous JICA's study.

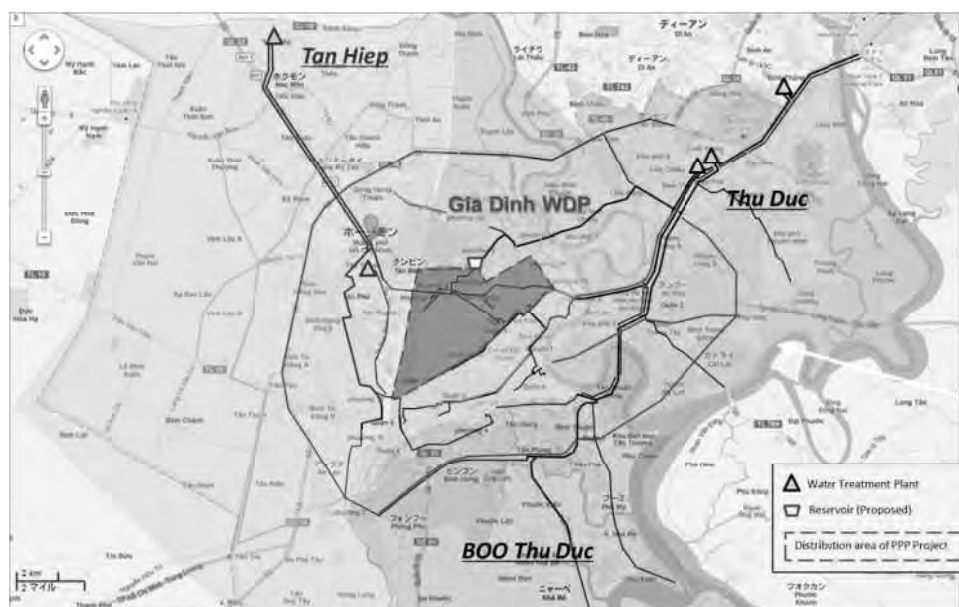


Fig.1-5 Project Site of Gia Dinh WDP and its distribution area

1-4. Project Funding

To estimate the total project costs and/or business execution costs, all the conditions for the business relating issues such as loan currency (Japanese Yen or US Dollar), loan methods (Direct or 2step loan), loan conditions, governmental subsidy, SAWACO's payment schedule, etc., should be set based on the discussion and confirmation among SAWACO (including HCMC), the Team, and funding authorities.

However, actual contract matters will be discussed after the submission of the Report to HCMC's relevant authorities, in this survey report (the Report), the Team provide some business relating calculation sheets including funding information, but these are for reference only based on some assumed conditions but not yet confirmed by relevant authorities, stakeholders, etc.

Chapter 2. Project context and rationale

2-1. Social and Economic Environment

As preconditions, the Team reconfirmed the necessity of the water distribution plant based on the current status of Economy, water supply system, future network plan, issues and supports.

Basically, there are no big differences in water sector and the background for WDP implementation from the previous JICA's survey.

2-1-1 The country's macro economy and development policies

The cities in developing countries, with the economic growth such as population growth, and increasing demand for water, have a variety of challenges in managing its operations and enhance water system. In the water system to be developed and operated in accordance with the growth of those cities, the Study Team consider that there seems to be a huge business opportunity and technology, due to taking advantage of the operational know-how of local governments in Japan.

Vietnam is in particular one of the remarkable economic growth countries of VISTA, and infrastructure development has become an issue in accordance with the future development.

Ho Chi Minh City, along with the capital Hanoi, is expected to evolve as an important city of Vietnam, and the infrastructure becomes urgent issue as a result.

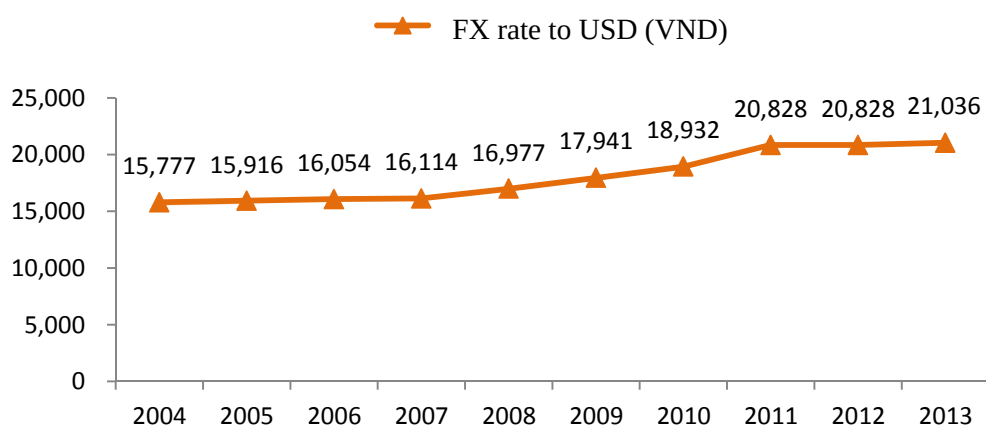
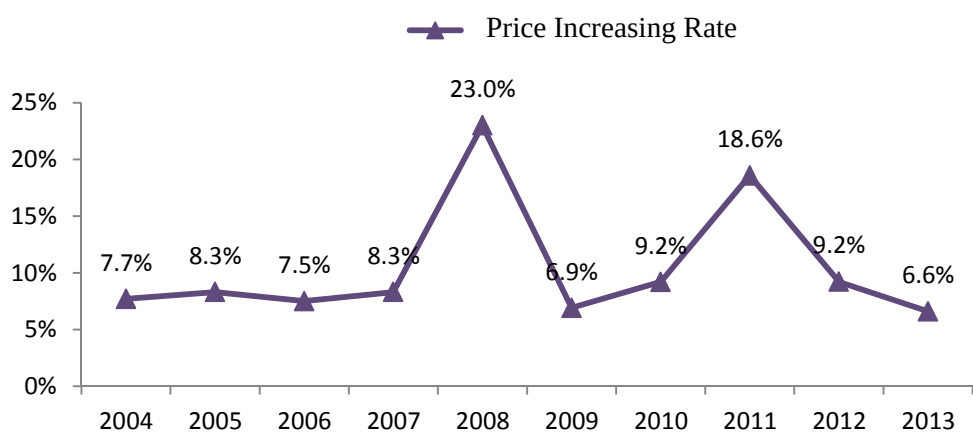
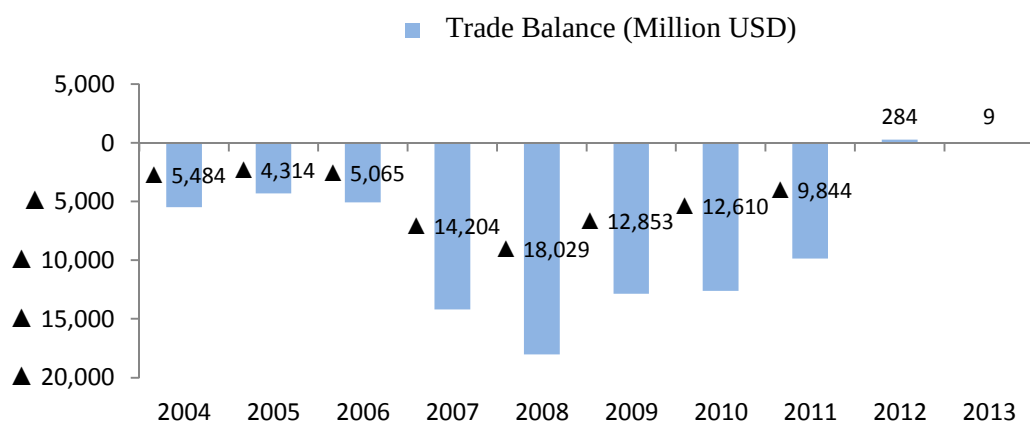
Tab.2-1 Overview of Ho Chi Minh City

	Ho Chi Minh City	Ref. Osaka City
Population	7,162,864	2,667,817
Area	2,095 km ²	222 km ²
Density of Population	3,419persons/km ²	12,001persons/km ²

Note: HCMC by the year 2009 statistics, Osaka City as is Aug. 1 in 2010

■ Economic Climate

Vietnam's real GDP growth rate for the period 2004 to 2013 was approximately 5 to 7% on an annual average, and the latest rate for 2013 alone was 5.4%, which is a sign of the country's continuing long-term high growth. In proportion to its economic growth, imports have increased for building infrastructure and the country is annually recording a trade deficit. This trade deficit is a cause for the weak dong which in turn has resulted in a hike in import prices and led to inflation. Furthermore, because of such rising prices, people cannot trust their local currency and tend to purchase the dollar or real assets, and this situation has led to further inflation. In 2010, the government has raised both the bank rate and lending rate in order to hold down the rise in prices, and although the inflation rate could be controlled. After that, in 2012, the government loosened monetary policy but excessive inflation didn't occurred and stable GDP growth had been accomplished



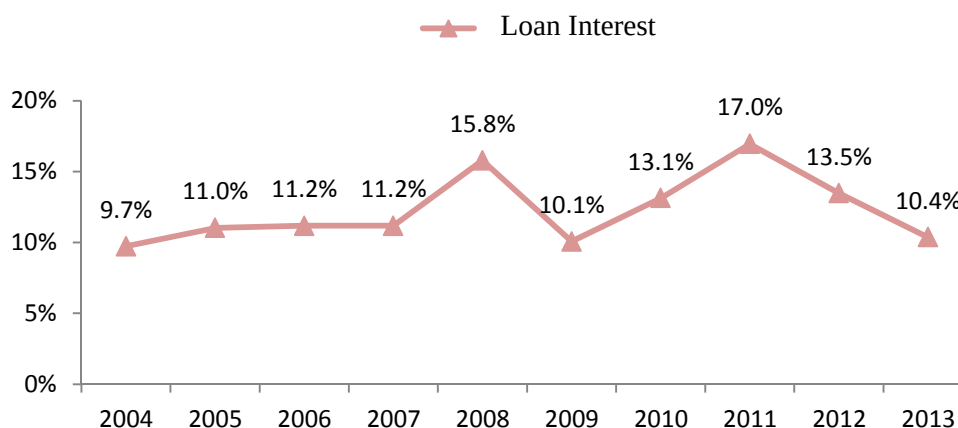


Fig.2-1 Vietnam's economic indicators
<Provided by: Japan External Trade Organization, IMF>

■ Financial condition

In order to resolve the significant inflation described above, the government officially announced Government Resolution No.11 on February 24, 2011, and changed its policy from aiming for economic growth to controlling inflation and stabilizing the economy. Specifically, 2 pillars were established, namely, the monetary and fiscal policies; the monetary policy's goal was to control the increase in credit to below 20%, while the fiscal policy aimed to increase revenue by 7-8% and to reduce expenditure by around 10%. As a result of such monetary policy being taken, Vietnam's lending rate greatly rose to a high level of 17% in 2011, but dropped to 12.4% as of November 2012 as monetary easing measures were taken thereafter. Most recently, the government has set a goal of 5.5% for 2013 real GDP growth rate and an inflation rate of below 8%. It is considered that in 2013, the government will continue its tight monetary policy, and implement measure to stabilize its currency, control inflation and stabilize the macro economy under Government Resolution No.11, same as for 2012.

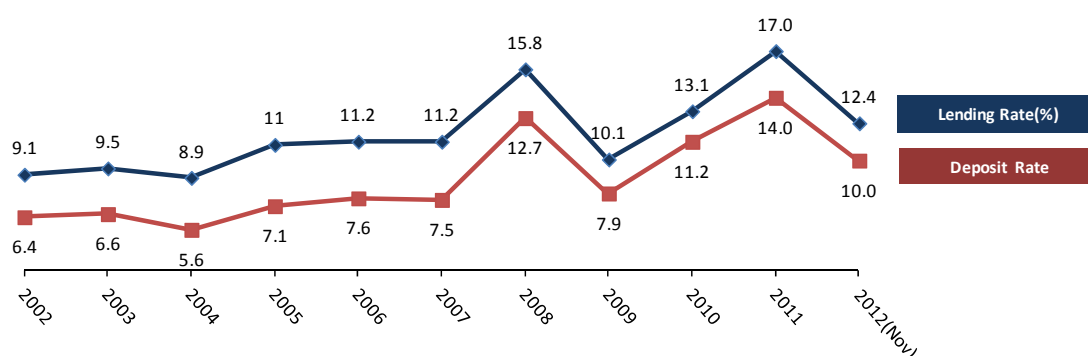


Fig.2-2 Vietnam's interest rate
<Provided by: Japan External Trade Organization, IMF>

2-1-2 Framework conditions and background of the project

In HCMC, the current water supply business is provided by Saigon Water Corporation (SAWACO). In HCMC, the first water company was founded by France in 1874. And Ho Chi Minh City Water Supply Corporation was founded in 1975 as then, has come to be reorganized into the current Saigon Water Supply Corporation (SAWACO), in 2005. It should be noted that the Osaka City Waterworks Bureau and SAWACO, in December 2009 have entered into a "Memorandum on technology exchange".

In the current status of water supply in HCMC, water supply capacity is insufficient at the present time,

the expected rapid increase in water demand requires additional challenges in the future. The specific issues are as follows.

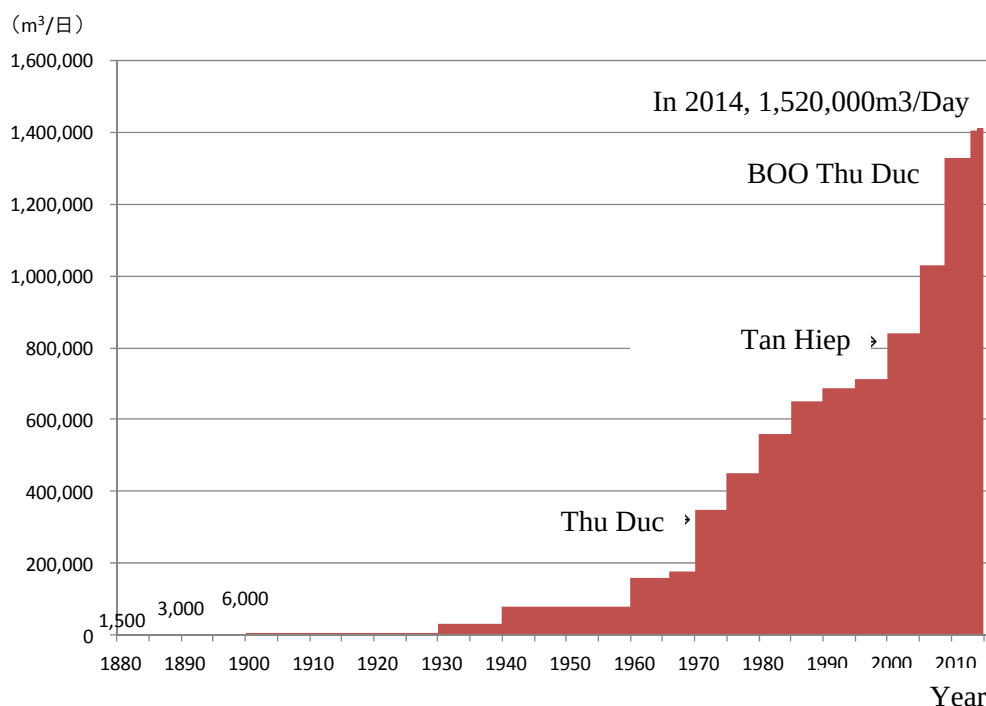


Fig.2-3 Transition of Water Supply Capacity in Ho Chi Minh City

In HCMC, the ability for water supply is 1,550,000 m³/day and insufficient, because the quantity of present potential water demand is estimated 1,800,000 m³/day (as of September, 2014). WTP implementation is conducted steadily in spite of its delay.

Tab.2-2 Feature of Water Treatment Plant (Capacity, Water Source, and Treatment Methods)

(As of 2014)

	Normal Capacity (m³/day)	Water Source	Treatment Method	Notes
Thu Duc WTP	700,000	Dong Nai River	Coagulation Sedimentation Rapid sand filtration	
Binh An BOT WTP	100,000			Receive from other company
BOO Thu Duc WTP	300,000			Receive from other company
Tan Hiep WTP	270,000	Sai Gon River		
Kenh Dong WTP	75,000	Kenh Dong Canal		Receive from other company
Tan Phu WTP	65,000	Underground water	Aeration, Sand filtration	
Others	10,000	Underground water		Receive from other company (Partially)
Total	1,520,000			

- Ho Chi Minh City's population growth rate is high and future population growth (currently about 2% per year) due to the economic development and etc., from the current 7.82 million (as of 2013, General Statistics Office of Vietnam) to 13 million in 2025 are expected in WSMP.
- Water Treatment Plant is planned to be implemented, however, the water demand will increase rapidly, low pressure at the fringe, and water deterioration will be concerned.
- In Dong Nai River and the Saigon River which are the current sources of water supply, the intake point has been affected by the intrusion of sea water according to the fluctuation of the sea level.

Furthermore, water pollution is caused by the development of each riverside in the upstream because waste water is exhausted as a state of non-processing or insufficient processing into the public waters

Tab.2-3 Overview of supply water in HCMC

	Present(Sep,2010)	Master Plan up to 2025
Provided by	SAWACO	-
Water source	River, Underground water	-
Population	approx. 7million persons	13million persons
Capability	1.55million m3/day	3.4million m3/day
Water supply ratio	Approx.85%	100%
NRW ratio	Approx.40%	25%
Unit Consumption	Approx.150L/capita, day	Approx.200L/capita, day

Based on the overview hereinabove, the issues and measures are as follows:

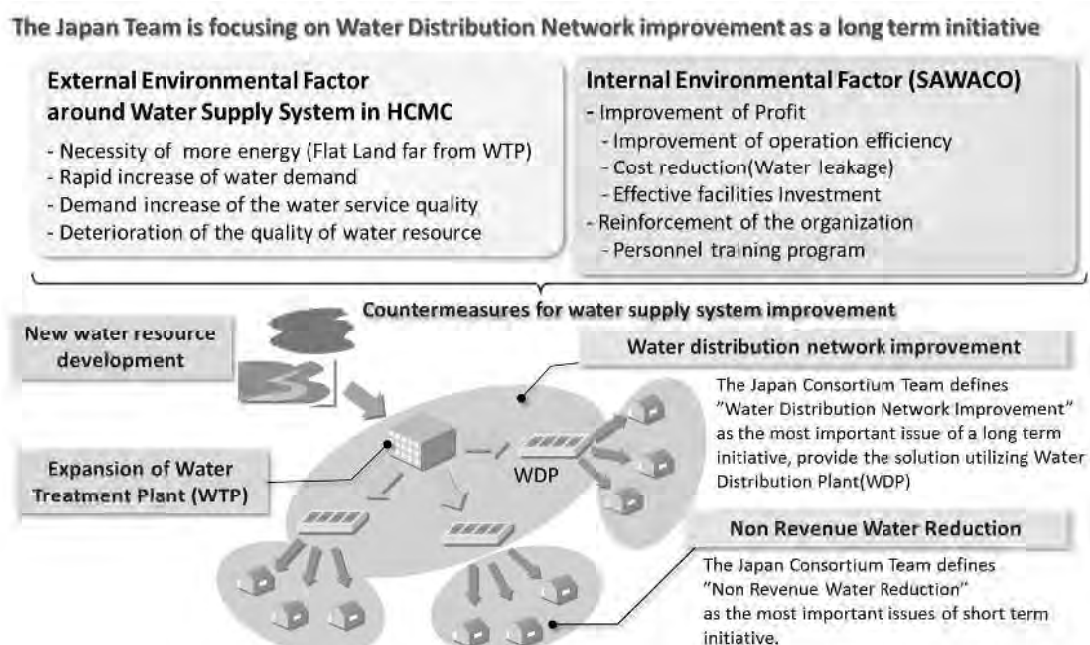


Fig. 2-4 Issues of the Water Sector

As for these issues in water supply system in HCMC, the above 4 approaches were studied in the previous JICA's study. And the Team studied on new water source, water supply network, and improvement of non-revenue water based on the existing future plan of water treatment plant extension.

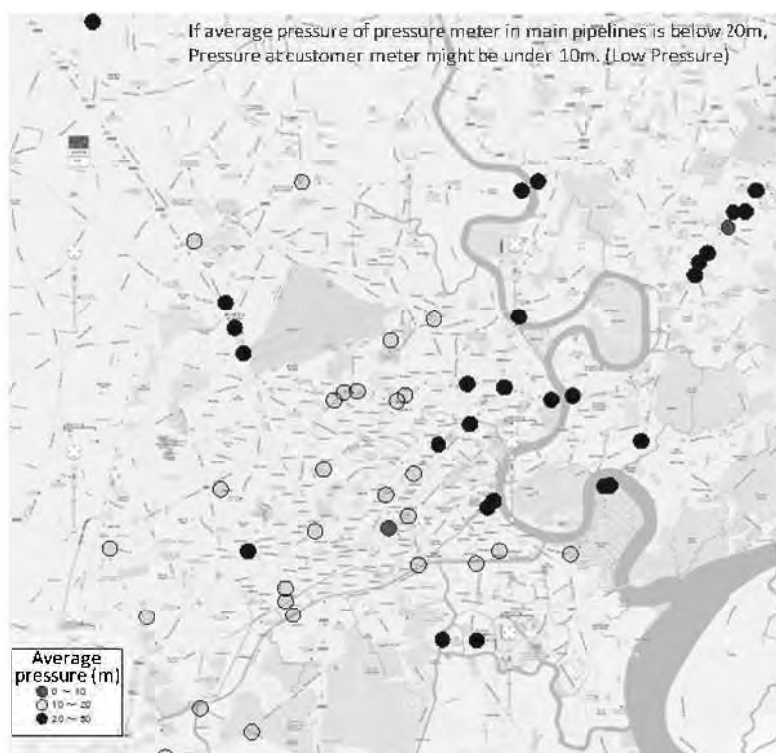


Fig. 2-5 Low Water Pressure Area in HCMC (at main pipelines)

As for new water source development, the plan is already described in WSMP, therefore, in the previous JICA's study, the Team studied its feasibility. However, as for water supply network, the Team pointed out that future network plan described in WSMP itself has big issues.

2-1-3 Market: demand and supply analysis

Estimated future water demand is very important precondition to study optimized distribution network for future HCMC.

In WSMP, users were categorized in domestic use (resident), industrial use, public use, commercial use, and for non-resident use, and estimated for future. Basic units and/or related indexes are described in Tab.2-3 ~2-7as follows. Fore reference, population forecasts based on other consideration is shown in Fig.2-8

Tab.2-4 Covering ratio and basic unit for domestic use

	2015		2025	
	Served percentage	Standard (l/person/day)	Served percentage	Standard (l/person/day)
Old inner city	100%	180	100%	180
New inner city	98%	180	100%	180
Suburb area	98%	130	100%	180

WSMP table 8.4.

Tab.2-5 Basic unit for industrial use

Industrial use	35	m3/ha/day
Small industry	5-10%	(Ratio to domestic use)

Tab.2-6 Water demand for public and commercial use

Public services	5-10%	(Ratio to domestic use)
Commercial services	5-10%	(Ratio to domestic use)

Tab.2-7 Ratio and basic unit for non-resident

	2015		2025	
	Non-resident rate according to total city population	Standard (l/person/day)	on-resident rate according to total city population	Standard (l/person/day)
Old inner city	15%	35	25%	35
New inner city	15%	30	25%	30
Suburb area	15%	25	25%	25

Tab. 2-8 Estimated future water demand, population, area for industrial zone

District	design maximum daily supply		Population in 2025 (persons)			Industrial Zone (ha)
	2015	2025	Minimum	Maximum	Average	
1	65,877	69,932	200,000	205,000	203,000	
2	152,187	218,709	600,000	650,000	625,000	124
3	67,658	73,429	200,000	220,000	210,000	
4	60,536	71,680	200,000	210,000	205,000	
5	62,316	73,429	200,000	220,000	210,000	
6	89,023	101,401	280,000	300,000	290,000	
7	100,378	121,505	350,000	350,000	350,000	300
8	151,340	162,592	450,000	480,000	465,000	
9	145,055	200,620	400,000	400,000	400,000	460
10	78,340	87,415	240,000	260,000	250,000	
11	72,999	80,422	210,000	250,000	230,000	
12	137,403	157,566	450,000	450,000	450,000	28
Phu Nhuan	62,316	66,435	180,000	200,000	190,000	
Tan Binh	149,559	153,850	420,000	460,000	440,000	
Tan Phu	151,151	158,813	400,000	465,000	433,000	134
Binh Thanh	174,486	188,816	520,000	560,000	540,000	780
Go Vap	176,266	202,803	500,000	670,000	585,000	
Thu Duc	163,014	198,188	550,000	550,000	550,000	151
Binh Tan	197,256	216,334	550,000	550,000	550,000	
Cu Chi	170,000	274,000	700,000	800,000	750,000	1,215
Hoc Mon	86,943	189,473	600,000	700,000	650,000	210
Binh Chanh	120,928	252,441	700,000	800,000	750,000	248
Nha Be	83,695	175,717	400,000	400,000	400,000	952
Can Gio	31,274	74,430	200,000	300,000	250,000	105
URBAN	2,257,160	2,603,939	6,900,000	7,450,000	7,176,000	1,977
SUB-URBAN	492,840	966,061	2,600,000	3,000,000	2,800,000	2,730
TOTAL	2,750,000	3,570,000	9,500,000	10,450,000	9,976,000	4,707
exclude for Cu Chi	2,580,000	3,296,000	8,800,000	9,650,000	9,226,000	3,492
(source)	table8-7 (VIWASE)	table8-8 (VIWASE)	WSMP table5.2	WSMP table5.2		table8-7 (VIWASE)

2-2. Project objective and rationale

2-2-1 Project background

The Team has studied the issues on water supply network in HCMC. The followings are the history of the approach.

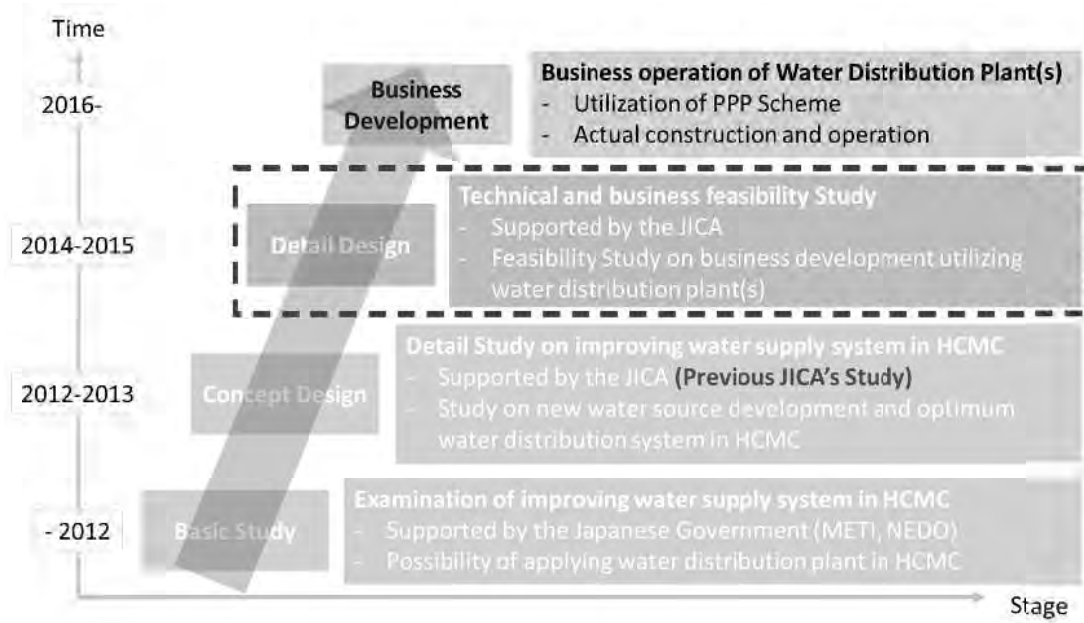


Fig. 2-6 Tracking Record of JICA Study Team

The study on the utilization of WDP for HCMC started in 2009, as the survey supported by NEDO, and the Team has discussed with SAWACO regarding the WDP's effects. In the previous JICA's study, the Team concluded that WDPs are essential elements for the future water supply network of HCMC.

The main reason is that without WDP (with the implementation of WTP and pipelines only, based on the WSMP approved in June, 2012), SAWACO can't supply water with sufficient water pressure for the future water demand in 2025.

The followings are the short contents of the previous JICA's study which are the basis of the Survey.

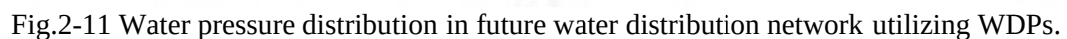
1.Reviewing	2.Setting Study Policy	3.Setting Evaluation Criteria	4.Network Analysis	5.Optimum Distribution Network for 2025
Existing documents and reports - WSMP up to 2025 - Options study for distribution network in ZONE 1&2 (World Bank) - TA for ADB project	Through discussions with SAWACO - Utilizing existing water distribution network assets (Pipelines, pumping stations, reservoirs in WTPs) - Setting distribution areas considering rivers/canals, main roads	Through discussions with SAWACO - Cost effectiveness - Energy saving - Minimize NRW (Balance water pressure in distribution areas)	Based on VIWASE model for WSMP - Creating distribution network alternatives along with study policy - Network analysis - Comparing alternatives along with evaluation criteria	Result of network analysis

Fig.2-7 Procedure of the previous JICA's Study

For these issues, the Team proposed 7 distribution areas with the implementation of 5 WDPs as the best solution to control the water supply pressure suitably in the future water supply network as shown in Fig. 2-10.



Fig.2-10 shows the results of the water network analysis of water pressure improvement by implementing water distribution network utilizing WDPs.



Basically WDP implementation is planned according to the water demand increase. Therefore, in the previous JICA's Study, the Team considered the priority of water distribution reservoirs according to the WSMP implementation schedule.

As a result, the Team confirmed with SAWACO that 1st priority is Gia Dinh WDP because its distribution area is city central where water demand will reach to the peak soon and created the 5 WDPs implementation plan shown in Fig.2-12.

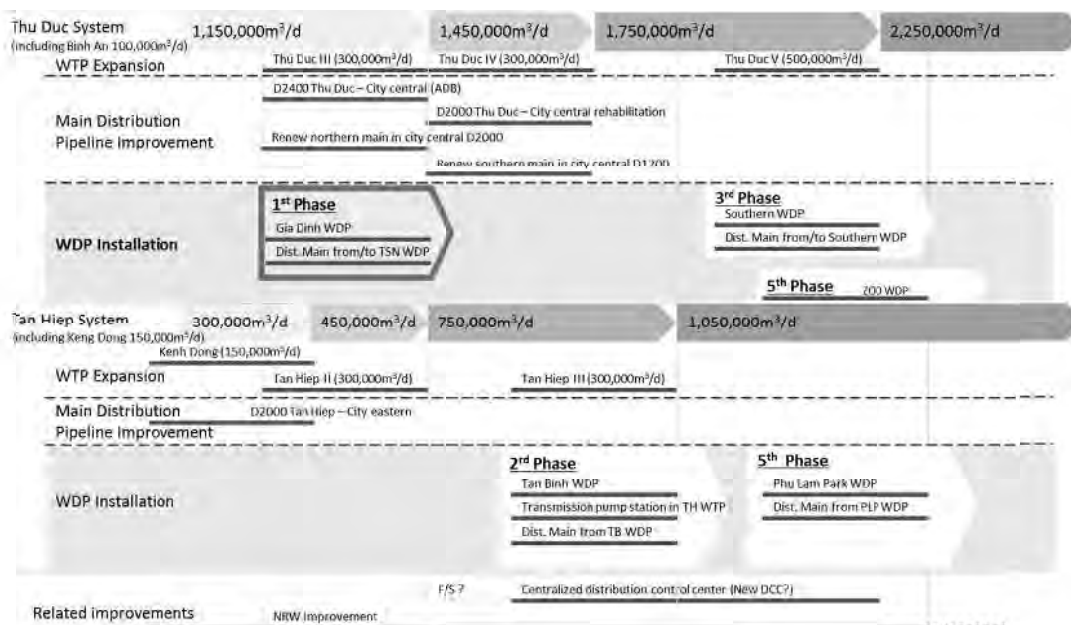


Fig.2-12 WDP implementation plan

The aim of the Survey is set to evaluate the feasibility of business development regarding the implementation and operation of the first WDPs.

Contents of the previous study

In the previous study, The JICA team conducted the study on the following 3 themes:

1. New Water Source Development...intake facilities and conveyance routes from 2 lake
2. Optimization of distribution network and future implementation plan
3. Technical Transfer

Relation between the previous study and this Preparatory Survey

As for the no.2 of the previous study, based on the defined future implementation plan, the JICA Team is planning to conduct this Survey as a first step for the business execution.

Therefore, the result of the previous study needs to be agreed (and/or authorized by SAWACO, at least during this Survey) by both SAWACO and the JICA team as preconditions for the Preparatory Survey.

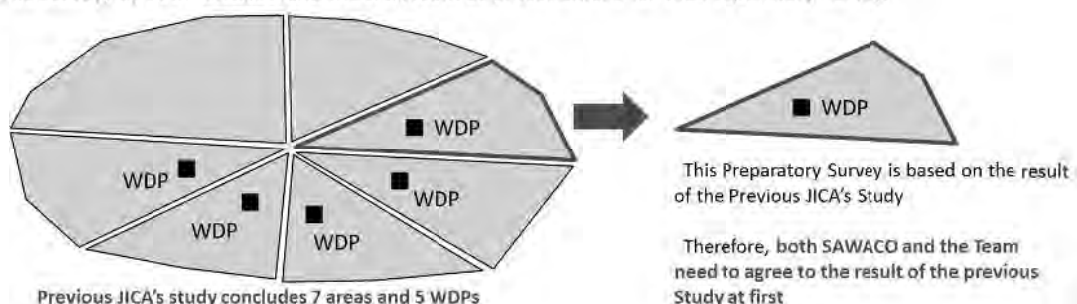


Fig.2-13 Purpose of the Preparatory Survey

In the actual business planning, as shown in Fig.2-14 and Fig.2-15, the distribution area of Gia Dinh WDP is different from that in 2025, because in the startup, Gia Dinh WDP is the only one and the effects need to be different.

Therefore, the Team studied the water distribution area and the effect of Gia Dinh WDP based on the actual pipeline installation progress and water demand forecast.



Fig.2-14 Water distribution area of Gia Dinh WDP (in 2025)

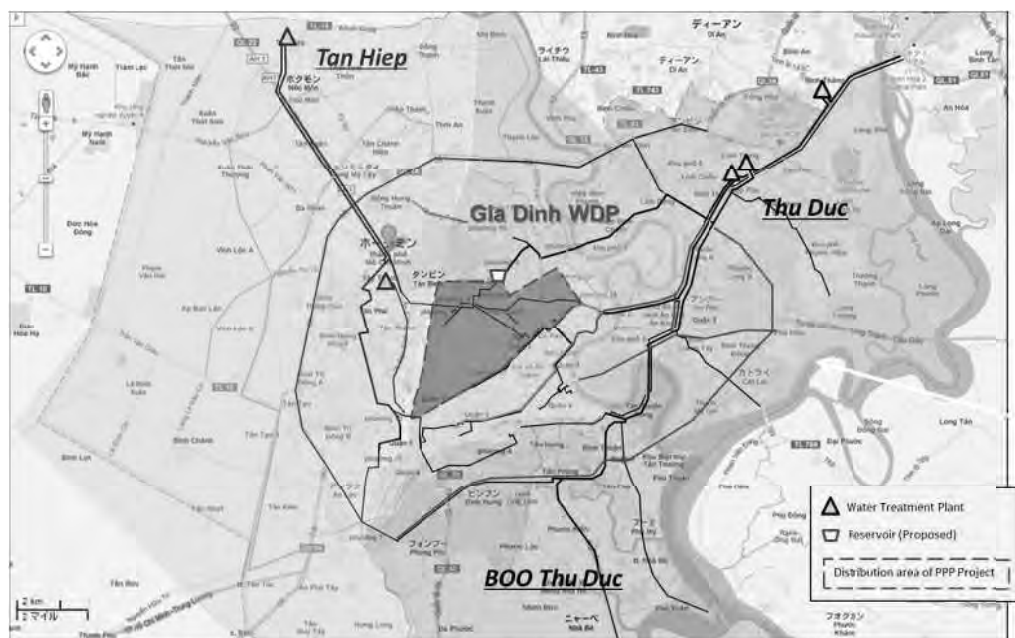


Fig.2-15 Conceptual Image of water distribution area of Gia Dinh WDP (at Startup)

2-2-2 Demand setting for year 2017

In addition to consider the water distribution area of the WDP and WDP operation, the Team conducted network analysis for year 2017 when the WDP will start operation to estimate effects of the WDP. Prior to

consider estimated water demand for year 2017 to set the calculation condition, the Team compared the current water demand (based on customers' consumption) and water demand forecast in WSMP.

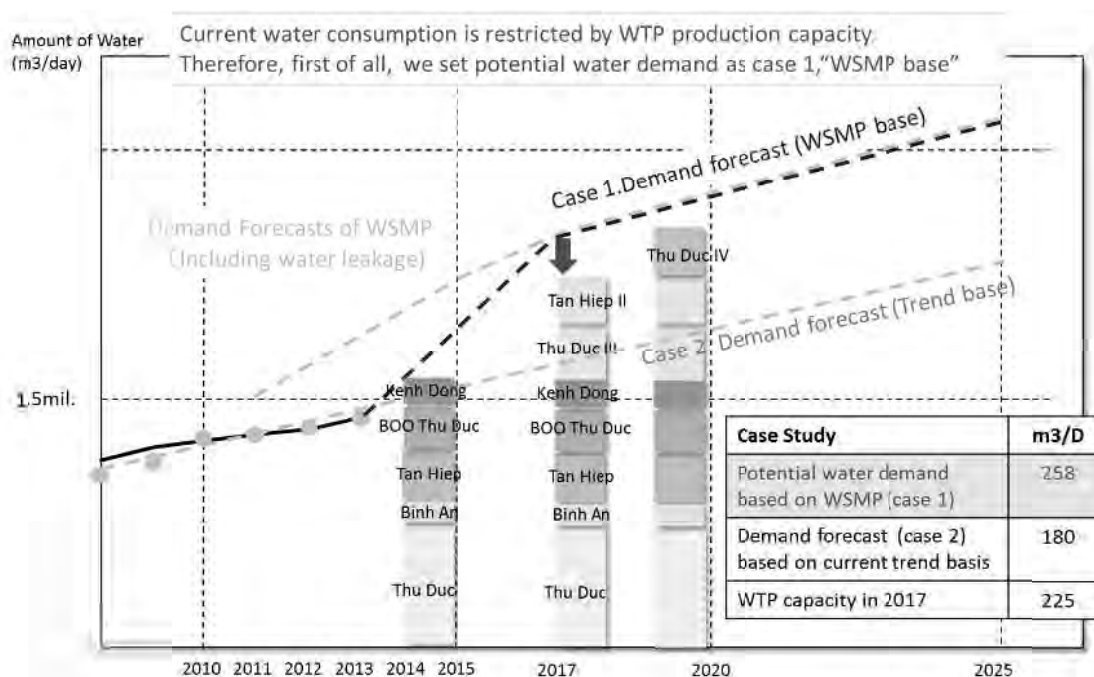


Fig.2-16 Water demand trend and forecast

Fig.2-16 shows 2 options of water demand forecast. The case 1 is based on the demand forecast of WSMP, and the case 2 is based on the water actual consumption trends up to 2013. Fig.2-16 also shows the WTP implementation plan in 2017

First of all, it is obvious that the current water consumption is far below the water demand forecast of WSMP. However it doesn't mean the water demand doesn't increase same as its forecast. Because the water consumption can't exceed the water supply capacity and it doesn't express the potential water demand. This leads the conclusion that the delay of WTP implementation depressed the water consumption.

Furthermore, insufficient water pressure at the fringe of network also seems to depress the water consumption per capita.

Table 2-9 shows the reference data of the water consumption (m3/day) of each meter of each WSC in HCMC. In the WSC near WTP, the water consumption exceeds 1m3/day, meter, but in the WSC which distribute water to district Tan Phu, Tan Binh, 5, 6, 8, and Nha Be, the water consumption is approx. 0.5m3/day, meter because of the location far from WTP.

Therefore, it is quite reasonable to consider that there are some gaps between water consumption and water potential demand

Tab.2-9 Water consumption in each WSC in 2009

WSC	Gia Dinh	Thu Duc	Nha Be	Tan Hoa	Phu Hoa Tan	Cho Lon	Ben Thanh
Consumption m3/D	100,000	110,000	69,156	56,016	87,200	200,000	105,205
Number of Meter	120,000	100,000	83,270	112,000	86,127	290,000	65,000
Consumption m3/D, meter	0.83	1.10	0.83	0.5	1.0	0.67	1.62

Furthermore, the WSMP sets the water demand forecast by taking into account the rapid population

increase and per capita water demand increase from QoL improvement with the recent city development of HCMC up to 2015 and 2025.

Based on the above consideration, in the water network analysis, the Team set the water demand based on the case 1 of WSMP (=potential water demand), not based on the actual water consumption trend.

In the actual demand setting, the Team sets the water demand to each district based on the demand forecast for year 2015 in WSMP. In case the actual water consumption of year 2013 exceeds the demand forecast for year 2015 in WSMP, the actual water consumption of year 2013 is adopted for demand setting.

The next list show the demand setting based on the potential demand for each district.

Tab.2-10 Demand setting for each district in 2017

Demand setting for 2017	Water demand including NRW (2013)					Future Demand Estimation			
	RW(2013)	NRW				Demand	WSMP Demand Estimation		Demand Setting for 2017
	(m3/day)	WSCs (%)	WSCs (m3/day)	Calibration (m3/day)	Overall (%)	(m3/day)	2015	2025	2017/2013
						(P)	(E)		(S) = (P)+(A) (S) / (P)
Bien Hoa (Dong Nai)	16	0.00%	0	1	4.69%	17			17 100%
Di An (Binh Duong)	2,750	0.00%	0	135	4.69%	2,885			2,885 100%
Huyen Can Gio	3,816	38.50%	2,389	188	40.31%	6,393	31,274	74,430	31,274 489%
Huyen Binh Chanh	9,898	20.00%	2,475	488	23.03%	12,860	120,928	252,441	120,928 940%
Huyen Hoc Mon	109	40.00%	73	5	41.72%	187	86,943	189,473	86,943 46473%
Huyen Nha Be	21,065	20.00%	5,266	1,038	23.03%	27,368	83,695	175,717	83,695 306%
Quan 1	67,538	34.00%	34,792	3,327	36.08%	105,657	65,877	69,932	105,657 100%
Quan 10	46,433	23.00%	13,869	2,287	25.81%	62,589	78,340	87,415	78,340 125%
Quan 11	36,011	23.00%	10,756	1,774	25.81%	48,541	72,999	80,422	72,999 150%
Quan 12	11,877	40.00%	7,918	585	41.72%	20,381	137,403	157,566	137,403 674%
Quan 2	34,562	23.48%	10,605	1,702	26.26%	46,870	152,187	218,709	152,187 325%
Quan 3	42,832	34.00%	22,065	2,110	36.08%	67,007	67,658	73,429	67,658 101%
Quan 4	33,204	40.40%	22,507	1,635	42.10%	57,347	60,536	71,680	60,536 106%
Quan 5	50,527	34.00%	26,029	2,489	36.08%	79,045	62,316	73,429	79,045 100%
Quan 6	45,097	34.00%	23,232	2,221	36.08%	70,551	89,023	101,401	89,023 126%
Quan 7	85,798	20.00%	21,449	4,226	23.03%	111,473	100,378	121,505	111,473 100%
Quan 8	64,054	34.00%	32,997	3,155	36.08%	100,206	151,340	162,592	151,340 151%
Quan 9	35,289	23.48%	10,828	1,738	26.26%	47,856	145,055	200,620	145,055 303%
Quan Binh Thanh	86,644	41.50%	61,465	4,268	43.14%	152,377	174,486	188,816	174,486 115%
Quan Binh Tan	52,241	34.00%	26,912	2,573	36.08%	81,726	197,256	216,334	197,256 241%
Quan Go Vap	34,853	40.00%	23,235	1,717	41.72%	59,804	176,266	202,803	176,266 295%
Quan Phu Nhuan	27,314	41.50%	19,377	1,345	43.14%	48,037	62,316	66,435	62,316 130%
Quan Thu Duc	55,491	23.48%	17,027	2,733	26.26%	75,251	163,014	198,188	163,014 217%
Quan Tan Binh	51,627	37.00%	30,321	2,543	38.90%	84,491	149,559	153,850	149,559 177%
Quan Tan Phu	37,393	37.00%	21,961	1,842	38.90%	61,196	151,151	158,813	151,151 247%
TOTAL	936,440		447,552	46,124		1,430,116	2,580,000	3,296,000	2,650,506 185%
					Overall NRW	34.52%	Planned capacity		2,270,000

* Calibration is allocated to each district according to water leakage of transmission line.

Based on the concept hereinabove, as a result, the total demand is assumed to be 2.65 million m3/ day in 2017. On the other hand, the water supply capacity will be 2.27 million m3/day based on the WTP implementation plan of SAWACO as described in Tab.2-11.

Tab. 2-11 Assumed water supply capacity of WTP in 2017

WTPs Capacity (2017 plan)	
Thu Duc I	750,000
(Binh An)	100,000
Thu Duc II (BOO)	300,000
Thu Duc III	300,000
Tan Hiep I	300,000
Kenh Dong	150,000
Tan Hiep II	300,000
Tan Phu	70,000
Total	2,270,000

Therefore, the potential demand in 2017 will exceed the planned water supply capacity in 2017. The next section shows the affection of this insufficient water supply capacity.

2-2-3 Network analysis results and issues

To consider countermeasures for the insufficient water supply, first of all, the Team checked the balance of water supply and demand for each WTP supply area.

Based on the potential demand in 2017, the Team sets the demand for each node. Considering current water supply area of each WTP, the Team conducted network analysis.

- The analysis model is created considering the following items:
- Current existing pipeline, new installation and renewal pipeline plan
- Demand setting
- Treated water quality of water treatment plants: residual chlorine density

In the course of the analysis, the Team confirmed the current water demand and water pressure, and proves the equivalence of water network analysis model, and agreed the validity of the results of the analysis with SAWACO.

As a result, the water supply from each WTP to satisfy potential demand in 2017 and pressure distribution for the potential demand are as follows:.

Tab.2-12 Calculated water supply from each WTP

Results of calculation	Thu Duc	BOO Thu Duc	Tan Hiep	Tan Phu	Total
(CMH)	60,667	13,439	32,557	2,965	109,628
(CMD)	1,456,008	322,536	781,358	71,170	2,631,072
	55.3%	12.3%	29.7%	2.7%	100.0%
Capacity(Planned)	1,150,000	300,000	750,000	70,000	2,270,000

Tab.2-12 says insufficient water supply occurs especially in Thu Duc system. On the other hand, in the other water supply area of WTP, the potential demand and water supply capacity are almost equal.

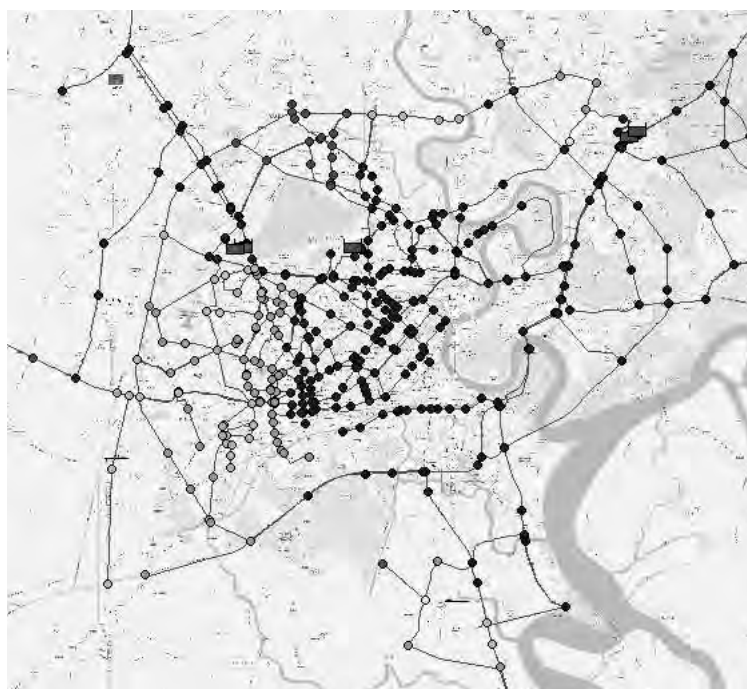


Fig.2-17-1 Result of network analysis: Pressure Distribution (@average flow)



Fig.2-17-2 Result of network analysis: Pressure Distribution (@peak flow)

On the other hand, from the results of the water pressure analysis in Fig.2-17-1, 2, the water pressure of Tan Hiep water distribution area is quite low.

From network analysis, two (2) big issues can be identified. One is an issue on insufficient capacity of network pipes in Tan Hiep System, and the other issue is on insufficient water supply capacity on Thu Duc System.

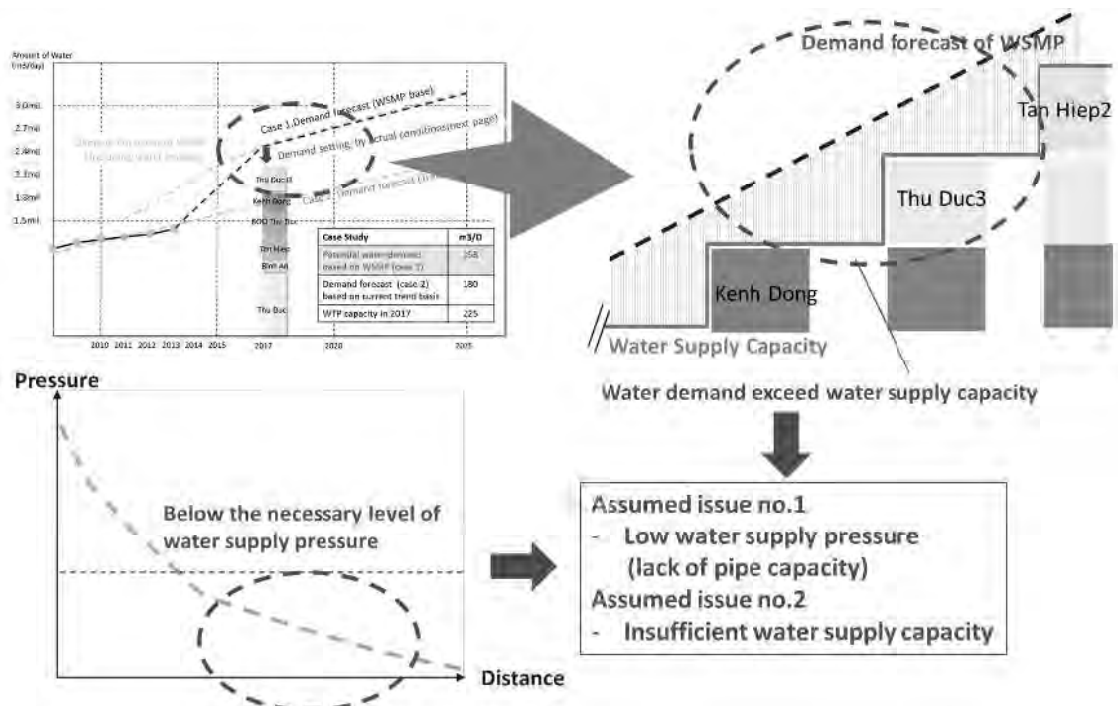


Fig.2-18 Major issues on water supply network in HCMC

Lack of pipeline capacity causes insufficient water pressure at the fringe. On the other hand, in case pipeline capacity is enough but the implementation of WTP is delay, the water supply capacity will be short and the customers cannot be supplied with sufficient water. These issues will happen to Tan Hiep and Thu Duc systems.

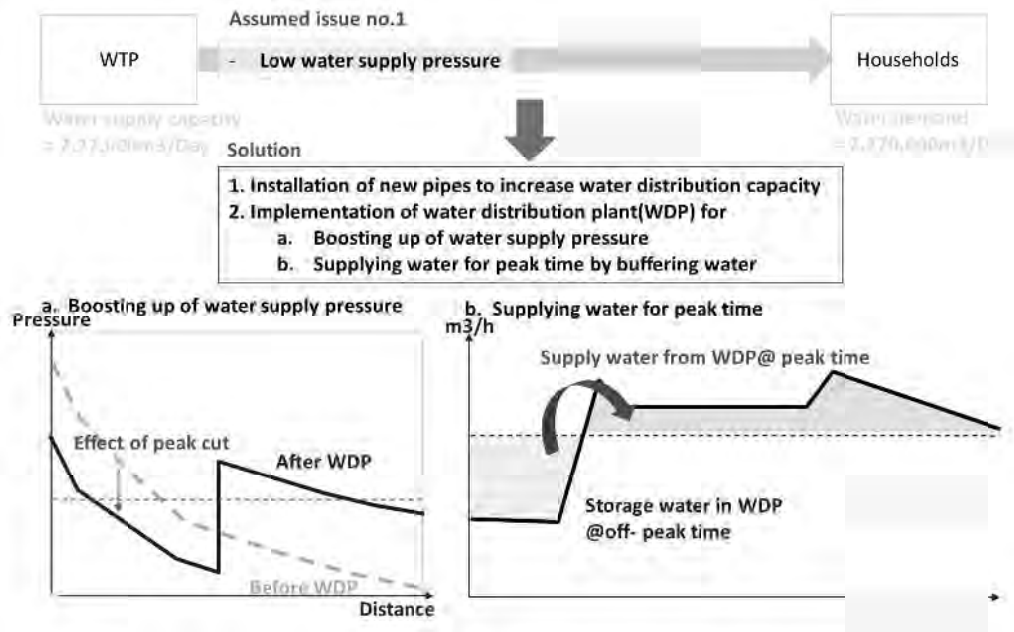


Fig.2-19-1 Solutions for the assumed issues

As for the issue on low water pressure caused by lack of pipeline capacity, the solutions of “installation of new pipelines” and/or “implementation of WDP” are effective. Fig.2-19-1 shows the effect of WDP for this issue, and the effect was already analyzed in the previous JICA’s study.

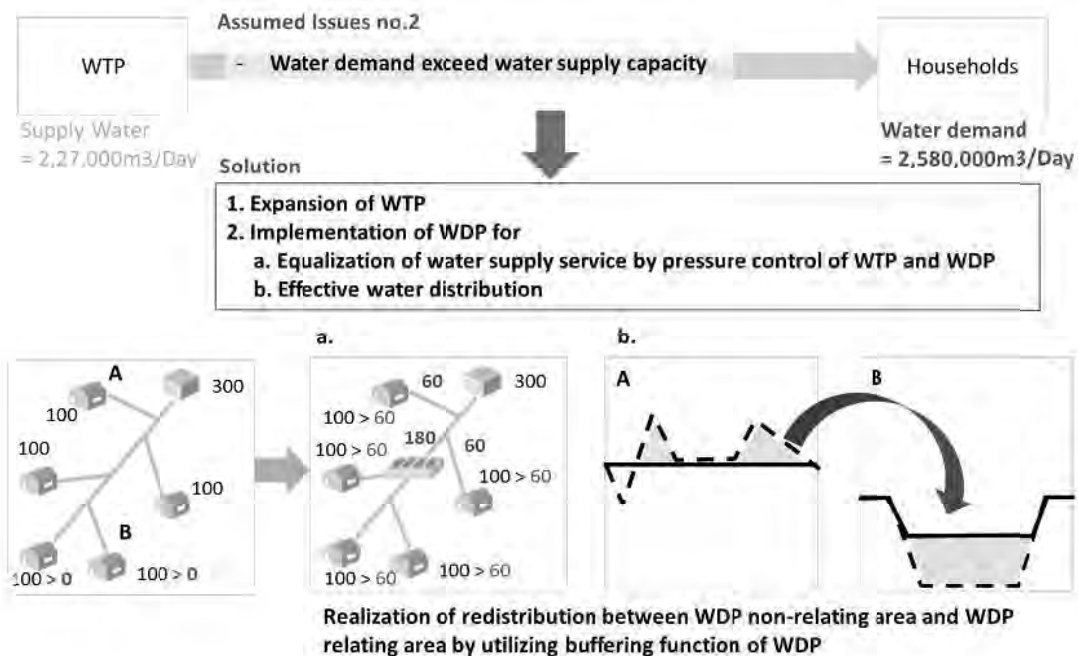


Fig.2-19-2 Solutions for assumed issues

On the other hand, as for the issues on insufficient water supply, the early expansion of WTP is the direct solutions, and NRW reduction is also effective as indirect solution. However, in the current situation of WTP implementation schedule’s delay, the water supply system cannot help utilizing the present available

supply water.

In this case, the alternative method is to utilize the WDP's function of storage water. The WDP stores the water of other distribution area and supply water to its distribution area, and can improve uneven distribution of insufficient water supply area. (Fig.2-19-2)

The impact of these issues for Thu Duc and Tan Hiep systems are shown in Fig.2-20 and Fig.2-21.

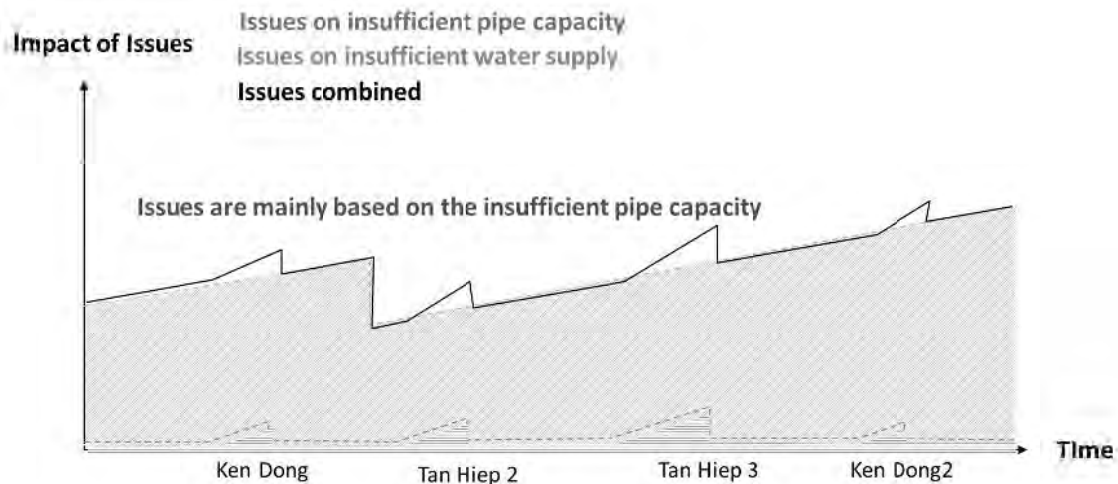


Fig.2-20 Image of issues on Tan Hiep System in case of without WDP

In Tan Hiep system, the water treatment plants are well-planned for demand increase; therefore, there are no issues for the amount of water supply. However, for lack of insufficient pipeline capacity, low water pressure at the fringe of the network will occur at all time.

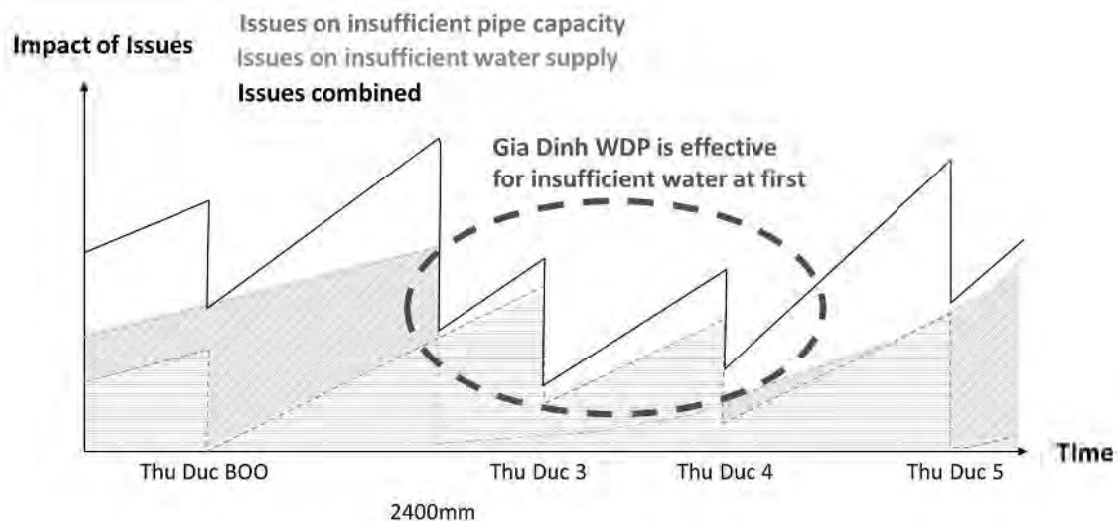


Fig.2-21 Image of issues on Thu Duc System in case of without WDP

On the other hand, in Thu Duc system, installation of 2,400mm pipes can improve temporarily low water pressure caused by lack of pipeline capacity. However, the delay of WTP implementation will cause many issues on insufficient amount of supply water in the current demand increase forecast.

As for Tan Hiep system, the issue in 2017 will be the same as that we already studied in the previous JICA's Study for 2025. However, the issue of Thu Duc system is different from that of 2025; therefore we focused on the Thu Duc system.

Fig.2-22 shows Customer's satisfaction as for potential water demand in case potential water demand exceeds supply water.

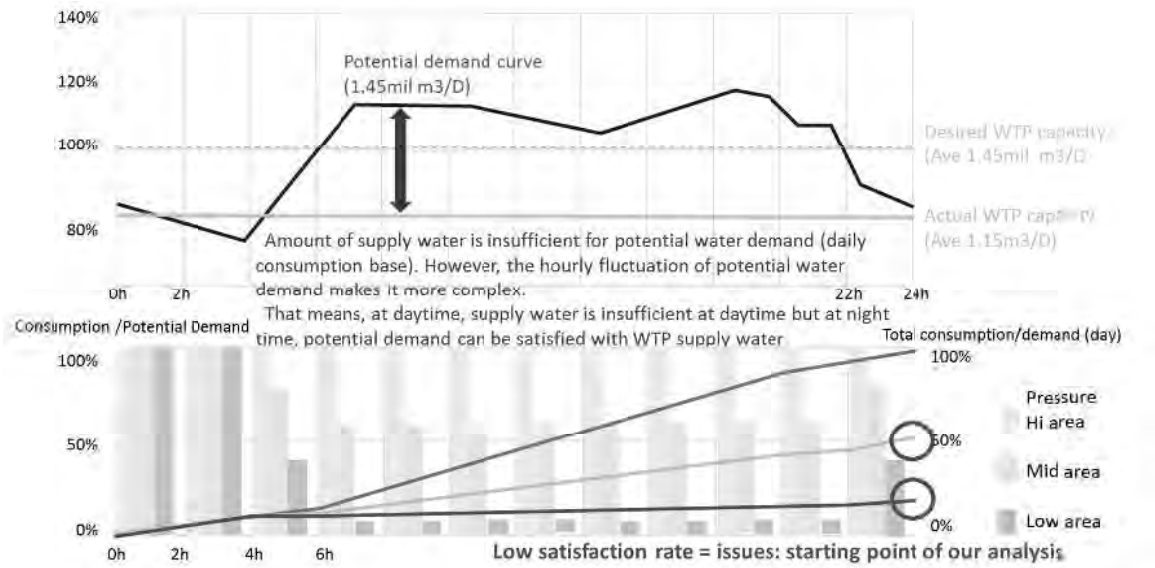


Fig.2-22 Customer's satisfaction as for potential water demand

Thu Duc WTP cannot supply sufficient water beyond the facility's capacity. Then pumping pressure from Thu Duc WTP will have to be decreased, and valve opening need to be changed in order to restrict water flow and to suppress water consumption and NRW. As a result, the customers in low water pressure area cannot take water enough for their demand.

Therefore, we can assume that the customers' satisfaction for potential water demand will be low.

The effects of WDP for these issues are described in Chapter 3.

2-2-4 The other localized issues

The followings are localized issues.

- Low pressure area exists in the high ground elevation area of Thu Duc district.
- Lack of capacity of planned pipelines for Long An Province
- Lack of capacity of planned pipelines in a part of district Binh Tan
- Lack of capacity of planned pipes in a apart of Nha Be district

Chapter 3. Project Description, Design, Resources and Outputs

In the selection of business location, the important elements are the prioritization of WDP, and distribution area setting for WDP. In the study, the Team analyzed the effects of each WDP based on the latest water demand trend, and discussed and confirmed with SAWACO about the analysis and results.

As for the selection of 1st WDP implementation, based on the issues described in the previous pages, we considered the following evaluation items. As a result, the Team prioritized Gia Dinh WDP for business development.

- Effects of each WDP
- Consideration of current progress of WDP relating pipeline installation from the point of securing inlet flow for WDP (Feasibility from technical aspects).
- Total investment costs (how much does the WDP contribute to reduce total investment costs?)
- Feasibility of WDP as for land acquisition

< Results> (◎Excellent or Best, ○good or need to confirm, △not suitable)

WDP name	Effects (2017)	Current Progress	Reduction of Investment Costs	Social Consideration (land acquisition)	Environmental Consideration	Evaluation
Gia Dinh WDP	○	◎	◎	◎ (Park)	○	◎: Highly recommended
Tan Phu WDP	◎	◎	○	△ (WTP)	◎	○: Highly recommended with issues on land use
Central WDP	○	○	△	△ (Zoo)	△	△: Issues on land use
Phu Lam Park WDP	○	△	△	○ (Park)	○	△: Insufficient progress
South WDP	△	△	△	○ (Park)	○	△: Insufficient progress

Fig. 3-1 Evaluation of candidate WDPs

3-1. Scale

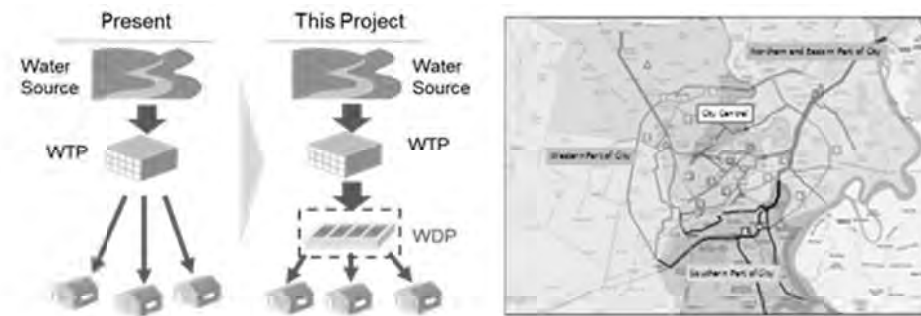
The scale of Gia Dinh WDP is set by the value of year 2025 proposed in the previous JICA's study.

The scale of Gia Dinh WDP is set based on the previous JICA's study as proposed specifications for year 2025.

As for the volume of distribution reservoir, in the previous JICA's study, it is set to 36,000 m³ considering planned maximum daily supply of 211,500 m³/day for the estimated distribution area with future time factor and time variation pattern in HCMC set through discussion with SAWACO. The time volume* is set to 4 hours, considering required reservoir volume to cope with pipeline burst, reservoir maintenance, etc. in addition to 2.1 hours of time volume for buffering water for peak time.

*Time volume: Reservoir volume expressed in time duration. [TIME VOLUME] (hour) = [Reservoir volume] (m³) / [Planned maximum daily supply] (m³/day) x 24 (hour/day) In this case, the time volume of the Gia Dinh WDP is as follows;

As for the required area for the site, it is estimated approx. 1 ha for the distribution reservoirs and approx. 0.5 ha for the building of electro-mechanical facilities, approx. 1.5 ha in total.



Candidate Site	Gia Dinh Park
Distribution Service Area	City Central Area
Estimated Population in Master Plan	681,000
Capacity of Reservoir	- Water Reservoir : 36,000m ³ - Planned max. daily supply : 211,500m ³ /day

Fig.3-2 Project Scale

3-2. Location and site

3-2-1 Site Selection and Investigation

■ Site Selection

Before the Survey, the candidate site of Gia Dinh WDP is assumed in the area near Tan Son Nhat Airport which is owned by SAWACO. However, in the beginning of the Survey, the Team confirmed that the candidate site will be used for military facilities.

As a result, the Team started the Survey based on the conditions that Gia Dinh WDP is planned at Gia Dinh Park which is studied in the previous JICA's study. As for the detail location in Gia Dinh Park, we confirmed with DOT which is in charge of Gia Dinh Park's right of use.

DOT allocated a space for Gia Dinh WDP at Gia Dinh Park and explained that official approval will be judged based on the the results of the Survey as for technical and financial aspects.

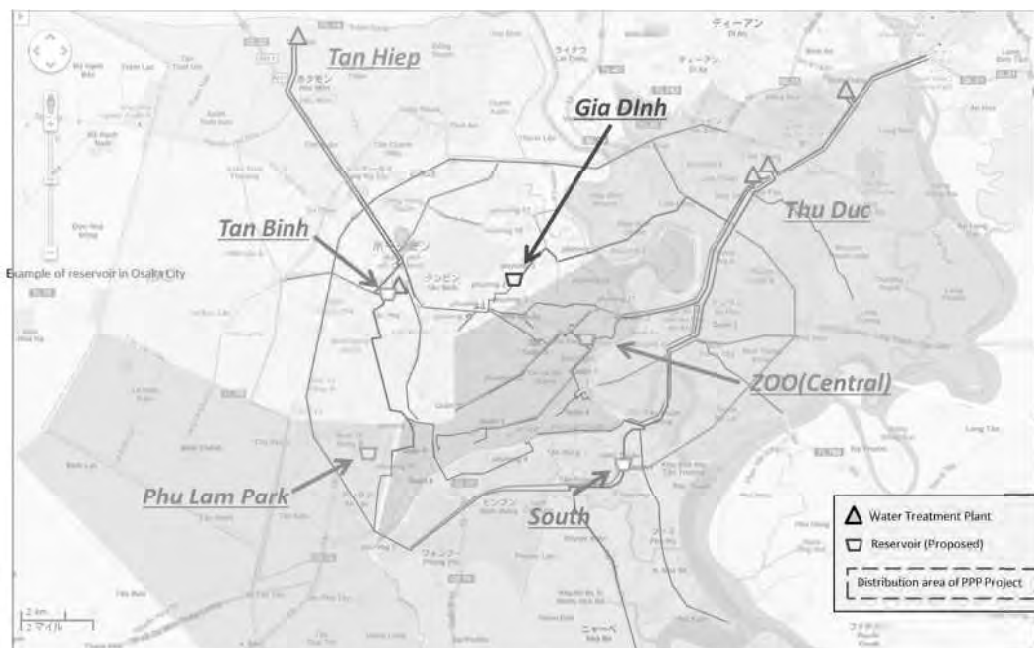


Fig.3-3a Project Location

■ Site investigation

The Team surveyed the candidate site and recorded the present conditions to photos. (June 13, 2014)

Candidate site is partially open ground, but is under developing area among the grove of miscellaneous trees.

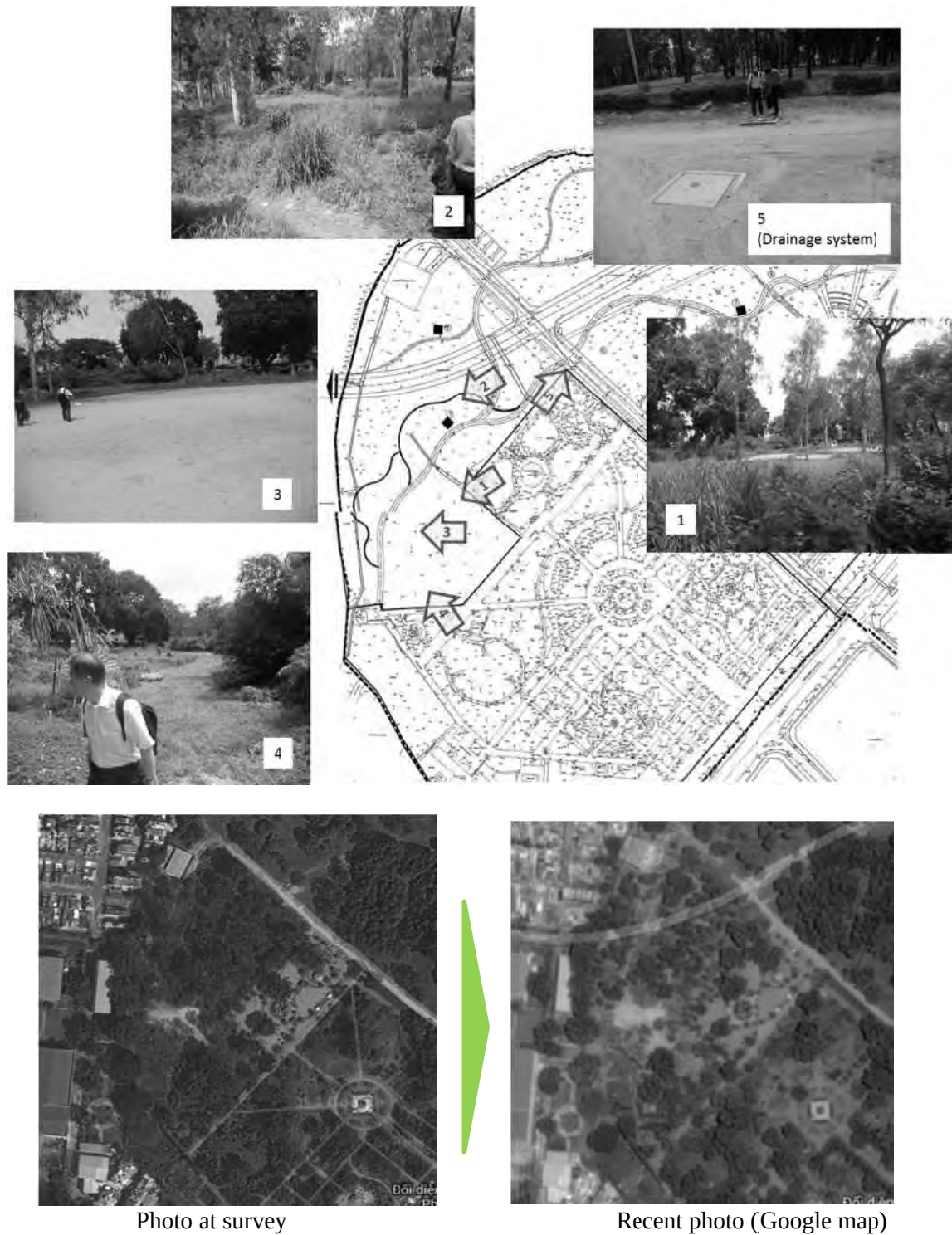


Fig.3-5 Photos of candidate site

■ Soil Conditions

As for the soil condition, the permission of soil investigation has been applied to the relevant authority by SAWACO, but not approved yet.

So, for design and cost estimation, the soil data of neighborhood is adopted as a temporary soil condition.

After the enforcement of soil investigation, actual soil data shall be applied.

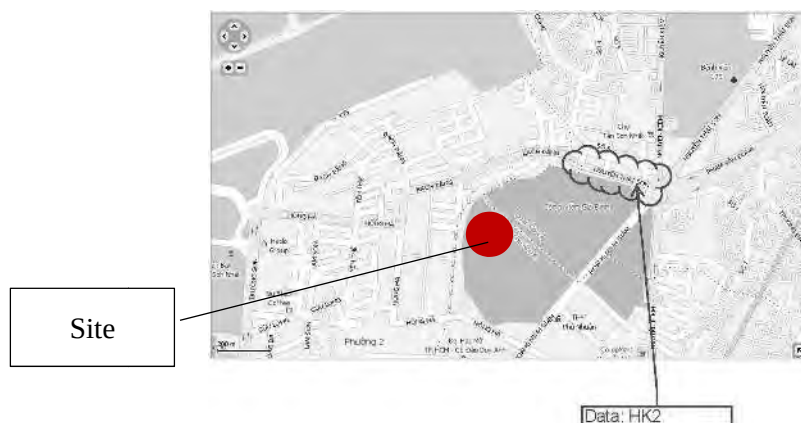


Fig. 3-6 Soil Investigation Area

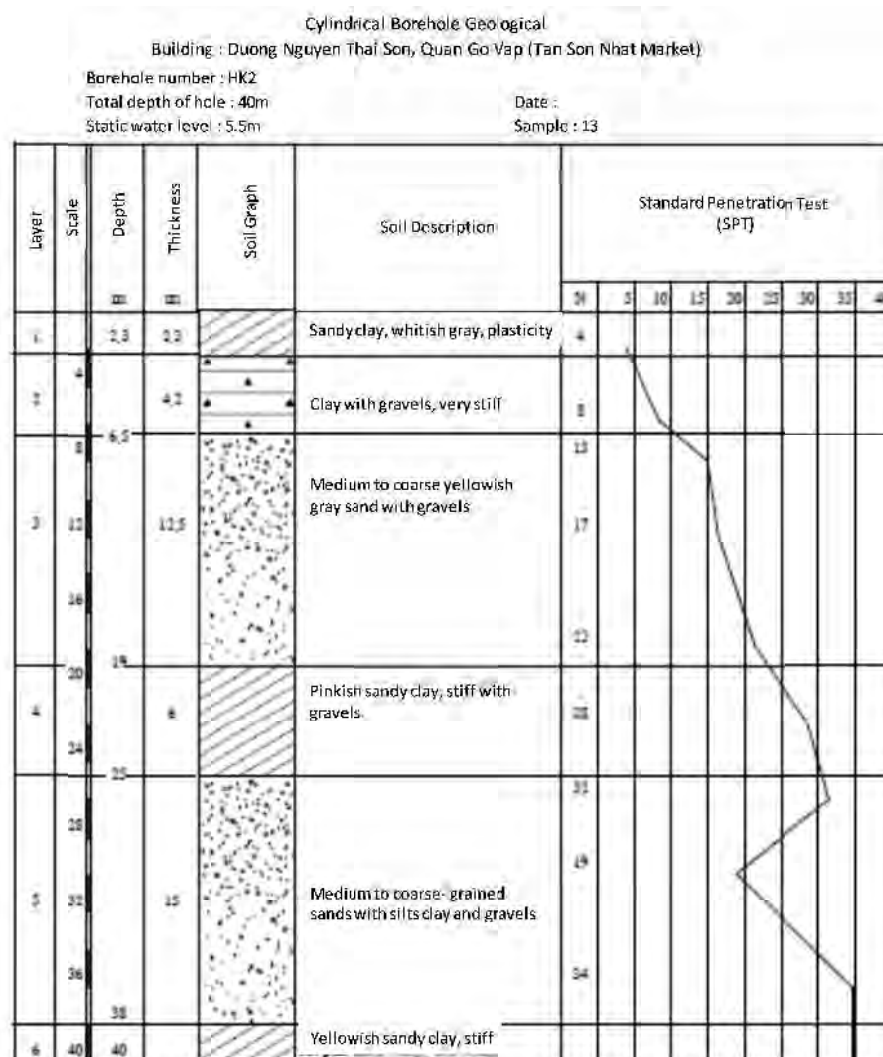


Fig.3-7 Soil data (referential)

3-3. Facility Plan

The followings are the facility plans of WDP which is described in the previous section.

3-3-1 Basic requirements of WDP

Fig.3-8 shows the general process flow of WDP.

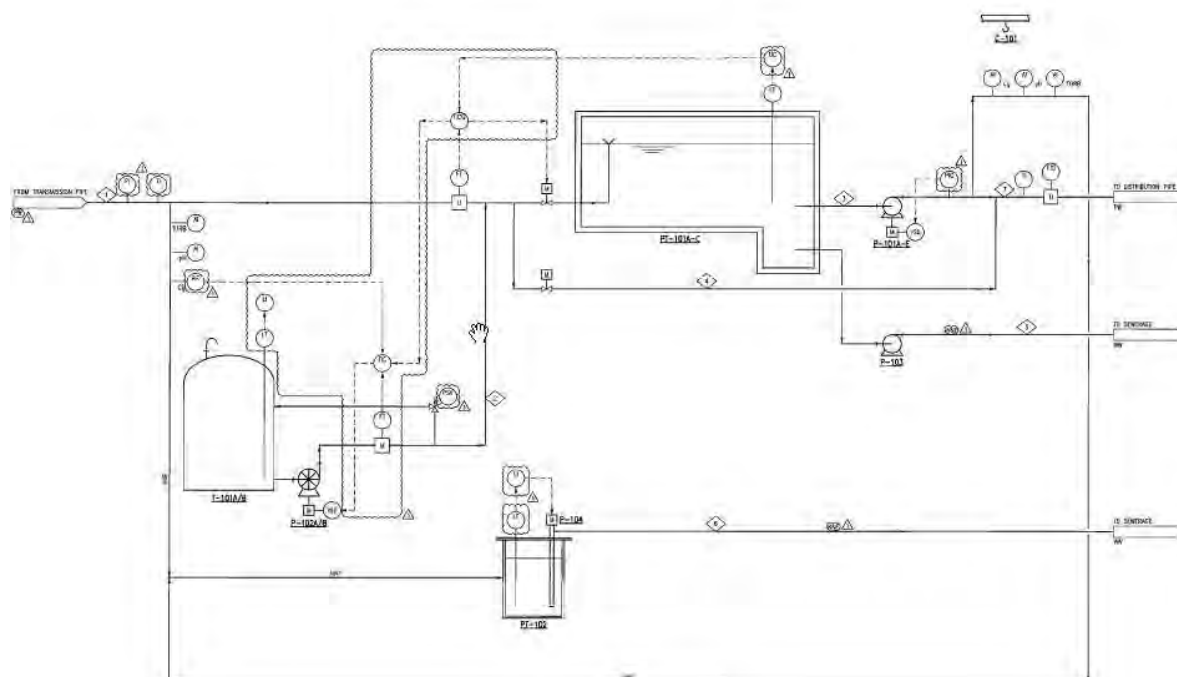


Fig.3-8 Process Flow Diagram of WDP

The Basic requirements of Gia Dinh WDP are set according to abovementioned study and the experiences of OMWB.

Tab. 3-1 Basic requirements of Gia Dinh WDP

Water supply condition	Water supply capacity	Planned maximum daily water supply <2025>	m3/day	211,500	(Dry season : set by the previous JICA's Study)
		Planned average daily water supply <2025>	m3/day	200,500	(5 months of dry season, 7 months of wet season : set by the previous JICA's Study)
		Planned minimum daily water supply <2025>	m3/day	192,500	(Wet season : set by the previous JICA's Study) *TET duration which is assumed as minimum daily demand shall be considered.
		Maximum hourly water supply <2025>	m3/hour	11,500	(Time factor 1.30 : set by the previous JICA's Study) (*Note 1)
		Minimum daily water supply <2025>	m3/hour	4,000	(Time factor 0.50 : set by the previous JICA's Study) *TET season which is assumed as minimum daily demand shall be considered.
	Inlet flow rate of reservoir	Average hourly flow rate (Constant flow rate during the day)	m3/hour	8,900	Average water flow for 24h water supply

WDP Facility	Reservoir	Structure	Reinforced concrete		
		Capacity	m3	36,000	Amount of water as 4 hours of daily supply : set by the previous JICA's Study (*Note 1)
		Number of Reservoir	Qty.	More than 3	Amount of water at minimum as 2.1 hours of daily supply to cope with hourly fluctuation
	Outlet pipe	Diameter	Mm	1,500	Set by the previous JICA's Study
	Inlet pipe	Diameter	Mm	1,200	Set by the previous JICA's Study
	Inlet flow control valve	Type	Butterfly valve		No cavitation occurs at any range of operation
		Diameter	Mm	1,200	
		Number of valves	Qty.	1	
	Water pressure	Inflow water pressure	kgf/cm2	3.4	According to G.L. (ground level) by the previous JICA's Study
	Distribution pump	Head	M	40	Assumption
		Flow rate	m3/min.	192	Maximum hourly flow : 11,500/60
		Motor power	kW	450	$P=0.163 \cdot \gamma \cdot Q \cdot H \cdot (1+\alpha) / \eta$
		Number of pumps	Qty.	5	4 workings + 1 stand by
		Variable speed control unit	Qty.	5	
	By-pass valve	Type	Butterfly valve		
		Diameter	Mm	1,200	
Chlorine injection	Type	NaClO	Chlorine contents 4%		
	Storage tank	Type	Vertical cylindrical type made by FRP		Inner lining by PVC
		Effective capacity	m3	25	For each tank
		Number of tanks	Qty.	2	1 working + 1 stand by
	Dosing pump	Type	Progressive cavity type		
		Flow rate	l/hour	450	Set by the requirements for Chlorine concentration.
		Number of pumps	Qty.	2	1 working + 1 stand by
Flow meter	Inlet flow meter	Type	Ultra sonic type		
		Number of meter	Qty.	1	
	Outlet flow meter	Type	Ultra sonic type		
		Number	Qty.	1	
	NaClO flow meter	Type	Magnetic type		PTFE lining
		Diameter	Mm	40	
		Number of meter	Qty.	1	
Pressure Gauge	Inlet water pressure	Number of gauge	Qty.	2	1 working + 1 stand by
Level gauge	Reservoir water level	Number of gauge	Qty.	3	1 for each reservoir
Water quality analyzer	Cl2 analyzer	Number of item	Qty.	2	Measuring points are reservoir inlet and outlet. The item placed at reservoir inlet is used for control.
	Turbidity analyzer	Number of item	Qty.	2	Measuring points are reservoir inlet and reservoir outlet.
	pH analyzer	Number of item	Qty.	2	Measuring points are reservoir inlet and outlet.

	Temperature gauge	Number	Qty.	2	Measuring points are reservoir inlet and outlet
Drainage	Reservoir drainage pump	Head	M	15	
		Flow rate	m3/hour	500	
Power supply	Power receiving	Voltage	kV	22(15)	
		Transformer	kVA	2,500	
		Number of item	Qty.	1	
	UPS	Capacity	kVA	10	
		Number of item	Qty.	1	
Operation system	Control system	PCL for control & monitoring	Set	1	Duplication of CPU
		Distribution pump control system	Set	1	Duplication
		Inlet flow control system	Set	1	Duplication
		NaClO injection control system	Set	1	Duplication
Monitoring system	Monitoring system	SCADA system	Qty.	2	Duplication
Outline of control	Reservoir inlet flow control	Manual	Manual operation of inlet control valve by operator		
		Auto (keep flow rate constant)	Automatic control according to set value (flow rate)		
		Auto (keep water level of reservoir constant)	Automatic control according to set value (reservoir water level)		
		Auto (control water level of reservoir according to scheduled value)	Automatic control according to set value (scheduled water level of reservoir)		
	Distribution pump control	Manual	Manual operation by an operator		
		Auto (keep constant water distribution pressure constant)	Automatic control according to set value (pressure)		
		Auto (control water distribution pressure according to scheduled value)	Automatic control according to set value (scheduled water distribution pressure)		
	NaClO injection control	Manual	Manual operation by an operator		
		Auto (keep injection volume constant)	Automatic control according to set value (injection volume)		
		Auto (keep injection rate constant)	Automatic control according to set value (injection rate)		
		Auto (feed forward control)	Feed forward control based on measured value of Cl2 analyzer		
	By-pass valve control	Manual	Manual operation by an operator		
		Auto	Set to open in case all distribution pumps stopped (in case of blackout, etc.) Set to close in case distribution pump start		
	Drain pit pump	Manual	Manual operation by an operator		
		Auto	Automatic on/off control according to water level of drain pit		

In addition, in case planned to be in a public park, the Team needs to plan the WDP that does not obstruct

the function of the park as much as possible is necessary

3-3-2 Engineering for WDP

■ Connection plan for the existing distribution network

About the connection between the WDP and existing distribution network, 1200mm (inlet) and 1500mm (outlet) pipes need to be installed to satisfy the water demand forecast of WSMP in 2025. But for the time being, WDP is connected to the water distribution pipe of 900mm passing the park, and WDP will distribute water through the 900mm pipelines.

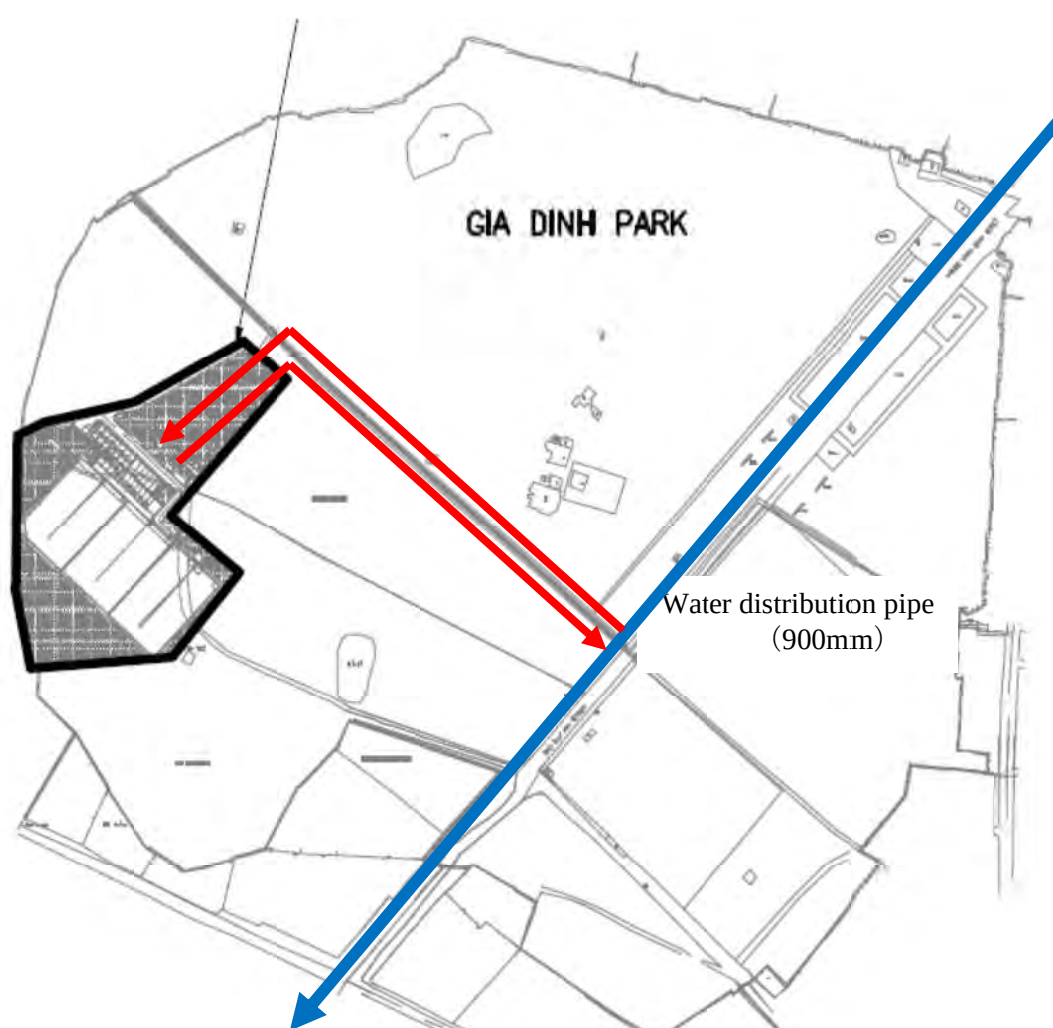


Fig.3-9 Connection plan to distribution network

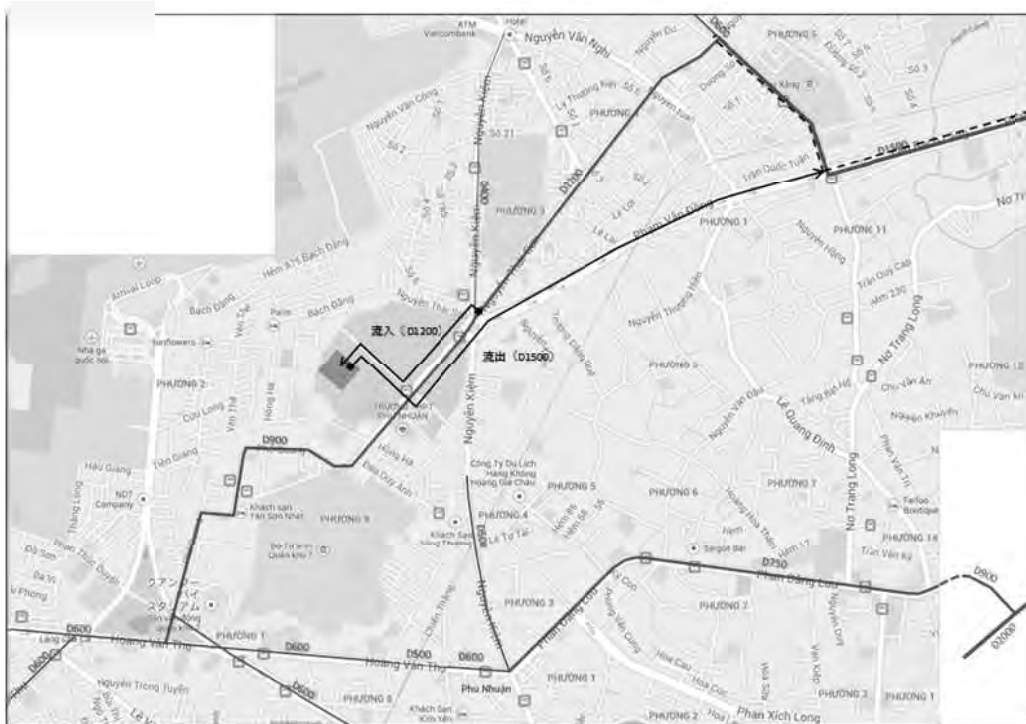


Fig.3-10 Future inlet and outlet pipes

■ Drainage system plan

As for the drainage from the WDP, the SFCC (a relevant authority of drainage plan) instructed the connection by the gutter (trench) to the present drainage system under the road which crossed the park.

This present drainage system lays 2 trains (section 2.5mx2m / train), and holds enough capacity.

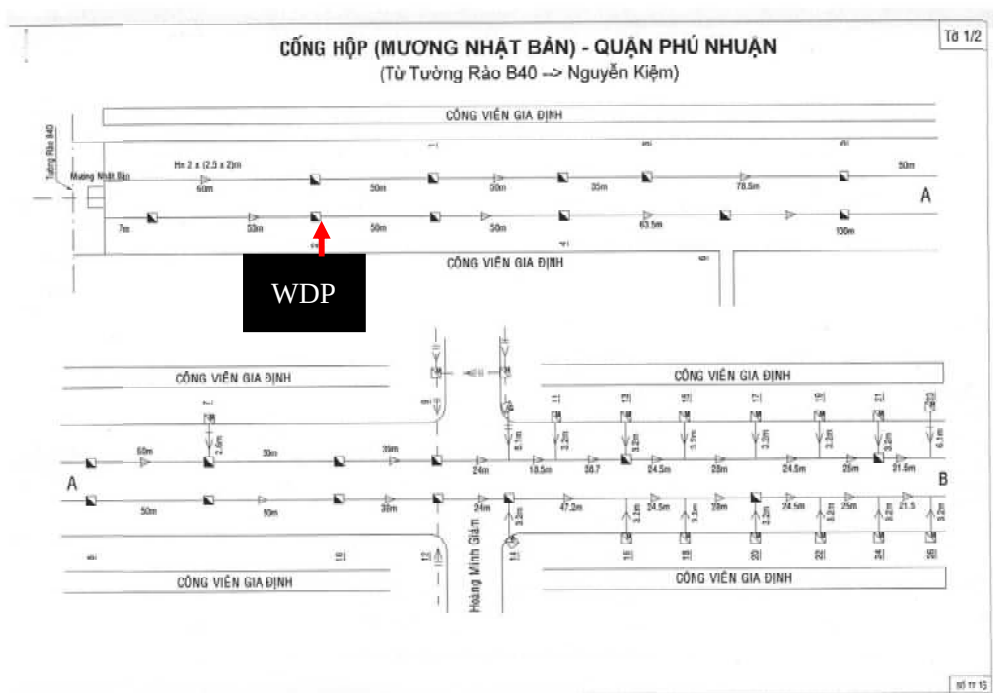


Fig.3-11 Drainage system near the candidate site (provided by SCFC)

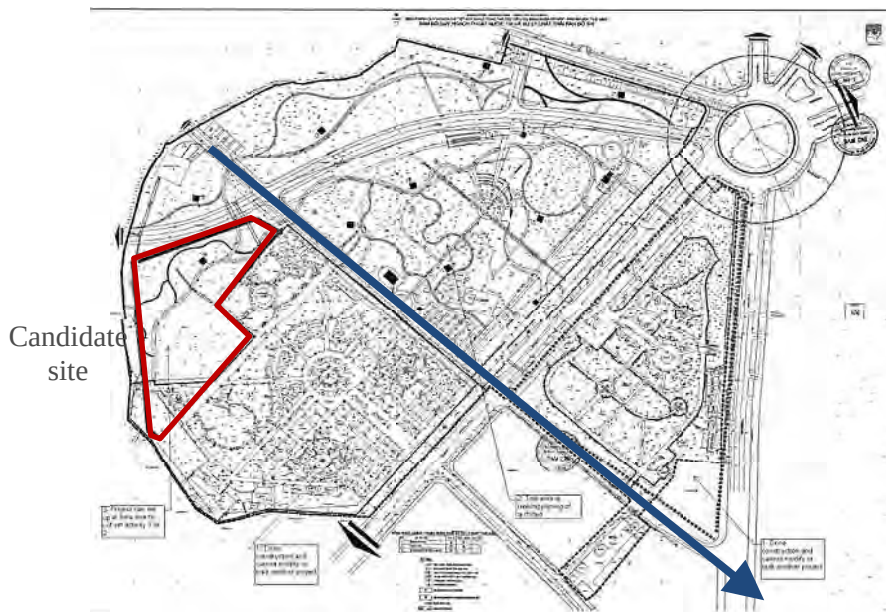


Fig.3-12 Connecting plan to drainage system

■ Electrical system plan

As for the electric power receiving, the Team confirmed with the Gia Dinh Power Supply Company that 22(15) kV electrical power supply can be received from Gia Dinh Park Substation.

From that Substation to WDP, a cable is buried along the promenade in the park.

As for the stability of power supply, the WDP needs to consider power fail. But the planned power fail will be noticed 1 month in advance. Furthermore, in public facilities and/or foreign facilities, power can be supplied prior to others, and that means WDP can receive power as the same quality as in Japan.

To consider the stable water supply, the WDP prepares UPS and Emergency Generator.

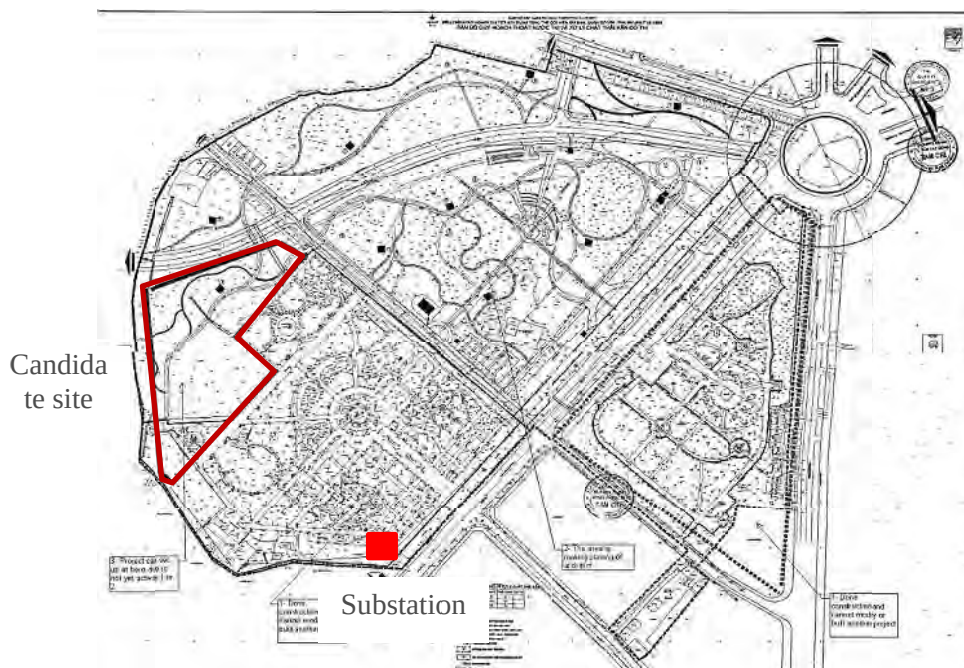


Fig.3-13. Power Source

■ Specification of electric power

1. Power source

- Initial power receiving : 3 phase 3 wires 22(15)kV 50Hz
- Main transformer : 2,500kVA
-

2. Power distribution

- Distribution pump : 3 phase 3 wires 400V
- Facilities of Building : 3 phase 3 wires 400V
- NaClO dosing facility : 3 phase 3 wires 400V
- UPS : single phase 2 wires 230V

3. Power Receiving

- Dual incoming line (normal use and spare) is planned. (But, spare line is not confirmed yet.)
- Power receiving point and incoming cable route

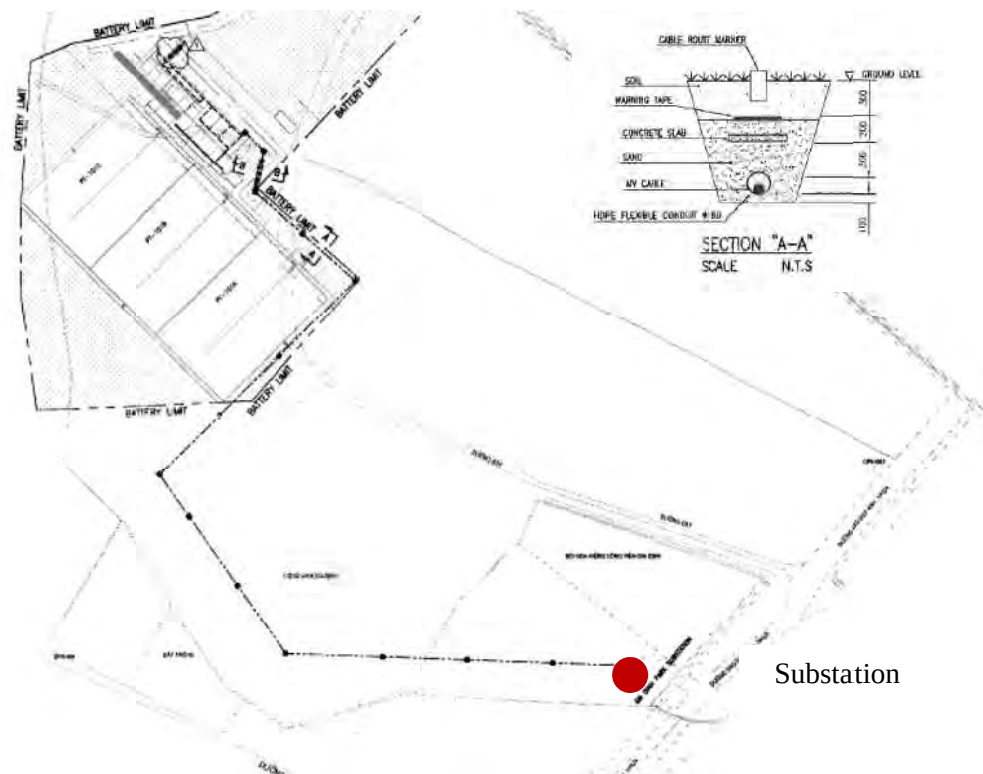


Fig.3-14 Power receiving point and incoming cable route plan

■ Mechanical equipment plan

Main equipment is as follows.

- Distribution pump
- Inlet flow control valve
- NaClO dosing facility
- Reservoir drain pump
- Overhead crane

➤ Equipment specification

1. Distribution pump

- Type : Centrifugal pump
- Head : 40m
- Capacity : 2,875m³/h (total : 11,500m³/h)
- Quantity : 5 (4 working + 1 stand by)
- Speed control : Inverter type

2. Inlet flow control valve

- Type : Motor drive butterfly valve
- Diameter : 1,200mm
- Quantity : 1

3. NaClO dosing facility

- Type : Progressive cavity pump
- Chemical : 4% sodium hypochlorite (NaClO)
Liquid chlorine is used as disinfectant at the water treatment plant. But in this project is planned WDP in the park. So from the safety aspect, sodium hypochlorite which is available in HCMC is planned as disinfectant.
- Quantity : 2 sets (normal use and spare)

4. Reservoir drain pump

- Type : Centrifugal pump
- Head : 15m
- Capacity : 500m³/h
- Quantity : 1

5 Overhead crane

- Lifting weight : 5 ton
- Lifting height : 5 m
- Rail span : 9.2 m

■ Reservoir plan

Specification of reservoir is as follows.

- Type : Semi-underground concrete pit
- Capacity : 12,000m³/reservoir (total 36,000m³)
- Quantity : 3

To prevent the water stagnation, the inside wall placement is planned to control the flow as 1 in, 1 out. As for the inside wall placement, it should be reconsidered in detail in the next execution phase.

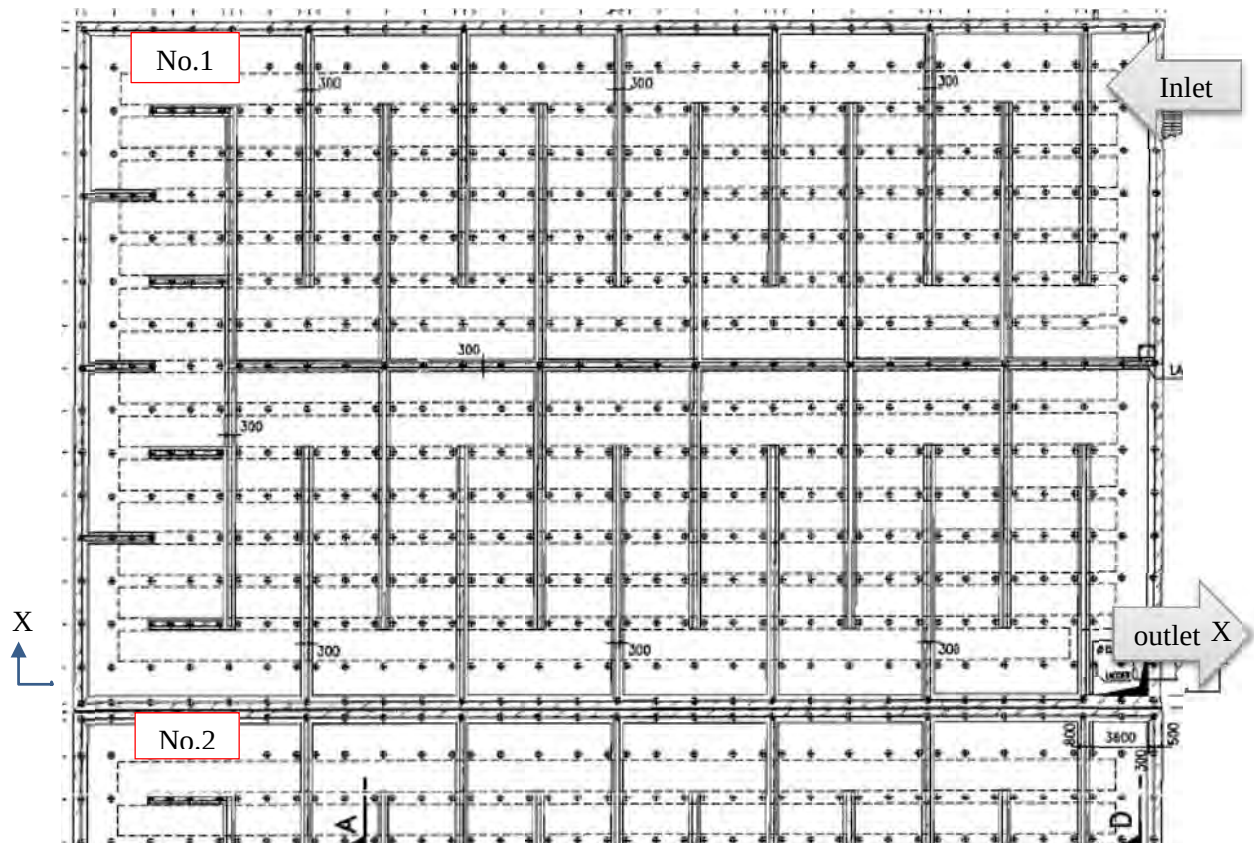


Fig.3-15 Image of inside wall placement for prevent the water stagnation

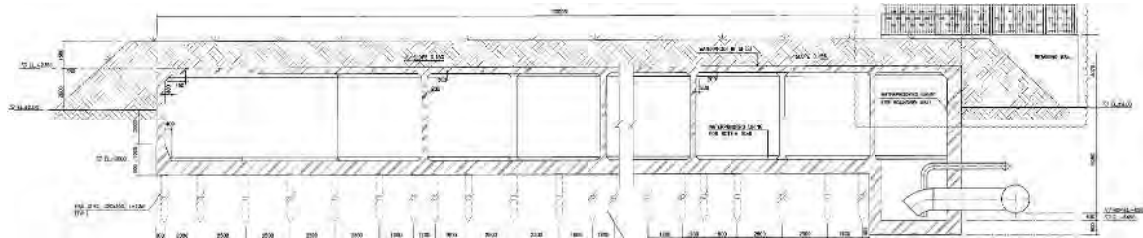


Fig.3-16 Sectional view (X-X) of reservoir

■ Instrument and control system plan

Main instruments are as follows.

1. Level meter
 - Contacting radar (Guided wave radar) type (for water)
 - Non-contacting radar (for NaClO)
2. Flow meter
 - Ultrasonic type (for water)
 - Magnetic type (for NaClO)
3. Pressure meter/Pressure gauge
4. Water quality analyzer
 - Cl₂ analyzer

- pH analyzer
- Turbidity analyzer
- Temperature meter
-

5. Instrument control system

Instrument Control Architecture is shown in Fig.3-16

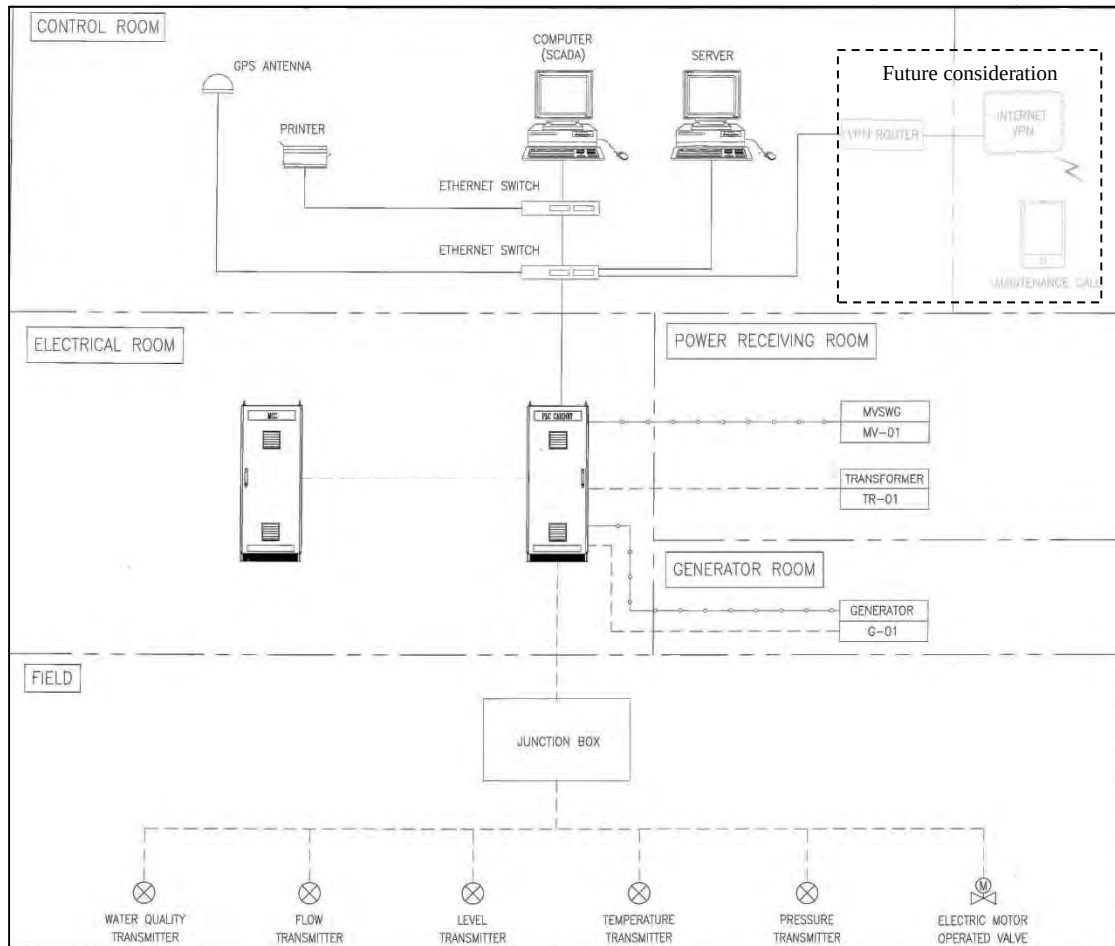


Fig.3-17 Instrument Control Architecture

■ Layout planning

Facility Layout planning was performed considering the site shape, conditions for connection to the outside utilities, etc.

And also, the minimization of WDP's effects for the park was considered.

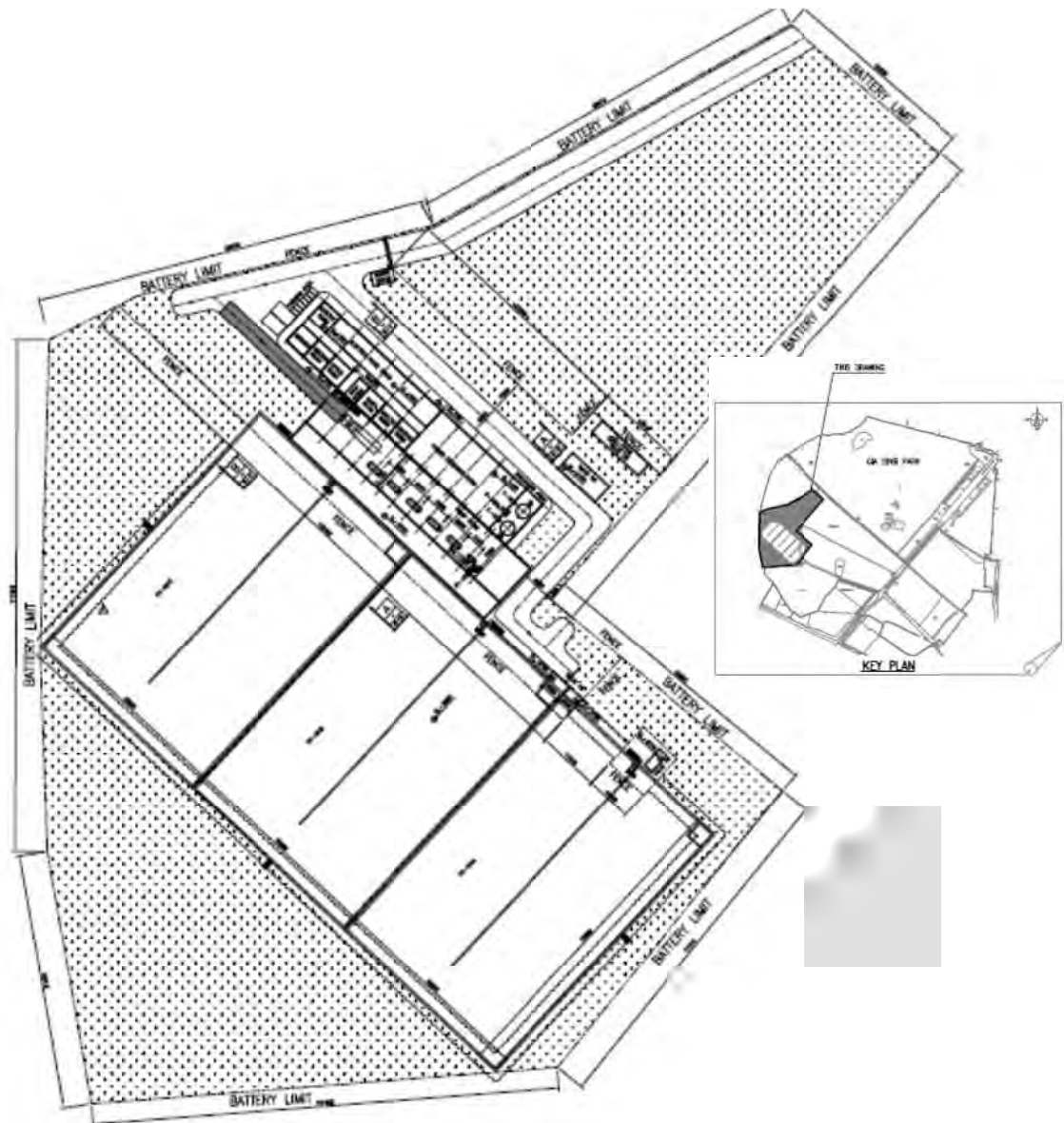


Fig.3-18 WDP Plot plan

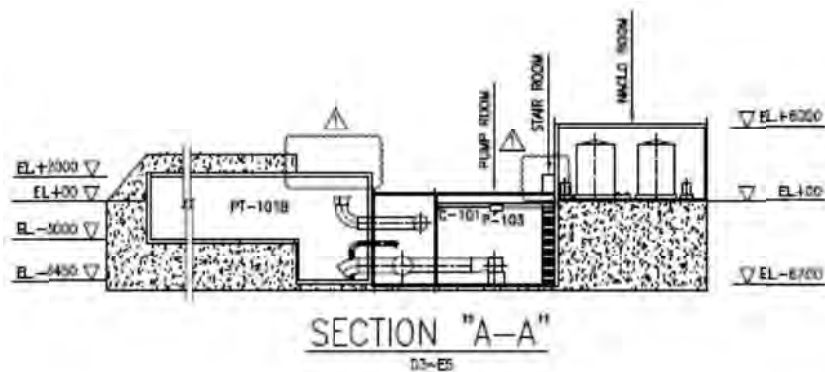


Fig.3-19 Sectional view of WDP

■ Reservoir top utilization plan

Based on the example of semi-underground WDP in Osaka city, the reservoir's top is designed as green area and open to the public to minimize the footprint because the WDP is planned in the park.

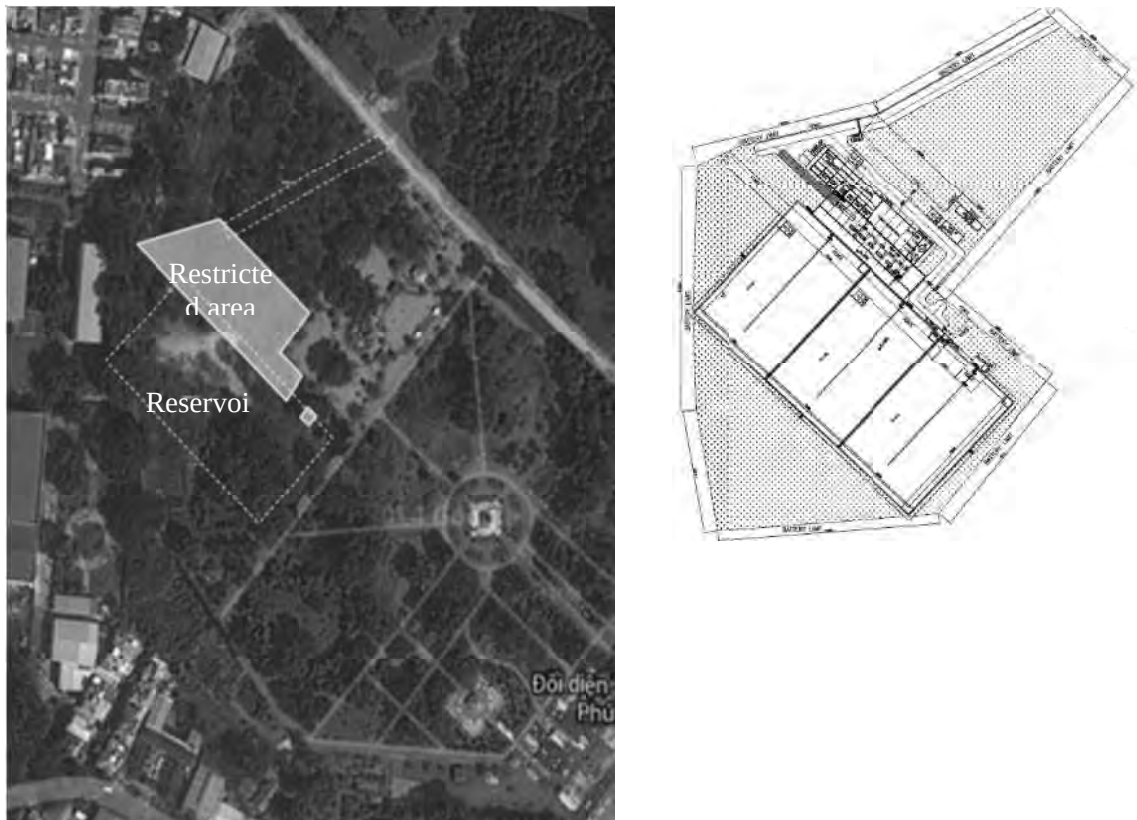


Fig.3-20 Image of restricted area of WDP

In Japan, soil covering depth for water supply facility is regulated not less than 1.5m in order for Enforcement of the Urban Park Act.

In Vietnam, there are no other semi-underground water relating facilities, therefore, soil covering depth is designed as 1.5m based on this Japanese standard. (OMWB also adopts in their WDP.)

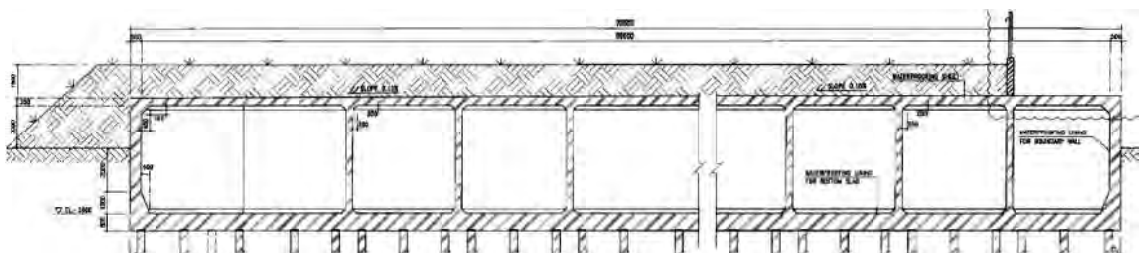


Fig.3-21 Image of the open area to public

3-3-3 Conceptual drawing of WDP

Fig.3-22 shows the bird's eye view of the Gia Dinh WDP.



Fig.3-22 Bird's-Eye View of WDP in Gia Dinh Park

3-4. Effect of alternatives

As for the two (2) issues (lack of pipeline capacity and insufficient water supply capacity) described in the previous sections, the Team analyzed the effect of Gia Dinh WDP.

Gia Dinh WDP is planned as a solution for contributing to the issue of Thu Duc system; therefore, this section shows a procedure of the analysis of the WDP's effect in case the potential demand exceeds the water supply capacity.

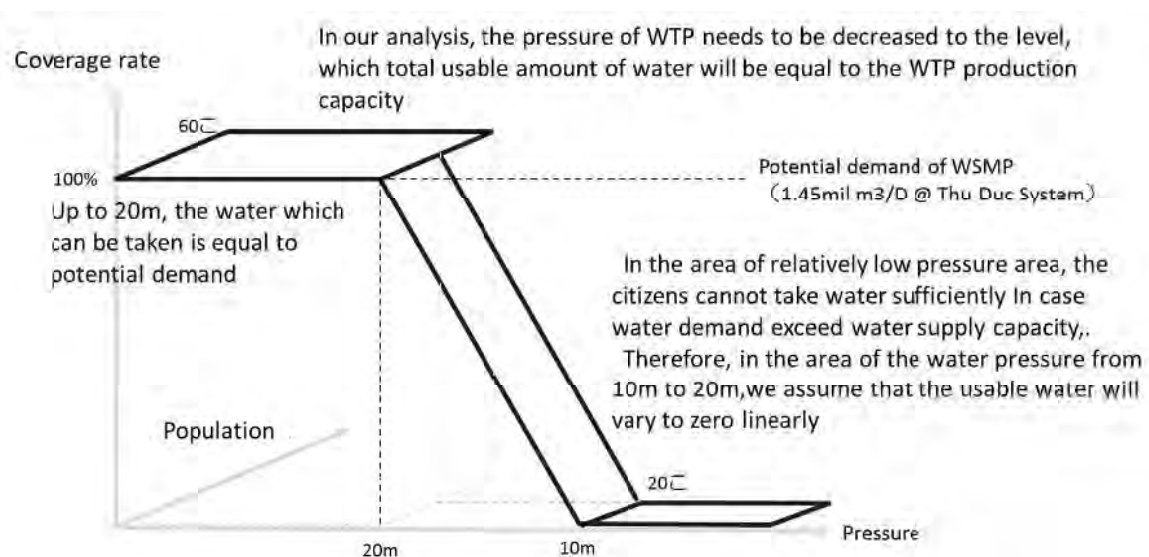


Fig.3-23 Concept and methodologies of analysis

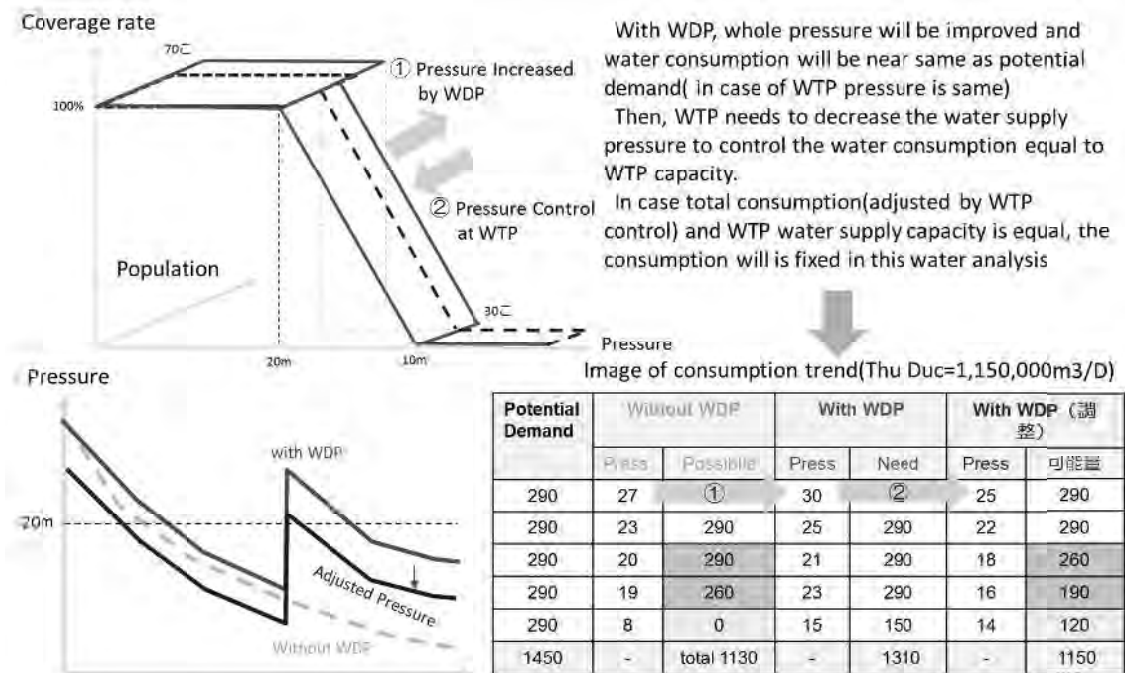


Fig.3-24 Examples of analysis

Based on the procedure above, The Team examined a network analysis to consider the effect of Gia Dinh WDP in 2017 when the Gia Dinh WDP starts in operation.

Fig.3-25 shows the result of distribution area and water pressure distribution.

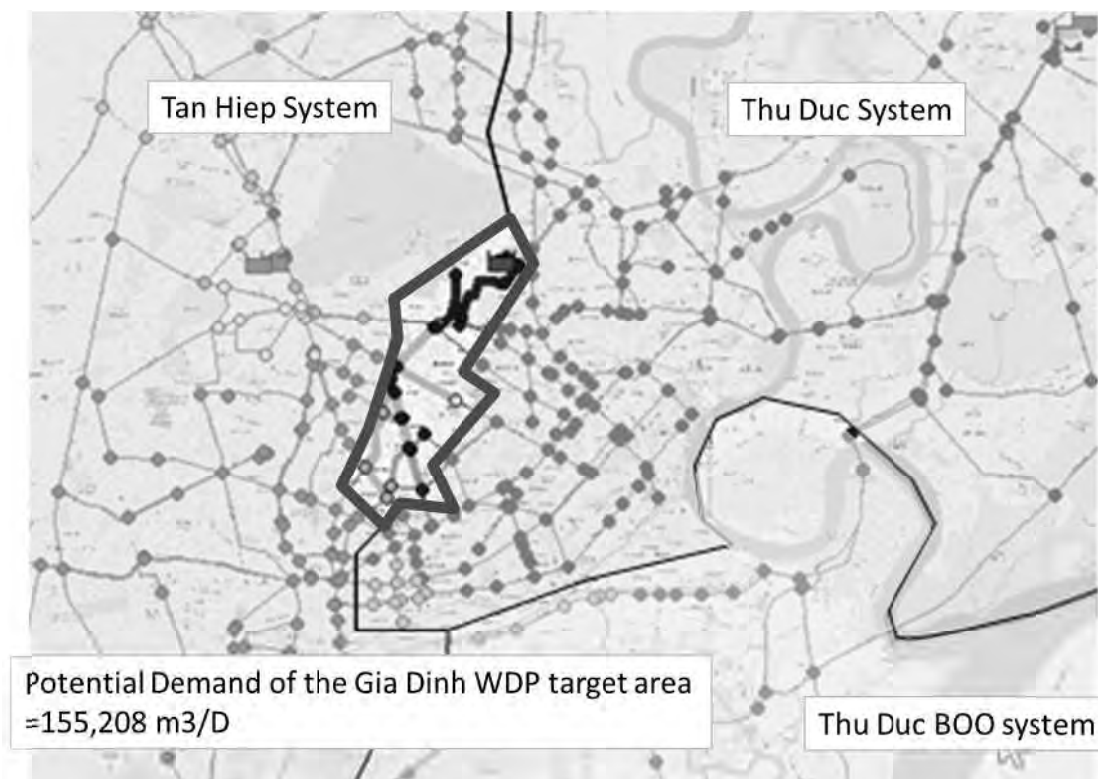


Fig.3-25 Result of the analysis as for Gia Dinh WDP

Gia Dinh WDP is supposed to be a secondary distribution plant in the area which is supplied directly from Thu Duc WTP, but the distribution area from Gia Dinh WDP will have no boundary (no close valve is

set between Gia Dinh WDP distribution area and Thu Duc WTP distribution area), inflow to reservoir will be fixed (average flow), outflow from reservoir with pumps will be only at peak time (during hourly demand of the area is above the daily average). During off-peak time, the distribution area from Gia Dinh WDP is supplied from Thu Duc WTP directly through the bypass pipeline in WDP.

The water demand of the area which is supplied by Gia Dinh WDP is assumed as 155,208m³/D, and at peak time, the amount of 6,500m³/h will be supplied by Gia Dinh WDP...

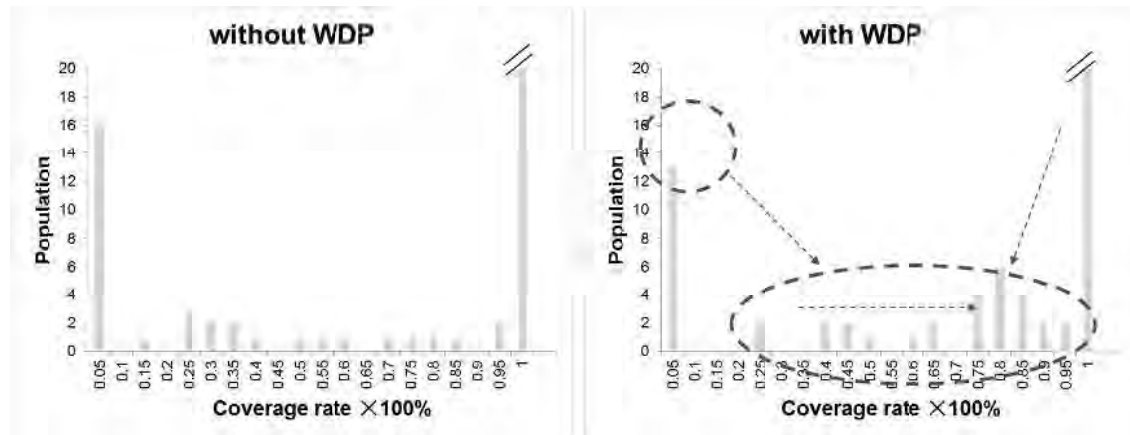


Fig.3-26 Effect of Gia Dinh WDP

Fig.3-26 shows how Gia Dinh WDP can improve the issues on uneven insufficient water supply. The left graph shows the distribution of “Supply water/potential demand” adequacy rate and its population. Without WDP, insufficient water supply causes low adequacy rate and many customers can’t take any water. (Actually they can take water by using pumps in their houses). However, with Gia Dinh WDP, the right graph shows that the water supply of low adequacy rate can be improved better by redistributing water for 100% adequacy customers. Fig.3-27 shows the how much amount of water will be improved by Gia Dinh WDP. Utilization of WDP, customers can take water approx. 1.5 times more than without WDP.

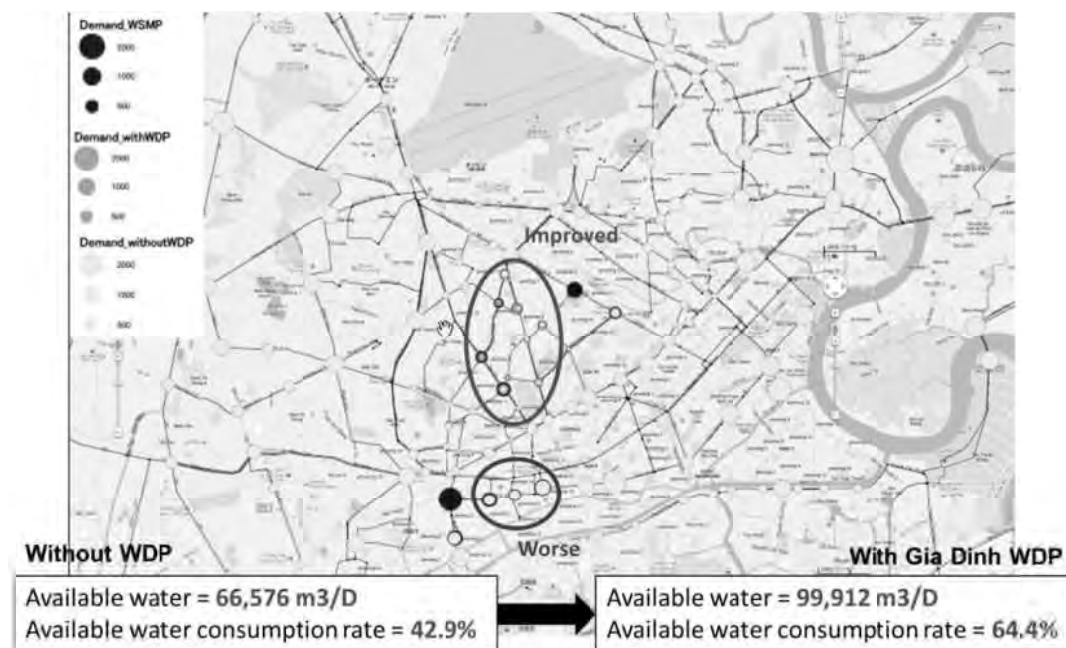


Fig.3-27 Calculation of Gia Dinh WDP’s effect

As for Thu Duc system, the implementation of WDP will provide a function to improve uneven insufficient water supply in the short term period, but also provide a function to solve the problems of insufficient capacity of pipelines for estimated demand of year 2025.

On the other hand, for Tan Hiep system, the issues on lack of distribution pipeline capacity will continue, the early implementation of Tan Phu WDP will be preferred in the future installation plan.

3-5. Mitigation alternatives

As for the issues described in 2-2-3, we propose the following countermeasures. For reference, the attachment 3-1 shows SAWACO's future pipeline installation plan up to 2020 and are the basis for the Survey.

■ Thu Duc WTP supply area

As for Thu Duc WTP supply area, the Team proposes the implementation of Gia Dinh WDP and installation of D1,000mm pipe in Ly Thuong Kiet St. alternative for D1,000mm pipe in Au Co St. described in WSMP. These solutions can improve the inequality of water distribution.

In 2025, Gia Dinh WDP will distribute water to the north area of the HCMC which is the end of Thu Duc system, and D1,000mm in Ly Thuong Kiet St. will contribute the loop distribution network in the distribution area of central WDP.

■ Tan Hiep WTP supply area

As for Tan Hiep WTP supply area, with the consideration of the distribution mains now undergoing in Kenh Dong Project, still the main issues are lack of capacity of distribution pipes divided from distribution main of D1,500mm and D2,000mm for the north area such as district Go Vap, district 12. In the previous JICA's Study, the Team already proposed the solution of installing new pipes for water demand forecast of WSMP in 2025, and that solution can be also applied for the issues in 2017.

■ Low pressure area in the high ground elevation area of District Thu Duc.

The installation of booster pumps can be considered.

■ Lack of capacity of planned distribution pipes for Long An Province

These issues are caused by the amount of water demand of Binh Chanh and Long An Province. Therefore, the installation of large pipes in accordance with the demand can be considered.

■ Lack of capacity of planned distribution pipes in a part of district Binh Tan

The installation of large pipes in accordance with the demand can be considered.

■ Lack of capacity of planned distribution pipes at Nha Be

The installation of large pipes in accordance with the demand can be considered.

Chapter 4. Evaluation of Business Feasibility

4-1. Consideration on the project implementation method

Ho Chi Minh City and SAWACO have traditionally been implementing projects through its internal revenue sources, subsidy received from the City, PPP method (e.g., BOO) or loans from international aid organizations (e.g., ADB).

However, loans extended by ADB or other international aid organizations are mainly for the construction of pipelines and none is scheduled for building water distribution facilities. Furthermore, as the basic concept is that projects that can be implemented through the PPP method will not be subject to assistance by international aid organizations, SAWACO had not been proactive in considering the development of water distribution facilities.

We have confirmed through discussions with SAWACO that receiving a subsidy for the water distribution facilities project would be difficult, considering the City's severe financial situation, and that applying SAWACO's internal revenue sources would also be difficult. Therefore, the method of implementation of the project will be considered assuming the application of the PPP method. The PPP method is a form of public-private cooperation for the financing, construction, repair and maintenance of infrastructure development or service provision projects that is frequently used worldwide, in particular, in countries in need of capital investment, for filling the gap between the infrastructure investment cost required and available source of funds, while efficiently maximizing cost-effectiveness to the extent possible. The use of this method is increasing. This method excels in the following points as compared to cases where the public sector directly implements a project, and is meaningful also for reasons other than those stated above.

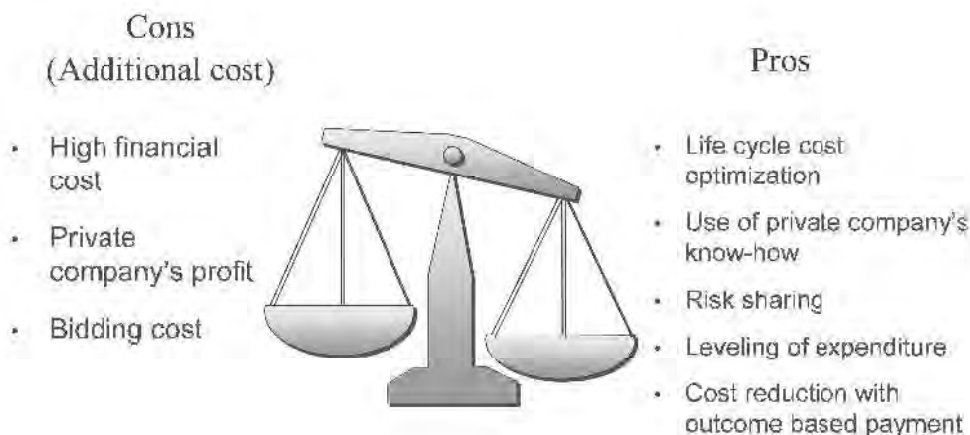


Fig.4-1 Advantages and disadvantages of the PPP method

1) Cost optimization from the point of the project's life cycle

Under the traditional method, orders will be placed separately for each of the designing, construction and operation & maintenance stages in many cases and the outsourcer would try to maximize their own profit, leading to excessive investments. Meanwhile, the PPP method will provide an incentive to hold down the maintenance cost during the entire life cycle of the project, thereby resulting in designing and constructing facilities in appropriate scale with appropriate equipment and in holding down the life cycle cost.

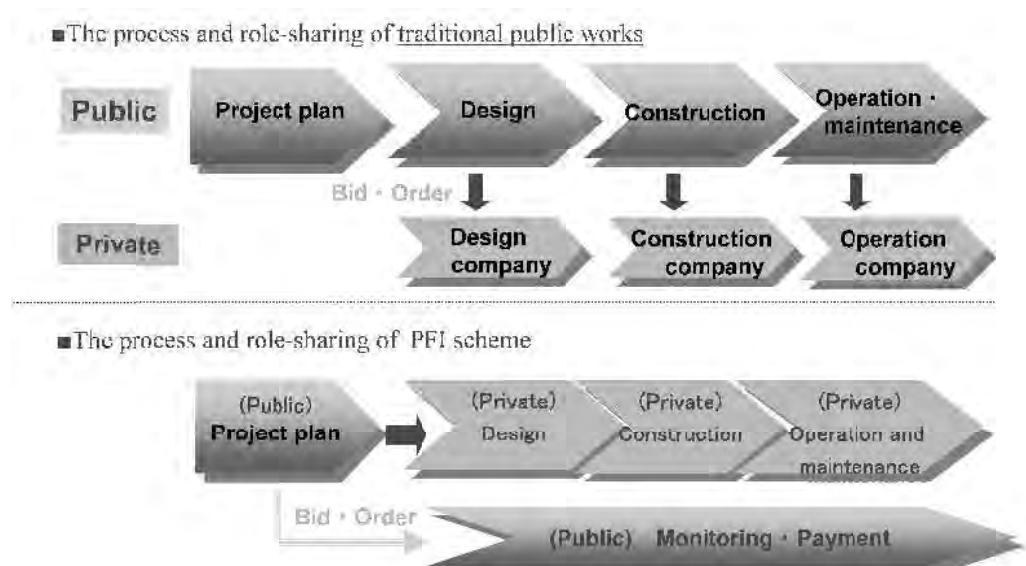


Fig.4-2 Project flow and roles for the traditional method and the PPP method

2) Application of the private knowhow

Under the traditional method, the public sector who is the procuring agency will determine detailed specifications and project details and there is little incentive for eliciting the private sector's knowhow or original ideas. Under the PPP method, the private sector who will be responsible for the entire project will select the project implementation method based on the results that can be achieved, and it is easier to apply the private knowhow.

3) Risk transfer

Under the traditional method, a large portion of the risk will remain with the public sector when placing separate orders for designing, construction and maintenance. As a result, there will be large involvement by the public, even when the project is outsourced.

Under the PPP method, the project will be transferred comprehensively, enabling the private sector to manage the entire project by applying its knowhow. Therefore, the entire project risk can be appropriately allocated between the public and private sectors.

4) Fund equalization

In case the PPP project selects a service purchase type, the public will be able to equalize the fee to be paid throughout the project period. The advantages of this scheme is that there will be no need for additional financing accompanying changes in the situation, this will lead to a more accurate estimation of the funds required and easier to develop the project's future financing plan.

5) Reduction of unnecessary cost through payments based on achievements

In a PPP project, the various additional costs that are incurred from the construction to the operation stages can be transferred to the private sector in accordance with the risks being shared, resulting in enabling the public sector to hold down unnecessary cost.

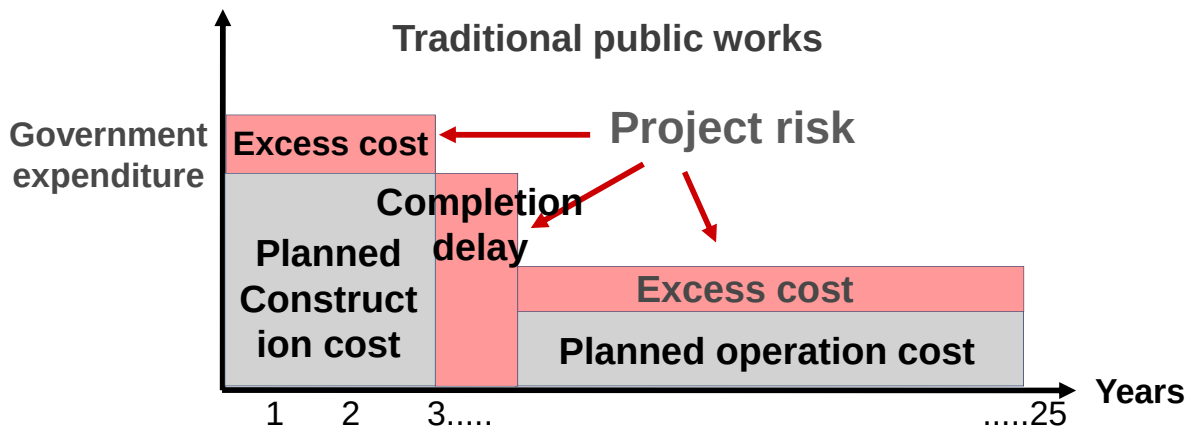


Fig.4-3 Difference in cost payment between traditional projects and PPP projects

SPC is normally established for a PPP project, as a separate entity from the private operator. The aim is to clarify the PPP project operator's responsibility and realizing a structure for managing assets appropriately. This will separate the project from the SPC bankruptcy risk, and reduce financing costs by improving credibility in case good assets are owned

Therefore, the PPP method which allows the private to secure funds and implement the project more effectively than under the traditional method, would be sufficiently beneficial for the public (Ho Chi Minh City and SAWACO) with little financial capacity.

In addition, the water distribution facility is new to Ho Chi Minh City and SAWACO, and the public is in lack of the knowhow and human resources required for implementing the project. Thus, applying the private knowhow will enable the project to be implemented easily and promptly, producing further results when compared to the introduction of other facilities. This is the reason for assuming the application of the PPP method for this project in this study.

4-2. Legal system relevant to the project

In case of utilizing PPP schemes, Investors need to develop the business according to various laws and regulations. The following explains laws and regulations relating to the Project.

4-2-1 Legal system on investment activities

1) Investment license

Vietnam's Common Investment Law (Law No. 59-2005-QH11) stipulates investment procedures for domestic and foreign investors. Those who wish to engage in an investment project in Vietnam must obtain an investment license issued by the People's Committee in accordance with this law. This Vietnam's Common Investment Law was revised (No.67/2014/QH13) last year. In accordance with this law, in addition to the Investment Certificate, the Certificate of Investment Registration and Enterprise Registration Certificate are required for investment projects involving foreign investors. If the project is subject to a prior approval by the National Assembly or the Prime Minister, the People's Committees of provinces, the registry office shall issue the Certificate of Investment Registration to the investor within 5 business days from the receipt of the decision on investment policies and within 15 business days in other cases.

The New Law of Enterprise (No.68/2014/QH13) requires a foreign investor to obtain an Investment Registration Certificate before it applies for the establishment of an enterprise in Vietnam. The registry office shall issue the Certificate of Enterprise Registration within 3 working

days from the receipt of the application.

An enterprise is not required to register the details of its business scope in Certificate of Enterprise Registration, but shall only record this in the company articles. An enterprise must register any changes to the details of its Certificate of Enterprise Registration with the relevant authority. The investor will be required to follow this procedure for the project.

2) Corporate/investment registration procedures by domestic investors

Pursuant to the New Law on Enterprises (No.68/2014/QH13), foreign and domestic investors are clearly defined. Accordingly, an investor will be deemed to be a domestic investor in case at least 51% of the charter capital of a Vietnamese Dominated Organization is held by a Vietnamese domestic investor, or at least 51% of the charter capital of a sub-subsidiary is held by a Vietnamese Dominated Organization or a Vietnamese domestic investor (Article 23.1).

When a Vietnam-based enterprise is established, it is required to submit the company articles, company directory, employees' legal identification card, decision on establishment, Certificate of Enterprise Registration or equivalent document, proxy letter and legal identification card of the proxy representative.

3) Corporate/investment registration procedures by foreign investors

In accordance with the New Law on Enterprises, foreign investors are majority foreign-owned capital (51%). A foreign investor is required a Certificate of Investment Registration in addition to the procedure for Vietnam-based enterprises. Thus, when a Japanese company will own 51% capital of the project, it will obtain a Certificate of Investment Registration, and then, a Certificate of Enterprise Registration and an Investment License.

4) Assessment procedures for an investment project

In case a project corresponds to any of the following conditions, a project assessment must be performed by the People's Committee prior to the issuance of an investment license (Article 32). This project may correspond to the condition, because part of a public park is assumed to be used. Application documents for the investment project assessment will be submitted to the Ho Chi Minh PC (DPI) who will prepare an assessment report and submit this to the People's Committee for approval.

- Projects for which the government will allocate or lease the land through a method other than a tender process, and projects accompanying a change of land purposes
- Projects applying technologies listed in the technology transfer restriction list as a result of a technology transfer

4-2-2 Regulations on land use

Vietnam's Land Law was revised Law (No.45/2013/QH13) in 2013. Under the revised law, foreign investors can be allocated or leased land. However, allocation of land is only permitted when a foreign investor implements investment projects for the construction of houses for sale or for a combination of sale and lease (Article55). This project will not meet this condition According to the Law on Land and related regulations (Decree No. 181/2004/ND-CP, Circular No. 14/2009/TT-BTNMT), the investor must perform the following: 1) request the People's Committee to issue a decision on land use; and, 2) sign a land lease contract with DONRE in order to lease the land. Application dossiers, which contain a written request for land lease and information on the approved investment project, shall be submitted to DONRE for screening and then forwarded to the People's Committee for approval. Once the decision is issued and the contract is signed, the land use right certificate will be issued to the applicant. The lease contract will be valid for a maximum of 50 years.

There is no established procedure for obtaining land which is under the management of Ho Chi Minh PC for a project site. Investors must discuss with Ho Chi Minh PC about the necessary procedures to obtain the right to use such land. This project assumes the utilization of a park owned by DOT.

In case of relocation, compensation for relocation, support, and relocation cost related to the acquisition of project land must be included in the SPC's project investment amount in accordance with Decree 69/2009/ND-CP, Article 15.

In case of BOT projects, the SPC will be exempt from payment of land levies and land use rents for project land in accordance with the provisions on incentives stipulated under the BOT Law (Decree 108, Article 38). It is stipulated the same in the new PPP Law and the project's profitability is estimated and assessed in the following section of the report based on the above.

4-2-3 Tax regulations

1) Incentives provided in the Enterprise Income Tax Law

The regular rate of enterprise income tax in Vietnam is set at 25%. According to Decree 124/2008/NC-DP (Decree Detailing and Guiding the Implementation of a Number of Articles of the Law on the Enterprise Income Tax), the incentive tax rate and reduction rate as shown in Tab. 5-1 will be applied for new enterprises, which are established under investment projects in certain domains including the development of water treatment plants. The current financing plan is also being considered based on the above.

Tab.4-1 Incentive Mechanism of the Enterprise Income Tax

Incentive tax rate	10% for the first 15 years of operation	
Reduction rate to the incentive tax rate	100% for the first 4 years of operation 50% for subsequent 9 years of operation	
Payable tax amount for each operational year	1st~4th year	0%
	5th ~9th year	5%
	10th ~15th year	10%
	16th year and after	25%

Source: Decree No.124/2008/NC-DP (Detailing and guiding the implementation of a number of articles of the law on enterprise income tax)

4-2-4 Incentives provided in the Common Investment Laws

In accordance with the Investment Law, reduction of taxation for “investment incentive sectors¹”, are stipulated as incentives. The water supply business is considered as one of these sectors and thus, investors can apply for the following incentives

- Tax incentives on income, which are distributed to investors according to their capital contribution or purchase of shareholding in the SPC, after the SPC has paid the full enterprise income tax;
- Application of a lower rate of corporate income tax for a certain period of time or throughout the project execution; exemption, reduction of corporate income tax
- Exemption or reduction of import tax on goods imported as fixed assets; raw materials, supplies, and parts used for the project
- Exemption, reduction of land rents, land levy

The business feasibility assessment in this project development study is estimated based on the assumption that the above tax incentives will be applied, and whether these will be applied.

¹ Specific sectors applicable to the incentives stipulated in the Common Investment Law. It includes development of infrastructure facilities, as well as other business sectors such as high-tech products, bio-technologies, education, environmental protection, and traditional industries.

The Common Investment Law also provides a non-tax incentive for the projects in investment incentive sectors that can accelerate the depreciation of fixed assets. This is not applied to the project as it provides no advantages to SAWACO's service fee payment. In addition, the New PPP law is still in the status of its draft version and is possible to be revised in the future.

4-2-5 PPP law systems

Vietnam had two major legal foundations which govern the implementation of PPP projects; namely, the Decree 108/2009/ND-CP".

Decree on Investment in the Form of Build-Operate-Transfer, Build-Transfer-Operate or Build-Transfer Contract" (hereafter referred to as "Decree No.108") and the Decision 71/2010/QĐ-TTg "Promulgating the regulation on pilot investment in the public – private partnership form" which is often referred to as the "pilot PPP law." As to date, many of the PPP projects in Vietnam were implemented in accordance with Decree 108, utilizing Build-Operate-Transfer (BTO), Build-Operate-Transfer (BOT), or Build-Transfer (BT) agreements, primarily in electricity and telecommunication sectors.

To enhance implementation of the PPP projects, the GOV consolidated these two regulations and released the new "Decree No 15 /2015/ND-CP Public Private Partnership Investment Form (hereafter referred to as the "New PPP Decree") on February 14th, 2015, which took effect on April 10th, 2015. Below is a summary of the conditions and procedures specified under the New PPP Decree, which should be considered by investors during project preparation.

1) Procedures on investor selection

Under the New PPP Law, the party determining the operator will differ by the scale and characteristic of the project. We consider that Ho Chi Minh City People's Committee will make the decision for this project.

The article 29 of the New PPP law stipulate that the selection of investor may be conducted in the form of open bidding or direct appointment and the conditions, procedures for selection of the investor(s) and incentives for the investor(s) during the tendering process for investor selection shall be conducted in accordance with the laws on public procurement.

According to the draft implementation decree for the Law on Public Procurement, the "Decree Providing detailed guidelines on the implementation of a number of articles of the Law on Public Procurement on selection of investors (draft as of October 22nd, 2014)", the article 6 of the decree stipulates the time limit for the announcement of the PPP Project information is no later than 7 working days since the approval of the PPP project proposal, and request for pre-qualification, request for proposals shall be published within 3 working days from the date of the first publication of the announcement. The article also stipulates the minimum period for the preparation as 30 days for pre-qualification and 90day for international bidding. Furthermore the article also stipulates maximum period for evaluation as 30 days for pre-qualification and 120 day for international bidding.

In regard to the direct appointment, Article 9.3 of the Decree also stipulates that depending on the nature of the proposed project, the Government may consider direct appointment of an investor for unsolicited projects. However, this decree has not been finalized and this is yet to be confirmed.

2) Project proposal

The investor may also make a project proposal under the New PPP Law. A project proposal must contain the following details as specified in Clause 2 of Article 12 of the BOT Law. Mandatory items are common in part, such as the need to explain the necessity of implementing the project in the form of PPP and explanation on project details.

- Analysis and explanation of the necessity and advantages of implementation of the project in the form of BOT contract as compared to other forms of investment;

- Determination of goods and service together with prices and charges expected to be provided by the new facility;
- Determination of the work construction and operation duration, and methods of management and operation;
- Conditions for and methods of transfer after the termination of the operation period; and
- Proposed application of investment incentives and supports and government guarantee (if any).

For projects formed under the private proposal system, the investor who made the proposal may receive a 5% incentive. In addition, the possible procedure of bidding process in accordance with the new PPP law is shown in Attachment 5-1.

3) Feasibility study (F/S) report

Information that must be included in the F/S report is specified under the law. This includes the necessity of the project, advantages of implementation of the project in the form of PPP contract as compared to other forms of investment, and economic assessment of the project.

Future processes are assumed to proceed smoothly by keeping this study by JICA consistent with the above to the extent possible.

4) Project funds

Regulation on the total project investment amount is the same as under the BOT Law. In case the total investment for a project is 1.5 trillion VND or below, an investment of 15% or more would be required in the SPC.

If the total investment for a project exceeds 1.5 trillion VND, the investment required would be the total amount or more of a. and b. below. The total investment for this project is likely to be more than 1.5 trillion VND, therefore this project needs to meet this condition, and in this study, cash flow is also calculated based on this.

- Out of the total investment amount, 15% of 1.5 trillion VND
- Out of the total investment amount, 10% of the amount in excess of 1.5 trillion VND

Government expenditure within the investment is permitted in the FS.

5) Project formulation cost

The government will bear the cost for the preparation of the project such as the cost for preparation and announcement of a project list and for investor selection. However, an investor selected as the operator of a project for which the government planned and performed a F/S, must pay the government the cost for the preparation and assessment of the F/S report. On the other hand, a condition set out by Decree 108 which stated that the costs for project land acquisition and relocation compensation were to be paid by the project enterprise and included in total investment amount of the project was abolished. This reduces the investor's burden.

6) Government guarantee

In addition to the right to mortgage assets and land-use rights, the right to commercially operate the project facilities can be securitized for the lenders. Regarding loan and bond guarantees, even though the level of government guarantees is set as within 80% of the total investment amount of a project, which includes all expenses related to the loan, in case a project enterprise has foreign shares, the level of guarantee will be limited to the ratio of the shares held by domestic (Vietnamese) investors in the enterprise.

7) Selection of subcontractors

As the selection of subcontractors is not particular stipulated under the New PPP Law, this will basically be the same as in the case of the previously-mentioned BOT Law, and the EPC

subcontractor must be selected in accordance with the Law on Tendering (Law No.61/2005/QH11), only if government expenditure accounts for 30% or more of the total investment amount. If a project is subject to this procedure, the EPC subcontractor will be selected through a competitive bidding process. In this project, a service fee is assumed and investors will need to take this into consideration.

8) Transfer of project facilities

The transfer of project facilities takes over what is stipulated under the BOT Law.

9) Application of investment incentives to the project

Basically, investment incentives will be applied based on measures stipulated under other laws and regulations. Therefore, procedures should be followed according to such laws or regulations.

4-3. Project scope

We have considered the division of roles between SAWACO and the SPC in the case where the project is introduced as a PPP and the SPC is to be the project operator.

4-3-1 Basic concept of the project scope

As other PPP projects in Ho Chi Minh City are planned by the City or SAWACO and the subject facilities' engineering, construction, O&M are outsourced as a PPP project, we have categorized the project scope as below by referring to such other projects. The basic concept is that the SPC will be responsible for the construction and O&M of the water distribution facilities based on the plan developed by SAWACO. Meanwhile, pipeline management will be the responsibility of SAWACO as in the past, in principle. However, as the pipeline development plan and improvement of water leakage can be addressed effectively by applying the private operator's knowhow on pipeline management, advice in this area has been included in the project scope.

4-3-2 Concept on project scope

Based on the above-mentioned concept, we assume that the operation can be divided into 3 areas, which are:

(1) Water distribution facilities construction and O&M

Engage comprehensively from the engineering of the water distribution facilities to procurement, construction and O&M, based on the plan developed by the City and SAWACO.

(2) Pipeline management plan development support

Provide advice on the development of a water pipe plan and on engineering for the primary pipe, and secondary pipe managed by SAWACO. Specifically, advice will be provided based on the water distribution facilities' operation data or past experience when a new pipeline needs to be built or the pipeline allocation plan needs to be updated in order to address issues such as low water pressure. This will contribute to the development of an efficient pipeline management plan.

(3) Pipeline operation support

While the above is advice on designing and engineering, this is advice on O&M. Specifically, advice will be provided on the kind of improvement plan effective for responding to the daily

occurrence of water leakage, or on the investigation of the fundamental cause for water leakage issues. In addition, advice will also be provided on easy construction technology or low-cost technology in case of repairs.

Asset	WTP	Pipe (1,2 grade)	WDP	Pipe (1,2 grade, meter)	Pipe (3 grade, service pipe)
Ownership/ Main Responsible Entity	SAWACO	SAWACO	SPC	SAWACO	WSC
Role	Planning	Planning	Planning	Planning	Planning
	Engineering	Engineering	Engineering	Engineering	Engineering
	Procurement	Procurement	Procurement	Procurement	Procurement
	Construction	Construction	Construction	Construction	Construction
	Operation	Operation	Operation	Operation	Operation
	Maintenance	Maintenance	Maintenance	Maintenance	Maintenance

Network Planning Service

WDP Operation Service

Network Operation Support

Fig.4-4 Service map for the water distribution facilities

We believe that engaging in the above (1), (2) and (3) comprehensively will lead to the provision of effective support, instead of only introducing the water distribution facilities.

4-4. Business scheme

As evaluation of business feasibility, we provide the following analysis on the types of PPP business, fee structure and implementation structure, considered to be appropriate for project development.

4-4-1 Type of PPP business

1) BOO (Build Own Operate) Style

A method under which the private operator designs/builds the facility, after which is owned and operated by such operator.

The private operator will own the facility throughout the project period and bears all risks involved in the facility. However, as the private operator will own the facility, costs will arise inherent to the possession of assets (e.g. fixed assets tax) that would not have been incurred had the public sector been the owner.

Different from when the contractee funds and implements the project itself, an “off-balance effect” may be expected in which assets and debt required for procuring the assets need not be booked. But if the contractee is substantially bearing the cost and enjoying the benefit related to the facility in reality, this could be considered as a “finance lease with no transfer of ownership” from the operator to the contractee, depending on the accounting standards applied to the contractee, and the contractee may be requested to book the lease assets and lease liability. Therefore, an extremely careful judgment should be made on the off-balance effect of the BOO method by conducting a detailed examination of the actual transaction and local accounting standards.

2) BOT (Build Own Transfer) Style

A method under which the private operator designs/builds the facility, after which it is own by the operator, to be transferred to the contractee at the maturity of the operation period.

The only difference with the BOO method is that this method is considered as a “finance lease with transfer of ownership.”

3) BTO (Build Transfer Operate) Style

A method under which the private operator designs/builds the facility, after which it is transferred to the contractee to be operated by the operator.

Assets and liabilities will be booked by the contractee without fail as the facility will be owned by the contractee. The contractee will bear the risk accompanying the owning of the facility, but if during the defect liability period, it is possible to have the private operator bear the responsibility. As the private operator will not own the facility, no cost inherent to as when this is owned by the private sector (e.g. fixed assets tax) will incur.

4) BT (Build Transfer) Style

A method under which the private operator designs/builds the facility, after which it is transferred to the contractee.

Operation and maintenance of the facility is handled by the contractee itself or by a designated manager, etc.

4-4-2 Comparison of type of PPP business

The below table illustrates the characteristics of each type of business that would be appropriate for the project development..

This project assumes to cover financing and O&M. There is no intention of acquiring development rights for other land and the BT scheme will also be excluded from possible options.

BOO is outside the scope of consideration as the facilities are not expected to be removed or privatized following the termination of the project period.

Out of the remaining 2 schemes which are BOT and BTO, BOT has an advantage in terms of efficient management, as the facilities will be owned by the private sector, the risk will be transferred, and ownership and management will match. On the other hand, there is concern over the increase in payments by Ho Chi Minh City or SAWACO, as the facilities will be taxed. We assume that the scheme to be applied will be narrowed down in future based on advantages and disadvantages. In this study, the cash flow shown later in this report is calculated assuming the BOT scheme. This is based on the concept during last year’s review of prioritizing ownership by the operator.

Tab.4-2 Comparison of the schemes

	DB	DBO	BOT	BTO	BOO	BT
Financing	Public	Public	Private	Private	Private	Private
Design	Private	Private	Private	Private	Private	Private
Construction	Private	Private	Private	Private	Private	Private
Maintenance	Public	Private	Private	Private	Private	Public
Operation	Public	Private	Private	Private	Private	Public
Facility owner	Public	Private	Private	Public	Private	Public
After the end of the project	Implemented by Public	Implemented by Public or re-ordering	Implemented by Public or re-ordering	Implemented by Public or re-ordering	Terminated or Implemented by Private company	Implemented by Public or re-ordering
Remarks						Development rights will be granted instead of the transfer of assets

4-4-3 Views on business components of the project scheme

Components in implementing the water distribution facilities as a PPP project are considered as follows

■ Fee structure

Under the PPP method, a usage rate is collected for the service provided which is applied to implement the project on a financially independent basis in many cases. However, as the water distribution facilities construction project contributes to an efficient water distribution operation and improvement of water quality, and does not newly create water, the construction of the facilities will not generate revenue. In other words, the project will not follow a model under which a usage rate is collected to be applied to the building and O&M of the facilities. This project should be implemented as a public project in nature, and as stated above, by applying the PPP method under which the public sector efficiently uses the service provided by the private operator. A contract stipulating that compensation for the service will be paid as service fee should be prepared.

■ Implement structure

A distribution reservoir has never been introduced in Vietnam in the past. Therefore, the most important is that construction and O&M can be handled efficiently by applying Japanese and/or some other leading countries' knowhow.

On the other hand, technical transfer to SAWACO can be realized to enhance SAWACO's ability as a water operator. This should contribute to a sustainable water distribution facilities operation and be for SAWACO to realize this project.

■ Financing

In case of implementing a PPP project; basically, the investor will procure project finance from commercial lenders. The application of JICA's overseas loans, etc. and investments at low interest rate will be considered for maximizing the SPC's profit and minimizing SAWACO's payments.

Government guarantee is likely to be needed for application of JICXA's overseas loans and the investor will need to discuss a specific method for implementing this with the Ho Chi Minh PC and lenders. According to past discussions with the Ho Chi Minh PC, it may be possible to obtain a government guarantee in the form of a letter.

We have specified below major project stakeholders with whom to hold discussions in order to consider the above.

4-4-4 Stakeholders involved in project promotion

The Team has identified the following major project stakeholders based on the above.

■ SPC Sponsor/SPC

The sponsors (investors in the project) are assumed to invest in the SPC and become shareholders. A "Shareholders Agreement" will need to be executed between the sponsors that determine the investment ratio of each sponsor, SPC's management structure and matters at times of emergency such as conflict of interest among shareholders or bankruptcy.

■ SAWACO (Saigon Water Corporation)

SAWACO could be the procuring party for this project. Its main responsibilities are the assessment and approval of the project proposal and feasibility study, and the selection of investors.

It is assumed that an agreement specifying the project terms will be executed between the People's Committee and the SPC.

■ HCMC PC (Ho Chi Minh City People's Committee)

HCMC PC is the party that will grant approval to the implementation of the project based on results of the study and approval to land lease and investment.

■ DOT

HCMC PC's Department of Transport which is responsible for water projects and manages SAWACO. DOT is a main stakeholder of this project and is the decision-making body mainly responsible for projects and technology.

■ DPI

HCMC PC's Department of Planning and Investment which promotes PPP. For this project, it is responsible for procedures and for financial aspects.

■ DONRE

HCMC PC's Department of Natural Resources and Environment which will make the decision on environmental consideration for this project.

■ Lender(s)

The SPC will need to execute a loan agreement with investor(s) and lender(s) to finance the necessary funds for the project.

A Japanese investor is assumed to be a project sponsor, for the project and JICA may provide its overseas loans and investments (Private Sector Investment Finance; PSIF). The PSIF will be provided directly to the SPC or through a local financial institution

■ Contractor(s)

The SPC will enter into an EPC contract and O&M contract with the sub-contractor. Toyo Engineering would be a potential EPC contractor candidate. The SPC will specify in the contract that the sub-contractor will engage in operation while complying with due dates and required levels, and will generally obtain consent on risk-bearing by requesting the party to bear the relevant cost in case of a violation.

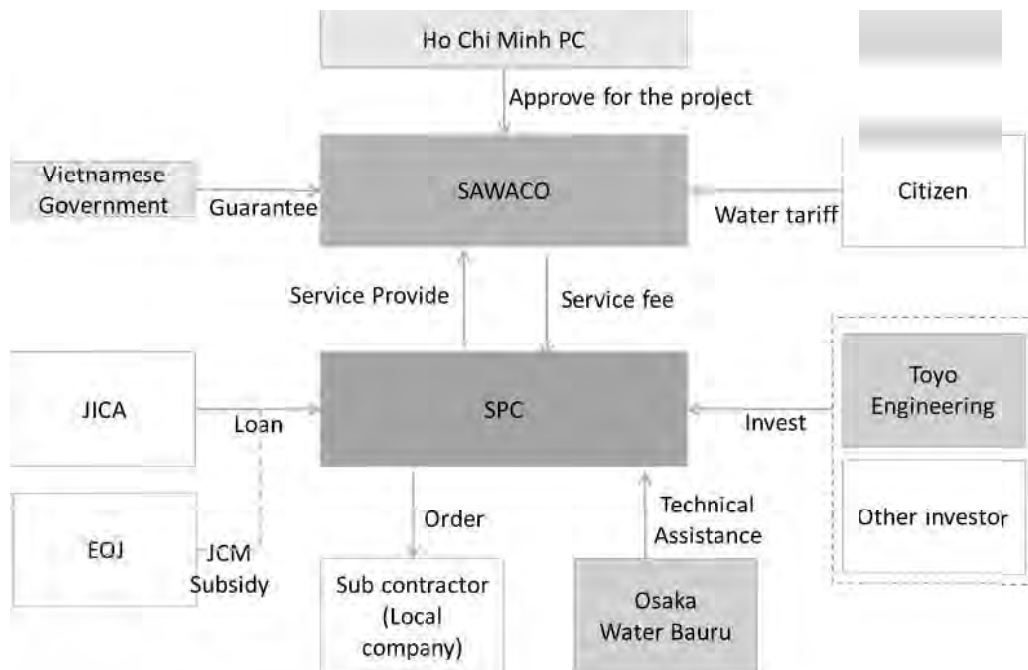


Fig.4-5 Business scheme

4-4-5 Other project scheme options

Other than the above, there is another possible scheme in light of the Vietnamese legal system. In case of application of this scheme, there is no need to pursue a competitive tender in contrast to the New PPP Law. However, the requirements and procedures for this scheme are unclear. Therefore, this study is based on the New PPP Law.

4-5. Risk analysis

4-5-1 Basic concept of risk sharing

Project risks need to be considered at the time of formulation of a project from the aspect of: 1) appropriate risk bearing among project stakeholders; and, 2) specific measures to be taken at the time of realization of risks. In particular, it is important that risks should be borne by the party that can most efficiently and effectively manage such risks. For instance, a sample case would be one where the government is the procuring party and an agreement will be executed which stipulates that the risk of a delay in the construction of facilities will be transferred to the SPC that will bear the entire additional cost when a delay actually occurs. In many cases, the SPC will further transfer the risk by executing an agreement with the EPC subcontractor stating that any additional cost accompanying a delay will be borne by the EPC subcontractor. This is because the EPC subcontractor is in the best position to most efficiently manage such risks related to construction. Similarly, the risk of a project being impacted by a revision in laws or regulations will be borne by the government that can most control such risks. The government will either set a condition that the project will be exempt from new regulations in case the project would be negatively impacted by a revision in laws or regulations, or, request for a structure that will pay the SPC a compensation in case of an occurrence of a negative impact.

Designing risk-bearing appropriately and specifically is important for both the government and the private sector in the sense that both parties will make the utmost effort in holding down the project cost and in trying to avoid the realization of risks. The higher the risk, the higher the cost for risk management will normally be, although in any case, it will be possible to reduce risk management costs such as the cost for monitoring progress on construction and the cost for purchasing insurance, to the extent such risks are transferred from the SPC to a third party. Project cost reduction will lead to the reduction of the fee for services provided by the SPC and is also beneficial for SAWACO that will be the payer of the service fee

under this project. Simultaneously, there will be an incentive for the risk-bearing company, e.g., the EPC subcontractor in the first sample case, to make the utmost effort to prevent a delay from occurring, so that there is the advantage of being able to hold down the actualization of the risk itself to a minimum.

4-5-2 Risk allocation

Following is draft image of risk identification and possible countermeasures for this project based on above basic concept. Basic concept of risk allocation is divided into two types: i) can identify to whom the risk is attributable; and, ii) cannot identify to whom the risk is attributable. Among the types under i), some cases are attributable to a single party (i-A) while others are attributable to multiple parties (ii.-b). For ii.-b cases, it may be possible to apply insurance. Cases for which an insurance can be applied in general are categorized as iii).

- Can identify to whom the risk is attributable: the owner of risks can control the risks and bear the cost (e.g. delay in completion, cost overrun, defect in facility, design error, third-party liability, approval and license, land acquisition, service level in transit, bankruptcy of co-sponsor, bankruptcy of EPC contractor, credit risk of SAWACO)
- Cannot identify to whom the risk is attributable: No one can control the risk, and thus, the government bears the cost (e.g. force majeure, regulation change, inflation, interest rate fluctuation, exchange rate fluctuations)
- An insurance can be reasonably be applied: Operator buys and applies insurance (e.g. fire disaster, strike)

Based on the above concept, the following Table has identified project risks and produced possible countermeasures. A circle has/circles have been placed for the party/parties assumed to bear the risks as of now. “Risk-bearing party” and “Risk measures/ Details of actions when faced with imminent risks” are the current plan and may be revised in future.

Items specified under “Matters to be implemented” will be implemented, the method for risk-bearing will be negotiated and finalized among stakeholders, and ultimately clearly specified in relevant documents (e.g., contracts and guarantees).

Tab.4-3 List of risk-bearing parties

Phase	No	Risk	Details	Risk-bearing party							Possibility of coverage by insurance	Key factor for risk allocation	Risk measures/Details of actions when faced with imminent risks	Matters to be implemented	Relevant documents
				Procuring party (SAWACO, PC)	Gov't of Vietnam	Financial Institutions	SPC								
							Sponsor	SPC operator	EPC subcontractor	O&M contractor					
Common	1	Changes in tax system, laws and regulations, policy	Risk of changes in subsidies, government guarantees, preferential treatment for the water project due to changes in the system	○	○							i-A Or iii iii	• Guarantee by the government of Vietnam • Purchase insurance to cover political risk	• Confirm possibility of a government guarantee • Confirm possibility of an insurance/insurance premium with insurance company	• Government guarantee • Insurance policy
	2	Cancellation /changes in permits and licenses	Risk of Cancellation/ changes in permits and licenses obtained	○	○						○	i-A Or iii	• Guarantee by the government of Vietnam • Purchase insurance to cover political risk	• Confirm possibility of a government guarantee • Confirm possibility of an insurance/insurance premium with insurance company	• Government guarantee • Insurance policy
	3	Workers' strike	Risk of operation being interrupted due to workers' strike					○			○	li-A	• Purchase insurance to cover political risk • Purchase insurance to cover the risk • Receive necessary staff from procuring party	• Confirm possibility of an insurance/insurance premium with insurance company • Discuss receiving necessary staff with procuring party	• Insurance policy • Service purchase agreement

Phase	No	Risk	Details	Risk-bearing party						Possibility of coverage by insurance	Key factor for risk allocation	Risk measures/Details of actions when faced with imminent risks	Matters to be implemented	Relevant documents	
				Procuring party (SAWACO, PC)	Gov't of Vietnam	Financial institutions	SPC								
							Sponsor	SPC operator	EPC subcontractor						O&M contractor
	4	Failure of sponsor	Risk of a failure of the sponsor				○				ii-A	Other sponsor(s) to acquire the failed sponsor's shares	- Confirm through past cases whether JICA requests for such sponsor support - Consider whether other sponsor(s) can make the acquisition	- Shareholders agreement - Investment agreement	
	5	Failure of cooperating companies	Risk of failure of cooperating companies (subcontractors)					○	○	○	ii-A	Arrange for back-up servicers in advance	Confirm the possibility of arranging for back-up servicers	Pledge/Letter of intent from back-up servicers	
	6	Early termination due to the procuring party	Risk of early termination due to the procuring party	○							ii-A	- Have the procuring party invest as a motivation for continuing with the project - Penalty, compensation for damages, asset purchase	Consider penalty, compensation for damages, handling of assets (whether or not to acquire the assets, acquisition price) in case of early termination	Service purchase agreement	
	7	Force majeure events	Risk of damages or stop of operation due to force majeure events (natural disaster, civil war, riot, terrorism, etc.)	○							lii or iii	- Specify measures in the Service purchase agreement - Purchase insurance to cover the risk in part	Confirm possibility of an insurance/insurance premium with insurance company	- Service purchase agreement - Insurance policy	
	8	Third party damages	Risk of the procuring party and/or other third party incurring damages due to grounds attributable to the project					○	○	○	○	li-B	- Purchase third party liability insurance - Borne by such operator	Confirm possibility of an insurance/insurance premium with insurance company	- Insurance policy - EPC contract - Operation contract

Phase	No	Risk	Details	Risk-bearing party							Possibility of coverage by insurance	Key factor for risk allocation	Risk measures/Details of actions when faced with imminent risks	Matters to be implemented	Relevant documents
				Procuring party (SAWACO, PC)	Gov't of Vietnam	Financial institutions	SPC								
							Sponsor	SPC operator	EPC subcontractor	O&M contractor					
			operator												• Maintenance contract
Preparation	9	Unable to/delay in obtaining permits and licenses	Risk of being unable to/delay in obtaining permits and licenses for project implementation (delay in preparing documents, delay in procedures due to defect in documents, delay in administrative agency's procedures)	○				○			li-B	• Obtain procuring party's cooperation • Borne by EPC contractor	Confirm necessary permits and licenses, procedures and possibility of a delay, and identify the schedule up to obtaining such permits and licenses	• Service purchase agreement • EPC contract	
	10	Preparation of land	Risk of being unable to prepare the land for starting the project	○							li-A	• Project cannot be launched (Preparation of land is the condition for the sponsor's internal approval, permits and licenses and loan)	• Consider compensation for damages in case land cannot be prepared or land cannot be made available after execution of the project agreement • Responsibility in preparing the land should be discussed as HCMC-PC's responsibility	• Land use permit	

Phase	No	Risk	Details	Risk-bearing party							Possibility of coverage by insurance	Key factor for risk allocation	Risk measures/Details of actions when faced with imminent risks	Matters to be implemented	Relevant documents
				Procuring party (SAWACO, PC)	Gov't of Vietnam	Financial institutions	SPC								
							Sponsor	SPC operator	EPC subcontractor	O&M contractor					
	11	No co-investor	Risk of being unable to find a company to invest in the SPC				○					i-A		Consider participation by co-investor in future (project participation by the procuring party is preferable)	
	12	No/delay in funding by investor	Risk of the company to invest in the SPC being unable to finance the funds or such financing being delayed				○					li-A	Obtain a written commitment for the investment	Consider wordings for the document making commitment to the investment	Investment agreement
	13	No/delay in funding by the financial institution	Risk of the financial institution to invest in the SPC being unable to finance the funds or such financing being delayed			○						li-A	- Select a highly reliable financial institution - Obtain a loan pledge	Confirm with JICA whether a loan pledge can be prepared, at which phase this can be provided	Loan pledge
Design	14	Changes in designing due to changes in the system	Risk of fluctuation in cost due to changes in designing (changes in designing guidance, changes in the conditions for permits and licenses)	○								i-A	Discuss risk-bearing in advance between the procuring party and HCMC-PC	Discuss in advance with the procuring party and HCMC-PC. If it is a government matter, discuss so that HCMC-PC will make efforts in making adjustments	Service purchase agreement

Phase	No	Risk	Details	Risk-bearing party						Possibility of coverage by insurance	Key factor for risk allocation	Risk measures/Details of actions when faced with imminent risks	Matters to be implemented	Relevant documents	
				Procuring party (SAWACO, PC)	Gov't of Vietnam	Financial institutions	SPC								
							Sponsor	SPC operator	EPC subcontractor						O&M contractor
	15	Changes in designing due to changes in specification attributable to the procuring party	Risk of connection, changes in requested specifications	○							i-A	Borne by the procuring party		Service purchase agreement	
	16	Changes in designing due to an error in designing	Risk of changes in designing due to an error in designing by the operator					○			i-A	• Borne by the EPC contractor		EPC contract	
Construction	17	Defects in land	Risk of construction being interrupted/delayed due to defects in land (e.g., underground installation, soil contamination)	○							li-A	• HCMC-PC	• Discuss risk-bearing with HCMC-PC in case of defects in land	Service purchase agreement	
	18	Cost overrun (including price fluctuation)	Risk of construction cost exceeding the original estimate					○			li-A or iii	• Execute the contract with the EPC contractor at a fixed price	• Confirm the risk of an increase in construction cost from past actual figures (e.g., price of materials, personnel cost)	• EPC contract	
	19	Damage to facilities attributable to the operator	Risk of facilities being damaged due to grounds attributable to the operator					○		○	li-A	• Borne by the EPC contractor • Purchase construction works insurance	• Confirm possibility of an insurance/insurance premium with insurance company	• EPC contract • Insurance policy	

Phase	No	Risk	Details	Risk-bearing party						Possibility of coverage by insurance	Key factor for risk allocation	Risk measures/Details of actions when faced with imminent risks	Matters to be implemented	Relevant documents	
				Procuring party (SAWACO, PC)	Gov't of Vietnam	Financial institutions	SPC								
							Sponsor	SPC operator	EPC subcontractor						O&M contractor
	20	Damage to facilities attributable to the procuring party/SPC	Risk of facilities being damaged due to grounds attributable to the procuring party/SPC operator	○				○			li-A	• Bone by the procuring party • Borne by the SPC operator • Purchase construction works insurance	• Confirm possibility of an insurance/insuranc e premium with insurance company	• Service purchase agreement • Insurance policy	
	21	Completion delay attributable to the operator	Risk of additional costs being incurred due to the delay in completion (delivery date of equipment/materials being postponed, defect in the vendor's construction works, mistake in the assumptions for groundwater level/ ground condition)						○			li-A	• Borne by the EPC contractor	• Confirm the EPC contractor's ability to bear the risk	• EPC contract
	22	Completion delay attributable to the procuring party	Delay in construction up to connection	○								li-A	• Borne by the procuring party	• Clarify works requiring implementation by the procuring party, and confirm the schedule	• Service purchase agreement
	23	Foreign currency exchange rate risk	Risk of spending during the construction period exceeding the initial estimation due to fluctuation of foreign currency exchange rate	○		○	○		○			i-A	a) Match the loan currency with the currency for making payments to the EPC contractor b) Currency swap c) Pass through to procuring party	• Confirm the currency in which the procuring party can make payments • Confirm the currency in which JICA can extend the	• Service purchase agreement • Currency swap agreement • EPC contract

Phase	No	Risk	Details	Risk-bearing party							Possibility of coverage by insurance	Key factor for risk allocation	Risk measures/Details of actions when faced with imminent risks	Matters to be implemented	Relevant documents
				Procuring party (SAWACO, PC)	Gov't of Vietnam	Financial Institutions	SPC								
							Sponsor	SPC operator	EPC subcontractor	O&M contractor					
												d) Link payments to the EPC contractor with foreign exchange fluctuations	loan Confirm with the local bank whether a currency swap can be used		
	24	Interest rate fluctuation risk	Risk of fluctuation in loan interest rate during the construction period	○		○			○		li	a) Calculate service fee at construction period interest rate inclusive of a buffer b) Purchase interest rate swap c) Pass through to procuring party	• Confirm the currency in which payments will be made to the EPC contractor • Confirm with JICA the possibility to use a construction period loan and a borrowing at a fixed rate • Confirm with the local bank whether an interest rate swap can be used	• Interest rate swap agreement • Service • purchase agreement • EPC contract	
	25	Price fluctuation risk	Risk of price fluctuation for cost during the construction period	○					○		i-A	a) Execute a contract with the EPC contractor at a fixed price b) Pass through to procuring party	• Confirm historical price fluctuation and consider the required level of contingency funds • Confirm possibility of procuring party accepting the pass through	• EPC contract • Service purchase agreement	

Phase	No	Risk	Details	Risk-bearing party						Possibility of coverage by insurance	Key factor for risk allocation	Risk measures/Details of actions when faced with imminent risks	Matters to be implemented	Relevant documents	
				Procuring party (SAWACO, PC)	Gov't of Vietnam	Financial institutions	SPC								
							Sponsor	SPC operator	EPC subcontractor						O&M contractor
Pre-operation	26	Extension of pre-operation period due to deficiency in performance									li-A	Additional cost borne by the EPC contractor		EPC contract	
	27	Extension of pre-operation period due to grounds attributable to the procuring party		○							li-A	Borne by the procuring party		Service purchase agreement	
Operation	28	Off-take risk (procuring party's credit risk)	Risk of the procuring party who is the service purchaser being unable to fulfill its payment obligation (e.g., drop in sales, application for an annual rate hike being rejected)		○	○	○				i-B	a) Borne by local bank through a 2-step loan b) Government guarantee c) Sponsor guarantee	- Confirm with JICA the need for a government guarantee, possibility of replacement with a sponsor guarantee - Confirm with local bank whether procuring party's credit risk can be borne	- Loan agreement - Government guarantee agreement - Sponsor support agreement	
	29	Risk of failure to achieve the service level	Risk of failing to achieve the established service level due to, e.g., a lack of facilities' capacity or					○	○	○		lii	Establish the service level to be achieved in the project contract, etc., to be executed	Consider the service level (e.g., water pressure) the SPC operator will	- Service purchase agreement - EPC contract

Phase	No	Risk	Details	Risk-bearing party							Possibility of coverage by insurance	Key factor for risk allocation	Risk measures/Details of actions when faced with imminent risks	Matters to be implemented	Relevant documents
				Procuring party (SAWACO, PC)	Gov't of Vietnam	Financial institutions	SPC								
							Sponsor	SPC operator	EPC subcontractor	O&M contractor					
			discrepancy with results of the distribution network analysis									between the procuring party • Borne by the party attributable	commit to the procuring party	• Operation contract Maintenance contract	
	30	Risk in fluctuation of interest rate	Risk of a fluctuation in loan interest rates. In case of a financing through local financial institutions, such as JICA 2-step loan or loan extended ty local bank(s), it is highly likely that fixing the loan interest rate would be difficult as Vietnam’s swap market is immature	○		○					i-A	a) Borrow funds directly from JICA (at a fixed rate) b) Interest rate swap, etc. c) Link service fee amount from the procuring party to fluctuation in interest rates	• Confirm with JICA whether a fixed rate direct loan would be possible • Confirm conditions for a 2-step loan with local bank (interest rate, fixed/floating rate) • Confirm with local bank the possibility to use an interest rate swap • Explain to procuring party that the service fee will reflect fluctuation in interest rates	• Loan agreement • Derivatives agreement • Service purchase agreement	
	31	Risk of being unable to continue the loan (risk of failure of local bank)	Risk of being unable to continue borrowing funds due to the failure of the lender financial institution (in case of a 2-step loan)			○					li-A	• Borrow directly from JICA	• Confirm options for loan terms (direct borrowing/2-step) with financial institutions, such as JICA • Confirm local bank’s credit status	• Loan agreement	

Phase	No	Risk	Details	Risk-bearing party							Possibility of coverage by insurance	Key factor for risk allocation	Risk measures/Details of actions when faced with imminent risks	Matters to be implemented	Relevant documents
				Procuring party (SAWACO, PC)	Gov't of Vietnam	Financial institutions	SPC								
							Sponsor	SPC operator	EPC subcontractor	O&M contractor					
	32	Risk in foreign exchange	Risk of not being able/taking time to exchange funds due to a lack of foreign currency. Foreign exchange will be required in case income and repayments are in different currencies.	○	○	○	○				○	i-A	a) Set the loan currency and service fee payment from the procuring party both in USD b) Vietnam government's guarantee on foreign exchange c) Purchase insurance to cover political risk d) Cash reserve for repayment currency	- Confirm possibility of an insurance/insurance premium with insurance company - Confirm possibility of a government guarantee	- Guarantee agreement (or document equivalent to an agreement) on foreign exchange by the Vietnam government - Insurance policy
	33	Exchange risk	Risk of the SPC's financial condition deteriorating due to fluctuation in exchange rates. Foreign exchange will be required in case income and repayments are in different currencies.	○		○						i-A or iii	a) Set the loan currency and service fee payment from the procuring party both in USD b) Currency swap c) Link service fee amount from the procuring party to fluctuation in exchange rates	- Confirm options for loan terms (currency, direct borrowing/2-step) with financial institutions, such as JICA - Explain in advance to procuring party that the service fee will reflect fluctuation in exchange rates	- Loan agreement - Service purchase agreement - Currency swap agreement
	34	Risk in transferring funds overseas	Risk of being unable to transfer funds out of Vietnam		○							○	iii	- Purchase insurance to cover political risk - Government's guarantee on money transfer	- Confirm possibility of an insurance/insurance premium with insurance company - Confirm possibility of a government

Phase	No	Risk	Details	Risk-bearing party						Possibility of coverage by insurance	Key factor for risk allocation	Risk measures/Details of actions when faced with imminent risks	Matters to be implemented	Relevant documents	
				Procuring party (SAWACO, PC)	Gov't of Vietnam	Financial institutions	SPC								
							Sponsor	SPC operator	EPC subcontractor						O&M contractor
													guarantee		
	35	Price fluctuation risk	Risk of fluctuation in utility costs and materials cost due to price fluctuation	○							li-A	Link service fee amount from the procuring party to price fluctuation	- Explain in advance to procuring party that the service fee will reflect price fluctuation - Consider price index that will form the basis and method of review (base date, review date)	Service purchase agreement	
	36	Risk of cost increase (other than interest rate, currency, commodity price) * Personnel cost, electrical power cost	Risk of an increase in operation, maintenance, management costs due to reasons other than fluctuation in interest rates, currency exchange or prices	○				○		○		li-A	Pass on SPC operator and O&M operator's cost increase to service fee from procuring party	Categorize the portion to be borne by the O&M operator and the portion to be passed on to service fee, by cost item	- Operation contract - Maintenance contract - Service purchase agreement

Phase	No	Risk	Details	Risk-bearing party						Possibility of coverage by insurance	Key factor for risk allocation	Risk measures/Details of actions when faced with imminent risks	Matters to be implemented	Relevant documents	
				Procuring party (SAWACO, PC)	Gov't of Vietnam	Financial institutions	SPC								
							Sponsor	SPC operator	EPC subcontractor						O&M contractor
	37	Facility failure	Defects in equipment, poor maintenance						○	○		liii	• Document EPC contractor's defect warranty liability • Others to be borne by the O&M operator	• Consider scope of defect warranty liability to be borne by the EPC contractor	• EPC contract • Maintenance contract
	38	Fluctuation in cost due to an increase/decrease in quantity of water to be treated	Risk of an increase/decrease in operation cost due to an increase/decrease in quantity of water to be treated	○								liii	• Link service fee amount from the procuring party to quantity of water to be treated	• Consider base date for measuring water quantity and timing to reflect in service fee	• Service purchase agreement
	39	Fire	Risk of damages to facilities due to a fire								○	li-A	• Purchase fire insurance	• Confirm possibility of an insurance/insurance premium with insurance company	• Insurance policy

4-5-3 Applicable main insurance

There are applicable insurance as below. Study team didn't decide to apply any insurance at this moment; therefore we calculate the cash flow exclude of insurance fee.

(1) Overseas Investment Insurance

The overseas investment insurance mentioned in the matrix is provided by Nippon Export and Investment Insurance (NEXI). This insurance covers losses suffered by a Japanese company with a joint venture (the SPC) in a foreign country. Losses are covered when the SPC is forced to discontinue business due to war, terrorism, or force majeure, such as a natural disaster. In addition, it also covers losses incurred when a Japanese company is unable to remit dividends to Japan due to prohibition of foreign currency exchange or suspension of remittance. However, it does not cover commercial risks for which the counterparts of overseas transactions are responsible (e.g., SPC cannot collect revenue due to financial troubles of the counterpart such as SAWACO or Ho Chi Minh City PC for this project).

(2) Delayed Start-up Insurance

Delayed start-up insurance is provided by various insurance companies, and its conditions and coverage may vary depending on the provider. Generally, it covers the lost profit incurred as a result of damages made to the facilities during the construction period.

(3) Construction Insurance

Construction insurance is provided by various insurance companies, and its conditions and coverage may vary depending on the provider. Generally, it covers the entire costs incurred as a result of damages made to facilities, people, and/or other assets at the construction site due to unexpected events, such as accidents or natural disasters.

(4) Contractor's Liability Insurance

Contractor's liability insurance is provided by various insurance companies, and its conditions and coverage may vary depending on the provider. Generally, it covers the entire costs incurred as a result of damages made to facilities, people, and/or other assets related to the execution of the contract.

(5) Third Party Insurance

Third party insurance is provided by various insurance companies, and its conditions and coverage may vary depending on the provider. Generally, this insurance is designed to cover specifically either construction period or O&M period. This means that single insurance does not cover the entire project period. Insurance for construction and O&M period must be obtained separately. It covers the entire costs for compensation payments claimed by third parties when the construction or O&M works of the project are responsible for damages made to third parties.

4-6. Total Investment

■ Initial investment cost (Capex)

The initial investment cost was estimated according to the facility design of chapter 3.

- Initial investment cost Capex): 20,181,000 USD
- (432,098 mil VND) (@0.0000467 USD/VND)

Table 4-4. Total Investment Cost

Category	Price(USD)	Remarks
Equipment	3,588,000	
Construction	8,510,000	
Engineering	1,859,000	
Others	1,796,000	
Test Operation	1,863,000	
Escallation	2,565,000	20% of Price increase
20,181,000		

The estimation conditions are as follows.

- EPC (Engineering, procurement, construction) is performed by local procurement.
- The estimation includes WDP itself, drainage connecting trench and electric power receiving cabling.
- The estimation does not include connecting pipes with water supply network.
This cost is estimated independently. (This scope will be discussed with SAWACO. For reference, necessary costs for preparation for SAWACO's scope will be 10-20 billion VND)

■ Operation and maintenance cost (Opex)

Operation and maintenance cost (Opex) is includes following costs.

- Manpower cost : operators, advisor of OMWB, and so on
- Direct cost : electric power, water, chemicals, safety, sanitary and so on
- Maintenance cost : periodical inspection and repair of equipment

Tab.4-5 Estimation of Opex (unit: mil VND)

Operating Expenses	Total	1	2	3	4	5	6	7	8	9	10
	582,448	15,453	16,270	22,755	22,755	30,121	22,755	23,572	22,755	31,853	39,240
Labor Cost	77,193	3,860	3,860	3,860	3,860	3,860	3,860	3,860	3,860	3,860	3,860
Direct Cost	459,363	10,938	10,938	18,239	18,239	18,239	18,239	18,239	18,239	27,338	27,338
Maintenance Cost	45,891	656	1,473	656	656	8,022	656	1,473	656	656	8,043
		11	12	13	14	15	16	17	18	19	20
		31,853	32,670	31,853	31,853	39,219	31,853	32,670	31,853	31,853	39,240
		3,860	3,860	3,860	3,860	3,860	3,860	3,860	3,860	3,860	3,860
		27,338	27,338	27,338	27,338	27,338	27,338	27,338	27,338	27,338	27,338
		656	1,473	656	656	8,022	656	1,473	656	656	8,043

As for stepwise increase of direct cost, operation condition of WDP is assumed that WDP utilization rate will be put up according to WTP implementation. (WDP will start up at year 2017, and year of 2025 is 9th year.)

■ Operation and maintenance cost (Opex)

In the current situation, now the Team still didn't contact to actual funding source, therefore it will be described in F/R.

4-7. Financing Scheme

The profitability of a project is strongly related to its financing scheme because the profit arising from the project is the source for the repayment. Generally, the project with low profitability needs long term financing, and the project with high profitability needs short term financing.

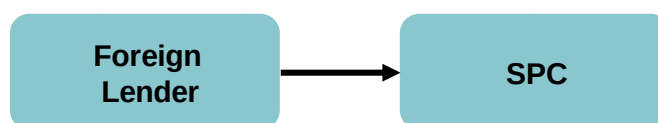
The fund required by the project's SPC is assumed to be financed through investment and borrowings (3:7). 2 types of borrowings are expected, which are preferential loans and subordinated loans (assumed to be provided mainly by the investors), and the following describes the possible financing method of preferential loans for the SPC.

4-7-1 Funding methods

■ Direct Investment by a foreign financial institution

A method under which a foreign financial institution will make direct investments in the SPC.

Potential lenders will include international cooperation agencies, such as the World Bank and JICA (Japan International Cooperation Agency), export credit agencies such as ADB (Asia Development Bank) and JBIC (Japan Bank for International Cooperation), and private commercial banks. Out of these, a loan from a Japanese financial institution with strong international competitiveness would provide an advantage, as it would be possible to receive a low, fixed rate loan. On the other hand, as the loan is highly likely to be denominated in foreign currency (other than the Vietnam dong), if revenue was not in such currency, or if the payment is not linked to the currency exchange, there is the disadvantage of the SPC having to bear the risk of exchange rate fluctuations.



■ 2-step loan from foreign financial institution via a local financial institution

A method under which a foreign financial institution will provide a loan to a domestic financial institution, which in turn will extend a loan to the SPC.

Potential lenders will include international cooperation agencies, such as the World Bank and JICA and export credit agencies such as ADB and JBIC. An advantage of this option is that the domestic lender in between is able to provide a loan in the same currency as the revenue of the SPC, and the SPC will not bear the risk of exchange rate fluctuations. On the other hand, a disadvantage of this option is that as Vietnam's interest rate is extremely high, having a domestic lender in between will greatly push up the interest rate to be borne by the SPC, and it may also be difficult to have a fixed rate loan.

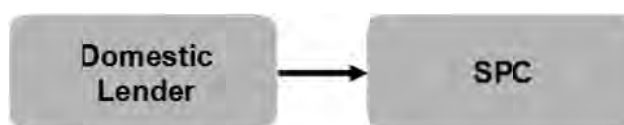


■ Loan from a local financial institution

A method under which a Vietnamese financial institution will provide a loan to the SPC.

An advantage of this option is that the SPC will not bear the risk of exchange rate fluctuations, if its revenue is in domestic currency. Meanwhile, as this is a loan in Vietnam with an extremely high interest rate, the interest rate to be borne by the SPC will be greatly pushed up, and in addition, there is the disadvantage that the rate cannot be fixed, as a currency swap market does not exist in Vietnam. Furthermore, the loan period could be shorter than the project period, depending on the

domestic lender's capability and performance, which may cause the SPC difficulty in financing the project.



4-8. Cash Flow Simulation

■ Assumptions

The Team performed a cash flow simulation based on the conditions assumed as of now. SAWACO's payments to the SPC consist of the SPC cost and margin. The Team has produced own estimation on cost, while the margin was calculated from the level required to achieve an EIRR (Equity Internal Rate of Return) of 12% which would be the target return for SPC.

The simulation established 2 cases as a basis for considering different financing plans. Both cases are common in which they reviewed measures to hold down SAWACO's payments during the initial project period. Although both cases assume to provide for the Yr. 1 operation cost and SPC cost through a Sub Loan, they differ in which Case 2 has a grace period of 2 years for the repayment of the Senior Loan.

The below tables show a breakdown of the service fee for Yr.1, Yr.2 and after Yr.3. The gray cells are those included in that years' service fee calculation, and the white cells are those for which SAWACO's burden is deferred to the following year onwards by having the SPC devise means of financing (operating cost and SPC cost financed through a subordinated loan, grace of preferential loan repayments, margin excluded).

Case1

	1	2	after 3
Operation cost			
SPC cost			
Senior loan principal			
Senior loan interest			
Sub loan principal			
Sub loan interest			
Margin			

Case2

	1	2	after 3
Operation cost			
SPC cost			
Senior loan principal			
Senior loan interest			
Sub loan principal			
Sub loan interest			
Margin			

4-8-1 Case 1

■ Assumptions

The below Tab.4-7 shows the assumptions for Case 1. The Team assumed the Debt: Equity ratio to be 70:30, which is a level expected from financial institutions in an ordinary infrastructure project. As the risk assumed for this project is not so high, the level should not greatly differ from such level. Debt has been calculated assuming a 2-step loan through a local financial institution.

Tab.4-6 Calculation basis (Case 1)

PPP Scheme	BOT or BOO
Project period	22 Years
Construction Period	2 Years
Operating Period	20 Years
initial Cost	432 Billion VND (Excluding Interest during Construction Phase)
Financing	
Debt: Equity	Debt 70% (338 Billion VND) Equity 30% (145 Billion VND)
Debt Facility	2 Step Loan by Government of Japan (JPY→VND)
Repayment	Equal payments with interest (18years)
Interest Rate	13% (Base Rate & Spread) ※Fixed Rate
Target EIRR(Dividend base)	12%
Income Tax Rate	Fiscal year 1st to 4th 0% 5th to 9th 5% 10th to 15th 10% after 16th 25%
Payment Formula	Project Cost + Margin
Currency	VND
Inflation	Exclude
Exchange Rate Fluctuation	Exclude
Fluctuation of Operating Cost	Exclude
Working Capital	Exclude

■ Calculation results

Tab. 4-8 shows the total initial investment and financing amount and total income and expenditure for the 20-yr project period from the start of operation for Case 1. SPC's revenue indicates SAWACO's payments.

Tab. 4-9 is a detailed cash flow for Case 1 for the project period. Case 1 proposes to reduce SPC's revenue (payments from SAWACO) for Yrs. 1 and 2 of operation.

This is proposed as a method for holding down the impact on SAWACO's rate hike to the extent possible.

Tab.4-7 Investment Summary (Case 1)

Initial Investment (Summary)

Cash Out		Cash In	Billion VND
Construction Cost	432	Loan	338
Other Cost	39		
Interest during Construction	12	Equity	145
Total	483	Total	483

Total of Project Period (Summary)

Cash Out		Cash In	Billion VND
Operating Cost	582	Revenue	2,483
SPC Cost	19		
Senior loan principal	338		
Senior loan interest	462		
Sub-loan interest	15		
Income Tax	186		
Dividend	736		
Redemption of stock	145		
Total	2,483	Total	2,483

Total Service Fee

Tab.4-8 SPC Cash Flow (Case 1)

Summary Financial Statement of SPC

Billion VND			Fiscal year	FY1	FY2	FY3	FY4	FY5	FY6	FY7	FY8	FY9	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	-
Operating year				-	-	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	-
Profit and Loss			Total																							
1	Revenue	2+3+(-d)+(-k)+(-l)+(-n)+(-o)+p	2,483	-	-	62	77	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	-
2	Operating Expenses		582	-	-	15	16	23	23	30	23	24	23	32	39	32	33	32	32	39	32	33	32	32	39	-
3	SPC Cost		19	-	-	8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
4	Depreciation		483	-	-	48	48	48	48	48	48	48	48	48	48	-	-	-	-	-	-	-	-	-	-	-
5	Operating Profit	1-2-3-4	1,398	-	-	▲10	12	59	59	51	59	58	59	49	42	98	97	98	98	90	98	97	98	98	90	-
6	Interest		476	-	-	45	43	41	38	36	34	32	30	27	25	23	20	18	16	14	11	9	7	5	2	-
7	Profit before Tax	5+6	922	-	-	▲55	▲31	18	20	15	25	26	29	22	17	75	76	80	82	77	86	88	91	93	88	-
8	Income Tax		186	-	-	-	-	1	1	1	1	1	3	2	2	8	8	8	20	19	22	22	23	23	22	-
9	Profit after Tax	7+8	736	-	-	▲55	▲31	17	19	14	23	25	26	20	15	68	69	72	61	58	65	66	68	70	66	-
Cash Flow			Total																							
a	Profit before Tax	7	922	-	-	▲55	▲31	18	20	15	25	26	29	22	17	75	76	80	82	77	86	88	91	93	88	-
b	Depreciation	4	483	-	-	48	48	48	48	48	48	48	48	48	48	-	-	-	-	-	-	-	-	-	-	-
c	Interest	6	476	-	-	45	43	41	38	36	34	32	30	27	25	23	20	18	16	14	11	9	7	5	2	-
d	Income Tax	④ in Last Year	▲186	-	-	-	-	-	▲1	▲1	▲1	▲1	▲1	▲3	▲2	▲2	▲8	▲8	▲8	▲20	▲19	▲22	▲22	▲23	▲23	▲22
e	Operating Cash flow	a+b+c+d	1,695	-	-	39	60	107	106	99	106	105	106	95	88	96	89	90	90	70	79	75	76	75	67	▲22
f	Capital Expenditure		▲483	▲236	▲247	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
g	Share issue		145	145	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
h	Senior loan borrowing		338	91	247	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
i	Sub loan borrowing		23	-	-	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
j	Available cash for debt service	e+f+g+h+i	1,718	-	▲	62	60	107	106	99	106	105	106	95	88	96	89	90	90	70	79	75	76	75	67	▲22
k	Senior loan Interest	6	▲462	-	-	▲44	▲42	▲40	▲37	▲35	▲33	▲31	▲29	▲26	▲24	▲22	▲20	▲18	▲15	▲13	▲11	▲9	▲7	▲4	▲2	-
l	Senior loan principal Repayment		▲338	-	-	▲17	▲17	▲17	▲17	▲17	▲17	▲17	▲17	▲17	▲17	▲17	▲17	▲17	▲17	▲17	▲17	▲17	▲17	▲17	▲17	-
m	Available cash after debt services	j+k+l	919	-	▲	1	1	50	52	46	56	57	60	52	47	57	53	56	58	40	51	50	52	54	48	▲22
n	Sub-loan Interest		▲15	-	-	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲	▲	▲	▲	▲	-
o	Sub-loan principal Repayment		▲23	-	-	-	-	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲2	▲2	▲2	▲2	▲2	-
p	Available cash for dividend	m+n+o	881	-	▲	0	▲	48	50	44	54	55	58	50	45	55	51	54	56	38	49	48	50	52	46	▲22
q	Dividend		▲736	-	-	-	-	-	-	-	-	▲12	▲26	▲20	▲15	▲68	▲69	▲72	▲61	▲58	▲65	▲66	▲68	▲70	▲66	-
r	Redemption of stock		▲145	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	▲145
s	Net Cash flow	p+q+r	▲	-	▲	0	▲	48	50	44	54	43	32	30	30	▲12	▲18	▲18	▲6	▲20	▲16	▲18	▲18	▲18	▲20	▲167
Balance Sheet																										
①	Cash and Cash equivalents	Accumulated o	-	▲	0	0	48	98	143	197	240	272	301	331	319	301	283	277	257	241	223	205	187	167	-	-
②	Fixed Asset	Accumulated ((-f)-4)	236	483	435	386	338	290	242	193	145	97	48	0	0	0	0	0	0	0	0	0	0	0	-	-
③	Total Asset	①+②	236	483	435	386	387	388	384	390	385	368	350	331	319	301	283	277	257	241	223	205	187	167	-	-
④	Accrued Tax	8	-	-	-	-	1	1	1	1	1	3	2	2	8	8	8	20	19	22	22	23	23	22	-	-
⑤	Senior loan (Construction loan)	Accumulated (h -(-i))	91	338	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
⑥	Senior loan (Permanent loan)		-	-	321	304	287	270	254	237	220	203	186	169	152	135	118	101	85	68	51	34	17	▲	▲	
⑦	Sub-loan		-	-	23	23	22	22	21	20	19	18	17	15	14	13	12	10	9	7	5	4	2	0	0	-
⑧	Total Liability	④+⑤+⑥+⑦	91	338	345	328	311	293	275	258	240	223	205	186	174	156	138	132	112	96	78	60	42	22	▲	-
⑨	Equity	Accumulated (g-(-r))	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	-	-
⑩	Retained Earnings	Accumulated (9 -q)	-	-	▲55	▲86	▲69	▲50	▲36	▲12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
⑪	Net Asset	⑨+⑩	145	145	90	59	76	95	109	132	145	145	145	145	145	145	145	145	145	145	145	145	145	145	-	-
⑫	Total Liability and Net Asset	⑧+⑪	236	483	435	386	387	388	384	390	385	368	350	331	319	301	283	277	257	241	223	205	187	167	▲	▲
	Balance	⑫-③	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

EIRR(Dividend)

12.00%

4-8-2 Case 2

■ Assumption

Tab.4-10 shows the assumptions for Case 2. The difference with Case 1 is that Case 2 has a 2-yr grace period for the repayment of the Senior Loan from start of operation.

Tab.4-9 Calculation basis (Case 2)

PPP Scheme	BOT or BOO
Project period	22 Years
Construction Period	2 Years
Operating Period	20 Years
initial Cost	432 Billion VND (Excluding Interest during Construction Phase)
Financing	
Debt: Equity	Debt 70% (338 Billion VND) Equity 30% (145 Billion VND)
Debt Facility	2 Step Loan by Government of Japan (JPY→VND)
Repayment	Equal payments with interest (18years) *Repayment grace period : 2 years
Interest Rate	13% (Base Rate & Spread) ※Fixed Rate
Target EIRR(Dividend base)	12%
Income Tax Rate	Fiscal year 1st to 4th 0% 5th to 9th 5% 10th to 15th 10% after 16th 25%
Payment Formula	Project Cost + Margin
Currency	VND
Inflation/Exchange Rate Fluctuation	Exclude
Fluctuation of Operating Cost	Exclude
Working Capital	Exclude

■ Results Summary

Tab. 4-11 below shows the total initial investment and loan, and total revenue and cost for the 20-yr project period from start of operation for Case 2. SPC's revenue indicates SAWACO's payments.

Tab. 4-12 is a detailed cash flow for Case 2 for the project period. By establishing a grace period for repayments, Case 2 proposes to reduce SPC's revenue (payments from SAWACO) for Yrs 1 and 2 of operation more than in Case 1.

Tab. 4-10 Investment Summary (Case 2)

Initial Investment (Summary)

Cash Out		Cash In	Billion VND
Construction Cost	432	Loan	338
Other Cost	39		
Interest during Construction	12	Equity	145
Total	483	Total	483

Total of Project Period (Summary)

Cash Out		Cash In	Billion VND
Operating Cost	582	Revenue	2,562
SPC Cost	19		
Senior loan principal	338		
Senior loan interest	505		
Sub-loan interest	15		
Income Tax	198		
Dividend	759		
Redemption of stock	145		
Total	2,562	Total	2,562

Total Service Fee

Tab.4-11 SPC Cash Flow (Case 2)

Summary Financial Statement of SPC

Billion VND		Fiscal year Operating year	FY1	FY2	FY3	FY4	FY5	FY6	FY7	FY8	FY9	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	-
			-	-	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	-
Profit and Loss		Total																							
1	Revenue	2+3+(-d)+(-k)+(-l)+(-n)+(-o)+p	2,562	-	-	45	62	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	136	-
2	Operating Expenses		582	-	-	15	16	23	23	30	23	24	23	32	39	32	33	32	32	39	32	33	32	32	-
3	SPC Cost		19	-	-	8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
4	Depreciation		483	-	-	48	48	48	48	48	48	48	48	48	48	-	-	-	-	-	-	-	-	-	-
5	Operating Profit	1-2-3-4	1,478	-	-	▲26	▲3	65	65	57	65	64	65	56	48	104	103	104	104	97	104	103	104	97	-
6	Interest		520	-	-	45	45	45	43	40	38	35	33	30	28	25	23	20	18	15	13	10	8	5	-
7	Profit before Tax	5+6	958	-	-	▲72	▲48	20	22	17	27	29	32	25	21	79	80	84	86	81	91	93	96	99	-
8	Income Tax		198	-	-	-	-	1	1	1	1	1	3	3	2	8	8	8	22	20	23	23	24	25	-
9	Profit after Tax	7+8	759	-	-	▲72	▲48	19	21	16	26	27	29	23	19	71	72	75	65	61	68	70	72	74	-
Cash Flow		Total																							
a	Profit before Tax	7	958	-	-	▲72	▲48	20	22	17	27	29	32	25	21	79	80	84	86	81	91	93	96	99	-
b	Depreciation	4	483	-	-	48	48	48	48	48	48	48	48	48	48	-	-	-	-	-	-	-	-	-	-
c	Interest	6	520	-	-	45	45	45	43	40	38	35	33	30	28	25	23	20	18	15	13	10	8	5	-
d	Income Tax	④ in Last Year	▲198	-	-	-	-	▲1	▲1	▲1	▲1	▲1	▲3	▲3	▲2	▲8	▲8	▲8	▲22	▲20	▲23	▲23	▲24	▲25	-
e	Operating Cash flow	a+b+c+d	1,763	-	-	22	45	113	112	105	112	111	112	101	94	102	95	96	96	75	84	80	81	80	-
f	Capital Expenditure		▲483	▲236	▲247	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
g	Share issue		145	145	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
h	Senior loan borrowing		338	91	247	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
i	Sub loan borrowing		23	-	-	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
j	Available cash for debt service	e+f+g+h+i	1,786	-	▲	45	45	113	112	105	112	111	112	101	94	102	95	96	96	75	84	80	81	80	-
k	Senior loan Interest	6	▲505	-	-	▲44	▲44	▲44	▲42	▲39	▲37	▲34	▲32	▲29	▲27	▲24	▲22	▲20	▲17	▲15	▲12	▲10	▲7	▲5	-
l	Senior loan principal Repayment		▲338	-	-	-	-	▲19	▲19	▲19	▲19	▲19	▲19	▲19	▲19	▲19	▲19	▲19	▲19	▲19	▲19	▲19	▲19	▲19	-
m	Available cash after debt services	j+k+l	943	-	▲	1	1	50	52	47	57	58	61	53	48	59	55	58	60	42	53	52	55	56	-
n	Sub-loan Interest		▲15	-	-	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲	▲	▲	▲	-
o	Sub-loan principal Repayment		▲23	-	-	-	-	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲1	▲2	▲2	▲2	▲2	-
p	Available cash for dividend	m+n+o	904	-	▲	0	▲	48	50	45	55	56	59	51	46	57	53	56	58	40	51	50	53	54	-
q	Dividend		▲759	-	-	-	-	-	-	-	-	-	▲18	▲23	▲19	▲71	▲72	▲75	▲65	▲61	▲68	▲70	▲72	▲74	-
r	Redemption of stock		▲145	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
s	Net Cash flow	p+q+r	-	-	▲	0	▲	48	50	45	55	56	41	28	28	▲14	▲20	▲20	▲7	▲21	▲18	▲20	▲20	▲20	-
Balance Sheet																									
①	Cash and Cash equivalents	Accumulated o	-	▲	0	0	48	98	143	198	254	295	322	350	336	316	296	289	268	250	230	210	190	168	-
②	Fixed Asset	Accumulated ((-f)-4)	236	483	435	386	338	290	242	193	145	97	48	0	0	0	0	0	0	0	0	0	0	0	-
③	Total Asset	①+②	236	483	435	386	386	388	384	391	399	391	371	350	336	316	296	289	268	250	230	210	190	168	-
④	Accrued Tax	8	-	-	-	-	1	1	1	1	1	3	3	2	8	8	8	22	20	23	23	24	25	24	-
⑤	Senior loan (Construction loan)	Accumulated (h -(-i))	91	338	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
⑥	Senior loan (Permanent loan)		-	-	338	338	319	301	282	263	244	225	207	188	169	150	131	113	94	75	56	38	19	▲	-
⑦	Sub-loan		-	-	23	23	22	22	21	20	19	18	17	15	14	13	12	10	9	7	5	4	2	0	-
⑧	Total Liability	④+⑤+⑥+⑦	91	338	361	361	343	323	303	284	264	246	226	205	191	171	151	144	123	105	85	65	45	24	-
⑨	Equity	Accumulated (g-(-r))	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	-
⑩	Retained Earnings	Accumulated (9 -q)	-	-	▲72	▲120	▲101	▲80	▲64	▲38	▲11	-	-	-	-	-	-	-	-	-	-	-	-	-	-
⑪	Net Asset	⑨+⑩	145	145	73	25	44	65	81	107	134	145	145	145	145	145	145	145	145	145	145	145	145	145	-
⑫	Total Liability and Net Asset	⑧+⑪	236	483	435	386	386	388	384	391	399	391	371	350	336	316	296	289	268	250	230	210	190	168	-
Balance		⑫-③	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	▲	▲	-	▲	-	-

EIRR(Dividend)

12.00%

4-9. The method of recovering service fee

The followings are the study on the methods of recovering service fee for this project.

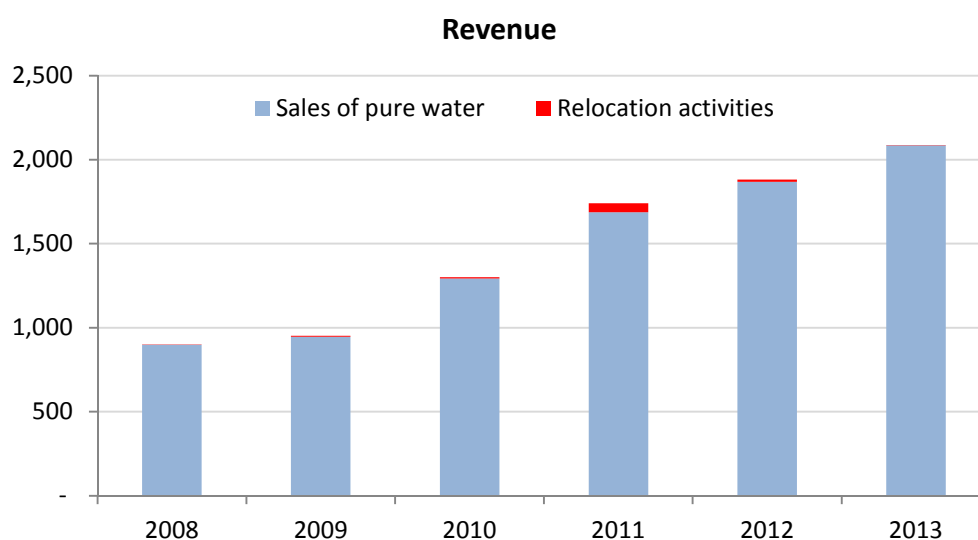
4-9-1 Payer of the service fee

The purpose of this project is to undertake construction and operation of water distribution facilities to be constructed between water purification plant operated by SAWACO and terminal feed pipelines. As the recipient of the service provided through this project is SAWACO, it is considered to be appropriate that the payee of the service fee should be SAWACO based on benefit principle.

Therefore, the studies are made based on the presumption that the service fee is to be paid by SAWACO.

4-9-2 Financial capability of SAWACO in light of its earnings structure

As shown below, revenue of SAWACO is mostly from sales of water.

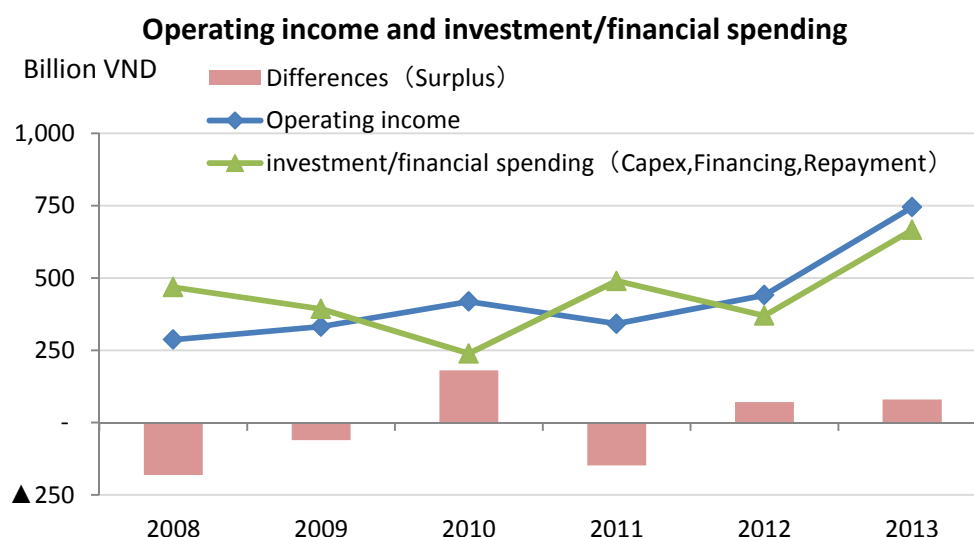


Source : SAIGON WATER CORPORATION Audited Financial Statements

Fig. 4-6 Transition of Revenue

Unit rate of water is calculated by adding up necessary costs subject to the approval of People's Committee. Therefore, earning structure of SAWACO is not such structure that allows earning profit more than necessary.

Operating income and investment/financial spending during 6 year period between FY 2008 and FY 2013 as shown below shows no substantial surplus funds are accumulated. (As an exception, FY 2010 shows surplus of 200 billion VDN. However, it seems to have been intentionally reserved to prepare funds to offset negative balance of the operating income and investment/financial spending in FY 2011.)



Source : SAIGON WATER CORPORATION Audited Financial Statements

Fig. 4-7 Operation income and investment/financial spending

As such, SAWACO has no surplus funds in hand at present, and it is necessary to increase income by raising the price of water so as to prepare funds to pay service fee for this project.

4-9-3 Required amount of price increase

Following is a calculation of revised price of water based on Case-2 of cash flow analysis described earlier.

Annual amount of Service Fee (123,102,000,000 don) ÷ Predicted annual volume of water supplied (2,270,000 m³/day × 365days × 66%) = 225.11 VND/m³

When the cost of operation by SPC increases due to inflation, the price of water which is the sole source of the service fee should also be increased. It should be noted, however, assuming expeditious increase of the water price may not be easy, consideration to measures to remedy time lag between increasing service fee and water price should be made.

4-9-4 Permission of increase of water supply price

As mentioned above, increase of water price is necessary for SAWACO to pay the service fee for this project. Followings are the studies for permissibility of increase of water price from viewpoints of legal and burden on citizens.

➤ Legal~Is there any legal issue in price increase?

1) Is it possible to include the amount of increase in price calculation as a cost?

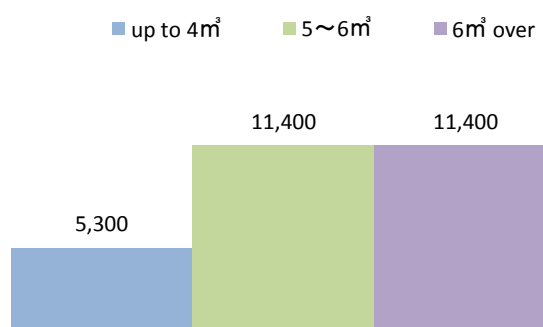
The method of calculating water price is set forth by a ministerial order of the Ministry of Finance (Circular 75/2012/TTLT-BTC-BXD-BNNPTNT) which stipulates that the price shall be calculated based on necessary cost. The decree also objectively stipulates methods of calculation and cost items to be included, and the cost of this project (service fee) is considered to be pertinent to 「3.Overall production cost」 of the decree among others.

2) Is there any conflict with upper limit stipulated in law?

Ministerial order of the Ministry of Finance (Circular n°88/2012/TT-BTC) stipulates 18,000 VND/m³ as the upper limit of the water price in Ho Chi Minh City. On the other hand, recent (as of May 2014) highest water price in Ho Chi Minh City is 11,400 VND/m³ as applicable to the

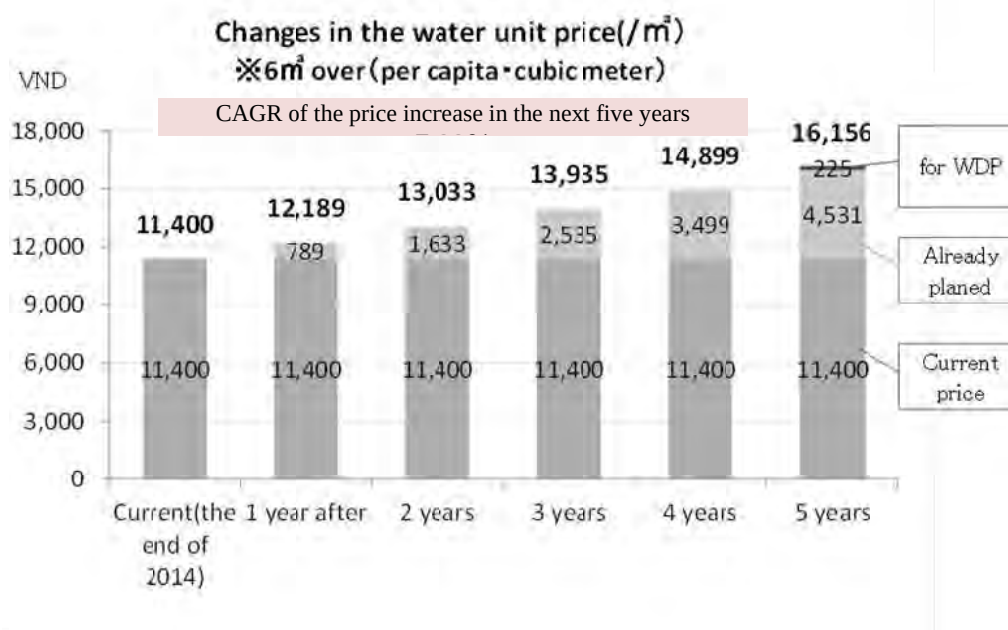
volume of 6m³ or more.

Water price structure for household use (as of May 2014)
※per capita・cubic meter (VND)



Source : Data from JETRO of Investment cost comparison of the Asia Oceania region
 Fig. 4-8 water price structure for household use

According to SAWACO, they are planning to increase the price average 6.92% annually for the next 5 years and currently applying the approval of People's Committee. (According to the interview to SAWACO and documents received from SAWACO) Assuming that increase of price by 225.11VND/m³ required to cover the service fee of this project is to be made in addition to the said planed increase 5 years later, unit price of water applicable to the volume of 6m³ or more, which is the highest price zone , will be 16,156VND/m³ in 5 year and average percentage of annual increase will be 7.22%. (Ref. to the chart below)



Source : Proforma Calculation by Research Team
 Fig.4-9 Changes in the water unit price

As stated above, the upper limit of water price as stipulated in Ministerial order of the Ministry of Finance is 18,000VND/m³. Therefore, price increase for the purpose of appropriating the fund for service fee payment for this project may be legally permissible.

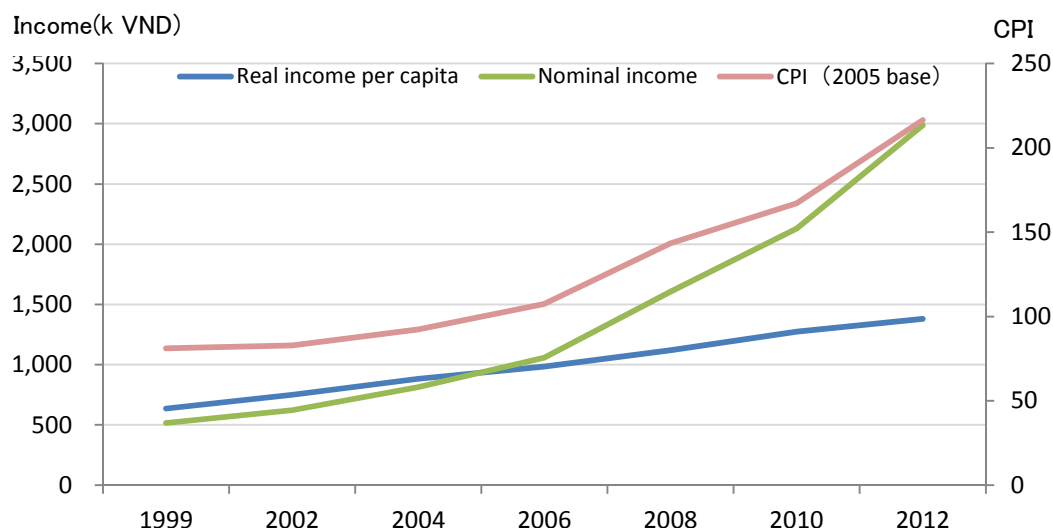
➤ Burden on citizens~Is the increased water price affordable for the citizens of Ho Chi Minh City?

If the price increase necessary to cover the service fee for this project, and is made on top of

the planned increase as stated above, rate of increase for the next 5 years will be average 7.22% annually.

On the other hand, as shown below, per capita income of urban area in Vietnam including Ho Chi Minh City have increased average 7.83% annually (real increase after adjusting inflation) during 13 years from 1999 to 2012. (Increase of income due to inflation, does not affect buying power of citizens, therefore calculation is made based on the real increase of income after adjusting inflation.)

Monthly income transition in urban part of Vietnam



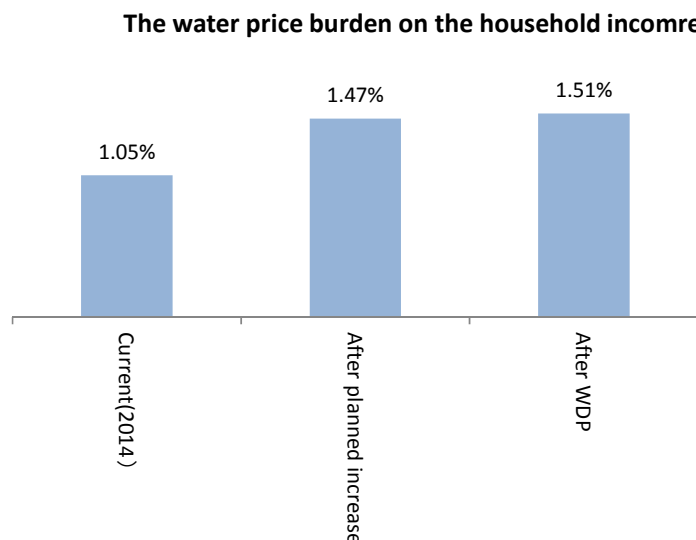
Source: Proforma Calculation by Research Team based on the data of GENERAL STATISTICS OFFICE of VIET NAM

Fig.4-10 Monthly income transition in urban part of Viet Nam

Therefore, assuming that increase of income of similar level (annual average of 7.83%) will continue for coming years, average annual increase of 7.22% in water price is considered to be not excessive burden to the life of citizens.

➤ (For reference) % of water price in family income

As shown below, % of water price in family income will be 1.47% after implementation of planned increase and 1.51% after implementation of increase to cover service fee payment. (Based on the assumption of 3 person per family and monthly water consumption of 15 m³ per family or 5 m³ per person.)



Source: Data from GENERAL STATISTICS OFFICE of VIET NAM for per capita income.

Fig. 4-11 The water price burden on the household income

4-9-5 Study of measures to increase certainty of recovering service fee

As have been discussed, the cost of this project may be covered by increase of water price by SAWACO. After the proposed price increase becomes possible, next concern is the certainty of the portion of SAWACO's increased revenue generated by such price increase will be actually paid to SPC. The followings are studies for measures to increase certainty of recovering service fee.

■ Margin of SAWACO's cash flow

SAWACO sets water price to the level of recovering necessary cost of operation and its financial structure is not designed to maintain surplus funds, and the price increase for the purpose of implementing this project is likely to be made to a minimum necessary level. Therefore, availability of funds required at the time of certain situation i.e. decrease of water consumption, rapid increase in costs of payroll, power, chemicals etc. and damages caused by natural disaster are likely to be very limited

■ Ho Chi Minh City to bail out SAWACO at the time of shortage of fund

When delay of service fee payment or insolvency occurs at SAWACO, which is possible as discussed above, SAWACO being a wholly owned entity of Ho Chi Minh City, it is possible that the City may inject money to SAWACO. However, since such mechanism seems not to be guaranteed by law, there is certain level of uncertainty remains. In order to increase the involvement of the City in this project thereby making the service fee payment more certain, one of possible measures is to have the City as a party of the contract with SPC and make the City to pay service fee payment to SPC. In a meeting with SAWCO and People's Committee of Ho Chi Minh City during the course of this research, a comment was given to the extent of either the City becoming a party of the contract with SPC or the City providing a guarantee SAWACO's obligation to pay service fee. Therefore, the idea of having the City as a party of the contract is possible depending on the future discussions.

■ Level of water tariff increase

In the previous cash flow calculation, step by step service fee increase was described. Considering forecast basis of supply amount of water (2,257,000m³/day) and NRW rate (34%);

- 1st year: 62 billion VND ÷ 365days ÷ Revenue water (2,270,000m3/day × 66%) =113vnd/m3
- 2nd year: 15 billion VND ÷ 365days ÷ Revenue water (2,270,000m3/day × 66%) =27vnd/m3
- 3rd year: 53 billion VND ÷ 365days ÷ Revenue water (2,270,000m3/day × 66%) =97vnd/m3

Considering other investment plans, this step by step payment will make the project to be considered easier.

4-9-6 (Reference materials) Financial data of SAWACO

■ Company profile

Saigon Water Corporation (SAWACO) is a state company situated in Ho Chi Minh City and wholly owned by Ho Chi Minh City government.

■ Outline of financial condition

Annual revenue at FY 2013 is 2,085 Billion VND with capital amount of 4,672 Billion VND as on the end of FY 2013,

Fig.4-11 Summary financial statement of SAWACO

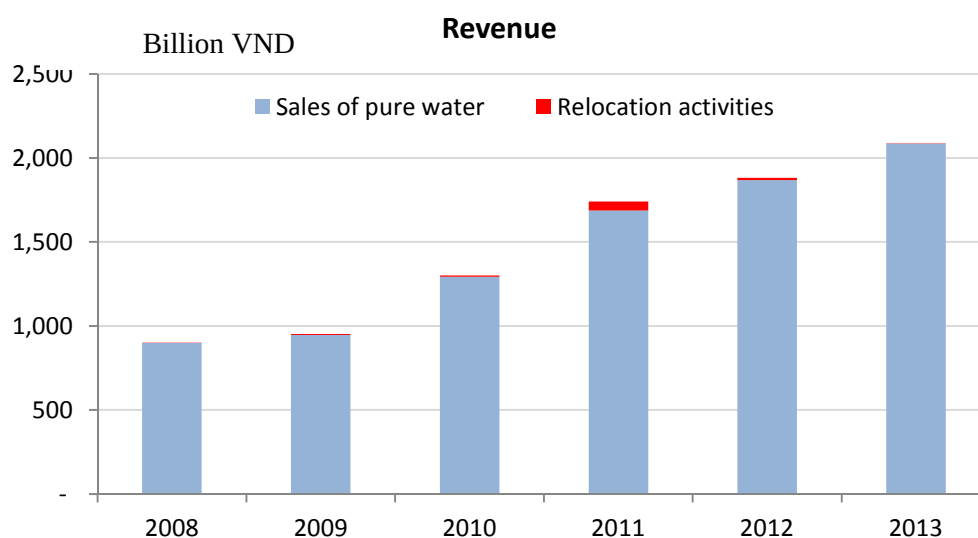
Summary financial statement of SAWACO (Million VND)						
Profit and loss statement	2008	2009	2010	2011	2012	2013
Revenue	901,058	952,679	1,299,910	1,741,407	1,881,395	2,085,078
Gross profit	199,521	230,894	324,731	513,851	623,553	874,200
Operating profit	2,071	48,258	39,066	41,285	10,802	70,211
Profit before tax	38,063	55,397	66,637	81,224	124,012	107,716
Profit after tax	33,348	47,512	57,547	69,888	106,129	92,070
Gross profit margin	22.14%	24.24%	24.98%	29.51%	33.14%	41.93%
Operating profit margin	0.23%	5.07%	3.01%	2.37%	0.57%	3.37%
Cash flow statement	2008	2009	2010	2011	2012	2013
Operating cash flow	286,691	331,500	418,136	341,265	440,422	744,627
Investment cash flow	▲431,383	▲310,267	▲741,159	▲633,335	▲394,778	▲720,948
Financial cash flow	▲36,490	▲82,378	502,727	143,840	25,312	55,188
Net cash flow	▲181,182	▲61,145	179,704	▲148,230	70,957	78,867
Balance sheet	2008	2009	2010	2011	2012	2013
Cash and cash equivalents	569,861	509,494	689,198	540,968	589,264	679,074
Other current assets	337,960	404,229	502,234	514,610	564,518	568,914
Total current assets	907,821	913,723	1,191,432	1,055,578	1,153,782	1,247,987
Fixed assets	5,886,088	6,264,322	5,473,085	5,727,430	5,772,666	5,869,178
Total assets	6,793,909	7,178,045	6,664,517	6,783,008	6,926,448	7,117,165
Current liabilities	228,049	156,709	342,305	248,961	296,740	330,657
Fixed liabilities	3,515,828	3,438,955	2,106,019	2,103,744	2,068,441	2,114,267
Total liabilities	3,743,877	3,595,664	2,448,324	2,352,705	2,365,181	2,444,923
Net assets	3,050,032	3,582,381	4,216,193	4,430,303	4,561,267	4,672,242
Total liabilities and net assets	6,793,909	7,178,045	6,664,517	6,783,008	6,926,448	7,117,165
Current ratio	398.08%	583.07%	348.06%	423.99%	388.82%	377.43%
Debt to assets ratio	55.11%	50.09%	36.74%	34.69%	34.15%	34.35%

Source : SAIGON WATER CORPORATION Audited Financial Statements

■ Details of financial condition

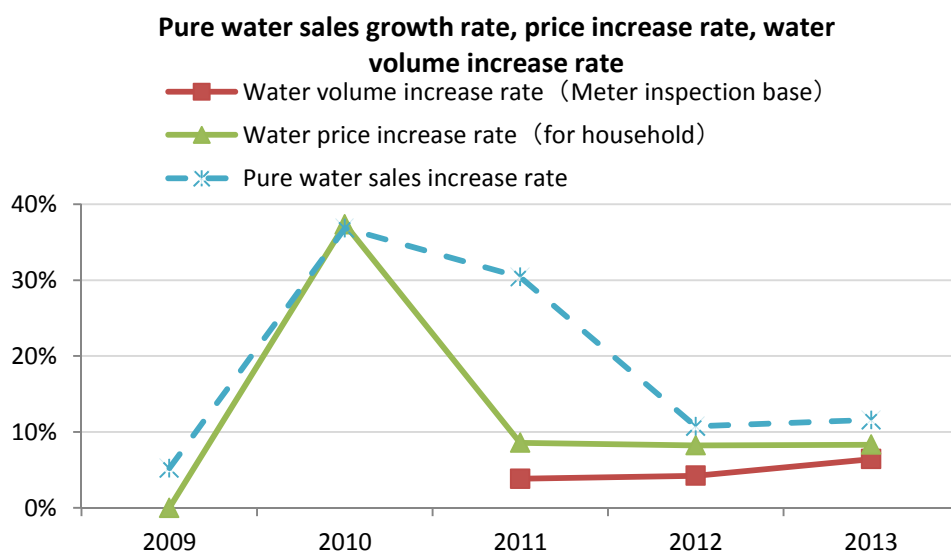
1) Revenue (Chart identical to the char in 4-1-2)

More than 99% of revenues are generated by the subsidiary company operating terminal feed pipelines with minimal revenues from other sources, and the revenue by selling water increases every year since FY 2010.



Source : SAIGON WATER CORPORATION Audited Financial Statements

As shown in the below chart, increase in the revenue by selling water is contributed by the result of increase in the unit price of water, and there is no significant increase in the volume (measuring basis).

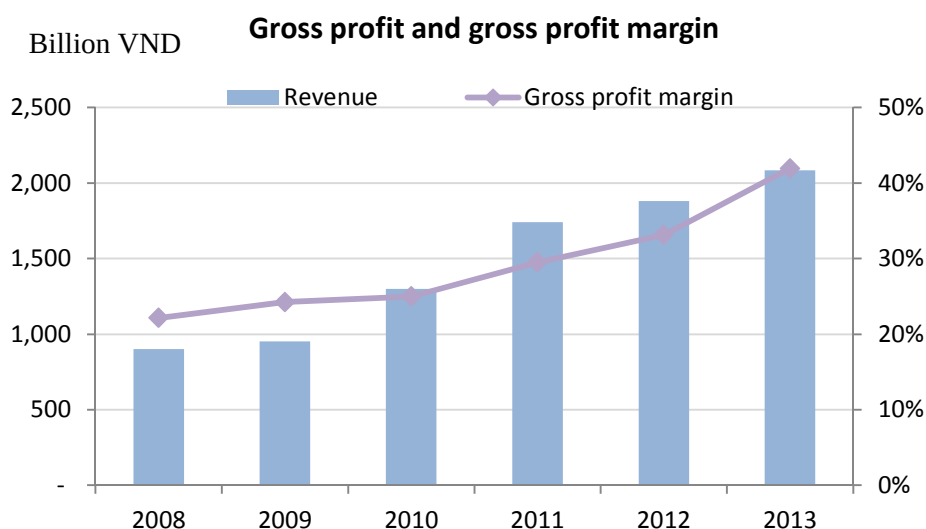


Source : SAIGON WATER CORPORATION Audited Financial Statements

The above chart indicates a significantly higher growth rate of revenue from selling water compared to that of price increase and volume of water sold. The parity is caused by the increase of revenue from selling bottled water which was started during the same period.

2) Gross operating profit

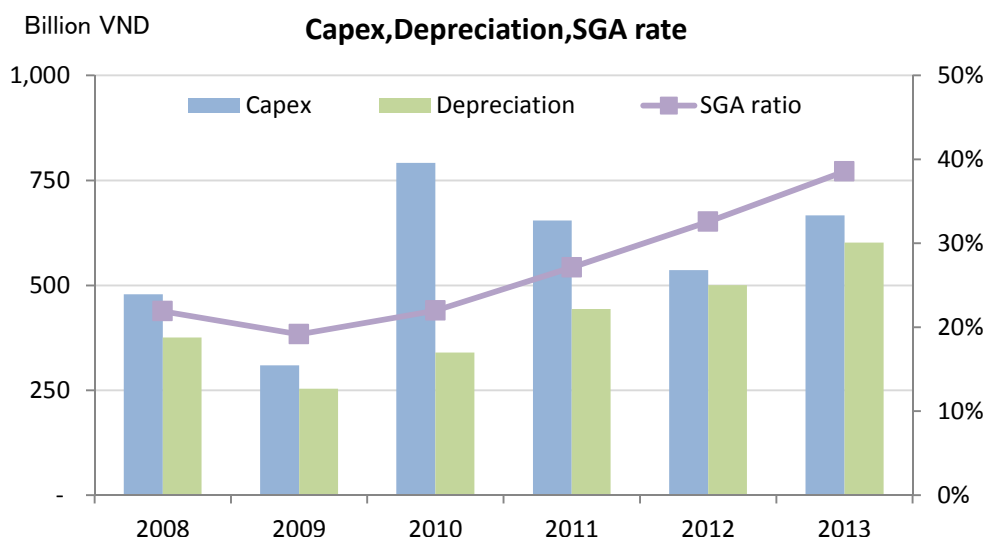
Gross operating profit increases from FY 2010. This is assumed to be due to the aforementioned increase of price.



Source : SAIGON WATER CORPORATION Audited Financial Statements

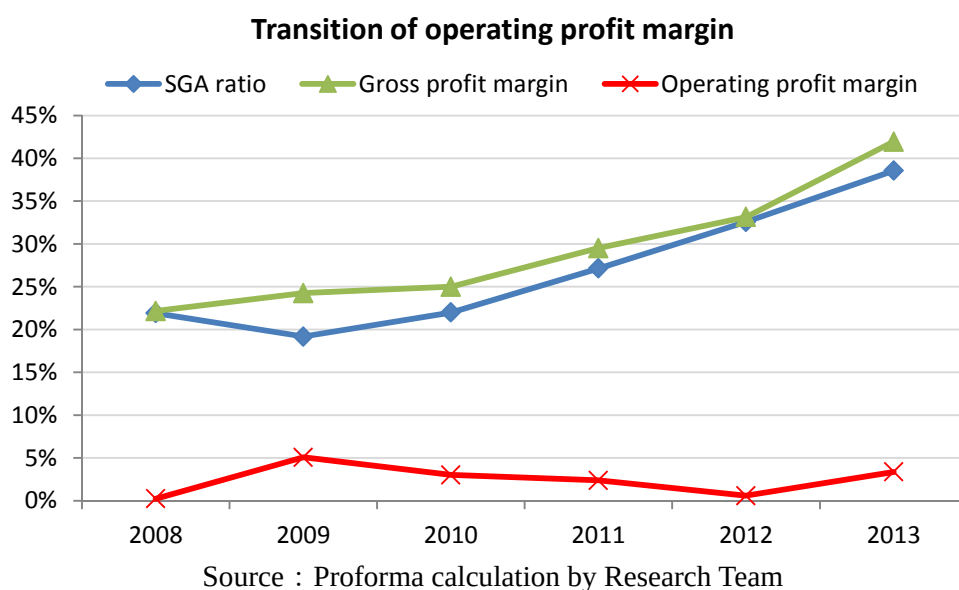
3) Net operating profit

Capital investments of more than 500 Billion VND every year from FY 2010 have been made. Such investments have resulted increase of depreciation cost thus causing increase in the ratio of general and administrative expenses



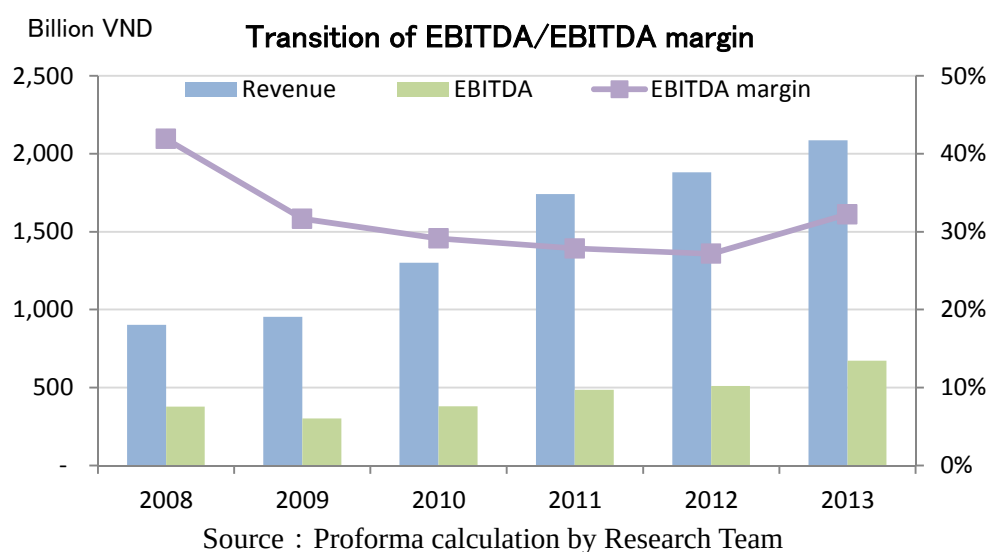
Source : SAIGON WATER CORPORATION Audited Financial Statements

As shown above, gross operating profit has been increasing, however because of increase in the rate of general and administrative expenses; rate of net operating profit has been decreased from FY 2010 to FY 2012. However, it seems, in FY 2013, further increase in the rate of gross operating profit has been achieved thereby causing improvement of the rate of net operating prof



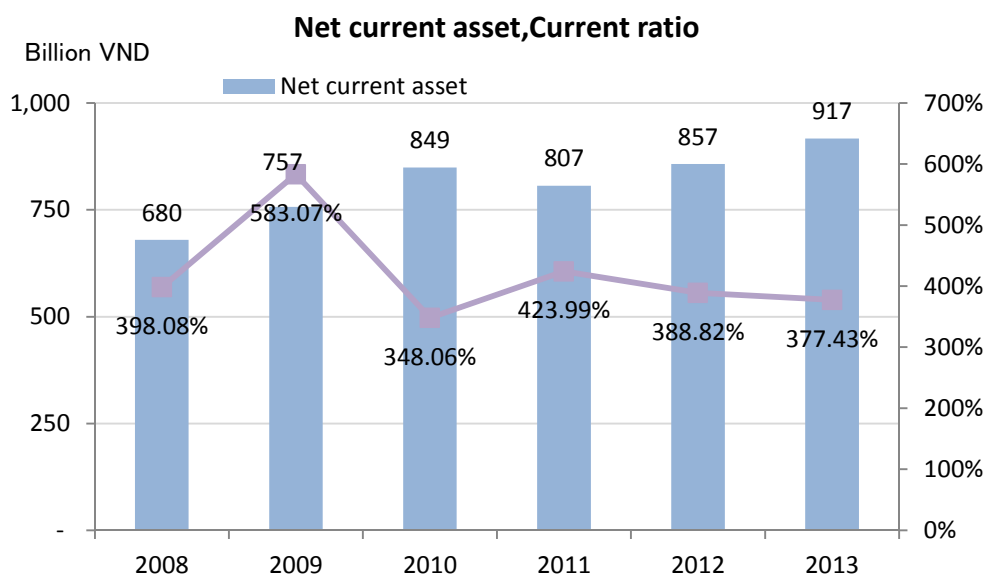
4) EBITDA (Earnings before interest, taxes, depreciation and amortization)

EBITDA (Earnings before interest, taxes, depreciation and amortization), which is the amount adding back the cost of depreciation to the net operation profit, is more or less 50 Billion VND and rate of EBITDA against gross revenue is stable at 30 % throughout last 5 fiscal years.



5) Liquidity on hand

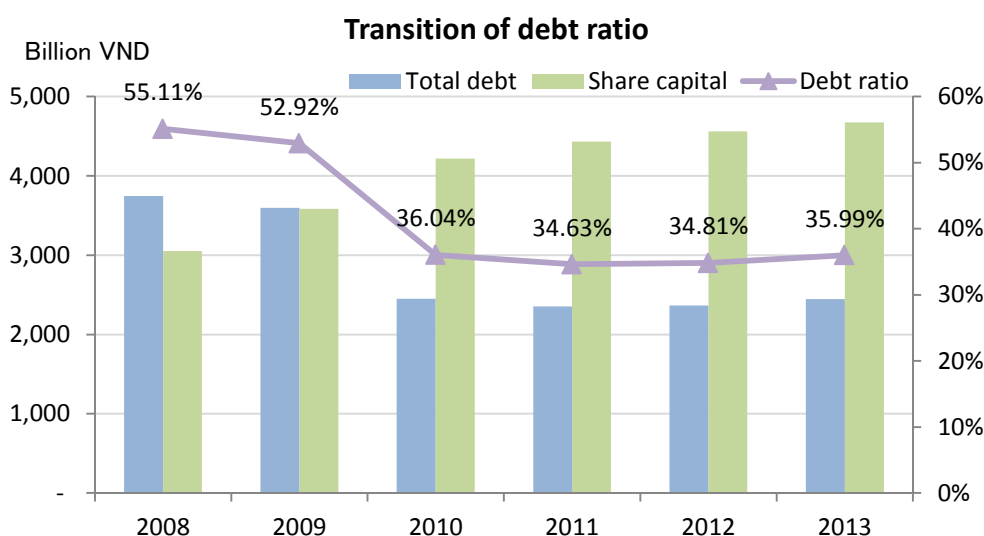
Net current asset which is current asset minus current liability is 917 Billion VND in FY 2013 with the current ratio of 377.3% which may be interpreted as the company has short term solvency. No information is available as to the SAWACO's policy of maintaining what level of short term solvency.



Source : SAIGON WATER CORPORATION Audited Financial Statements

6) Debt ratio

Debt ratio which is the ratio of debt against total asset is stably more or less 35% between FY 2010 and FY 2013. Despite big amount of capital investments from FY 2010 as mentioned earlier, no significant increase in both debts and capital. The fact indicates that the fund generated by increase of water price is the source of capital investment.



Source : SAIGON WATER CORPORATION Audited Financial Statements

4-10. Economic analysis

The new PPP Law stipulates conditions for economic performances as a prerequisite to implement PPP projects. For those projects which have already been experienced by way of conventional public works method, decision to select the procurement method either PPP or conventional public work should be made through comparative evaluation of VfM. This project, however, is the first of its kind for SAWACO, and difficult to evaluate through typical VfM analysis. Therefore, comparative analyses considering multiple aspects have been done simulating a case of direct implementation by SAWACO as oppose to PPP.

4-10-1 Aspect of implementation of the project

As SAWACO has never experienced a project of construction and operation of water distribution facilities, PPP method utilizing private sector's experience in business know-hows and operation structure is advantageous. Also, by employing PPP method, the project implementation is expected to be faster.

Fig.4-13. Comparison of two method of project implimentation

	Project implementation by SAWACO	Project implementation by PPP method
Business know-hows	➤ As SAWACO has never experienced a project of construction and operation of water distribution facilities, therefore they need to accumulate know-how through training and consulting. ➤ Due to lack of capabilities, there is concern that it would be difficult to establish sufficient plan for water distribution plan.	➤ It would be achieved to make a contract with the company(s) which has good experience on water distribution plant. The company would design and construct appropriate water distribution plant.
Operation structure	➤ There is no person in charge, and need to be employed someone or reorganized the current organization structure.	➤ It would be achieved to make a contract with the company(s) which has good experience on water distribution plant.
Fastness of implementation	➤ It takes a fair amount of time to do above.	➤ It is faster to implement the project by PPP than Project implementation by SAWACO.

4-10-2 Cost aspect

As discussed above, in case of typical PPP projects, aspects of costs are also reviewed by comparing VfM of both PPP method and conventional method. However, SAWACO has no experience of this kind of project, comparative analysis considering multiple aspects have been done simulating a case of direct implementation by SAWACO as oppose to PPP.

■ Conditions precedent

The followings are points considered to be different in two methods namely direct implementation by SAWACO and PPP.

- In case of PPP, debt-equity ratio is governed by debt provider (bank etc.) and not possible to cover all cost of the project by loan.
- In case of PPP, assuming international loan by JICA is arranged; lower interest rate may be expected.
- While no grace period is expected for the loan to SAWACO, two years grace period is available in international loan by JICA.
- In case of PPP, cost of construction tends to be lower because of introduction of Design-Build method and effective O&M.

Based on the above consideration, the followings are the conditions precedent on which the project cost is calculated.

Tab. 4-14 Assumption of cost comparison

	Implemented by SAWACO	Implemented by PPP Scheme
Debt: Equity ratio	100%	70%
Lender	Vietnamese bank	2 step loan JICA Vietnamese bank
Borrowing currency	VND	VND
Interest rate	16%	13%
Repayment method	Principal and interest equal	Principal and interest equal
Grace period	Non	2 years
Repayment period	20 years It assumed that can be refinancing	18 years
FX rate fluctuation	Exclude	Exclude
Interest rate fluctuation	Exclude	Exclude
Inflation	Exclude	Exclude
Weighted average capital cost	16.00%	11.61%
Initial cost	-	
EPC cost (M VND)	472,408	432,098
SPC establishment cost (M VND)	-	39,124
Advisor Fee (M VND)	21,411	-
O&M cost (M VND)	582,448	582,448
TA Fee	18,975	18,975
Reduction rate of initial cost	18,975	8.553%(Estimated by TEC)
Reduction rate of O&M cost		
Discount rate	10.00%	10.00%

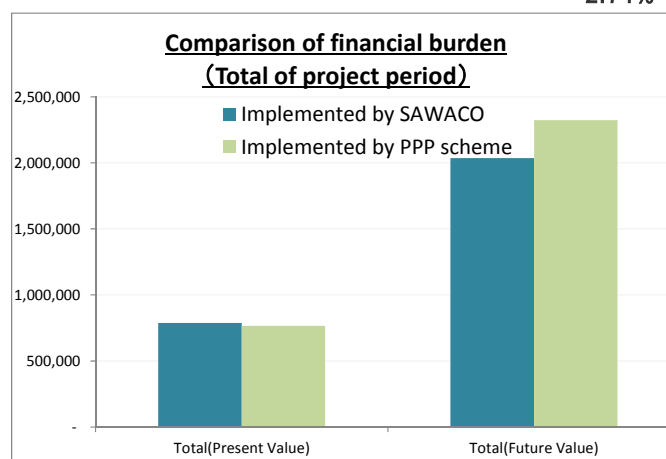
Note: the above calculation refers to Japanese advisor fee, but in case SAWACO implements WDPs by itself, advisor function will not be provided by Japan Consortium team.

■ The result of calculation

The result of calculation based on the above condition shows that the cost of project implemented by PPP is advantageouse in the light of net present value.

Fig.4-15. Comparison of project cost between direct implementation by SAWACO and PPP

Million VND	Total(PV)	Total(FV)
Implemented by SAWACO	787,402	2,035,325
Implemented by PPP scheme	765,808	2,322,937
Differences	21,594	▲287,612
VFM	2.74%	-14.13%



Source : Proforma calculation by Research Team

4-10-3 Others

As have been discussed, proposed scopes of the project include ③advise to the operation of supply network, and advices for the entire water distribution plan and advices for maintenance of pipelines etc. based on experiences and know-hows of Osaka City can be provided including data useful for improving water leakage.

Improvement of water leakage is expected by utilizing such data and the improvement will not only cause increase of available water volume but also two other impact contributing to the improvement of SAWACO's profit.

The first impact is increase of revenue. At present, in entire Ho Chi Minh City water supply is always chasing demands and it is expected that the increased available water means revenue increase.

Although, Manila Water and SAWACO by itself have been working on similar efforts of improvement in Ho Chi Minh City, by utilizing know-hows of Osaka City, better result in improving water leakage is expected.

Fig.4-16. Comparison of the results of water leakage improvement between existing technology and technology introduced by JICA Survey

Date	1st time		2nd time		3rd time		4th time(JICA Survey)	
	Sep.13	Oct.13	Oct.13	Nov.13	Nov.13	Dec.13	Mar.21	Apr.3
Inlet Flow(indication)	12,629	85,692	85,692	149,564	149,564	206,451	37,059	56,718
Inlet Flow(amount)	73,063		63,872		56,887		19,659	
Demand(amount)	35,160		33,088		35,700		13,966	
NRW(%)	51.88%		48.20%		37.24%		28.96%	

The above are the results of improvement applying two different technologies. The 1st time through 3rd time are carried out by SAWACO and the 4th is by Osaka City jointly with Toyo Engineering. SAWACO found 15 leakage points and repaired in 3 month period with the results of improvement of NRW (%) from 51.88% to 37.24%. On the other hand, Osaka City-Toyo Engineering Team found and repaired 24 points resulting NRW (%) as low as 28.96%

Chapter 5. Project implementation and operation management

5-1. Description of the latest scheme for implementation of the Project

In addition to the laws, regulations, some other restrictions, actual approach for business development is described in this section.

As is described in the previous section, our study is based on the followings:

A special purpose company (“SPC”) will be set up in HCMC by investors. The SPC will build and operate a water distribution plant (“WDP”) (WDP will receive water from water treatment plants (“WTP”) run by Saigon Water Supply Corporation (“SAWACO”), reserve water in reservoirs, improve water pressure and quality and distribute water directly to households through SAWACO’s networks). The SPC may also provide related services such as network planning, network operation support and network maintenance services (the “Proposed Scheme”).

SAWACO will pay service fees to the SPC in exchange for the services provided by the SPC as mentioned in the Proposed Scheme.

The Proposed Scheme requires

- Vietnamese Government guarantee for SAWACO’s payment of the service fees
- loan from JICA
- technical assistance from Osaka Water Bureau
- sub-performance by the SPC’s local sub-contractors.

The Proposed Scheme may contain (i) technical assistance from JICA and (ii) Joint Crediting Mechanism subsidy from the Ministry of Environment of Japan.

5-2. Pending issues which may affect the feasibility of the Proposed Scheme

There are a number of the following main issues which should be resolved in order to enhance the feasibility of the Proposed Scheme (further details including other issues are discussed later below):

■ Securing of the budget

In order to implement the Project, SAWACO needs to secure its budget for joining the Project and the Project has to fall within the water supply master plan (“WSMP”) approved by the Prime Minister. If the current WSMP does not contain the Project, it would take SAWACO two years to obtain the approval of the Prime Minister for the revision of the current WSMP, and thus the Project’s construction may only be commenced in 2017 in such case.

■ Revision of WSMP

The current WSMP is Decision 927/QĐ-TTg of the Prime Minister on approval of the water supply planning of HCMC till 2025 dated 19 June 2012 (“Decision 927”). Under Article 1.7(c) of Decision 927, the project to restructure the water supply pipeline network in HCMC under the major branches (the “Master Project”) is given priority to implement during the period of 2010 – 2015. According to the meeting with the relevant authorities of HCMC and SAWACO, there seemed to be the possibility to construe that the Project falls within the Master Project. However, the authorities in the meeting did not give clear confirmation. In another meeting with the Department of Transportation of HCMC (“HCMC DOT”), HCMC DOT opined that the Project does not fall within the Master Project and the approval for the amendment of WSMP to incorporate the Project is necessary. However, SAWACO seems to have selected the consultant to form the Master Project on the basis of Decision 927. Therefore, subject to further

confirmation with the competent authorities of HCMC and SAWACO that Decision 927 would be accepted as the approved WSMP for the Project as well, there is a possibility that the implementation of the Project expects to be much faster;

■ Discussion Parties

The investors(possibly including SAWACO) needs to work with HCMC People's Committee ("HCMC PC"). Often, HCMC PC will assign HCMC Department of Planning and Investment ("HCMC DPI") to receive such meeting. However, considering the Project is relating to WDP and under Article 1 of Decision 70/2010/QD-UBND of HCMC People's Committee dated 17 October 2010, HCMC DOT, among others, has function to assist HCMC PC in implementing State management in transport-related infrastructure, including water supply and drainage and, in fact, HCMC DOT acts as the coordinator of, and helps HCMC PC to manage, water projects in HCMC, HCMC DOT should take an important role in managing and overseeing the Project. Therefore, JICA Study Team may be requested to work directly with DOT (possibly including HCMC DPI) to fix the legal basis of the Project (i.e., whether the regulations on PPP projects under Decree 15/2015/ND-CP of the Government dated February 14, 2015, on investment in the form of public-private partnership ("Decree 15") should be applied to the Project and whether SPC can implement the Project under the Law on Investment without being subject to Decree 15) ; If Decree 15 should be applied to the Project, then the investor(s) need to obtain the approval of direct appointment as investor(s) of the Project from the Prime Minister after discussing with the HCMC PC, Ministry of Planning and Investment ("MPI") (in charge of implementing and supervising the implementation of Decree 15) and Ministry of Construction ("MOC") (in charge of urban water projects);

Therefore, the investors (possibly including SAWACO) needs to discuss with the Ministry of Planning and Investment, Ministry of Construction, HCMC DOT and HCMC DPI on whether SPC, a foreign invested company, can conduct its contemplated business lines as discussed above.

5-3. Rough roadmap to proceed with the Project

Bearing in mind the current situation, the investors should take to move the Project forward:

■ Singing a Memorandum of Understanding (MOU) with SAWACO (and other stakeholders if possible)

The MOU should describe the main features of the Project as preliminarily agreed by the concerned parties. The MOU should also state the pending issues mentioned in 2. (1) above that need to be worked out to enhance the feasibility of the Project. It also specifies the roles of SAWACO and the investors in proceeding with the Project. In general, the MOU will not have binding effect. However, it should be the basis for JICA Study Team to work with relevant State authorities in Vietnam such as the HCMC PC, HCMC DOT, MOC and the Government Office. This also confirms SAWACO's interest in the Project.

■ Working with HCMC PC

➤ Obtaining preliminary approval from HCMC PC or the like:

JICA Study Team (possibly including SAWACO) should seek preliminary approval from HCMC PC in the sense that HCMC PC agrees that JICA Study Team may conduct research on the [preliminary] feasibility of the Project. This document will be helpful for JICA Study Team to continue working with the PC's branches such as, HCMC DOT, the Department of Finance

(“HCMC DOF”) and HCMC DPI. Alternatively, JICA Study Team may arrange to enter into a sort of MOU with HCMC PC confirming basic concept for the Project as well as support to be made by HCMC PC towards the Project.

➤ Issues to continue discussing with HCMC PC and its branches

Issues to continue discussing with HCMC PC and its branches

1) Overall guidelines to formation and implementation of the Project

2) Project contract form:

the Investors (possibly including SAWACO) should discuss with the PC (directly with the HCMC DOT and HCMC DPI) which project contract form (e.g. BOO or BOT) that they favor for the Project and how the project form affects any issues such as water tariff revision, investment incentives, tendering requirements.

3) Water price

As HCMC PC (which is directly assisted by HCMC DOF) is vested the right to approve the daily-life clean water tariff, JICA Study Team (possibly including SAWACO) should discuss with HCMC DOF to check if the water tariff may be increased ahead of schedule considering the effectiveness of the Project so that SAWACO will be able to pay the tariff fees or if not how the PC can assist JICA Study Team to resolve this issue (for instance, suggesting the concerned ministries to amend Joint Circular 75/2012/TTLT-BTC-BXD-BNNPTNT on determination of clean water selling price).

4) WSMP:

Still, certain officials from HCMC DOT and SAWACO confirmed that the WSMP approved by the Prime Minister under Decision 729 does not cover the Project. Therefore, JICA Study Team should work with HCMC PC (directly with Department of Transportation and Department of Construction) to check if HCMC PC may confirm the availability of the approved WSMP and help to shorten the time for amendment of the WSMP by the Prime Minister if applicable.

5) Foreign ownership in the SPC:

HCMC PC should confirm if 100% foreign ownership in the SPC as well as the full ownership of the SPC over the WDP is permissible. HCMC PC then may assign HCMC DPI to seek preliminary opinions from MPI, MOC and Ministry of Natural Resource and Environment in this regard.

6) Investment incentives and support:

The investors should ask HCMC PC (directly HCMC DOT and HCMC DPI) to confirm the investment incentives that the SPC may enjoy and the support that the PC may give to the SPC.

7) Obtaining in-principle approval of the PC

After the above issues resolved by HCMC PC, the investors (possibly including SAWACO) would seek the so-called in-principle approval of HCMC PC in which HCMC PC initially approves that the Project may be implemented. This approval may be subject to a condition that the WSMP is revised by the Prime Minister or the approval of the formation of the Master Project as contemplated by SAWACO.

The in-principle approval is not an official approval of HCMC PC but it would serve as the legal basis for investors to continue working with other State agencies to pursue the Project.

■ Working with the Government Office

There are at least 4 issues that investors must work with the Government Office:

- To check if the process for revision of the WSMP shall or shall not be required. If it is required, how to facilitate the process;
- To check if government guarantee (for SAWACO's performance of the service agreement) is available;
- To check if tendering is required for JICA Study Team (and other investors) to implement the Project and for the procurement, construction and sub-contractor selection by the SPC taking into account the fact that the SPC is a wholly foreign owned company;
- To check if there is any special mechanism allowing the increase of the water tariff beyond the set limit (including revising Joint Circular 75/2012/TTLT-BTC-BXD-BNNPTNT).
-

■ Working with the related Ministries

As the Government office is not in charge of specialist fields, based on the supporting opinion from the Government office, it may be necessary to further work with the following specialist authorities in the Government:

- MPI: To discuss about the feasibility of the Project and form of investment as well as special arrangement given to the Project if any, since the MPI is the competent authority to issue investment registration certificate to PPP projects at the moment;
- MOC: To discuss about the feasibility of the Project and possible consensus, since the MOC's consensus is required for investment project for construction of water supply works of a capacity of 30,000 m³/day or more each, for urban centers of special grade, or 10,000 m³/day or more each, for other urban centers.

■ Other steps to implement the Project under Decree 15

The scope of the Project falls within the sector eligible for implement the Project in the investment form of private public partnership ("PPP") as regulated under Decree 15. Additionally, as mentioned above we are under impression that the Project should be requested to perform in the investment form of PPP by the relevant State authorities in HCMC. Therefore, it is likely that the Project would be practically required to implement in the form of PPP under Decree 15. In this case, the Project should follow the procedural steps as specified in Appendix I attached hereto.

5-4. Outlines of major definitive agreements to implement the Project

Attached hereto as Appendix II and Appendix III are outlines for Project Contract and the Service Purchase Contract respectively, which are two possible definitive agreements to implement the Project in case the Project is implemented under PPP from pursuant to Decree 15 and the Proposed Scheme is taken.

Chapter 6. Social and Environmental Consideration

6-1. Procedure to conduct an EIA

The Fundamental Law on Environment in Viet Nam is Law on Environmental Protection: LEP, No.52/2005/QH11), which stipulates the articles on strategic environment assessments (SEAs), environmental impact assessments (EIAs), environmental protection, environmental monitoring, and others. The LEP has been revised and supplemented through the Decrees (Decree No. 80/2006/ND-CP, No. 21/2008/ND-CP, No. 29/2011/ND-CP), and the LEP contains the rules on how to conduct EIA studies, projects that need EIA reports, timing of conducting EIA studies, contents of an EIA report, appraisal and approval of EIA reports, and others.

DecreeNo.29/2011/ND-CP stipulates that a building that has a basement deeper than 10m needs an EIA, therefore, this project needs an EIA. Circular No.26/2011/TT-BTNMT has a template of contents and structure of an EIA report. Accordingly, the TOR for the EIA for this project was prepared based on the template. The TOR is attached as Annex 6-1. The JICA study team made a contract in June 2014 with the following local consultant, selected through competitive bidding, for conducting the EIA.

■ Selected local consultant

Environmental Technology Center (ENTEC)

- Address: 439A9, Phan Van Tri Str., Ward 5, Go Vap Dist., Ho Chi Minh City
- Tel : 84.8.39850540 Fax : 84.8.39850541 E-mail : entecvn@yahoo.com
- Responsible person: Ass. Prof, Dr. Phung Chi Sy (Acting Director)

6-2. Socio-economic conditions

Ho Chi Minh City (HCMC) has 19 urban districts and 5 suburban districts. Gia Dinh Park is located in Ward 9 of Phu Nhuan district, Ward 3 of Go Vap district and is adjacent to Ward 2 of Tan Binh district. The districts of Phu Nhuan, Go Cap, and Tan Binh have 15, 16, and 15 Wards respectively. The Project Area belongs to Ward 9 of Phu Nhuan District. Figure 6-1shows the location of Gia Dinh Park.

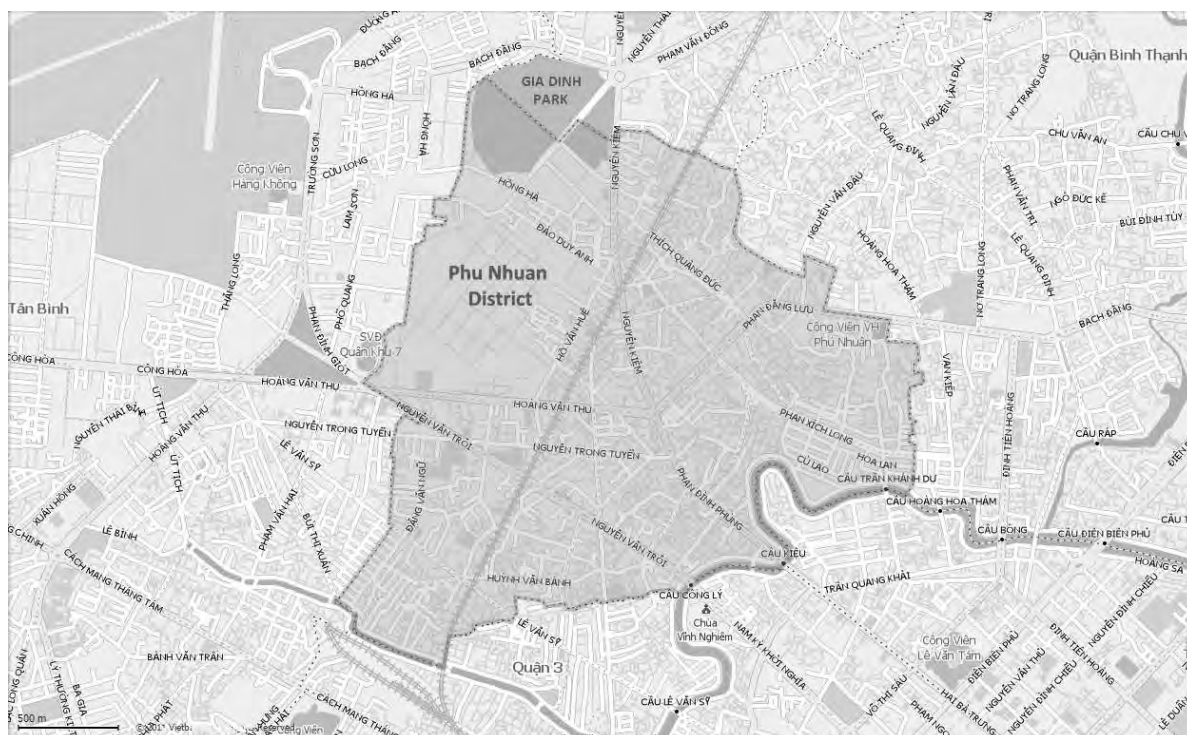


Figure 6-1. Location of Gia Dinh Park

Phu Nhuan District is located 4.7 km from the city center. The economic structure of Ward 9 has developed in the direction of service-trade, industry and handicraft industry. In particular, the service developed the kind of high-grade services such as credit and finance, Office for rent, senior housing, tourism services etc. As for tourism, as of 2008, Phu Nhuan district has 97 hotels of all types. Including one 5 star hotel, 4 star hotel 2. The number of international tourists staying in hotels reached 110,504 visitors, guests staying inland reached 91,136 visitors (source: People's Committee of Phu Nhuan District, 2010, and Tourism planning and development in local of Phu Nhuan District until 2020).

The district consists of 15 Wards with a total area of 4.88 km² and a total population statistics in 2011 is 175,631 people with a density of 35,990 people/km². In 2008, Phu Nhuan District completed the goal that the poor do not exist based on the standards of HCMC.

Phu Nhuan district has 2 universities, 5 colleges, 4 Vocational Colleges, 6 high schools, 6 junior high schools, and 12 elementary schools. As for medical facilities, there are one 1 public health establishments: the Phu Nhuan Hospital, and 2 private medical establishments. A round the Gia Dinh Park, there are some sport centers such as: Phu Nhuan sport stadium, Aircraft Sports Club, etc.

Phu Nhuan District has large number of pagodas, up to 40 pagodas, including some big pagoda like Avalokitesvara Bodhisattva Pagoda. There is also the grave of Vo Di Nguy – Nationally Architectural - Art monument, but there is no areas that are designated as protected cultural heritage or that are considered to have historical/cultural value in and around Phu Nhuan District.

6-3. Natural environment

■ Topography

The Gia Dinh Park terrain is relatively flat. The terrain is low; the average elevation is from 2 - 4m.

■ Geological conditions

The soil layers around Gia Dinh Park have three layers, and the characteristics are shown in Table 6-1.

- Layer 1: Mixed clay, pale brown, the hard state, located in a depth of 0.3 - 8.0 m thickness layers from 7.7 m-8.0 m.
- Layer2:Mixed clay, yellow-grey, located at a depth of 8.0-12.0m thickness 4.0 m
- Layer 3: Mixed sand, yellow-pink, appear from the 12.5 m and less

Table 6-1. Characteristics of Nearby Soil Layers

	Parameter	Symbol	Unit	Layer 1	Layer 2	Layer 3
1	Gravel		%	7.13	2.50	3.50
2	Sand		%	50.75	72.50	72.63
3	Dust		%	13.50	8.00	9.50
4	Clay		%	29.13	18.00	14.38
5	Natural humidity	W	%	13.34	15.75	16.80
6	dry density	γ_k	g/cm ³	2.06	2.02	2.02
7	Saturated density	γ_{bh}	g/cm ³	1.06	1.02	1.02
8	Empty Coefficient	e _o		0.48	0.53	0.54
9	Angle of internal friction	ϕ	Angle	27°43'	31°34'	29°54'
10	Adhesive force	C	kG/cm ²	23.01	31.58	30.27

■ Meteorological conditions

The monthly average air temperature is approximately 28.2°C. The highest temperature is 34.2°C (2000), the lowest temperature is about 20.8°C (2000). The monthly average temperature from 2005 to 2012 is presented in Table 6-2.

Table 6-2. Monthly Average air Temperature in HCMC (°C)

Year	month												Ave.
	1	2	3	4	5	6	7	8	9	10	11	12	
2005	26.2	27.7	28.4	29.8	29.7	28.9	27.5	28.4	27.9	27.6	27.5	26.2	28.0
2006	27.2	28.2	28.6	29.5	29.2	28.4	27.9	27.6	27.6	27.7	28.9	27.3	28.2
2007	27.3	27.2	28.8	30.1	28.9	28.7	27.7	27.7	27.7	27.5	26.9	27.6	28.2
2008	27.2	27.3	28.2	29.5	28.2	28.6	28.3	27.7	27.7	28.0	27.2	26.9	27.9
2009	25.9	27.7	29.3	29.4	28.5	29.2	28.0	28.6	27.6	27.7	28.4	27.5	28.1
2010	27.3	28.4	29.4	30.3	31.3	29.3	28.3	27.9	28.6	27.5	27.2	27.4	28.6
2011	26.9	27.6	28.3	29.1	29.5	28.5	27.9	28.4	28.1	28.1	28.1	27.2	28.1
2012	26.7	27.5	28.7	29.3	29.1	28.2	27.5	28.8	28.4	28.3	28.5	27.3	28.2

Source: Ho Chi Minh City Statistical Yearbook 2012, Tan Son Hoa Station

In the city area, the rainfall is uneven, which tends to increase along the Southwest – North East. Annual rainfall of the city is high, that varies from 1,700 to 2,300mm/year (Table 6-3).

Table 6-3. Monthly Average Rainfall in HCMC(°C)

(unit:mm)

Year	Month												total
	1	2	3	4	5	6	7	8	9	10	11	12	
2005	-	-	-	9.6	143.6	273.9	228.0	146.3	182.9	388.6	264.5	105.4	1,742.8
2006	-	72.7	8.6	212.1	299.2	139.4	168.6	349.0	247.7	256.1	16.1	28.9	1,798.4
2007	0.4	-	59.3	7.7	327.9	188.8	414.3	301.0	495.4	391.2	147.1	7.1	2,340.2
2008	9.5	1.5	58.9	127.0	246.9	147.2	331.2	297.8	202.6	165.6	167.1	57.8	1,813.1
2009	0.3	21.4	57.8	187.0	318.5	83.2	223.0	323.9	325.1	249.0	141.2	49.5	1,979.9
2010	23.0	-	3.9	9.9	8.8	160.0	294.3	400.6	373.7	321.8	379.9	40.3	2,016.2
2011	9.4	-	40.3	181.9	124.4	213.1	281.5	244.4	232.1	232.6	321.1	73.0	1,953.8
2012	8.4	-	41.3	167.9	224.4	243.1	284.5	246.4	322.1	275.6	341.1	75.1	2,229.9

Source: Ho Chi Minh City Statistical Yearbook 2012, Tan Son Hoa Station

■ Air quality

Five sampling locations for air quality were selected as shown in Figure 6-2 because of the following reasons: KK01 is at the center of project area. It helps assessing environmental quality in the project area. KK02 – KK05 was chosen on base of yearly wind directions at project area. The measurement results it is shown in Table 6-4. The three samples at each point it was taken. The values of the TSP partly (3rd of KK2, 3rd of KK3, 3rd of KK5) exceeded the standards, but remaining values are within the standard.

Table 6-4. Results of air quality analysis

		Result (mg/m ³)						
		TSP	SO ₂	NO ₂	CO	H ₂ S	NH ₃	THC
Acceptable Standards *		0.3	0.35	0.2	30	0.042	0.2	5
KK1	1	0.09	0.038	0.021	2.18	<0.002	0.017	ND
	2	0.15	0.093	0.086	1.87	<0.002	0.012	ND

	3	0.20	0.074	0.054	1.72	<0.002	0.016	ND
KK2	1	0.09	0.062	0.047	1.64	<0.002	0.126	ND
	2	0.21	0.051	0.033	1.94	<0.002	0.131	ND
	3	0.31	0.065	0.051	2.83	<0.002	0.128	ND
KK3	1	0.11	0.043	0.025	1.15	<0.002	0.028	ND
	2	0.25	0.042	0.037	1.84	<0.002	0.031	ND
	3	0.39	0.038	0.027	2.15	<0.002	0.015	ND
KK4	1	0.09	0.026	0.015	2.76	<0.002	0.074	ND
	2	0.15	0.071	0.063	2.05	<0.002	0.094	ND
	3	0.27	0.041	0.034	1.23	<0.002	0.081	ND
KK5	1	0.10	0.062	0.047	1.82	<0.002	0.120	ND
	2	0.24	0.071	0.058	2.34	<0.002	0.120	ND
	3	0.33	0.058	0.045	2.16	<0.002	0.122	ND

Source: Environmental Technology Center (ENTEC), 2014

Notes:

ND: Not detected;

(*) Standard for TSP, SO₂, NO₂ and CO are from QCVN 05:2013/BTNMT: National technical regulation on ambient air quality, average 1 hours column; Standards for H₂S, NH₃, and THC are from QCVN 06:2009/BTNMT: National Technical Regulation on certain hazardous substances in ambient air.



Figure 6-2. Location of air sampling, measurement noise and vibration levels

■ Noise

Noise level was measured in the locations shown in Figure6-3, and the results are shown in Table 6-5. All the measured levels are within the Vietnamese environmental standard.

Table 6-5. Results of Measured Noise Level

(unit : dBA)

Location		Time	Max. and Min.	LA50	Standard based on QCVN26:2010/BTNMT
KK1	1	06h-08h	Max	56.0	70
			Min	51.7	
	2	11h-13h	Max	49.4	
			Min	47.8	
	3	16h-19h	Max	58.0	
			Min	53.4	
KK2	1	06h-08h	Max	66.0	
			Min	47.2	
	2	11h-13h	Max	50.2	
			Min	47.1	
	3	16h-19h	Max	58.0	
			Min	47.1	
KK3	1	06h-08h	Max	58.8	
			Min	55.5	
	2	11h-13h	Max	49.7	
			Min	47.3	
	3	16h-19h	Max	66.7	
			Min	58.8	
KK4	1	06h-08h	Max	56.5	
			Min	50.8	
	2	11h-13h	Max	50.3	
			Min	47.5	
	3	16h-19h	Max	54.9	
			Min	53.6	
KK5	1	06h-08h	Max	56.0	
			Min	53.7	
	2	11h-13h	Max	49.8	
			Min	47.2	
	3	16h-19h	Max	53.0	
			Min	51.1	

Source: Environmental Technology Center (ENTEC), 2014

Note:

- QCVN 26:2010/BTNMT: National Technical Regulation on noise (at normally area from 6h to 21h). It regulated that the noise level at normally area from 6h to 21h is 70 dBA.

■ Vibration

Vibration was measured in the locations shown in Figure 6-2, and the results are shown in Table 6-6. All the results are within the Vietnamese environmental standard.

Table 6-6. Results of Measured Vibration

Location		Time	Max. & Min.	X-Lva50	Y-Lva50	Z-Lva50	QCVN 27:2010/BTNMT
KK1	1	06h-08h	Max	27.0	27.8	28.6	70
			Min	24.9	24.8	27.4	
	2	11h-13h	Max	25.7	25.3	27.7	
			Min	24.0	23.4	26.4	
	3	16h-19h	Max	30.3	30.9	29.7	
			Min	23.0	24.6	24.0	
KK2	1	06h-08h	Max	46.8	35.6	38.2	
			Min	26.4	18.7	22.1	
	2	11h-13h	Max	25.2	25.8	27.8	
			Min	24.2	24.2	22.5	
	3	16h-19h	Max	33.2	33.4	38.7	
			Min	26.1	25.4	31.6	
KK3	1	06h-08h	Max	27.3	28.3	27.7	
			Min	24.6	25.0	24.6	
	2	11h-13h	Max	25.5	25.2	27.9	
			Min	24.4	24.3	22.3	
	3	16h-19h	Max	42.4	42.0	44.5	
			Min	27.9	23.3	25.0	
KK4	1	06h-08h	Max	26.5	26.3	23.7	
			Min	23.5	23.8	20.3	
	2	11h-13h	Max	28.2	24.4	38.1	
			Min	21.1	22.5	25.9	
	3	16h-19h	Max	24.5	22.7	30.6	
			Min	22.9	21.2	28.4	
KK5	1	06h-08h	Max	25.2	25.0	32.5	
			Min	22.9	23.1	28.6	
	2	11h-13h	Max	24.6	24.8	31.6	
			Min	23.7	23.5	29.1	
	3	16h-19h	Max	24.7	25.3	29.7	
			Min	23.7	24.1	28.7	

Source: Environmental Technology Center (ENTEC), 2014

Note:

QCVN 27:2010/BTNMT: National Technical Regulation on vibration (production, trade and services at normally area). It regulated that the vibration level at normally area from 6h to 21h is 70 dB.

■ Groundwater

Five Sampling locations of groundwater were selected (Figure 6-3), and samples were taken from the existing wells. The results of groundwater quality analysis are presented in the Table 6-7.



Figure 6-3. Sampling Locations of Groundwater

Table 6-7. Results of Groundwater Quality Analysis

Item	Unit	NN1		NN2		NN3		NN4		NN5		Standard
		1	2	1	2	1	2	1	2	1	2	
pH	-	5.8	5.9	5.7	5.8	5.7	6.0	6.0	5.9	5.9	6.1	5.5 - 8.5
The color	Pt-Co	1	1	5	4	1	1	1	1	1	1	-
Hardness	MgCaCO ₃ /l	25	25	25	25	25	25	15	15	25	25	500
TDS	mg/l	179	182	180	178	178	185	155	161	210	212	-
Fluoride	mg/l	1.06	1.08	0.61	0.65	0.46	0.48	0.51	0.55	0.61	0.64	1.0
Chloride	mg/l	84.5	54.8	84.6	84.8	84.6	84.4	40.9	50.5	86.4	86.2	250
Nitrate	mg/l	1.70	1.70	6.80	6.94	5.16	4.84	0.59	0.63	1.12	1.18	15
Nitrite	mg/l	0.006	0.006	0.003	0.003	0.004	0.004	0.003	0.003	0.005	0.005	1.0
Sulfate	mg/l	27	27	52	53	9	10	2	2	8	8	400
Mn	mg/l	0.014	0.015	0.039	0.041	0.042	0.04	0.057	0.057	0.024	0.026	0.5
Total Fe	mg/l	1.112	1.114	1.105	1.105	1.115	1.095	1.326	1.122	0.541	0.562	5.0
Pb	mg/l	0.008	0.008	0.005	0.05	0.007	0.007	0.002	0.002	0.003	0.003	0.01

Zn	mg/l	0.01 6	0.01 6	0.02 7	0.02 7	0.06 7	0.06 7	0.01 2	0.01 4	0.02 1	0.01 8	3.0
Hg	mg/l	<0.0 001	<0.0 001	<0.0 001	<0.0 001	<0.0 001	<0.0 001	<0.0 001	<0.0 001	<0.0 001	<0.0 001	0.00 1
E. Coli	MPN /100 ml	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Colif.	MPN /100 ml	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3

Source: Environmental Technology Centre (ENTEC) 2014

ND: not detected;

Standard: QCVN 09:2008/BTNMT: National technical regulation on groundwater quality; Limit of detection regulated in the standards: Nitrite = 0.001 mg/l; Fluoride = 0.05 mg/l; Hg = 0.0001 mg/l.

■ Soil

Soil samples were taken at the same locations as groundwater. The results are shown in Table 6-8. No pollution was found in those samples, compared with the Vietnamese environmental standard.

Table 6-8. Results of Soil Analysis

Location No.		Cd (mg/kg)	Cr (mg/kg)	As (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	Zn (mg/kg)	TOC	Oil (mg/kg)
Standard		5	-	12	120	-	200	-	-
D1	1	1.24	2.86	1.01	18.12	1.64	0.65	2.8	1.1
	2	1.26	2.84	0.97	17.25	1.52	0.67	2.7	1
D2	1	1.31	3.18	0.83	13.42	0.76	0.33	3.2	0.8
	2	1.34	3.14	0.71	11.24	0.71	0.29	3	0.9
D3	1	51.47	0.22	0.57	14.73	2.06	1.11	4.1	1.2
	2	1.35	0.28	0.61	13.34	2.11	1.17	4.2	1.1
D4	1	1.39	3.21	0.72	7.84	3.78	0.39	3.5	0.9
	2	1.43	3.54	0.78	6.97	2.93	0.35	3.7	0.9
D5	1	1.28	2.14	0.83	4.55	0.75	0.41	2.9	0.7
	2	1.25	2.01	0.94	4.79	0.81	0.47	2.7	0.8

Source: Environmental Technology Centre (ENTEC), 2014

Note:

“-”: Not regulated

QCVN 03:2008/BTNMT: National technical regulation on permissible limits of heavy metals in soil (people's land);

■ Flora and Founa

The Gia Dinh Park is considered one of the most important parks in HCMC. It has an area of lawns is 34,410 m², bed of flowers cover area of 647 m², with many types of flowers, plants. The Green plate has the number about 700 trees include several categories such as: Monkey Skull, Yellow Flamboyant, French tamarind, Cassia fistula Linn, etc.

The trees, grasses, and the animals found in and around the Project Area are shown in Table 6-9.

None of those are included in the IUCN list as endangered IA class (Critically Endangered), IB class Endangered (EN), or endangered II class Vulnerable (VU). None of those are designated as protected or endemic species as well. And no area in and around the Gia Dinh Park is designated as protected area or important habitat for ecologically important species.

Table 6-9. Trees, Grasses, and the Animals Found in and around the Project Area

No.	Scientific name	Quantity	No.	Scientific name	Quantity
Trees			14	<i>Zoysia Tenuifolia</i>	
	FABALES			ASTERALES	
	Fabaceae			Asteraceae	
1	<i>Senna siamea</i>	23	15	<i>Bidens pilosa</i>	
2	<i>Mimosa pudica</i>		16	<i>Eclipta alba</i>	
3	<i>Delonix regia</i>	1		ZINGIBERALES	
	ROSALES			Musaceae	
	Moraceae		1	<i>Musa acuminata</i>	12
4	<i>Ficus religiosa</i>	2			
	SAPINDALES		Birds		
	Meliaceae			PASSERIFORMES	
5	<i>Khaya senegalensis</i>	39		Muscicapidae	
	Anacardiaceae		18	<i>Copsychus</i>	2
6	<i>Mangifera laurina</i>	1		Dicaeida	
	ARECALES		19	<i>Dicaeum</i>	2
	Arecaceae			Pycnonotidae	
7	<i>Cocos nucifera</i>	6	2	<i>Pycnonotus icocus</i>	1
	MALVALES			Passeridae	
	Muntingiaceae		2	<i>Passer domesticus</i>	5
8	<i>Muntingia calabura</i>	2			
	MYRTALES		Mammals		
	Myrtaceae			RODENTIA	
9	<i>Eucalyptus camaldulensis</i>	1		Sciuridae	
10	<i>Terminalia catapa</i>	1	22	<i>Sciurus carolinensis</i>	1
Grasses					
	POALES				
	Poaceae				
11	<i>Phyllostachys aureosuncata</i>				
12	<i>Axonopus compressus</i>				
13	<i>Setaria pallide-fusca</i>				

6-4. Legal and Administrative Framework for Environmental and Social Considerations

6-4-1 Legal framework

- Law on Environmental Protection : LEP、No.52/2005/QH11

The basic law on environmental in Vietnam is Law on Environmental Protection (LEP、No.52/2005/QH11) The main contents are:

Chap	Contents
1	General conditions
2	Environmental Standards
3	SEA, EIA & environmental commitment
4	Natural resources protection and rational use

Chap	Contents
9	Prevention, support and repair for environmental damage
10	Environmental monitoring
11	Resources for environmental protection
12	International cooperation for environmental protection

5	Environmental conservation in business	13	Responsibility of the national environmental protection agency
6	Environmental conservation in urban and residential areas	14	Inspection and corresponding to the violation
7	Environmental protection in the sea, rivers, and in other water bodies	15	Implementation provisions
8	Waste management		

Revised Environmental Protection Act (No. 55/2014 / QH13) was issued in 2014, which is supposed to be effective from January 1, 2015. As for the EIA report for this project, it was submitted under the old law, but it is recommended to re-submit it under the new law. Submission an EIA report under the new law needs enforcement of the related decrees, which stipulates details, but it has not been done yet.

■ Decrees (No. 80/2006/ND-CP、Circular 26-2011 TT-BTNMT、No.29/2011/ND-CP)

Those are all issued to supplement the LEP. The contents are implementing regulations for an EIA, project list that need EIAs, implementation period, contents of the EIA report, procedures for examination and approval for an EIA, etc.

The project list that need EIAs are in Decree No.29/2011/ND-CP, which includes the following condition. This project was found that it needed an EIA based on this item.

- No.15: Construction of a building with a basement (deeper than 10m)

Circular 26-2011 TT-BTNMT stipulates the contents and a template of an EIA report. But all those related decrees will be replaced with the new ones with the enforcement of the new LEP.

■ Environmental standards

The related environmental standards are shown below.

Water quality	QCVN 08:2008/BTNMT - National technical regulation on surface water quality QCVN 38:2011/BTNMT - National technical regulation on surface water quality protection of aquatic life QCVN 09:2008/BTNMT - National technical regulations on groundwater quality QCVN 14:2008/BTNMT - National technical regulation on domestic wastewater quality QCVN 40:2011/BTNMT- National technical regulations on industrial waste water
Air quality	QCVN 06:2008/BTNMT - Air quality - Allowable maximum concentration of toxic substances in the ambient air QCVN 05:2013/BTNMT - Air Quality - National technical regulations on ambient air quality
Soil	QCVN 03:2008/BTNMT - National technical regulation on the permissible limits of heavy metals in the soil QCVN 43:2012/BTNMT - National Technical Regulation on sediment quality
Waste management	QCVN 07:2009/BTNMT - The national regulation on classification of hazardous waste QCVN 50:2013/BTNMT - National technical regulation on wastewater leakage from solid waste landfills
Noise and vibration	QCVN 26:2010/BTNMT - National technical regulation on noise QCVN 27:2010/BTNMT - National technical regulation on vibration
Safety for labor	Decision No.3733/2002/QD-BYT on 10 October 2002 about applications of 21 standards for safety and health

This project does not need land acquisition and resettlement; therefore, laws/regulations related to those themes have not been collected.

6-4-2 Related organizations

Examination and approval of the EIA report is done by Ministry of Natural Resources and Environment (MONRE) for large-scale projects and national project, and by Department of Natural Resources and Environment (DONRE) for small and medium-sized projects. The EIA report for this project is to be submitted to DONRE.

The EIA report for this project was submitted to DONRE in December 2014. However, it is expected that new rules on SEAs and EIAs are publicized soon, so the EIA report is supposed to be re-submitted observing the new rules (as of June 2015). No information about the schedule is given to the EIA preparer after submission. Holding stakeholder meeting after EIA submission is not required. DONRE of Ho Chi Minh City was founded in 2003; also the People's Committee of the province gives advice for implementing the environmental management

6-5. Study on alternatives

There are no other appropriate project areas for this project, and there are two alternatives only for the type of the WDP: semi-underground WDP and Underground WDP. Comparison between those two alternatives is shown in Table 6-10.

Table 6-10. Comparison between Two Alternatives

	Semi-underground WDP	Underground WDP
Overview	Half of building and reservoir is located underground and the other half is above ground.	The building and reservoir are located underground. Only respective entrances for the vehicles and people are above ground.
Initial Cost	432 Billion VND (20,181,000 USD)	509 Billion VND (23,781,000 USD) *17.8% higher than Semi-underground WDP
O & M Cost	Required costs are the same.	
Impact on landscape	The outlook of the WDP is different from other part of the Park, but the impact is considered to be insignificant.	Change of landscape is small.
Mitigation measures for above issue	To make the outlook design so as to fit the surrounding environment	No measures are needed.
Impact on other environment	All the trees in the construction site will be cut first. Then trees will be planted, but the area planted with trees is smaller compared to the case of Underground WDP.	All the trees in the construction site will be cut first. Then trees will be planted, and much area of the construction site will be covered with trees.
Mitigation measures for above issue	No special measures are needed, because there is a rule that 20% of the project site should be covered with trees, and this rule will be observed.	No measures are needed.
Social impact	The same	
Institutional, training and monitoring requirements	Requirements are the same.	

As shown in Table 6-10, the impacts on environment including landscape is larger for semi-underground WDP, but the impacts are not significant. On the other hand, as for cost, underground WDP is higher than semi-underground one by 17.8%. Therefore, it has been decided to adopt semi-underground type, judged in a comprehensive manner.

Those are both 'with project' condition. In the 'without project' situation, no cost will be required, no environmental impact including change of landscape will occur. However, the two major problems on water distribution in HCMC: low water pressure in distribution system, and difficulty to control water flow and pressure remains, which should be avoided.

6-6. Scoping

The scoping results are shown in Table 6-11. The items evaluated as B or C was included in the TOR for the EIA.

Table 6-11. Scoping Results

	item	Evaluation		Reason
		CP	OP	
Pollution				
1	Air pollution	B-	B-	CP : There may be pollution to some extent because of equipment operation. OP : There is minor pollution.
2	Water pollution	B-	B-	CP : There may be pollution to some extent because of equipment operation. OP : Staff discharge wastewater.
3	Waste	B-	B-	CP : Waste soil or waste material may occur. OP : Staff discharge waste.
4	Soil contamination	B-	D	CP : There may be pollution because of oil spill. OP : Pollutant emission is not expected.
5	Noise and vibration	B-	B-	CP : There may be some noise and vibration because of equipment operation. OP : There is noise caused by the operation of the equipment.
6	Ground subsidence	D	D	Notable impact is not predicted.
7	Offensive odor	D	D	Emission of odor is not assumed.
8	Bottom sediment	D	D	Notable impact is not predicted.
Natural Environment				
9	Protected area	D	D	There is no protected area in and around the Project area.
10	Flora, fauna and biodiversity	B-	D	CP : No rare species exists, but the trees and plants in the site may be affected to some extent. OP : No impacts are expected.
11	Hydrological situation	D	D	Work to cause change on river flow or physical conditions of the river is not planned.
12	Topography and geographical features	D	D	Large change on topography and geographical features is not planned.
Social Environment				
13	Involuntary resettlement & Land acquisition	D	D	There are no residents. Land is not going to be acquired, but to be rent.
14	Poor peoples	D	D	No impacts are expected on people's living conditions or livelihood, because change will take place only inside the park.
15	indigenous and ethnic people	D	D	There are no indigenous and ethnic people in and around the project area.
16	Local economy such as employment and livelihood	D	D	There will be no activities that may affect on this item, and therefore, no effect is expected.
17	Land use and utilization of local resources	D	D	Activities to impact on these are not expected
18	Water use	C	C	Notable impact is not predicted, but the water quality will be studied.
19	Social infrastructure and social service	D	D	There will be no activities that may affect on this item, and therefore, no effect is expected.
20	Social institutions (local decision making system, etc.	D	D	There will be no activities that may affect on this item, and therefore, no effect is expected.
21	Misdistribution of benefit and damage	D	D	There will be no activities that may affect on this item, and therefore, no effect is expected.
22	Local conflict of interests	D	D	There will be no activities that may affect on this item, and therefore, no effect is expected.
23	Cultural heritage	D	D	There is no cultural heritage in and around the project area.
24	Landscape	B-	B-	Landscape in the park will be changed.
25	Gender	D	D	There will be no activities that may affect on this item, and therefore, no effect is expected.
26	Children's right	D	D	There will be no activities that may affect on this item, and therefore, no effect is expected.
27	Infectious diseases (HIV/AIDS, etc)	D	D	Construction work is not large, and therefore, no effect is expected.
28	Working conditions including security for workers	B-	D	CP: Working conditions may be bad, if proper consideration is not made. OP: There will be no activities that may affect on this item, and no effect is expected.
29	Accidents	B-	B-	CP: There may be accidents, if proper consideration is not made. OP: There will be no activities that may affect on it, and no effect is expected.
30	Impacts on broad area, and climate change	D	D	Construction work is limited in a part of the park, and not large, and therefore, no effect is expected.

A+/-: Significant positive/negative impact is expected.

B+/-: Positive/negative impact is expected to some extent.

C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses)

D: No impact is expected.

CP: Construction Period

OP: Operation Period

6-7. Results of EIA

The predicted negative impacts through the EIA are shown in Table 6-12.

Table 6-12. Predicted Negative Impacts through the EIA

Before and during construction	
Air	- Dust by soil excavation, land clearance and ground leveling pollutes air environment. - Pollution is caused by emission from transportation in soil excavation, land clearance and ground leveling. (Soil to be moved is about 35,770 tons, and using trucks with payload of 15 tons to transport. The total time is about 2,385 times to go in and out the site.) - Pollution is caused by emission from equipment, machinery - Above main pollutants are SO_x, NO_x, CO, and VOC (volatile organic compounds).
Water	- Domestic wastewater is generated by the workers. Main pollutants are BOD₅, COD, SS, NH₃ N, and P. Total wastewater generated in the project's construction is approximately 18 m³/day at maximum. - Wastewater is generated from cleaning and maintenance of machinery. Volume is expected as 1 m³/day. The main pollutants are COD, oil & grease, and SS. - Those kinds of wastewater may pollute rivers or groundwater, if not treated properly.
Waste	- Household solid waste is generated by the workers. It is estimated discharged waste is 0.3 - 0.5 kg/day. With 100 workers at the construction site, the total amount of garbage is about 30 - 50 kg/day. Organic waste (vegetables, fruit, rice surplus, etc.) makes up approximately 75%. - Construction waste such as pebble, sand, cement, wood, and paint, etc. are generated in the construction site. - Hazardous solid wastes include oil, grease, glue, paint, paint containers, gasoline, and batteries are generated. Judged from some practical experiences, hazardous solid waste occupies about 5% of construction waste.
Soil	Domestic wastewater, washing wastewater from washing of equipment, and waste raised above may contaminate soil.
Noise, Vibration	- Ground leveling, soil excavation and construction works generate noise through operation of heavy equipment. Noise (8 m distance from the site) is estimated 86-98 dBA. The nearest residential area is about 150 m from the site, and noise is calculated to be reduced to less than 69-79 dBA by formula. The acceptable level is about 70 dBA. - Vibration sources are bulldozers, compressors, trucks, etc. and the vibration level of all kinds of machinery is estimated as 64-71 dB at the point 30 m away from the sources. The standard is 75 dB.
Ecology	Almost trees in Project Area will be sawn, but the species that are prioritized for protection and endemic species are not included. Cutting trees will impact on habitats of some birds and animals. However, they can move to new habitats in other area of the park.
Conflict	Concentration workers, approximately 100 workers at the maximum, during the construction period may cause negative impacts such as affray, gamble, drug evil, etc., which may affect people who live near the construction site.

Land scape	Different type of landscape appears.
Work environ ment	-Bad working environmental or neglect of working rules can cause fatigue, dizziness, or fainting while working.
Accident	-Number of vehicles going in and out the Project Area will be increased, which may increase traffic accident risk. -Accidents may be caused due to the negligence of workers, lack of protective equipment, or due to lack of awareness about the strict compliance with safety rules of construction workers.

During operation	
Air	-Loading and unloading of goods generate CO ₂ , SO _x , NO _x , etc. but the quantity is small. -Sodium hypochlorite (NaClO) and liquid chlorine will be used during operation, but it does not affect the environment significantly because the forecasted evaporation rate of about 0.05 to 0.1%.
Water	Domestic wastewater is generated by the employees. Total wastewater generated is approximately 1.8 m ³ /day at maximum.
Waste	Household solid waste is generated by the employees. With 15 employees the total amount of garbage is about 4.5 – 7.5 kg/day.
Noise	Noise arising from sources such as pumps, compressors, generators. The noise level generated relatively frequent and continuous higher (average 80 - 85 dBA). Frequent exposure to 80 dBA noise source inhibits central nervous system, causing fatigue state of discomfort and reducing labor productivity.
Land scape	Different type of landscape appears.
Accident	- Carelessness of workers in control machinery, equipment and vehicles, or bad health conditions of workers, etc. may cause accidents. - Fuel storage, transformers, power supply system may be source the fire, if proper attention is not paid.

6-8. Evaluation of the Impacts

Table 6-13 shows the comparison between the scoping results and the EIA results. Some items had D at the scoping, but had B- at the EIA, but the impacts on those are slight.

Table 6-13. Comparison between Scoping Results and the EIA Result

	Item	Scoping		EIA		Reason
		CP	OP	CP	OP	
1	Air pollution	B-	B-	B-	B-	CP : There may be pollution to some extent because of equipment operation. OP : There is minor pollution.
2	Water pollution	B-	B-	B-	B-	CP :There may be pollution to some extent because of equipment operation. OP : Staff discharge wastewater.
3	Waste	B-	B-	B-	B-	CP: Waste soil or waste material may occur. OP: Staff discharge waste.
4	Soil contamination	B-	D	B-	D	CP: There may be pollution because of oil spill. OP: Pollutant emission is not expected. .
5	Noise and vibration	B-	B-	B-	B-	CP: There may be some noise and vibration because of equipment operation. OP: There is noise caused by the operation of the equipment.
6	Ground subsidence	D	D	N/A	N/A	Notable impact is not predicted.
7	Offensive odor	D	D	N/A	N/A	Emission of odor is not assumed.
8	Bottom sediment	D	D	N/A	N/A	Notable impact is not predicted.
9	Protected area	D	D	N/A	N/A	There is no protected area in and around the Project area.
10	Flora, fauna and biodiversity	B-	D	B-	D	CP: No rare species exists, but the trees and plants in the site may be affected to some extent. OP: No impacts are expected.
11	Hydrological situation	D	D	N/A	N/A	Work to cause change on river flow or physical conditions of the river is not planned.
12	Topography and geographical features	D	D	N/A	N/A	Large change on topography and geographical features is not planned.
13	Involuntary resettlement & Land acquisition	D	D	N/A	N/A	There are no residents. Land is not going to be acquired, but to be rent.
14	Poor peoples	D	D	N/A	N/A	No impacts are expected on people's living conditions or livelihood, because change will take place only inside the park.
15	Indigenous and ethnic people	D	D	N/A	N/A	There are no indigenous and ethnic people in and around the project area.
16	Local economy such as employment and livelihood	D	D	N/A	N/A	There will be no activities that may affect on this item, and therefore, no effect is expected.
17	Land use and utilization of local resources	D	D	D	D	Activities to impact on these are not expected
18	Water use	C	C	D	B+	Notable impact is not predicted, but the water quality will be studied.
19	Social	D	D	N/A	N/A	There will be no activities that may affect on

	Item	Scoping		EIA		Reason
		CP	OP	CP	OP	
	infrastructure and social service					this item, and therefore, no effect is expected.
20	Social institutions (local decision making system, etc.	D	D	N/A	N/A	There will be no activities that may affect on this item, and therefore, no effect is expected.
21	Misdistribution of benefit and damage	D	D	N/A	N/A	There will be no activities that may affect on this item, and therefore, no effect is expected.
22	Local conflict of interests	D	D	B-	D	There will be no activities that may affect on this item, and therefore, no effect is expected.
23	Cultural heritage	D	D	N/A	N/A	There is no cultural heritage in and around the project area.
24	Landscape	B-	B-	B-	B-	Landscape in the park will be changed.
25	Gender	D	D	N/A	N/A	There will be no activities that may affect on this item, and therefore, no effect is expected.
26	Children's right	D	D	N/A	N/A	There will be no activities that may affect on this item, and therefore, no effect is expected.
27	Infectious diseases (HIV/AIDS,etc)	D	D	N/A	N/A	Construction work is not large, and therefore, no effect is expected.
28	Working conditions including security for workers	B-	D	B-	D	CP: Working conditions may be bad, if proper consideration is not made. OP: There will be no activities that may affect on this item, and no effect is expected.
29	Accidents	B-	B-	B-	B-	CP: There may be accidents, if proper consideration is not made. OP: There will be no activities that may affect on it, and no effect is expected.
30	Impacts on broad area, and climate change	D	D	N/A	N/A	Construction work is limited in a part of the park, and not large, and therefore, no effect is expected.

A+/-: Significant positive/negative impact is expected.

B+/-: Positive/negative impact is expected to some extent.

C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses)

D: No impact is expected.

6-9. Mitigation Measures

Mitigation measures to be taken against the expected negative impacts can be summarized as in Table 6-14.

Table 6-14. Mitigation measures against Expected Negative Impacts

Item	Mitigation measures	During construction	
		Cost ('000 VDN)	I.A.
Air	-To use well-maintained vehicles. -To spray water 2 times/day at the construction site, surrounding the transport route and gathering of materials, machinery, construction entrances, dumping area and traffic hubs. - To set speed limit inside the park.	1,000	Contractor

	- To make a schedule to minimize traffic volume		
Water	- To store wastewater in concrete tanks, temporary built, and make a contract with a licensed unit to vacuum wastewater and carry it to a designated area for treatment - To filter the rainwater before discharging into Nhieu Loc-Thi Nghe canal	15,000	
Waste	- As for construction waste, to sell them as much as possible to a recycler and ask a licensed unit to deal with the remaining - As of household waste, to install waste bins with a capacity of 100-liter at construction area, construction camp and canteens, and to contract with a licensed unit to collect, transport and process solid wastes as regulated - As for hazardous wastes such as oily rags, wasted oil, paint, glue, to store them in special tanks and make a contract with a licensed unit	8,000	
Soil	(Included in the measures for Water and Waste)		
Noise & vibration	- To install noise isolation devices into the machines with high noise levels, such as excavators, compressors, excavator etc.; - To use appropriate noise protection gears (helmet, ear plug) to avoid noise impact	4,000	
Ecology	- To make a plan to cut trees not to affect the surrounding landscape - To use barrier to cover construction site so that to minimize the impacts on the birds, etc. - To design WDP that green area is the largest (>20%) and rearrange to make new landscape	4,000	
Conflict	- To raise awareness of the workers through training, etc.	-	
Landscap e	(Included in the measures for Ecology)		
Working condition	- To train workers about workplace safety in construction - To enforce the wearing of protective gear for employees	2,000	
Accidents	- To train to response to fire-related incidents - To fully equip with fire prevention equipment in accordance with the applicable law	3,000	

I.A.= Implementing Agency

During operation

Item	Mitigation measures	Cost ('000 VND/yr)	I. A.
Air	-To use well-maintained vehicles	6,000	Owner (SPC or other)
Water	- To store wastewater in a concrete tank, and to make a contract with a licensed unit to vacuum wastewater and carry it to a designated area for treatment	15,000	
Waste	- As of household waste, to install waste bins, and to contract with a licensed unit to collect, transport and process solid wastes as regulated	3,000	
Noise & vibration	- To install anti-vibration cushion around machinery that produce loud noise. - To install compressors in soundproof chamber - To soundproof the major noise source	2,000	
Landscap e	(Landscape is already rearranged)	-	
Accidents	- To prepare water valves for fire-fighting - To install fire alarm systems, water tanks, sand bags, fire extinguishers and protection gear, and to check them regularly - To check periodically health's workers	20,000	

I.A.= Implementing Agency

6-10. Monitoring Plan

Monitoring will be done shown in 6-15

Table 6-15. Monitoring Measures

Component monitoring	Selective indicator	Monitoring site	Frequency	Cost ('000 VDN/yr)	I.A .
Construction period					Owner (SPC or other)
Air	Dust, SO2, NO2, CO, H2S, NH3	2 sites at the Project Area	Once per 6 months	6,800	
Water	-	-	-	-	
Waste	weight of solid waste construction waste, (domestic waste and hazardous waste respectively)	all the Project Area	Daily	8,000	
Soil	-	-	-	-	
Noise & vibration	Noise & vibration	2 sites at the Project Area	Once per 6 months	200	
Ecology	Site inspection		As needed	2,000	
Conflict	Hearing from related people		As needed		
Landscape	Site inspection		As needed		
Working conditions	Inspection and hearing from related people		As needed		
Accidents	Inspection and hearing from related people		As needed		
Operation period					Owner (SPC or other)
Air	Dust, SO2, NO2, CO, H2S, NH3	2 sites at the Project Area	Once per 6 months	6,800	
Water	-	-	-	-	
Waste	weight of solid waste	all the Project Area	Daily	8,000	
Noise & vibration	Noise & vibration	2 sites at the Project Area	Once per 6 months	200	
Landscape	Site inspection		As needed	200	
Accidents	Inspection and hearing from related people		As needed		

I.A.= Implementing Agency

The monitoring points to be used for air quality and noise and vibration are shown in Figure 6-5. The affected range on air quality and noise and vibration are considered to be relatively small through the study, and it is judged to be sufficient to monitor them only in the premise.

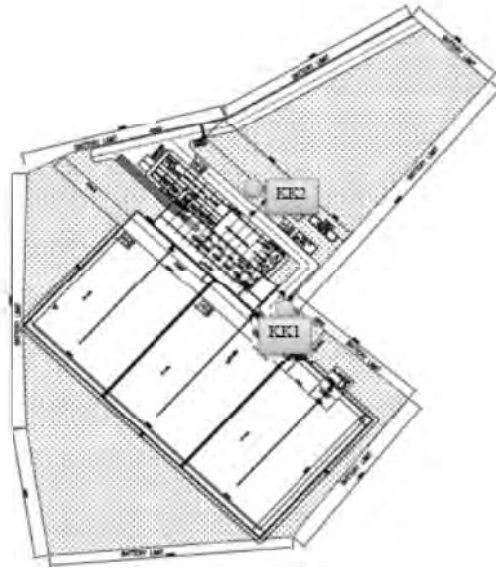


Figure 6-5 Monitoring Points to be used for Air Quality and Noise and Vibration

6-11. Stakeholder Meetings

It is required to hear opinions from the residents' representatives in Vietnam. Interview with 20 households were conducted who live in the neighborhood of the park, and the following opinions were obtained. As for the comments on the project, the countermeasures are already included in the study.

Status of air pollution: according to feelings of the majority of household (16/20), the air is not polluted. Among those, there are some people (4/20) living downstream along The Nhieu Loc-Thi Nghe canal has felt unpleasant odors, but odors arising primarily from seafood processing odor.

The majority of household (15/20) says that the Nhieu Loc Thi Nghe water canal is polluted.

For groundwater quality, the majority of household (20/20), who extracted and used the ground water, says there was no groundwater pollution problem.

One household (1/20) living near the project area proposed to improve the stream before the rainy season to avoid flooding when heavy rains happened, and to strictly treat the wastewater before discharging into the receiving water body.

Chapter 7. Project outcomes and impacts

7-1. Investment efficiency: Economic and financial effectiveness/benefits

The effects of WDP from the point of business aspects are described in Fig. 7-1.

		Issue	Impact
For Residents	(A) Water quality enhancement	• Water quality deteriorates due to the chlorine decrease by the temperature, time, etc	• Chlorine injection in WDP will maintain the chlorine level at households • Total effect of "not buying drinking water" = 2,812 VND/m ³
	(B) Water storage for emergency	• There is risk of water supply stop if any incidents take place in WTP	• WDP functions as the water supply source
For Residents and SAWACO	(C) Saving energy to provide water	• Direct water supply from WTP cost much energy	• The energy cost saved by 12% due to the WDP functions
	(D) Reduction of the household cost creating more room for higher tariff revenue	• Each household purchase tank for daily use of the water, suppressing the household incomes	Household cost will decrease by 173 billion VND/year, providing room for SAWACO tariff increase Total effect of "no tank, no pump" = 4,340 VND/m ³
For SAWACO	(E) Reduction of Investment	• Temporary pipes installation will be required	Pipe along Au Co street will not be required Total effect in investment cost reduction = 4-8 million

Fig.7-1 Effects of WDP

The followings are calculation results of the effects and impacts for each item

■ Water quality enhancement (A)

First of all, as is described in the previous section, the effect of WDP implementation is to improve water pressure, suppress the deterioration of water quality caused by the intrusion of underground water from the water leakage points, and supply safe water by dosing suitable chlorine.

As a result, water can be distributed to the tap as same quality enough for drinking in water treatment plant. This change enables each household to reduce costs for buying bottled water and increase the affordability for buying tap water, and to accept tariff increase. After all, SAWACO can obtain the merits for income increase.

Fig. 7-2 shows the calculation results of this change from bottled water to tap water.

Implementation of WDP prevents from contamination of underground water into pipes and keep the water quality, therefore people can drink water from the tap directly, and don't need to buy drinking water anymore.

⇒ Total effect of “not buying drinking water” = 2,812 VND/m³
(affordability will be increased)



Note: Calculation Policies

- ✓ Population of the WDP's target area: 681,000 persons
 - ✓ The number of the household: 136,200 household (5 persons/household)
 - ✓ The amount of drinking water: 500mL/D/person
 - ✓ Price of drinking water server: 18,000 VND/20L
 - ✓ Approx. 4 of 5 households are buying drinking water.
- < Total loss benefit in 5 years in case WDP is started not in 2017 but 2022 >
- $681,000 \text{ persons} \times 0.5 \text{ L/D/person} \times 365 \text{ days} \times 5 \text{ years} \times 900 \text{ VND/L} \times 80\% = 447 \text{ Billion VND}$
 - $\text{Total loss} = 450 \text{ VND/day} \div 0.16 \text{ L/D/person} = 2,812 \text{ VND/m}^3$

Fig. 7-2 Calculation Results of reducing bottled water costs

It is quite natural that it depends on citizen's understanding whether water quality improvement can increase water tariff. Therefore, the Team conducted a survey of questionnaire regarding the utilization of tap water for the residents of Gia Dinh WDP candidate area.

This questionnaire was for the standard households which don't manage shops and/or restaurants, and were not concentrated in 1 place but distributed in main streets as widely as possible.

This survey is for calculation conditions, and trend analysis, therefore, the results are just for reference. However, the water supply service ratio from this survey is the same as that from Water Supply Company, so the results can be taken as the standard trend of the citizens

Tab.7-1 The results of questionnaire for water use at Gia Dinh WDP candidate distribution area

Results of 189 families (Overview)

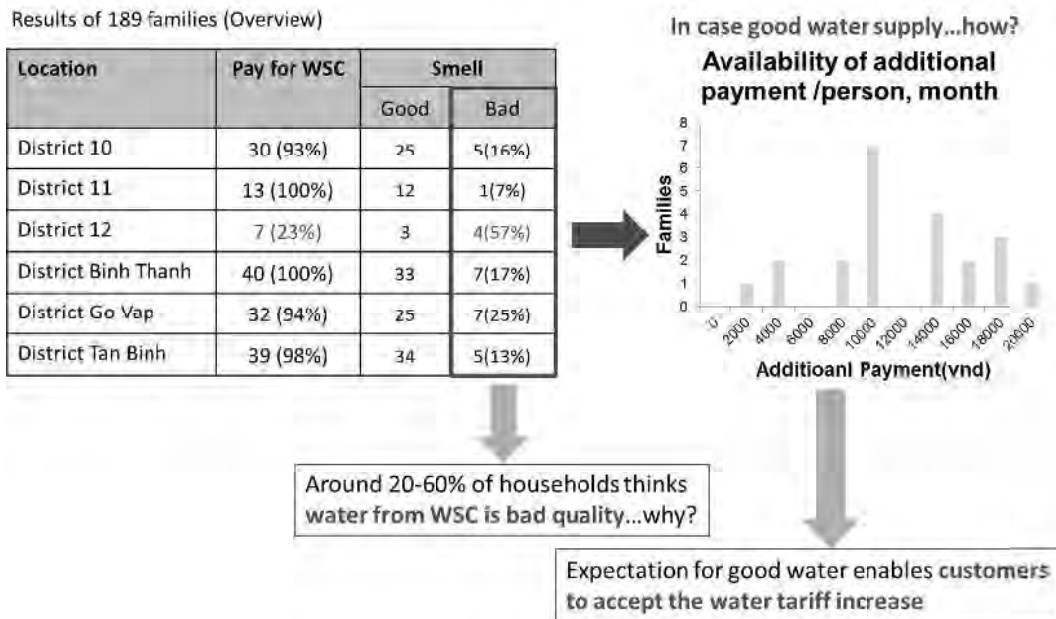
Location	Number of families	Pay for WSC	Underground water	Underground water only
District 10	32	30 (93%)	15 (47%)	1 (7%)
District 11	13	13 (100%)	8 (61%)	
District 12	30	7 (23%)	27 (90%)	23 (77%)
District Binh Thanh	40	40 (100%)	13 (32%)	
District Go Vap	34	32 (94%)	20 (59%)	2 (6%)
District Tan Binh	40	39 (98%)	12 (30%)	1 (2%)

About WDP business area,

Already many households buy water from WSC, but still many families are using underground water

These families, especially in district 12, never know WSC's service, so SAWACO needs to satisfy them to pay for water.

Tab.7-2 Expectation for quality improvement for tap water



Tab. 7-1 shows that still many households use underground water and promotion of using tap water enables SAWACO to increase sales income. Furthermore, in the households which use tap water, still many peoples are not satisfied with the quality of tap water, and they have strong needs for water quality improvement. The right figure of Tab. 7-1 shows the amount of additional payment for quality improved water and it says around 10 to 20% of water tariff increase can be accepted for water quality improvement.

Tab. 7-3 Measure for drinking water

Location	Number of families	Buy Dinking Water	Boil Water	Water Purification tools
District 10	32	13 (41%)	15 (47%)	3 (9%)
District 11	13	3 (23%)	10 (77%)	
District 12	30	22 (73%)	5 (17%)	2 (7%)
District Binh Thanh	40	11 (28%)	25 (63%)	5 (13%)
District Go Vap	34	21 (62%)	13 (38%)	1 (3%)
District Tan Binh	40	30 (75%)	10 (25%)	

More than 20% to 70% customer want to drink natural water (from WTP or underground) , So potential demand for water quality improvement is very strong.

Furthermore, Tab.7-3 shows the results of questionnaire which asks how to secure drinking water. Some households which don't buy drinking water drink tap after boiled or by utilizing water purification tools. In such cases, the total costs for securing drinking water are almost same. That means the needs for tap water and quality improvement are very high.

■ Energy-saving distribution system (C)

As for the effects of WDP implementation, energy-saving can be expected. The meaning of energy-saving is not less energy consumption than the current water distribution system, because WDP require additional energy itself

For considering the effects of WDP, it is necessary to compare the energy consumption of WDP system, with that of which realize the same water distribution quality. Therefore, we compared energy consumption of WDPs with the future system (pipeline only), which we defined in the previous JICA's study to secure the same water pressure at the fringe of the network.

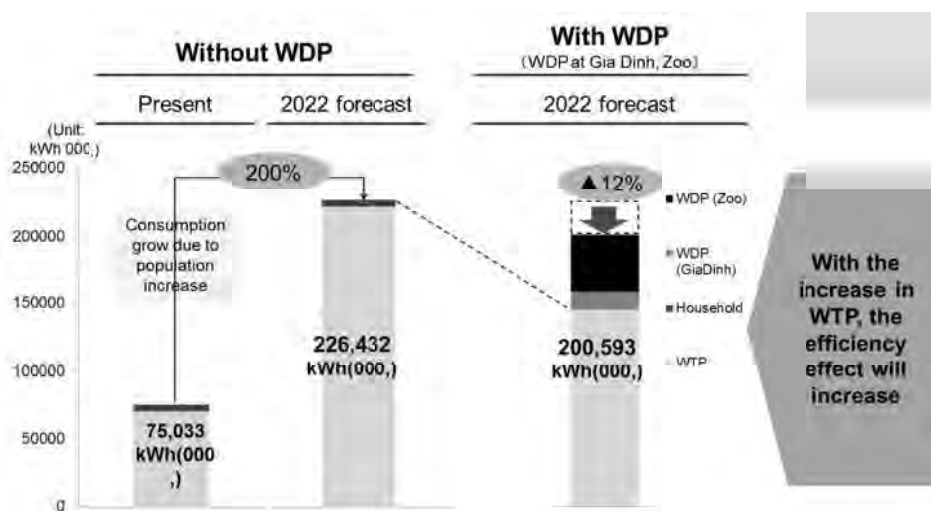


Fig.7-3 Comparison of energy consumption

Fig.7-3 shows the comparison of energy consumption especially for Thu Duc System only; however, the energy consumption of WDP will be approximately 12% less than that of future distribution system with pipeline only, and the amount of cost reduction was calculated as approximately 700 to 800 thousand USD.

■ Reduction of citizen's cost burden (D)

In the present HCMC, water distribution system has chronic low water pressure problems. As a self-protection, each household secures water by utilizing reservoir and pumps. Therefore, it is additional costs for each household to install and maintenance such facilities.

WDP Implementation enables the citizens to reduce such costs. As a result, the citizens' payment affordability will increase and they can accept tariff increase.

Implementation of WDP enables households to reduce the costs for receiving tanks and pumps, and strengthen the payment affordability for SAWACO's water supply
 $\Rightarrow$ Total effect of "no tank, no pump" = 4,340 VND/m³ (affordability will be increased)

< Information of WDP >

- ✓ Population of the WDP's target area: 681,000 persons
- ✓ The number of the household: 136,200 household (5 persons/household)

< Conditions >

- ✓ Receiving pumps: 750W, 100L/min (3.8mil VND, implementation fee, replaced in every 5 years)
- ✓ Receiving tank: 1500L (2.5mil VND, construction fee, replaced in every 10 years)
- ✓ The amount of water: 160L/person, day
- ✓ Electricity Tariff: 1,092.3VND/kWh
- ✓ 2 tanks and 1 pumps in each household

< Lost effects of total households in 5 years (in case WDP is started not in 2017 but 2022) >

- Reduced power consumption at each household (per year)
 $= 160\text{L/person/day} \times 5 \text{ persons} \times 365\text{days} \div 100\text{L/min} \div 60\text{min/h} \times 0.75\text{kW} \times 136,200 \text{ households}$
 $= 4,971,300\text{kWh}$
- Maintenance fee of Tanks: $3.8\text{mil} \times 2\text{items} \times 136,200\text{households} \times 0.5 = 518 \text{ Billion VND}$
- Maintenance fee of Pumps: $2.5\text{mil} \times 1\text{item} \times 136,200\text{households} = 340 \text{ billion VND}$
- Electricity expense of households: $1,092.3\text{VND} \times 4,971,300\text{kWh} \times 5\text{years} = 5 \text{ billion VND}$
- Total effect = $(518+340+5) \div (100\text{L} \times 365\text{days} \times 5\text{years} \times 681,000) = 4,340\text{VND/m}^3$

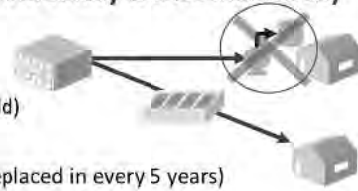


Fig.7-4 Effects of cost reduction of reservoir and pumps

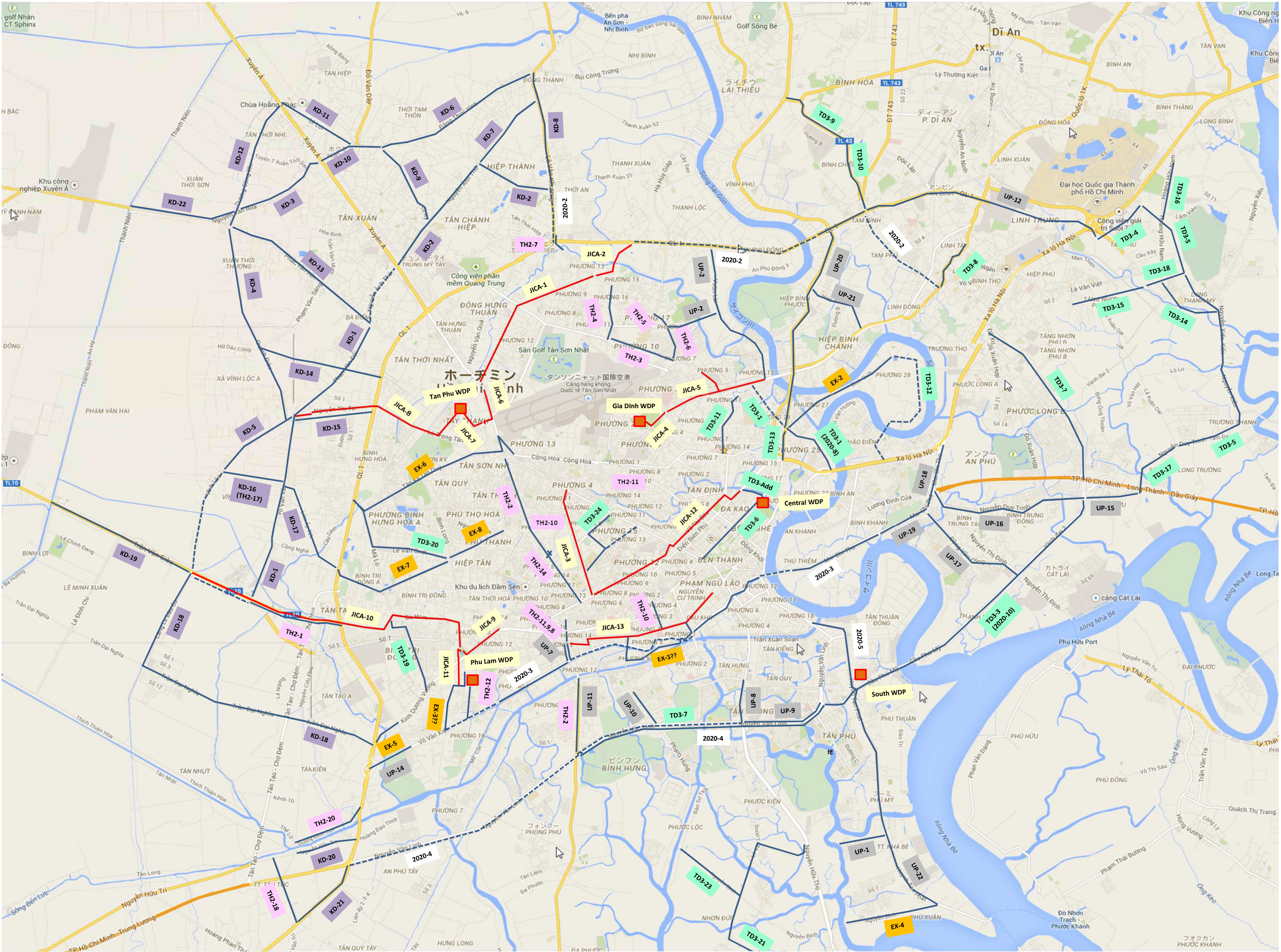
■ Reduction of investment costs (E)

By utilizing existing pipeline network at a maximum and implementing optimum WDPs according to the demand forecast based on the WSMP, total investment costs will be reduced compared with that of the water distribution network without WDP.

Attached 7-1 shows the list of unnecessary pipes from the future installation plan, and their costs impacts.

7-2. Other considerable Risks

The important risk items as a basis of Chapter 4 and 5 are shown in the attachment 7-2.



PROCEDURAL STEPS TO IMPLEMENT THE PROJECT IN THE FORM OF PPP

1. Formulation and Publication of PPP Projects

Under Decree 15, a PPP Project can be formulated from either of the two (02) methods, (i) Projects proposed by the State authorities (including Ministries, Branches and Provincial People's Committees), or (ii) Projects proposed by the investors.

In this Project, Decision 729 has approved the planning for HCMC's development of water supply system until 2025. Additionally, SAWACO is selecting the consultant to form the Master Project (to which the Project should belong). Accordingly, the State authorities, through SAWACO, may be under the process of formulating the projects to implement the above planning. Therefore, it is likely that the Project mentioned herein will be formulated by the State authorities in method (i) mentioned above.

2. Formulation, approval and announcement of the Project proposal¹

The competent ministry, branch or provincial people's committee shall arrange formulation of the Project proposal. Where no approved WSMP is available, obtaining approval for new WSMP or adjustment as to the approved WSMP should be necessary.² The competent authority shall the arrange evaluation and approval of the Project proposals in accordance with the law on public investment.

Announcement of or listing of the Project on the national tendering network shall be done within 7 business days after approval of the Project proposal.

3. Formulation and Approval of Feasibility Study Report ("FS Report") of the Project

The process for formulation and approval of the FS Report of the Project can be summarized as follows:³

- FS Formulation: A ministry, branch or provincial people's committee shall arrange formulation of the FS Report for a project in order to provide the basis for tender invitation documents for investor selection and for negotiation of the project contract.
- FS Contents: A FS Report shall contain the statutory contents.⁴
- Evaluation of FS Report: Authority to evaluate FS Reports:
 - The State Evaluation Committee shall evaluate FS Reports for national important projects;
 - Ministers, heads of ministerial equivalent agencies and chairmen of provincial people's committees shall assign their PPP Coordinating Unit to evaluate FS Reports for Group A and B projects.

¹ Articles 15, 16, 17, 18 of Decree 15.

² Article 15.2 of Decree 15.

³ Articles 24 to 28 of Decree 15.

⁴ Article 25 of Decree 15

- Timeline for Evaluation of FS Report:
 - National important projects: no more than 90 days;
 - Group A projects: no more than 40 days;
 - Group B projects: no more than 30 days.
- Approval of FS Report:
 - The Prime Minister shall approve FS Reports for national important projects.
 - Ministers, heads of ministerial equivalent agencies and chairmen of provincial people's committees shall approve FS Reports for Group A and B projects, except for projects using ODA and concessional loans from foreign donors in the national defense and security sector and/or in the religious sector.

4. Selection of Investor

Selection of Investor for PPP Projects shall be conducted via either of 02 methods, public tendering or direct appointment. Below is the summary of these selection methods.⁵

4.1 Public Tendering

The procedures of public tendering for selection of investor to implement PPP project can be summarized as follows:⁶

- (i) Preparation for the investor selection:
 - a) Make the tendering documents;
 - b) Appraise, approve the tendering documents.
- (ii) Organization of investor selection:
 - a) Invite tenderers;
 - b) Publish, adjust, clarify the tendering documents;
 - c) Prepare, submit, receive, manage, adjust, withdraw tender-envelopes;
 - d) Open technical proposals.
- (iii) Evaluate technical proposals, including:
 - a) Inspect the validity of technical proposals;
 - b) Evaluate technical proposals in details;
 - c) Appraise, approve the list of investors that satisfy technical requirements.
- (iv) Opening and evaluating financial-commercial proposals, including:
 - a) Open financial-commercial proposals;
 - b) Inspect the validity of financial-commercial proposals;

⁵ Articles 29 of Decree 15.

⁶ Article 25 of Decree 30/2015/ND-CP on Investor Selection under the Law on Bidding.

- c) Evaluate financial-commercial proposals in details and rank investors;
 - d) Preliminarily negotiate the contract.
- (v) Submit, appraise, approve, and publish the investor selection result
- (vi) Contract negotiation, completion, and conclusion:
 - a) Negotiate and complete the contract;
 - b) Sign the investment agreement and project contract.

It should be noted that details of each step in the procedure above are prescribed under Chapter III, Section 2 (Articles 26 to 44) of Decree 30/2015/ND-CP on Investor Selection.

4.2 Direct Appointment

4.2.1 Conditions

Direct appointment of investor for PPP projects may only be used in the limited circumstances as follows:⁷

- (i) Only one investor registers and satisfies requirements of the pre-qualification documents; only one investor passes the pre-qualification;
- (ii) Only one investor is capable of executing the project;
- (iii) The project proposed by the investor is feasible and most efficient including PPP projects, projects of investment using land meant for protection of national sovereignty, national borders, and islands. Feasible and most efficient projects are considered and decided by the Prime Minister when the following conditions are satisfied:
 - There are feasibility study reports (for PPP projects) or project proposals (for PPP projects of Group C) that are approved;
 - The investor proposes reasonable service prices, state contribution, social benefits, or state interests;
 - The requirements for protection of national sovereignty, national borders, and islands are satisfied.

4.2.2 Procedures

Once the direct appointment is selected, the summary of procedures of selection of investor for direct appointment to implement PPP project can be summarized as follows:⁸

- (i) Preparation for investor selection
 - a) Making the request for proposals
 - b) Appraising and approving the request for proposals.
- (ii) Organization of investor selection
 - a) The request for proposals shall be issued to a pre-determined investor.

⁷ Article 9.3 of Decree 30/2015/ND-CP

⁸ Section 1 of Chapter VI of Decree 30/2015/ND-CP

- b) The investor shall prepare and submit the proposal as requested in the request for proposals.
- (iii) Proposal evaluation and preliminarily contract negotiation
- (iv) Submission, appraisal, approval, and publishing the result
- (v) Contract negotiation, completion, and conclusion:
 - a) Negotiate and complete the contract;
 - b) Sign the investment agreement and project contract.

5. Negotiation and conclusion of the Investment Agreement

After selection of the Investor, the competent State authority (hereinafter referred to as the “**Competent State Authority**”) and the selected Investor shall arrange negotiation of a project contract.⁹ However, after completing project contract negotiation, the Competent State Authority and the investor shall sign an Investment Agreement (not the Project Contract) in order to confirm the following contents:

- (i) Draft project contract;
- (ii) Rights and obligations of each party in implementing procedures in order to obtain the Investment Registration Certificate (“**IRC**”) and to establish the SPC;
- (iii) Other contents as agreed between the parties.¹⁰

6. Obtaining the IRC and Establishment of the SPC

Upon conclusion of the Investment Agreement, the investor should go ahead with establishment of the SPC. Before establishment of an economic entity like SPC, the Law on Investment generally requires that foreign investors must have an investment project and implement the procedures for issuance of an IRC and upon issuance of the IRC, then the foreign investors will implement the procedures for establishment of the economic entity which means the procedures for obtaining an enterprise registration certificate (“**ERC**”) in accordance with the Law on Enterprises. For the implementation of investment projects in the form of a PPP contract, investors need to obtain IRC regardless of whether the investors are foreign or domestic nature.

Below are the brief procedures for obtaining the IRC and ERC respectively.

6.1 Obtaining IRC¹¹

⁹ Article 30.1 of Decree 15

¹⁰ Article 30.2 of Decree 15

¹¹ Article 39 and Article 40 of Decree 15

The Investor shall prepare and submit five sets of the application file to the competent Licensing Authority.¹² The competent Licensing Authority shall issue an IRC within twenty-five (25) days after the date of receipt of a complete and valid application file in case of acceptance. The Ministry of Planning and Investment shall provide detailed regulations on the application file and procedures for issuance, amendment and revocation of IRCs.

Notably, the Licensing Authority shall vary depending on the type of project:

- MPI shall issue, amend and revoke IRCs for the following projects: (a) Projects of national importance; (b) Projects for which ministries or branches sign project contracts, or for which agencies authorized by ministries or branches being authorized State agencies to sign project contracts; (c) Projects implemented in two or more provinces or cities under central authority.
- Provincial people's committees shall issue, amend and revoke IRCs for the remaining projects. However, Group C projects shall not require IRCs.

Additionally, an application file for obtaining an IRC shall mainly comprise of the following:

- (a) Request for issuance of an IRC;
- (b) Investment Agreement and draft Project Contract;
- (c) Feasibility study report and decision approving the Project;
- (d) Written in-principle approval of use of State investment capital (if any) participating in implementation of the Project;
- (dd) Joint venture contract and draft charter of SPC (if any);
- (e) Decision on selection of the Investor.

6.2 Establishment of the SPC¹³

Upon issuance of an IRC, the Investor shall establish the SPC pursuant to the Law on Enterprises to implement the Project (except for BT Contract projects and Group C projects).¹⁴ Under the Law on Enterprises, there are several forms of an enterprise including a limited liability company (with sole member (being individual or organization) or with two members or more), shareholding company,

¹² Article 40.2 of Decree 15

¹³ Article 42 of Decree 15

¹⁴ The Investor may, without establishment of the SPC, directly execute the project, but shall be required to carry out independent management and make accounting report on the capital and project-related activities.

private company solely owned by an individual and partnership company. The form of limited liability company and the form of shareholding company are common here in Vietnam. The application file and procedures for establishment of the SPC shall mainly comprise of the different application dossier subject to the specific form of the SPC:

(a) In case of being a limited liability company:¹⁵

- An application form for business registration.
- The SPC's charter.
- A list of members.
- Copies of: (i) the ID card or other ID papers of members being individuals; (ii) Decision on Establishment, Certificate of Business registration, or an equivalent document of the organization and the letter of authorization; the ID card or other ID papers of the authorized representatives of members being organizations (if a member is a foreign organization, the copy of the Certificate of Business registration or an equivalent document must be consularly legalized); iii) IRC.

(b) In case of being a shareholding company:¹⁶

- An application form for business registration.
- The SPC's charter.
- A list of founding shareholders and shareholders being foreign investors.
- Copies of: (i) The ID card or other ID papers of founding shareholders and foreign investors being individuals; (ii) Decision on Establishment, Certificate of Business registration, or an equivalent document of the organization and the letter of authorization; the ID card or other ID papers of the authorized representatives of founding shareholders and foreign investors being organizations (If shareholders are foreign organizations, the copy of the Certificate of Business registration or an equivalent document must be consularly legalized); (iii) the IRC.

The above said application dossier for obtaining the ERC shall be submitted to the business registration body. It takes the business registration body 03 working days to consider and issue the ERC to the SPC in case of acceptance.¹⁷

7. Conclusion of the Project Contract¹⁸

¹⁵ Article 22 of the Law on Enterprises

¹⁶ Article 23 of the Law on Enterprises

¹⁷ Article 27.2 of Decree 15

The Project Contract may be signed after obtaining the IRC between the Competent State Authority and the Investor only.

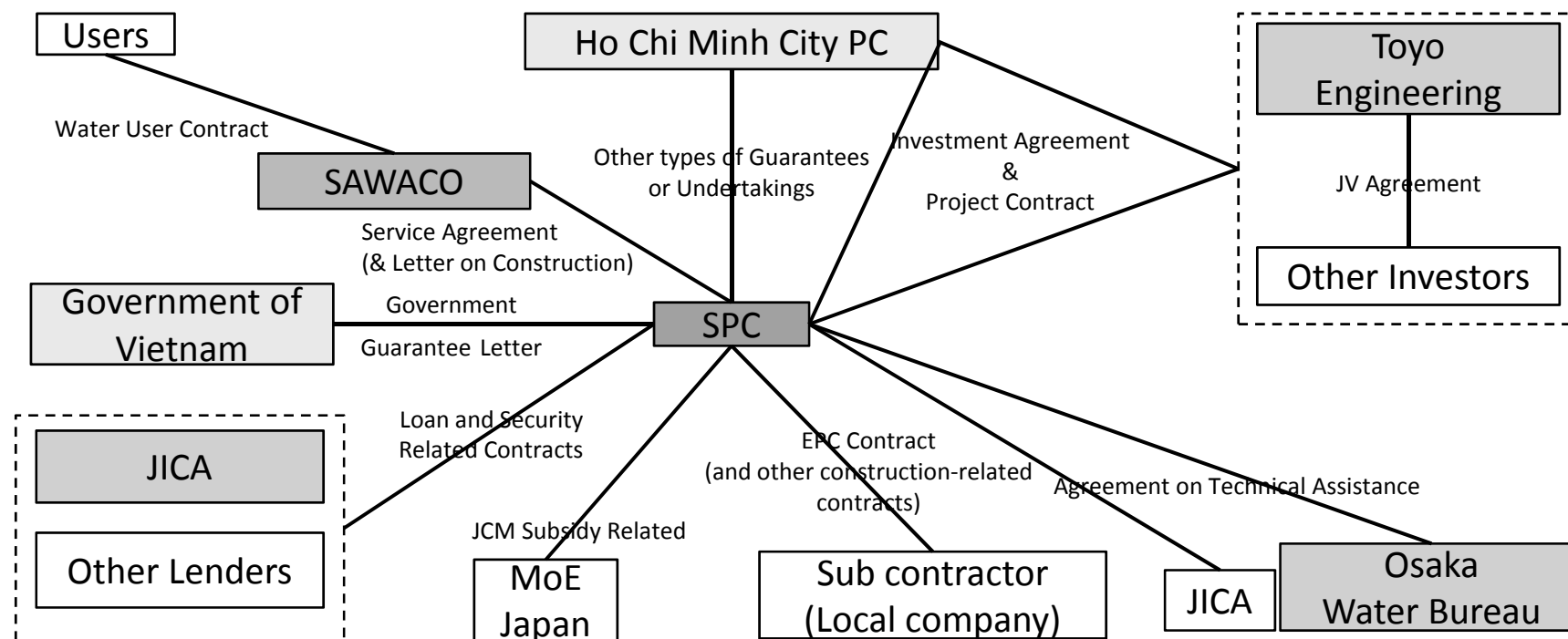
After establishment of the SPC, either of the following options can be done:

- a) the SPC may also sign in the Project Contract to become a joint party with the Investor as one of the parties to The Project Contract; or
- b) the Competent State Authority, the Investor and the SPC shall sign a document permitting the SPC to take over and exercise the rights and obligations of the Investor stipulated in the IRC and in the Project Contract. This document shall form an integral part of the Project Contract.

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¹⁸ Article 31 of Decree 15

Proposed Major Contracts



Notes:

1. Investment Agreement & Project Contract: SAWACO can be added as a party (subject to discussion with SAWACO).
2. Service Agreement: Proposed Service Agreement in Appendix III is drafted on the assumption that Service Agreement does not cover SAWACO's role as owner of the land and existing facility related to construction of water distribution plant. Such SAWACO's role can be covered in a separate Letter on Construction and/or other Project Contract.
3. Guarantee Letter: It depends on the negotiation with the authorities whose and what warranty/guarantee will be provided in the project.
4. Loan-related Contracts will be executed among multiple parties: HCMC PC, Investors, SPC and lenders.

BASIC TERM SHEET OF THE PROJECT CONTRACT UNDER BOT SCHEME¹

No.	Term	Major contents/Notes
1.	The objective and scale of the project	Primary objective: To build and operate a water distribution plant (WDP) and [may also] provide related services such as network planning, network operation support and network maintenance services, aiming at water quality enhancement; water storage for emergency; saving energy to provide water; and reduction of household costs which creates room for higher tariff revenue. Scope of Operation: - Construction, operation and management of the WDP; - Advisory, engineering services/Support for development of Pipeline management plan; - Advisory, engineering services/Support for Pipeline operation Scale of Project (Capacity of the WDP): - Water Reservoir: 36,000 m3 - Planned maximum daily supply: 211,500 m3/day
2.	Contract parties	Private parties (“Investors”): [Toyo Engineering]; [Other Investors] Public party (“Competent State Agency”): [People’s Committee of Ho Chi Minh City] or [Department of Transportation, etc.]
3.	Project Company	A Project Company shall be set up in form of a two member or more limited liability company for implementation of the project (“ Project Company ”) in accordance with the laws and regulations.
4.	Investment agreement and project contract and other related contracts	This term sheet shall serve as the basis for the Parties to negotiate and sign the investment agreement (which confirms matters in Article 30.2 of Decree 15) and thereafter the project contract and the service purchase agreement regarding the operation of the WDP between the Project Company and SAWACO (“ Service Purchase Agreement ”), if the Investors are officially selected

¹ This is the first draft term sheets for discussion purpose and subject to further amendments and supplementations upon the discussion.

No.	Term	Major contents/Notes
		as the investors of the project in accordance with the applicable laws and regulations.
5.	Project location	Gia Dinh Park, Go Vap District, Ho Chi Minh City, Vietnam
6.	Project term	22 years, including 2 years of construction and 20 years of operation. The total project term may be subject to changes based on mutual agreement between the contract parties.
7.	Project implementation schedule	The project is estimated to be implemented upon this tentative schedule: • To negotiate and sign the investment agreement: 01/2017 • To obtain IRC and ERC: 03/2017 • To conclude the Project Contract: 06/2017 • To conclude the Service Purchase Agreement: [] • To complete land use right procedures: 12/2017 • To select construction contractors: 01/2018 • To complete preliminary preparations for construction: 1/2018 • To start construction: 1/2018 • To complete construction and tests: 12/2018 • To officially start operation: 01/2019
8.	The technical and technology requirements and the quality of the WDP	Construction and operation norms and standards applied to the Project: [To be decided in accordance with the feasibility study report ("FS")]; Design and construction solutions (requirements on survey, construction design, procedures for preparation and approval of the design): [To be prepared by the Investors in accordance with the FS]; Other technical and technology details shall be decided in line with the FS and the applicable laws and regulations.
9.	The total investment capital and the Project's financial plan; adjustment of investment capital for the project	Investment Capital of project shall be: [VND 432,098,000,000] equivalent to [USD 20,181,000], includes: • Equity capital: [VND 129,629,400,000] equivalent to [USD 6,054,300] (30% of total Investment Capital), which shall be fully funded by the Investors; and • Other capitals including loan capital: [VND 302,468,600,000] equivalent to [USD

No.	Term	Major contents/Notes
		14,126,700]. The Investors/Project Company undertakes obligation to ensure the capital sources and schedule to mobilize the capital to implement the project. VAT and loan interests are not included in the investment capital. Investment capital and equity capital may be increased or decreased through mutual agreements between the parties and subject to registration with competent State authorities, to the extent permitted by laws. Business plan for capital recovery and profits gaining: [Determination of proceeds and prices, fees of goods and services; method of determination; commercial exploitation period; principles for adjustment of prices, fees of goods and services and commercial exploitation period; costs of operation, management and maintenance of works of the project, etc. will be described based on the discussion with HCMC.]
10.	The conditions, ratio and schedule for disbursement of State investment capital (if any)	The Competent State Agency shall be responsible for disbursements of the State investment capital for construction of auxiliary works, land user compensation, land clearance and resettlement, but no later than 01/2018 [If the State does not provide any fund or incentives for this Project, this section may be removed]
11.	Conditions for using land and related works	To use the land and related works, the Parties shall comply with the following general obligations: • Location of the construction works, estimated area of land used for the project and relevant works (if any) must be compliant with the project contract; • Time and schedule of land assignment/lease to be agreed by the parties in line with the work construction schedule must be complied; • Competent State Agency shall assign land in line with the construction schedule and cooperate with the Investors/Project Company to carry out the tasks of site compensation, clearance and resettlement • Investors/Project Company shall secure capital resources for paying the costs of site

No.	Term	Major contents/Notes
		compensation, clearance and resettlement.; • [] [if necessary, rights and obligations of the Investors/Project Company in using and managing the assigned land area; rights and obligations of Competent State Agency in supervising and checking the implementation of compensation, site clearance, resettlement and land use by the Investors/Project Company will be added. • Conditions for use of necessary infrastructure works and ancillary works for construction, operation and management of WDP (if any) under the project contract or the laws; • Obligations under the laws and provisions on excavation and treating fossils, antiques, architectural works or other objects within the project area and the rights and obligations of the Investors/Project Company to these objects; • Other rights and obligations of Competent State Agency and the Investors/Project Company to be agreed by the parties in accordance with legislation on land and construction, Decree 15/2015/ND-CP and relevant legal documents; • [] [After the discussion between both Parties, additional responsibilities of each party will be described in the case of violating obligations committed in this section.]
12.	Site clearance and/or resettlement	The Competent State Agency shall be responsible for working with relevant State authorities to complete site clearance, payment of compensation and procedures for handing over land to Investors in accordance with the agreed schedule, but no later than [01/2018]
13.	Construction, checking, supervision and management of quality, inspection for handover of WDP	The Parties shall comply with the following general rights and obligations: • Rights and obligations of the Parties in performing the procedures and meeting the requirements on construction in compliance with construction legislation and specific agreements between the Parties; • Conditions for selection of contractors in the course of construction in compliance with the provisions of tendering legislation, Decree 15/2015/ND-CP, Decree

No.	Term	Major contents/Notes
		30/2015/ND-CP and other guiding documents; The regime for management of quality, supervision and inspection for handover of WDP in compliance with the Law on Construction and specific agreements between the Parties.
14.	Accounting finalization of the project	Construction costs of the project must be finalized within 6 months from construction completion based on the Art. 53.1 of Decree 15/2015/ND-CP; An independent and reputable auditor shall be appointed in accordance with the agreement between the parties to audit the construction costs [among these auditors:]
15.	Step-in right of the lender	The Parties agree to allow step-in by the lender or by the organization which the lender appoints if the Investors or Project Company fail to discharge the obligations prescribed in the project contract or loan agreement. [This may be required by the creditors/sponsors of the project. If the parties do not plan to have any agreement with the creditors/sponsors for step-in right, this item can be removed.]
16.	Appraisal, operation, maintenance and commercial exploitation of WDP	The Parties shall comply with the following general rights and obligations: - Rights and obligations of the parties in implementing the provisions on appraisal (design, appraisal and verification of construction quality, appraisal of equipment) in compliance with construction legislation and specific agreements between the parties. - Rights and obligations of the Project Company in organising the management, business exploitation and maintaining the normal operation of the WDP and in ensuring the uninterrupted provision of services; maintenance of the WDP during the exploitation and operation; conditions for and handling measures upon temporarily suspension of goods and services supply and provision due to technical breakdown, events of force majeure and other circumstances in compliance with laws and specific agreements between the Parties. Of which, WDP shall be operated by the Project Company on the following

No.	Term	Major contents/Notes
		principles: + To provide the services in accordance with the requirements and conditions under the project contract; + To maintain and repair WDP in accordance with the designs or procedures as agreed under the project contract; + Obligations of the Project Company and buying insurance for, and conducting warranty of, WDP in compliance with the provisions of the Law on Construction, the Law on Insurance Business, relevant legal documents and specific agreement between the Parties; + Rights and obligations of the Competent State Agency in checking, supervision and coordination with the project enterprise to perform the obligations stated in this Section.
17.	Transfer of WDP	WDP shall be transferred to the State authority in accordance with the terms and conditions as follows: • The procedures for transfer shall comply with the applicable laws and regulations; • WDP shall be on good working conditions, except normal wear and tear, and free from all encumbrances; • The Investors shall support necessary training, technology instructions required for smooth transfer; • The Competent State Agency, or other legally authorized party, shall receive the transfer of WDP on time. These general conditions are roughly based on conditions under Article 54 of Decree 15/2015/ND-CP but are not mandatory. The parties may develop these conditions more in this Term Sheet or in the Project Contract.]
18.	Performance security for the project contract	Form: [Deposit] [The parties may agree on other forms of security, such as escrow account or letter of guarantee from credit institutions licensed in Vietnam (Article 4.2 of

No.	Term	Major contents/Notes
		Law on Tendering 2013).] Amount: [1% of total Investment Capital] [The amount within the scope of 1% to 3% of total investment capital as per Law on Tendering will be specified.] Term: [Before the effective date of the Project Contract, the Investors must transfer the deposit amount to the account designated by the Competent State Agency. Upon the complete construction of the WDP, the deposit shall be discharged and released to the Investors.] [The Parties may negotiate on when and how to carry out the Performance Security.] Conditions for enforcement: [The deposit shall be forfeited in cases that: - the Investors refuse to perform the Project Contract after the Project Contract becomes effective; or - the Investors breach an obligation under the Project Contract which is agreed to be the condition for deposit forfeiture; or - the Investors fall behind schedule in performance of the Project Contract and refuse to extend the term of the performance security.] [According to Article 72.4 of Law on Tendering 2013] Changes of performance security: The type and terms of the performance security shall be subject to changes upon agreement between the Parties.
19.	Risk sharing as between the authorized State agency and Investor; force majeure events and principles for dealing with same	Government approvals and license: [to be guaranteed or cooperated by the Competent State Agency]; Sites and water rights: [to be guaranteed by Competent State Agency]; Risk in construction, operation and maintenance: [to be covered by insurance or to be borne by a party directly liable for the outcome; if no insurance is available and one is directly liable, EPC contractors bear risk]; Demand risks: [to be covered by “take or pay”];

No.	Term	Major contents/Notes
		Non-performance of off-taker (“SAWACO”): [to be guaranteed by Competent State Agency]; Regulatory framework risk (change in law): [to be guaranteed or borne by the Competent State Agency]; Foreign currency availability, convertibility and transferability risk: [to be guaranteed by State agency]; Currency devaluation risk: [to be covered by the structure of 2-step loan and Vietnam local bank bears/to be covered by adjustment of service fee (using consumer price index, etc.) and guaranteed by the Competent State Agency]; Force Majeure Events: [to be borne by SAWACO and be guaranteed by the Competent State Agency and to be covered by insurance to the extent possible]. [This part should be discussed and negotiated between the parties.]
20.	Forms of incentives and investment guarantees including Government guarantees (if applicable)	Land use right and payment: Exemption of 100% of land rents for the entire land lease/assignment period. Corporate Income Tax: Tax exemption for 4 years, reduction of 50% of tax amounts for the next 9 years; Incentive tax rate of 10% for 15 years from gaining revenue. Guarantees: [Government guarantee or guarantee by the Competent State Agency or other State agency for (1) foreign currency availability, convertibility and transferability, (2) the proposed loans of the project, (3) the payment of SAWACO; commitment by the Competent State Agency as 100% owner of the SAWACO for the provision of necessary funds to SAWACO for the payment of its debts] [This part needs to be discussed with the State authorities whether they can secure any guarantee for the project.]
21.	Governing law of the Project Contract relationship and related contracts, and dispute settlement regime	Governing law: [the Laws of [Japan/Singapore/Vietnam]] Dispute shall be settled [by arbitration in Tokyo in accordance with the Commercial Arbitration Rules]

No.	Term	Major contents/Notes
		of the Japan Commercial Arbitration Association/by arbitration in Singapore in accordance with the Arbitration Rules of the Singapore International Arbitration Centre/at Vietnam International Arbitration Centre at the Vietnam Chamber of Commerce and Industry (VIAC)] Languages: [English]
22.	Effectiveness and term of the project contract	The term of the project contract shall commence from [] until [].
23.	Assignment of rights and obligations pursuant to the project contract	Apart from the step-in right of the lenders, the Investors may only assign part or all of its rights and obligations in the project contract to another party in accordance with mutual agreement between the parties and the assignee(s), provided that such assignment must not adversely affect the objective, scale, technical specifications or implementation schedule of the project and the assignee shall participate in negotiating any assignment agreement in accordance with provisions in the loan contract.
24.	Indemnification	The Competent State Agency shall waive any immunity or otherwise limited liability available to it under the applicable laws and regulations and shall be fully liable for its performance and compensation as agreed under the Project Contract.
25.	Other rights and obligations of the parties	[] [Other rights and obligations not specified elsewhere in this term sheet will be inserted]
26.	Other matters	The existence and terms of this term sheet and the fact that discussions are taking place between the parties are confidential and are not to be disclosed by any party, except to the competent governmental authority for the purpose of obtaining necessary guidance, approval or clearance and to their own professional counsels. This term sheet is non-binding and shall only serve as materials for discussion and negotiation, except for the confidentiality obligations.

SERVICE PURCHASE AGREEMENT

THIS AGREEMENT is made on the [*] day of [*]

BETWEEN:

1. [SPC]

Address: [*]

Telephone: [*] Fax:[*]

Tax code number: [*]

Account: [*] Bank: [*]

Represented by: [*] Title: [*]

*Hereinafter referred to as the “**Supplier**”*

2. SAIGON WATER CORPORATION

Address:[*]

Telephone:[*] Fax:[*]

Tax code number: [*]

Account: [*] Bank: [*]

Represented by: [*] Title: [*]

*Hereinafter referred to as the “**Purchaser**”*

WHEREAS

- (A) The Supplier is a company jointly established by [*] which entered into the [BOT Agreement] with the [People’s Committee] on [*];
- (B) The Supplier has expertise in the operation and maintenance of water facilities; and
- (C) The Purchaser desires to appoint the Supplier to provide the Services (as defined below) to the Purchaser on the terms and subject to the conditions of this Agreement;

IT IS AGREED as follows

1. DEFINITIONS AND INTERPRETATION

1.1 Definitions

In this Agreement the terms defined below shall have the meanings assigned to them, except where the context requires otherwise:

"Agreement" means this service purchase agreement, as amended, supplemented or restated from time to time.

"Base Monthly Charge" means the charge so defined in Schedule 2.

"Charge" means the Base Monthly Charge and the Variable Charge.

"Commencement Date" means [*] days after the date upon which the Facility is determined to have met the Performance Tests and is otherwise available for commercial operation as stated in the Performance Certificate, being the date upon which the Performance Tests were passed or were deemed to have been passed in accordance with Sub-Clause 2.3 or 2.4.

"Contract Period" means the period commencing from the Commencement Date until the Expiry Date, as may be extended in accordance with the provisions of this Agreement.

"Cost" means all expenditure properly incurred (or to be incurred) by the Supplier, including administrative costs, financing costs (including without limitation any principal, interest, fees or breakage costs incurred in unwinding any arrangements) and similar charges.

"Equipment" means machinery, apparatus and other things required for the execution and completion of the Services which is not incorporated in the Facility.

"Expiry Date" means the date specified in Sub-Clause 3.1.

"Facility" means the facility to be constructed by the Supplier for the purposes of provision of the Services as described in the Technical Specification.

"Force Majeure Event" has the meaning given in Clause 11.

"Guaranteed Level" means the quality and quantity of Raw Water to be provided to the Supplier by the Purchaser as set out in the Technical Specification.

"Intellectual Property" means all intellectual property of every kind, including without limitation all patents, registered designs, unregistered design rights, works subject to the laws of copyright, trade secrets, processes, trademarks whether registered or not, know-how and any associated or similar rights (including, in all cases, applications and right to apply therefore and documentation thereof).

"Lenders" means the entities providing financing to the Supplier for the Facility.

"Materials" means all things of all kinds (other than the Equipment) to be used for the performance of the Services by the Supplier.

"Party" or **"Parties"** means the Purchaser and the Supplier, or one of them as the context indicates.

"Performance Certificate" means a certificate issued under Sub-Clause 2.3.

"Performance Tests" means the tests specified in the Technical Specification and any other such tests as may be agreed by the Purchaser and the Supplier, which are to be carried out before the Performance Certificate is issued by the Purchaser.

"Permits" means all licences, permits, approvals, consents and other forms of authorisations required to be obtained under any Applicable Laws by the Purchaser or the Supplier in connection with the operation of the Facility or the performance of the Services.

"Purchaser's Risk" means those risks set out in Sub-Clause 10.5.

"Raw Water" means the water to be supplied by the Purchaser to the Supplier for purification by the Supplier in accordance with this Agreement.

"Raw Water Treatment Point" means the connection between the Facility and the Purchaser's pipe carrying the Raw Water to the Facility, as indicated on the plan set out in Schedule 3.

"Services" means the services to be provided by the Supplier as specified in Sub-Clause 5.1¹.

"Technical Specification" means the specification of the scope, standard, design criteria (if any) and programme of work as agreed by the Purchaser and the Supplier, as provided in Schedule 1 and any Variations thereto.

"Treated Water" means the filtered and purified water to be produced by the Supplier utilising the Facility and supplied to the Purchaser in accordance with this Agreement.

"Treated Water Supply Point" means the connection between the Purchaser's premises and the Supplier's pipe carrying the Treated Water from the Facility to the Purchaser's premises, as indicated on the plan set out in Schedule 3.

"Utilities" means the utilities to be supplied by the Parties in accordance with the Technical Specification.

"Variable Charge" means the charge so defined in Schedule 2.

¹ N&A Note: We understand from the Interim Report that the SPC/foreign investors may also provide advisory/engineering services to SAWACO; however given the significant difference between the water distribution plant services (as described in Sub-Clause 5.1) and the advisory/engineering services we suggest that SPC/foreign investors should enter separate agreements with SAWACO for provisions of advisory/engineering services.

"Variation" means any alteration and/or modification to the Technical Specification, which is instructed by the Purchaser or approved as a variation by the Purchaser, in accordance with Clause 7.

Other terms may be defined throughout this Agreement.

1.2 Interpretation

Words importing persons or parties shall include firms and corporations and any organisation having legal capacity. Words importing the singular also include the plural and vice versa where the context requires.

2. PERFORMANCE TESTS AND CERTIFICATE

2.1 Supplier's Obligations

The Supplier shall carry out the Performance Tests in accordance with this Clause 2 and the Technical Specification. The Supplier shall give to the Purchaser [7] days' notice of the date on which the Supplier will carry out the Performance Tests.

As soon as the Facility has passed the Performance Tests, the Supplier shall provide the Purchaser with a certified report of the results of all such Performance Tests.

2.2 Retesting

If the Facility fails to pass the Performance Tests, the Supplier shall promptly and in any event within [14] days inform the Purchaser of the action it proposes to take to ensure that it does pass them when retested and such failed tests shall be then promptly repeated under the same terms and conditions. Such failed tests shall be repeated in accordance with this Clause 2 until the Facility passes the Performance Tests.

2.3 Performance Certificate

The Supplier may apply by notice to the Purchaser for a Performance Certificate not earlier than [14] days before the Facility is, in the Supplier's opinion, constructed in accordance with [the BOT Agreement]. The Purchaser shall, within [28] days after the receipt of the Supplier's application:

- (a) issue the Performance Certificate to the Supplier, stating the date on which the Facility has passed the Performance Tests (except for case provided in Sub-Clause 2.4); or
- (b) reject the application, giving its legitimate reasons proving that the Facility has not passed the Performance Tests and specifying the work required to be done by the Supplier to enable the Performance Certificate to be issued. The Supplier shall then complete such work before issuing a further notice under this Sub-Clause.

If the Purchaser fails either to issue the Performance Certificate or to reject the Supplier's application within the period of [28] days, and if the Facility has passed the Performance Tests, the Performance Certificate shall be deemed to have been issued on the last day of that period and the Commencement Date shall be deemed to be the date of receipt of the application.

3. CONTRACT PERIOD

3.1 Term

This Agreement shall continue in full force and effect from [*] (“**Effective Date**”) until [*] (“**Expiry Date**”).

3.2 Extension to Contract Period

Either Party may propose to the other Party to extend the Contract Period by giving notice to that effect to the other Party not less than [*] months prior to the date on which the Contract Period would otherwise end. In the event that a Party gives notice hereunder and the other Party agrees to such extension the terms of such extended period shall be as agreed between the Parties.

4. THE PURCHASER

4.1 General Obligations

The Purchaser shall, at no cost to the Supplier and in such a manner as will not prevent, interfere with or delay the Supplier carrying out its obligations under this Agreement:

- (a) provide the supply of Raw Water in accordance with the Guaranteed Levels;
- (b) pay the Supplier in accordance with Clause 8;
- (c) if requested by the Supplier, take reasonable steps to procure access by the Supplier to any legislative bodies having jurisdiction over the Services and/or the Facility and advise the Supplier of any planned discussions with any such bodies and, if requested by the Supplier, involve the Supplier in such discussions;
- (d) ensure the full co-operation of the Purchaser's employees, agents, suppliers and subcontractors in connection with the provision of the Services and prevent its employees, agents, suppliers and subcontractors from taking any steps which adversely affect the Supplier's ability to discharge its obligations under this Agreement;
- (e) [make available for the exclusive use of the Supplier, its employees, agents, suppliers and Subcontractors secure and convenient parking facilities and work and office space reasonably required by the Supplier and any other facilities required by the Supplier for its employees, agents, suppliers and Subcontractors, to a standard reasonably acceptable to the Supplier]; and

(f) [other obligations].

5. THE SUPPLIER

5.1 General Obligations

The Supplier shall from the Commencement Date operate and maintain the Facility from and including the Raw Water Treatment Point to and including the Treated Water Supply Point in order to improve the quality of the Raw Water before pumping Treated Water with enhanced pressure to end-users through the Purchaser's pipe in good faith, in accordance with:

- (i) this Agreement;
- (ii) the Technical Specification; and
- (iii) all Applicable Laws, including, without limitation, all laws relating to public health, labour or the environment.

5.2 Subcontractors

The Supplier may subcontract any part of the Services to be provided by it under this Agreement without consent of the Purchaser.

6. METERING

6.1 Responsibility for Metering

The Supplier shall be responsible for all metering as set out in the Technical Specification. Such metering shall (where appropriate) monitor the quantity and quality of both Raw Water and Treated Water.

6.2 Testing

The Supplier shall use its reasonable endeavours to arrange for the testing and calibration of all meters referred to in Sub-Clause 6.1 above on installation and thereafter on a regularly scheduled basis, being at least once every [12] months.

If at any time either Party has reasonable grounds to suspect that any meter or measuring equipment is not accurate in any respect, the discrepancy or suspected discrepancy shall be immediately reported to the other Party in writing along with any evidence in support of such claim and (i) the Supplier shall arrange for the testing of the relevant meter where the Supplier is the owner of such meter and (ii) the Purchaser shall arrange for testing in the case of meters owned by it or third parties at its own cost.

7. VARIATIONS

7.1 Right to Vary

Variations may be initiated by the Purchaser at any time after the Effective Date and before the Expiry Date, either by instruction or by a request for the Supplier to submit a proposal. If the Purchaser requests the Supplier to submit a proposal and subsequently elects not to proceed with the change, the Supplier shall be reimbursed by the Purchaser for the Cost incurred.

The Purchaser shall not be entitled to request a Variation which would reduce the scope of the Facility and/or the Services unless agreed in writing by the Supplier in advance.

7.2 Value Engineering

The Supplier may, at any time, submit to the Purchaser a written proposal which in the Supplier's opinion will reduce the cost of maintaining or operating the Facility, or improve the efficiency or value of the Facility, or otherwise be of benefit to the Parties. Any such proposal shall include the items listed in, and shall be responded by the Purchaser in accordance with, Sub-Clause 7.3.

7.3 Variation Procedure

If the Purchaser requests a proposal or instructs a variation, the Supplier shall submit, as soon as practicable:

- (a) a description of the proposed design, work and/or services to be performed and a programme for its execution; and
- (b) the Supplier's proposal for adjustment to the Charge and/or modifications to this Agreement.

The Purchaser shall, as soon as practicable after receipt of any proposals made by the Supplier under this Agreement, respond with its approval, rejection or comments. If a Variation is to be carried out, the Parties must first agree adjustments to the Charge and Expiry Date, modifications to this Agreement and who is to obtain any necessary Permits and the relevant Party shall obtain such Permits and who is to bear the cost for preparation of the relevant proposals.

7.4 Right of Refusal

The Supplier shall have the right to refuse a Variation requested by the Purchaser if:

- (a) the Supplier reasonably considers that the Variation, if implemented, would have a material adverse effect on the Supplier's ability to provide the Services or perform its obligations under or in connection with this Agreement;
- (b) the Variation would cause the Supplier to breach any Permits; or

- (c) the Variation would, if implemented, materially adversely affect the health and safety of any person or give rise to a breach of any Applicable Law.

7.5 Base Monthly Charge

If whilst implementing the Variation, the Variation affects the ability of the Supplier to provide the whole or part of the Services or fulfil its obligations under or in connection with this Agreement the Supplier will be entitled to be paid the Base Monthly Charge.

8. CONTRACT PRICE AND PAYMENT

8.1 Payment Mechanism

- (a) The Supplier shall submit a monthly invoice for the Charge calculated pursuant to Schedule 2 and any additional amounts payable to it under this Agreement and the due date for payment of such monthly invoice shall be the date falling [*] days after the date of the invoice. The Base Monthly Charge shall be settled in accordance with Sub-Clause 8.2.
- (b) Where the period of payment would include a day which is a bank holiday in Vietnam, that day shall be excluded.
- (c) All payments made under this Agreement shall be made by transfer to such bank account as each Party shall notify to the other and shall be in the currency indicated in Schedule 2.
- (d) Any amount properly due to a Party pursuant to this Agreement and remaining unpaid after the final date for payment shall bear interest (both before and after judgement), such interest to accrue from day to day at the rate of [*]% from the date when payment was due until the amount due is actually received by the payee.

8.2 Regular Payment of Base Monthly Charge

To ensure the punctual payment of the Base Monthly Charge and timely performance of its obligations under this Agreement, the Purchaser shall set up a payment mechanism to allow the automatic payment of the Base Monthly Charge on [*] of each month into such bank account as the Supplier shall notify to the Purchaser. This mechanism shall remain in force throughout the Contract Period.

8.3 Suspension

Without prejudice to any rights or remedies that the Supplier may have under this Agreement or at law, if the Purchaser fails to pay any amount stated in any monthly invoice by the relevant final date for payment (and the Parties have not agreed otherwise) and it has not given to the Supplier an effective notice of intention to withhold payment, the Supplier shall be entitled upon giving the Purchaser seven (7) days notice, to suspend the performance of any of its obligations under this Agreement until such time as the due amount is paid in full. In giving such notice the

Supplier shall specify the ground or grounds on which it intends to suspend performance.

9. TERMINATION

9.1 Default of Supplier

If the Supplier:

- (a) if there is a material failure by the Supplier to perform any of its obligations hereunder (including without limitation failing to perform the Services in such manner and of such quality provided under the Technical Specification), unless the Supplier has cured such breach during the notice period or has initiated and is pursuing diligently the cure of such breach and thereafter continues to pursue diligently such cure, provided that such cure is effected within [90] days from the receipt of such notice by the Supplier;
- (b) assigns this Agreement without the Purchaser's written consent except in accordance with Clause 16;
- (c) becomes bankrupt or goes into liquidation.

then after giving [90] days written notice to the Supplier and if the default has not been cured by the end of the [90] day period (except in the case of defaults referred to in Sub-Clauses 13.1(c) where termination may be with immediate effect), the Purchaser may issue a notice of the termination of the Supplier's employment under this Agreement.

If it is subsequently found that the Purchaser was not entitled to terminate under this Sub-Clause 9.1, this Agreement shall be deemed to have been terminated under Sub-Clause 9.2.

9.2 Default of Purchaser

If the Purchaser:

- (a) fails to pay the Supplier in accordance with Clause 8;
- (b) becomes bankrupt or goes into liquidation;
- (c) consistently fails to meet the Purchaser's obligations or fails to perform a material Purchaser's obligation under this Agreement;
- (d) assigns this Agreement without the Supplier's written consent.

then after giving [90] days notice to the Purchaser and if the default has not been cured by the end of the [90] day cure period (except in the case of Sub-Clauses 9.2(b) where notice of termination will have immediate effect), the Supplier may terminate this Agreement on expiry of the termination notice.

9.3 Consequences of Termination

Following the Expiry Date or after termination under Sub-Clauses 9.1 or 9.2, the Supplier shall cease all further work, except for work as may be necessary and instructed by the Purchaser for the purpose of leaving the Facility in a clean and safe condition and repatriate its entire staff and labour from the Facility.

Upon receipt by the Supplier of the sums referred to in Schedule 2 Part 2 or following the Expiry Date:

- (a) the Purchaser shall reimburse the Supplier all Cost incurred by the Supplier in connection with any legislative obligation on the Supplier to decommission and/ or make safe the Facility or any part of it, unless such Cost is due to the negligence or default of the Supplier;
- (b) the title in the Facility, Equipment and Materials shall be transferred from the Supplier to the Purchaser;
- (c) the Facility shall be at the risk of the Purchaser and the Purchaser shall at its own cost be responsible for all insurances related to the Facility and the use of it and shall ensure that it is used and maintained in accordance with all statutory requirements and so as not to give rise to any danger to health, safety or the environment; and
- (d) the Supplier shall have no liability for the condition of the Facility, its operation or otherwise in connection with the Facility after the termination of this Agreement for whatever cause.

9.4 Payment on Termination

After termination under Clause 9 or Sub-Clause 11.4, the Purchaser shall pay the Supplier the relevant amounts calculated in accordance with Schedule 2 Part 2.

10. COMPENSATION FOR LOSS AND DAMAGE

10.1 Compensation

- (a) The Party in breach is responsible to pay compensation for loss and damage caused by its breach to the Party affected for loss, damage and costs the affected Party suffers during the process of exercise of rights and discharge of its obligations under this Agreement including any loss of or damage to property; loss of profit, death or injury to a person; legal expenses, witness expenses, evaluation fees and other expenses directly arising as a result of the breach by the party in breach.
- (b) If a claim for payment of compensation is made, the claimant shall immediately provide written notice to the other party in order to determine the nature of the claim. Any delay by the claimant in notifying the claim shall not affect the obligation of the other party to pay compensation, unless such other

party suffers actual loss and damage as a result of late notification of the claim by the claimant.

10.2 Release Events

The Release Events are:

- (a) Raw Water which does not conform with the Guaranteed Levels (Quality) [or exceeds the Guaranteed Levels (Quantity)];
- (b) shortage of power;
- (c) any default or delay by a governmental agency in the issue or extension of a Permit or any act or omission of any or governmental agency, any withdrawal of a Permit (unless caused by the negligence of or breach of law by the Supplier) or the failure by a governmental agency to renew a Permit;
- (d) any operation of the forces of nature against which an experienced contractor or operator could not reasonably have been expected to take precautions;
- (e) changes in Applicable Law which came into force after the Effective Date;
- (f) any act, omission or default by the Purchaser;
- (g) any failure of Utilities or failure by the Purchaser which causes the reduction or suspension of such Utilities;
- (h) suspension pursuant to Clause 8.3.

10.3 Consequences of Release Events

- (a) The Supplier shall give notice, to the Purchaser, of a Release Event upon it being foreseen by, or becoming known to, the Supplier.
- (b) If and to the extent that the Supplier is prevented or hindered from executing the Services as a result of a Release Event, for the period that the Release Event continues the Supplier shall be relieved of its obligations to provide the Services but shall endeavour to perform its obligations under this Agreement as far as reasonably practicable, PROVIDED that if and to the extent that the Supplier incurs additional Cost in so doing, the Supplier shall be entitled to the amount of such Cost (the Supplier having taken reasonable steps to mitigate that Cost).
- (c) Release Events specified in:
 - (i) Sub-Clauses 14.3(f) and (h); and
 - (ii) Sub-Clauses 17.3(a), (b), (c), (d), (e), (g) to the extent that they are due, directly or indirectly, to the action or inaction of the Purchaser

are “**Purchaser’s Risks**”. If the Services are interrupted as a result of a

Purchaser Risk, and this results in a loss of profit by the Supplier, then the Supplier shall be entitled to be compensated for reasonable loss of profit at the rates per day set out in Schedule 2 Part 1 in addition to the Base Monthly Charge.

For all other Release Events, the Supplier shall not be entitled to a loss of profit element during the period of interruption in addition to the Base Monthly Charge.

- (d) For the purposes of Clause 11, any Release Events which are not Purchaser's Risks shall be treated in the same way as termination for extended Force Majeure.
- (e) The Supplier shall be entitled to payment of the Base Monthly Charge during the period of interruption irrespective of whether the Release Event is a Purchaser's Risk or not.

11. FORCE MAJEURE

11.1 Definition of Force Majeure

In this Clause 11, "**Force Majeure Event**" means any unavoidable event or circumstance occurring which is outside the control of a Party and which prevents or delays discharge of a part or all of the contractual obligations of such Party despite such Party having taken reasonable preventive measures, including but not limited to:

- (a) natural disaster such as a fire, explosion, drought, flood, volcanic eruption, earthquake, landslide, typhoon, tornado, major storm or similar event;
- (b) riot, demonstration, insurrection, insurgence, war operations whether or not war was declared, activities of hostile resistance, terrorism, destruction, embargo, blockade, epidemic, strikes or lock outs or similar event; or
- (c) acts or threats of terrorism.

11.2 Consequences of Force Majeure Event

- (a) Neither the Purchaser nor the Supplier shall be considered in default or in contractual breach to the extent that performance of obligations is prevented by a Force Majeure Event which arises after the Effective Date, excluding payment obligations.
- (b) The Party which is prevented/ hindered from carrying out its obligations hereunder (the "**Affected Party**") shall give notice to the other Party of a Force Majeure Event upon it being foreseen by, or becoming known to, the Affected Party.

- (c) If and to the extent that the Supplier is prevented or hindered from executing the Services by the Force Majeure Event, whilst the Supplier is so prevented and hindered the Supplier shall be relieved of its obligations to provide the Services but shall endeavour to continue to perform its obligations under this Agreement so far as reasonably practicable, PROVIDED that if and to the extent that the Supplier incurs additional Cost in so doing, the Supplier shall be entitled to the amount of such Cost (the Supplier having taken reasonable steps to mitigate the Cost).
- (d) The Supplier shall be entitled to payment of the Base Monthly Charge during the period of interruption caused by the Force Majeure Event.
- (e) The Contract Period shall be extended by a period of time equal to the period of interruption caused by an Force Majeure Event.

11.3 Purchaser's Responsibility

Upon occurrence of an event being foreseen by the Purchaser to constitute Force Majeure Event and which may affect performance of the Purchaser's obligations, the Purchaser shall promptly notify the Supplier and shall endeavour to continue to perform its obligations as far as reasonably practicable. The Purchaser shall also promptly notify the Supplier of any proposals, with the objectives of completing the Services and mitigating any increased costs to the Purchaser and the Supplier.

11.4 Optional Termination, Payment and Release

Irrespective of any extension of time, if a Force Majeure Event occurs and its effect continues for a period of [*] days, either the Purchaser or the Supplier may give to the other a notice of termination, which shall take effect [*] days after the giving of the notice. If, at the end of the [*] period, the effect of the Force Majeure Event continues, this Agreement shall terminate.

12. DISPUTE RESOLUTION

12.1 Negotiations

Without prejudice to the Parties' rights under Sub-Clause 12.2 below, the Parties will attempt in good faith to resolve any dispute or claim arising out of or in relation to this Agreement through negotiations between the Parties. If the dispute has not been settled amicably within [*] days from the date on which either Party has served written notice on the other of the dispute then the remaining provisions of this Clause 12 shall apply.

12.2 Arbitration

In the event of a dispute between the Purchaser and the Supplier concerning the interpretation of any provision of this Agreement or the performance of any of the terms of this Agreement, such matter or matters in dispute shall be finally settled:

- a. by arbitration at [*] under its rules of arbitration;

- b. by [*] arbitrators, one appointed by each Party, and the third, who shall be the chairman, selected by the two appointed arbitrators and failing agreement by the chairman of [*];
- c. The language of the arbitration shall be [*]; and
- d. the place of the arbitration shall be [*].

12.3 Performance to Continue During Dispute

Performance of this Agreement shall continue during arbitration proceedings or any other dispute resolution mechanism pursuant to Clause 12. No payment due or payable by the Supplier or the Purchaser shall be withheld on account of a pending reference to arbitration or other dispute resolution mechanism except to the extent that such payment is the subject of such dispute.

13. CONFIDENTIALITY

13.1 Confidential Information

Subject to Sub-Clause 13.2 below, the Parties shall keep confidential all matters relating to the Services the Facility and this Agreement and will not make any disclosure, and shall use reasonable endeavours to ensure that their employees, subcontractors and agents do not make any disclosure to any person (except for the affiliates or professional advisors of each Party) of any information, data, experience and know-how, documents, secrets, dealings, transactions or affairs of or relating to the Parties, the Facility or this Agreement (the "**Confidential Information**").

13.2 Exceptions

The confidentiality obligation shall not apply to the following:

- (a) any matter which the Supplier can demonstrate is already generally available and in the public domain other than through unauthorised disclosure by the Supplier; or
- (b) any disclosure which may reasonably be required for the performance of the Supplier's obligations under this Agreement (including the disclosure to the Lenders) or the compliance by the Supplier with any statutory obligations or for the purposes of legal proceedings.

14. INTELLECTUAL PROPERTY

The Parties agree that all Intellectual Property in data, databases, reports, records, drawings, specifications, software (excluding any third party software), design, inventions, documentation (including documentation relating to any design) and/or other material produced in connection with this Agreement shall vest in and be the property or be deemed to vest in and be the property of the Supplier.

15. REPRESENTATIONS AND WARRANTIES

15.1 Purchaser

The Purchaser represents, warrants and undertakes to the Supplier that as at the date of this Agreement and the Effective Date:

- (a) it is a corporation organised and existing under the laws of Vietnam;
- (b) it has full power and authority to enter into and perform its obligations under this Agreement;
- (c) all relevant facts, circumstances or contracts have been disclosed to the Supplier, in particular those in relation to environmental matters;
- (d) it has taken all necessary action for the authorisation of its entry into this Agreement and the performance of its obligations under this Agreement;
- (e) it has complied with all applicable procurement rules and restrictions;
- (f) this Agreement will be enforceable in accordance with its terms under the Applicable Law without any requirement for further action to be taken by any party; and
- (g) by entering into this Agreement it will not contravene any Applicable Law.

15.2 Supplier

The Supplier represents, warrants and undertakes to the Purchaser that as at the date of this Agreement and the Effective Date:

- (a) it is a corporation duly established under the laws of Vietnam;
- (b) it has full power and authority to enter into this Agreement; and
- (c) it has taken all necessary action for the authorisation of its entry into this Agreement and the performance of its obligations under this Agreement.

16. FINANCING

16.1 Lenders' Security

The Purchaser acknowledges that the Supplier has the right to obtain financing for the Facility and that the Supplier may transfer title in the Facility, or part thereof to the Lenders. Where the Lenders take title in the Facility, or any part thereof, the Purchaser shall perform its obligations under this Agreement in relation to the Facility for the benefit of the Supplier and the Lender.

The Purchaser agrees, if requested by the Supplier, to enter into an agreement (in a form reasonably acceptable to the Purchaser) with the Lenders, pursuant to which

the Purchaser will acknowledge the creation of security over the Supplier's rights under this Agreement and agree that upon breach of this Agreement by the Supplier or the insolvency of the Supplier the Lenders shall:

- (a) have the right within a time to be specified in that agreement to cure such breach of this Agreement; and
- (b) have the right to assume all the rights and obligations of the Supplier under this Agreement.

16.2 Purchaser's Co-operation with Financing

The Purchaser shall, as and when requested to do so by the Supplier at any time after the execution of this Agreement, prepare and provide such information in connection with this Agreement and/or the Services as may be reasonably required for the purposes of any potential Lender to the Supplier under a proposed loan or other financing agreement. The Purchaser shall co-operate with the Supplier in good faith in order to satisfy on a mutually agreeable basis the requirements of the Supplier's financing arrangements, including where appropriate the making of amendments to the terms of this Agreement as may be reasonably required and agreed.

17. MISCELLANEOUS

17.1 Governing Law

Interpretation and performance of this Agreement shall be implemented in accordance with the law of Vietnam.

17.2 Communications

- (a) Notice, invoices or other necessary exchanges of information during the process of contractual implementation must be prepared in writing, specifying the date of the document and its relevance to this Agreement. In a case of sending a fax, the original must thereafter be sent via the post with postal fees paid in advance. Notices, invoices and exchanges of information must be sent to the following addresses:

Supplier: [*]

Purchaser: [*]

- (b) Notices, invoices and other exchanges of information sent by the forms prescribed in Sub-Clause (a) above shall be deemed to have been delivered and received at the following times:
 - (i) When delivered, in a case of personal delivery; or
 - (ii) When receipt is signed for, in a case of sending by registered post;
 - (iii) In the case of sending by fax, at the time of actual receipt of the fax, on

condition that the sender receives confirmation that there was no error in sending; or

- (iv) In the case of sending by ordinary letter, at the time of certification by the agency delivering the letter of receipt of the letter.

17.3 Severability

The invalidity, in whole or in part, of any of the provisions of this Agreement will not affect the validity of the remainder of this Agreement.

17.4 Whole Agreement and Amendment

This Agreement contains the complete agreement between the Purchaser and the Supplier with respect to the matters contained herein and supersedes all other agreements, whether written or oral, with respect to the matters contained therein. No modification, amendment, or other change of this Agreement will be binding on any Party unless consented to in writing by both Parties.

17.5 Costs of negotiation

Each of the Parties shall pay its own costs and expenses of and incidental to the negotiation, preparation and completion of this Agreement.

17.6 Waiver of immunity

The Parties hereby agree to waive immunity and hereby declare, ensure and agree not to claim immunity nor require nor permit their representatives to claim any immunity to which they may be entitled either now or in the future pursuant to law.

17.7 Copies

This Agreement is executed in [*] sets in English and [*] sets in Vietnamese. In the event of any discrepancies or inconsistencies, the English version shall prevail.

IN WITNESS WHEREOF the Parties have executed this Agreement on the date which appears on page 1.

Executed for and on behalf of **the Supplier:**

For and on behalf of [the SPC]

Name: [*]

Position: [*]

Executed for and on behalf of **the Transferee:**

For and on behalf of [SAWACO]

Name: [*]

Position: [*]

SCHEDULE 1
TECHNICAL SPECIFICATION

Specification to include description of:

1. The Facility²
2. Guaranteed Levels:

Quantity (including maximum flow)
Quality
3. Performance Tests
4. Utilities (to be provided by Purchaser)
5. [Others]

² N&A Note: We understand that the Facility comprises the water distribution plan, reservoirs and may include some lines of pipes.

SCHEDULE 2

FEES AND CONSEQUENCES OF TERMINATION

PART 1

Charge

Base Monthly Charge: [*]

Variable Charge: [*]

- (a) On or after the Commencement Date, the Supplier shall issue an invoice for the first payment of the Base Monthly Charge for the month in which the Commencement Date has fallen and for the month following the month in which the Commencement Date has fallen. In respect of all subsequent monthly invoices the Supplier shall issue an invoice on or after the first day of each month for:
- (i) the Base Monthly Charge in respect of the month following the month in which the invoice is issued; and
 - (ii) the Variable Charge for the month preceding the month in which the invoice is issued.
- (b) The Base Monthly Charge shall be adjusted in accordance with the following formula applied annually on the anniversary of the Commencement Date:³
- [*]
- The Purchaser shall pay the Base Monthly Charge throughout the Operating Period irrespective whether the Facility is available or not.
- (c) The Supplier shall vary the Variable Charge, accordingly, if the Raw Water falls outside the band that is plus or minus [*] % of the design level as detailed in the Technical Specification.
- (d) In the case of interruptions to the Facility caused by a Purchaser's Risk, reasonable loss of profit payable in accordance with Clause 10.5(c) shall be calculated per day of interruption as:

Reasonable loss of profit per day = [*]

³ N&A Note: The Base Monthly Charge may be adjusted to address exchange risk (only to certain extent by using consumer price index, etc.), interest rate fluctuation risk and actual operation cost.

PART 2

Payment upon Termination

All payments due under this Part 2 shall be paid within 30 days of the date of termination. Where relevant, title in the Facility, Equipment and Materials purchased by the Purchaser under the terms of this Part 2 shall be delivered on the date when payment is made in full.

On termination of this Agreement the Purchaser shall pay the Supplier as follows:

Category of termination	Amount Payable
Expiry of this Agreement	[Nil and the residual value of the Equipment and Materials]
Extended Force Majeure (including the Release Events which are not Purchaser's Risks)	[]% of aggregate of the Base Monthly Charge for the period from the date of termination of this Agreement until the Expiry Date as set out in Schedule 3 plus other unavoidable Costs minus any insurance proceeds received by the Supplier for the Force Majeure event, subject to a duty on the Supplier to use reasonable endeavours to minimise Costs
Termination for Purchaser Default	[]% of aggregate of the Base Monthly Charge for the period from the date of termination of this Agreement until the Expiry Date; plus the [residual value/market value] of the Facility, Equipment and Materials; plus breakage Costs, repatriation Costs, subject to a duty of mitigation of the Supplier to minimise Costs.

SCHEDULE 3
WATER DISTRIBUTION SYSTEM PLAN

**TECHNICAL SPECIFICATIONS
FOR
PREPARATION OF ENVIRONMENTAL IMPACT ASSESSMENT REPORT
FOR
WATER SUPPLY IMPROVEMENT PROJECT
IN
HO CHI MINH CITY**

DEFINITION OF TERMS

The Project is Water Supply Improvement Project in Ho Chi Minh City.

The Study is the Preparation of the environmental impact assessment (EIA) report for the Project.

JICA is Japan International Cooperation Agency.

JICA Study Team is a team of personnel assigned by JICA for studying the issues related to the Study.

The Consultant is a consultant firm awarded by JICA Study Team as a consultant to carry out the Work.

The Project Area is an area to be covered by the Project, which is shown in Figure 1.

The Work is to prepare the EIA report for the Project and to get approval for the EIA report by DONRE, the competent agency.

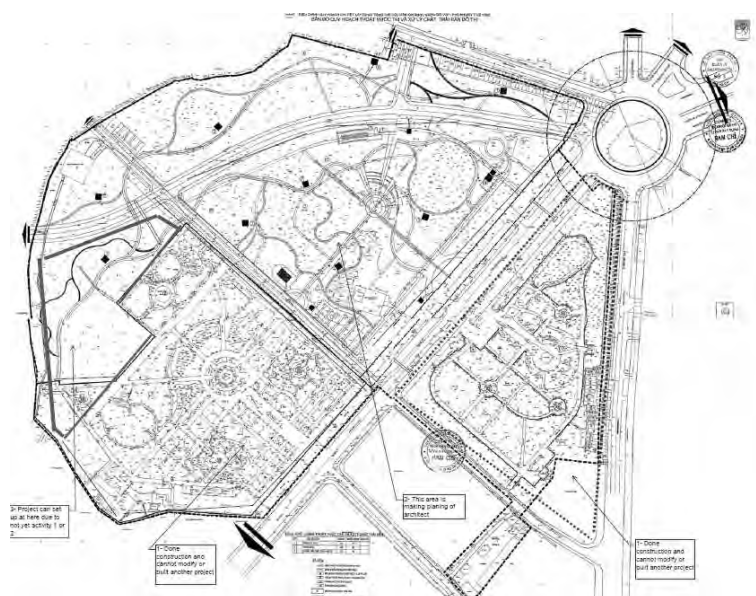


Figure 1. The Project Area (Located in Gia Dinh Park)

OBJECTIVES

The objectives of the Work are to prepare the EIA report and to get official approval for the EIA report.

OBLIGATION OF THE CONSULTANT

The Consultant shall conduct the Study under the supervision of JICA Study Team. The Consultant shall be responsible for:

- Preparation of all necessary equipment and materials for the execution of the survey,
- All transportation, including transportation of personnel and equipment to/from the job site and

- local transportation between job site,
- All accommodation and other necessary expenses (per diem, coordination fees, communication fees, etc.),
- Training, well-being and necessary insurance for the personnel, and
- Procurement of any necessary authorizations' approvals.

STUDY SCHEDULE

Activities	Month											
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Mobilization												
Collection of Data												
Sampling and Analysis												
Drafting EIA report												
1st Comment from Toyo												
Revising EIA report												
2nd Comment from Toyo												
Completing EIA report												
Submitting EIA report for reviewing												
Reviewing EIA Report in DONRE												
Revising EIA report by ENTEC according the comments from Review Committee												
3rd Comment from Toyo												
Submitting the completed EIA report to DONRE HCMC for approval												

The Draft Report shall be prepared in English, and one (1) set of hardcopy and one (1) set of softcopy shall be submitted. **The Final Report** shall be prepared in both Vietnamese and English, and three (3) sets of hardcopies and three (3) sets of softcopy shall be submitted.

The Consultant shall report the progress to the Client with a brief **Monthly Report**, which has the activities done in that month and activities scheduled to be done in the next month, once a month.

OTHER REQUIREMENTS

The template for the structure and contents of the environmental impact assessment report, issued together with Circular No. 26/2011/TT-BTNMT, should be referred.

SCOPE OF WORKS

TASK 1 Conducting Survey and Preparation of an EIA Report

The Consultant shall prepare the EIA Report as shown in ATTACHMENT.

TASK 2 Appraisal, Revision and Submission for Approval

The Consultant shall submit the EIA report to the Department of Natural Resources and Environment (DONRE), Ho Chi Minh City for appraisal, and revise it according to the given comments. After that, the consultant shall submit the completed EIA report to DONRE for approval. The Consultant shall be responsible to get DONRE's approval for the Project.

ATTACHMENT: Contents of the EIA Report

INTRODUCTION

1. Origin of the project

1.1. A summary of the project background and original context (for example, a perceived need for investment project), with the type of project, whether new, additional, expanded, upgraded, or another type of project.

1.2. The name of the competent authorized organization or agency responsible for approval of the investment project, feasibility study report, or equivalent document of the project.

2. Legal and technical basis for the EIA

2.1. List of legal and technical documents (indicating fully and accurately codes, names, issuing date, and issuing agencies for each document), which are used as the basis for implementation of the EIA and the EIA report.

2.2. List of applied standards and norms used in preparation of the EIA report.

2.3. List and describe sources of materials and data created by or supplied by the project owner, which are used in the EIA process.

3. Methodology applied in the EIA process

All the methodologies applied during the EIA process and in the EIA report, classified into two groups:

- EIA methodologies;
- Other methodologies (survey, investigation, studies, measurements, and environmental analysis)

4. Organization of EIA implementation

4.1. Summary of EIA implementation

State whether a consultancy contract for an EIA report was used. If a consultancy contract was used, provide the name of the consultancy, name of the principal consultant, and the address and other contact details of the consultancy service provider.

4.2. List of people that directly participated in preparing the project's EIA report (including project owners and members of the consulting agency, specifying degrees and the specialization of each member).

CHAPTER 1 BRIEF DESCRIPTION OF THE PROJECT

1.1. Name of the project

The same as the name indicated in the investment report, feasibility studies report, or equivalent document of project.

1.2. Project owner

The project owner, addresses, and contact information and the full names and titles of authorized representatives of the project owner.

1.3. Geographic location of project

Description of the geographic location of the project (including coordinates and boundaries) in relation to

- Natural features (road network; system of rivers, streams, ponds, lakes and other water areas; systems of mountains and hills; protected areas);
- Social and economic factors (residential areas; urban areas; production, business, service activities; cultural and religious structures; and historical relics);
- Other features of the project location, especially any objects likely to be affected by the project; and
- A detailed description of current land use status and management of the area for the project.

Information in this section must be illustrated with a map with details of the area and including clear explanations of the system of topography and symbols used.

1.4. Main description of the project

1.4.1. Description of project objectives

1.4.2. Volume and scale of construction components of the project

Provide a full list of details, describing the scale and scope (spatial and temporal) of all construction components, which may have impacts on the environment during the project's implementation. A sketch or map should also be included, locating and identifying each component. Components are classified into the two following types:

- Main components: These serve the main objectives of project, and include production, business, or services;
- Auxiliary components: These support and supplement the main components, and include infrastructure for transportation, telecommunication, power supply, water supply, rain water drainage, and waste water drainage; land clearance and resettlement; green coverage for environmental protection.

1.4.3. Description of the volume of construction work for the project

1.4.4. Technology for operation and production

Describe the production and operation technologies to be used in the project and specifically any individual components of the project that are likely to affect the environment. Illustrated diagrams of these should be attached. In these diagrams, there must be a clear indication of environmental issues that could occur as a result of this technology. Such issues may include but are not limited to sources of waste and also specifics such as changes in water balance, sedimentation, erosion, vibration, and noise and the invasion of natural ecological zones. Socioeconomic factors such as intrusion into residential quarters, historical monuments, works of religious culture, or other production or business facilities should also be considered and mentioned here.

1.4.5. List of machinery and equipment

Prepare a full list of the main machinery and equipment needed for the project. If old machinery and equipment will be used, it is necessary to state how much of the total machinery and equipment will be new.

1.4.6. Materials, fuels, input (raw materials) and output products of the project

List in full and describe the nature of materials, fuels, input substances, and output products of the project along with information relating to any trademarked materials and chemical formulas that will be used.

1.4.7. Timeline and description of implementation

A detailed description of the project's construction from commencement to completion should be supplied, along with details of the project's official operation, which can be illustrated in form of sketch.

1.4.8. Total investment for the project

Total investment and funding sources for the project should be supplied and must include details of the sum to be spent on environmental protection aspects of the project.

CHAPTER 2 NATURAL ENVIRONMENT, ECONOMIC, AND SOCIAL CONDITIONS IN THE PROJECT AREA

2.1. Natural environment

2.1.1. Geographic and geologic conditions

Provide descriptions of objects, phenomena, and processes likely to be impacted by the project. For projects that affect geographic factors and landscapes, such as mining and other projects that involve underground constructions, this description needs to be more detailed. Indicate which data sources and documents were used or referred to in preparing this description.

2.1.2. Meteorological conditions

Provide descriptions of meteorological characteristics relevant to the project and/or calculations related to the EIA (air temperature, humidity, wind speed, direction and frequency of wind, sun and radiation, the

amount of rainfall, storm, and other abnormal meteorological conditions). Indicate the length of data chains as well as which data sources and documents were used or referred to.

2.1.3. Hydrographic conditions

Provide descriptions of hydrographic characteristics relevant to the project and/or calculations related to the EIA (the level of water, volume of water flow, water speed, and other hydrographic and marine conditions). Indicate the length of data chains, as well as which data sources and documents were used or referred to.

2.1.4. Current state of natural environment

The Consultant shall propose the following sampling points, which are the most appropriate for the survey purpose. The following measuring, sampling and analyzing shall comply with the procedures and regulations of environmental monitoring and analysis and that the results shall be accomplished and confirmed by functional bodies under the law. The parameters are shown in Table 1.

Remarks on the pollution level of air, water, soil, and sediment in comparison to environmental technical standards and norms should be included. Remarks on causes and sources of pollution should be made.

(1) Air Quality

The day which is not affected by rain shall be selected.

- Sampling points: 5 points
- Frequency : three times (at 6:00 am, 12:00 am, and 6:00 pm) of the selected day

(2) Noise and vibration

The survey shall be carried out on a normal weekday without any events.

- Sampling points: 5 points
- Frequency : three times (at 6:00 am, 12:00 am, and 6:00 pm) of the selected day

(3) Surface water

The day which is not affected by rain shall be selected.

- Sampling points: 5 points in the river, into which the wastewater from the Project Area is supposed to be discharged
- Frequency :one time when the discharge is the minimum on the day

(4) Groundwater

- Sampling points: 5 existing wells
(2 samples shall be taken for each wells)
- Frequency : one time

(5) Soil

- Sampling points: 5 points
(2 samples shall be taken for each wells)
- Frequency : one time

Table 1. Parameters

	For Air	For Surface water	For Groundwater	For Soil
01	SPM	pH	pH	Cadmium
02	SO ₂	BOD ₅	Color	Chromium
03	NO ₂	COD	Hardness	Arsenic
04	CO	DO	TDS	Lead
05	H ₂ S	SS	Chloride	Mercury
06	NH ₃	Ammonia	Fluoride	Zinc
07	Total hydrocarbon (THC)	Nitrate	Nitrate	Oil and grease
08		Nitrite	Nitrite	Total organic

				carbon (TOC)
09		Sulfate	Sulfate	
10		Fluorine	Manganese	
11		Total Iron	Total Iron	
12		Lead	Lead	
13		Oil and grease	Mercury	
14		Total Phenols	Zink	
15		Total Nitrogen	E.Coli	
16		E.Coli	Total Coliform	
17		Total Coliform		

2.1.5 Current state of biological resources

Supply current data about the ecosystem based on field surveys done by the project owner or by commissioned consultants along with references from other sources.

Supply data and information on land-based ecosystems that may be affected by the project, including habitats, ecologically sensitive areas (wetlands, national parks, protected areas, and natural reserves in and around the project area), and the distance from the project to the nearest ecologically sensitive areas. Information should be included on areas and types of forest (if any) that may be affected. A list of biological species that are prioritized for protection and endemic species in the region that could be affected by the project should also be included.

Supply data and information on aquatic ecosystems which may be affected by the project, if any.

2.2. Economic and social conditions

2.2.1. Economic conditions

Provide information about economic activities (industry, agriculture, transportation, mining, tourism, trade, services, and others), careers, and household incomes that could be affected by the project at the project site and in neighboring areas. Source information should be provided if any outside data sources and documents are used.

2.2.2. Social conditions

Describe the local populations, and include characteristics of ethnic groups that may be affected by the project. Include information on cultural, social, and religious characteristics, as well as historical relics, residential areas, urban living quarters, and other related constructions in the project area and neighboring areas. Consider potential impacts on healthcare, culture, education, living standards, and poverty rates in the areas that may be affected by the project.

CHAPTER 3 ASSESSMENT OF ENVIRONMENTAL IMPACTS

The assessment of impacts of the project on the natural and socio-economic environment shall be carried out in phases. The following stages should be considered separately: preparation, construction, operation. Specific activities that are likely to have environmental impacts must be identified for each source of impact, and each affected object listed. Each impact should be considered on a specific, detailed level. The scale of space and time of the impact should be taken into consideration and the impacts assessed both from a qualitative and a quantitative perspective. The specific methodology or modeling chosen to quantify the impact should be justified and finally the expected impacts should be compared to, and checked with, environmental standards, norms, and regulations.

During the construction phase, the operation phase, it is necessary to clarify the activities of the project, and on that basis to assess the environmental impact of the activities of the project. Assessment of each source of impact should include the following: object affected, scope of impact, level of impact, probability of impacts occurring, and resilience of affected objects.

- Where discussion is of sources of impact related to waste, the volume (load) and concentrations of all typical waste parameters specific to the project along with applicable standards and current technical regulations should be included. Specific details of waste generation should be included.
- Sources of impact that are not related to waste include the following: noise, vibration, erosion, landslides, subsidence of land erosion, sedimentation of bodies of water, changes to surface water or groundwater, intrusion of salt water, intrusion of alum, deforestation, loss of wild vegetation and animals, impacts on sensitive ecosystems, degradation of physical and biological components of the environment, changes in biodiversity, climate change, and other impacts not related to effects of wastes.

3.1. Assessment of impacts

3.1.1. Assessment of impacts during the preparation period of the project

An impact assessment must be made for activities during the preparation period of the project and must include the following:

- Analysis and evaluation of the advantages and disadvantages (if any) of each planned location of the project to the environment.
- Analysis and evaluation of impacts due to land clearance.
- Analysis and evaluation of impacts due to leveling the ground for the project (if any).

3.1.2. Assessment of impacts during the construction period of the project

3.1.3. Assessment of impacts during the operation period of the project

3.1.4. Risk assessment

Provide a risk assessment of the investment project (a feasibility study report or equivalent document). Consider possible environmental incidents that may occur during the implementation of the project.

Give details about the area and time during which is possible for risks and environmental incidents to happen. Indicate the level, space, and time that the risk may occur.

3.2. Remarks on the level of detail and reliability of assessments

Objective remarks should be made regarding the level of detail and reliability of both (a) assessments of environmental impacts and (b) risks of environmental incidents likely occur in project implementation. Where reliability is considered insufficient, state both objective and subjective reasons.

CHAPTER 4 MEASURES TO PREVENT OR MITIGATE NEGATIVE ENVIRONMENTAL IMPACTS AND TO PREVENT AND COPE WITH ENVIRONMENTAL INCIDENTS

For each stage specified in sections 4.1 and 4.2, proposed measures must follow these principles:

- Each potential negative impact on the natural and socioeconomic environment that was identified in Chapter 3 requires a relevant measure to minimize it, with clear explanations of the relative strength, weakness, feasibility, efficiency, and effectiveness of the solutions. If there is no feasible solution yet provided for a potential impact listed in Chapter 3, please provide reasons for this and propose a strategy for developing solutions in the future.
- After the risk mitigation measures have been applied, it is necessary to show to what extent the negative impacts are minimized. This can be accomplished through comparisons with standard environmental criteria, norms, and regulations. In the event of force majeure, it should be clearly indicated and recommended in detail to relating agencies for consideration and decisions.
- Concrete information on the feasibility of each measure should be provided, as well as information on its potential effectiveness over space and time.

4.1. Measures for the prevention and minimization of the project's negative impacts on environment

4.1.1. During the preparation period

4.1.2. During the construction period

4.1.3. During the operation period

4.2. Measures for prevention and response to environmental risks and incidents

4.2.1. During the preparation period

4.2.2. During the construction period

4.2.3. During the operation period

CHAPTER 5 ENVIRONMENTAL MANAGEMENT AND MONITORING PROGRAM

5.1. Environmental management program

A program must be developed to manage environmental protection issues during the preparation and construction of the project, and then again during project operation and later periods such as dismantling, closure, and environmental rehabilitation. Program development should be based on the information from Chapters 1, 3, and 4 as shown in the table:

Project stage	Project activities	Environmental impacts	Measures to mitigate negative impacts	Budget for implementation of environmental protection measures	Time limits for implementation and completion	Responsible for implementation	Responsible for monitoring
Preparation							
Construction							
Operation							

5.2. Environmental monitoring program

A monitoring program should be put in place to monitor environmental impacts due to both waste generation and non-waste-related factors during project preparation, construction, operation.

Monitoring waste: Monitoring of waste should include both the flow and the total volume of waste, as well as monitoring the pollution parameters specific to the waste of the project in accordance with current Viet Nam national standards and norms. It should be conducted with a minimum frequency of one time per month. Monitoring points must be mapped with specific legends and coordinates according to current standards (note however that this mapping is not compulsory for solid wastes).

Continuous and automatic monitoring of wastes generated by the project shall be carried out in accordance with current standards, norms, and regulations. If there are no such legal normative documents to provide regulations for this activity, the agency responsible for approval of environmental impact assessment report will provide an appropriate type and schedule for such monitoring.

Monitoring the surrounding environment: If state agencies have no monitoring points or stations in the project area, waste disposal will be monitored in the surrounding environment at least once every 6

months, according to current standards, norms, and regulation of Viet Nam. Monitoring points or stations must be mapped with clear legends and coordinates following existing norms.

Other monitoring (if any, depending upon specific project): Monitoring of the following factors must be established: erosion, landslides, collapsed or sunken land; erosion of the banks of rivers, streams, lakes and sea banks; sedimentation of rivers, streams, lakes and sea bed; changes in surface water level and underground water; salt water intrusion; alum water intrusion; and any other impacts on the natural, economic, and social environment. Monitoring must take place with appropriate frequency in order to adequately track spatial and temporal changes in these factors. Monitoring points (if any) must be mapped with clear legends and coordinates following existing norms.

Monitoring population changes of rare animals and plants in the project area and the negative impacts caused by the project must occur at least once a year.

CHAPTER 6 COMMUNITY CONSULTATION

Provide a brief discussion of the process of community consultation and a summary of community opinions in the following sections:

6.1. Comments of communal level people's committees

6.2. Comments of representative of community (if any)

6.3. Comments of organizations that are directly affected by the project (if any);

6.4. Response from project owner to opinions, recommendations, and requests listed above, including commitments to address specific concerns.

CHAPTER 7 ANALYSIS OF ALTERNATIVE

The Consultant shall systematically compares feasible alternatives to the proposed the Project site, design, and operation including the 'without project' situation in terms of followings: The potential environmental impacts, the feasibility of mitigating these impacts, the costs, their suitability under local conditions, and their institutional, training and monitoring requirements. For each of the alternatives, it quantifies the environmental impacts to the extent possible. It also states the basis for selecting the particular proposed project design and offers justification for recommended emission levels and approached to pollution prevention and abatement.

CHAPTER 8 IMPLEMENTATION SCHEDULE AND COST ESTIMATES

The Consultant shall provide (i) an implementation schedule for measures that must be carried out as part of the project, showing phasing and coordination with overall project implementation plans, and (ii) the capital and recurrent cost estimates and sources of funds for implementing the Environmental Management Plan.

CHAPTER 9 CONCLUSIONS, RECOMMENDATIONS, AND COMMITMENTS

9.1. Conclusions

Conclusions must be made in the following areas: whether environmental impacts are fully recognized and assessed or not; whether any impacts remain that cannot be accurately predicted; overall assessment of the scale and size of potential impacts; evaluation of the feasibility of measures suggested to minimize impacts and prevent environmental incidents and risks; and an assessment of which negative impacts cannot be minimized or have no solutions within the project owner's capacity.

9.2. Recommendations

Recommendations should be made to relevant authorities and agencies, asking for assistance in solving problems that exceed the project owner's capacity.

9.3. Commitments

The project owner commits to implement the environmental management and monitoring programs described in Chapter 5 (including the environmental standards and norms which the project must comply with) and to comply with general regulations on environmental protection in all project stages, including:

- Commitments to environmental protection measures which are implemented and completed in stages of preparation and construction prior to the project's official operation;
- Commitments to environmental protection measures which are carried out during the operation stage from commencement to finalization of the project;
- Commitments to compensation and rehabilitation for environmental pollution where environmental incidents occur, and more generally from any risks associated with the project; and
- Commitments to aiding environmental recovery in compliance with relevant laws on environmental protection after project termination.

REFERENCE MATERIALS AND DATA

List all resources and reference data (not created by the project owner) used in the process of the environmental impact assessment (name, origin, time, author, and place of issuance of documents, data). The references should have relevance to and close links with key areas or explanations within the EIA report.

ANNEXES

The following documents must be attached to the EIA report:

- Copies of legal documents relevant to project, excluding general state legislation;
- Diagrams (drawings, maps) relevant to project which are presented in the EIA report;
- Analysis papers relating to the result of environmental parameters (air, noise, water, soil, sediment, bio-resources) bearing the signature, name, and title of the head of the analysis agency and stamp of that agency where relevant;
- Pictures of project site (if any); and
- Other relevant documents (if any).

These documents should have relevance to and close links with key areas or explanations within the EIA report.

End of ATTACHMENT

TOYO ENGINEERING CORPORATION

**ENVIRONMENTAL IMPACT ASSESSMENT REPORT
ON
THE PROJECT**

**"GIA DINH WATER DISTRIBUTION PLANT WITH A
CAPACITY OF 211,500 M3/DAY"**

HO CHI MINH CITY, JUNE 2015

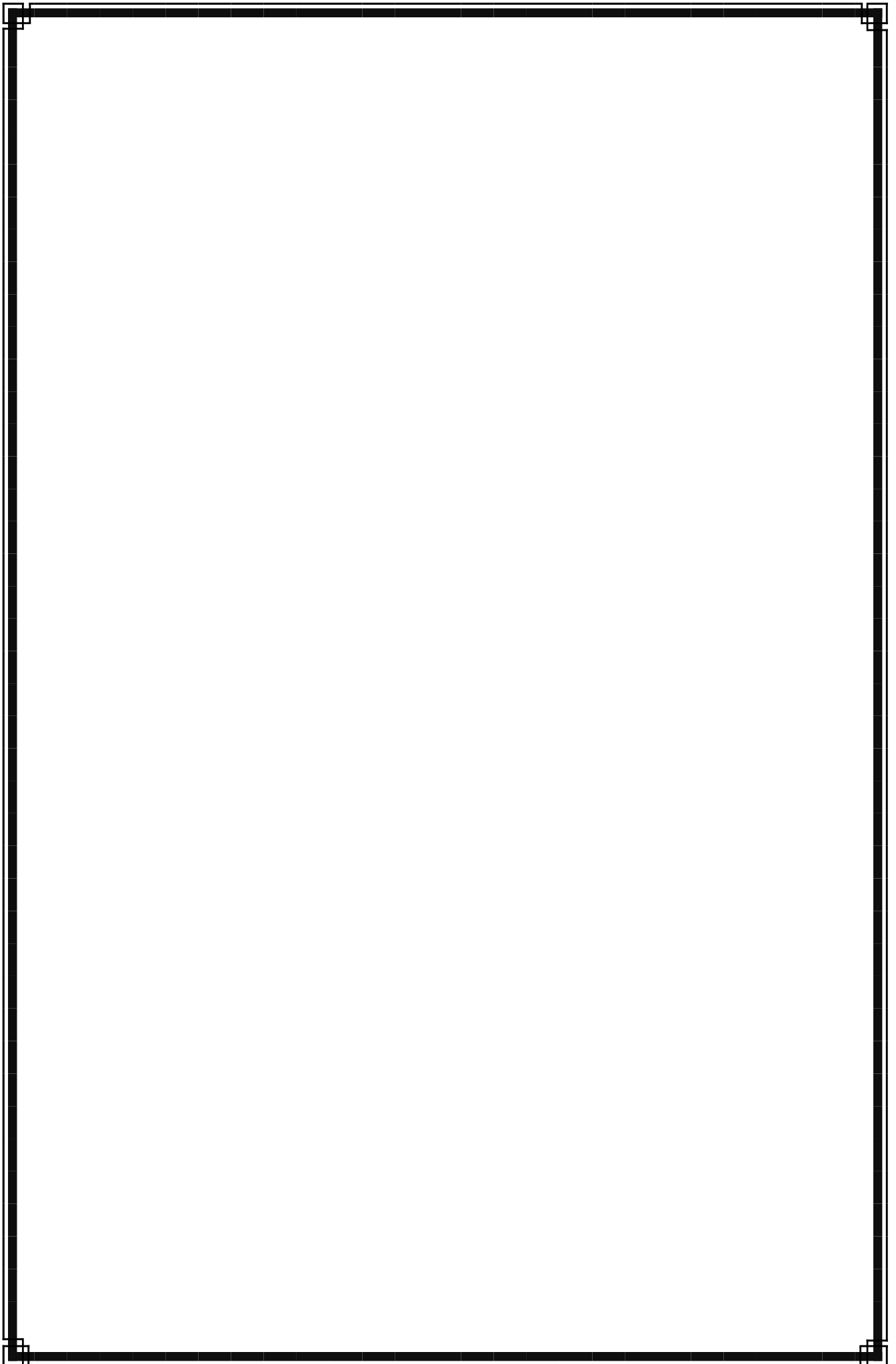


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ABBREVIATION

BOD	: Biochemical Oxygen Demand
BTNMT	: Ministry of Natural Resources and Environment
COD	: Chemical Oxygen Demand
DO	: Dissolved Oxygen
DONRE	: Devision of Natural Resources and Environment
EIA	: Environmental Impact Assessment
EMP	: Environmental Management Plan
HW	: Hazardous Waste
ND	: Not Detected
QCVN	: National Technical Regulation
USA	: The United States
WDP	: Water Distribution Plant
WHO	: World Health Organization

SUMMARY OF ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Toyo engineering corporation is the project owner of the project "Gia Dinh water distribution plant with a capacity of 211,500 m³/day" at Gia Dinh park, ward 9, Phu Nhuan district, Ho Chi Minh City. Environment impact assessment report of project is done by Environment Technology Center (ENTEC) of Viet Nam association for conversation of nature and environment. The main content of environmental impact assessment report of the project including nine parts.

1. THE CONTENTS OF PROJECT

- The project "Gia Dinh water distribution plant with a capacity of 211,500 m³/day" has the main content as following:
- Project owner: Toyo engineering corporation.
- Location: Gia Dinh park, ward 9, Phu Nhuan district, Ho Chi Minh City.
- Total investment: 20,181,000 USD.
- Investment: from World Bank, JICA, ADB, JBIC.

2. ENVIRONMENT QUALITY STATUS OF PROJECT AREA

Environment quality of project area is quite good, that as follows:

- Air quality: Compared with QCVN 05:2013/BTNMT, QCVN 06:2009/BTNMT, it is shown that measurement results meet the regulations allow;
- Noise and vibration: Compared with QCVN 26:2010/BTNMT and 27:2010/BTNMT it is shown that measurement results meet the regulations allow;
- Surface water: Almost the parameters meet the regulations allow of QCVN 08:2008;
- Groundwater quality: Compared with QCVN 09:2008/BTNMT shows that almost groundwater quality in the area meet the standard allow;
- Soil quality: Comparison of analysis results with QCVN 03:2008/BTNMT showed that soil quality at the sampled location has no signs of pollutions
- Biological resources: The Project Area has some trees account for a large number of individuals such as Senna siamea (23 individuals), Khaya senegalensis (39 individuals), Eucalyptus camaldulensis (123 individuals).

3. ENVIRONMENT IMPACT ASSESSMENT

The process of construction and operation of the project may cause negative impacts on the environmental and socio - economic conditions without measures to prevent or control them.

- In construction period:
 - + Impact on air;
 - + Impact on surface water;
 - + Impact on soil;
 - + Impact caused by noise and vibration;
 - + Impact caused by waste;
 - + Impact on flora, fauna, and landscape;
 - + Impact on social conditions.
- In operation period:
 - + Impact on air;
 - + Impact on surface water;

- + Impact caused by noise;
- + Impact caused by waste;
- + Impact on social conditions.

4. MEASURES FOR THE PROJECT'S NEGATIVE IMPACTS MITIGATION

The project owner implement measures to mitigate or prevent adverse impacts in the construction period:

- Air Pollution Control
- Water Pollution Control
- Soil Contamination Control
- Noise and vibrations control
- Solid Waste Management
- Flora, fauna protection
- Mitigation of social negative impacts
- Work accident prevention
- Explosion prevention
- Traffic Control
- Air monitoring
- Water monitoring
- Solid waste monitoring

The project owner implement measures to mitigate or prevent adverse impacts in the operation period:

- Air Pollution Control
- Water Pollution Control
- Noise Control
- Solid Waste Management
- Work accident prevention
- Measures to prevent and respond to fuel leaks
- Fire and explosion prevention
- Air monitoring
- Water monitoring
- Solid waste monitoring

5. ENVIRONMENTAL MANAGEMENT AND MONITORING PROGRAM

Environmental management program will be included in the contract between the Project owner and the contractor.

Project Environmental Manager will carry out the periodical environmental quality monitoring.

In construction and operation period include: air monitoring, water monitoring and solid monitoring.

6. PUBLIC CONSULTATION

Project owner submitted the Document No. 2612/TOYO-JP on Dec 26th 2014 regarding the suggestion of environmental impact assessment of the project to the Agency for comments in document:

- Communal Level People's Committees: Ward 9 appreciate the purpose of the project, the benefits that the project brings. The project owner should provide a full of legal documents related to the

project, then Ward 9 will respond to consultations about the impact of the project in writing as prescribed by law.

- Management Board Of Gia Dinh Park: Management Board of Gia Dinh Park has not written replies, because official decision has not been made yet

- Community: A household survey was conducted for 20 households who live near the Gia Dinh Park, through interview with respective household representatives. Almost of them support this project.

7. ANALYSIS OF ALTERNATIVE

This part analyzes between two alternatives Semi-underground and underground WDP, and the reason why select the semi-underground type.

8. IMPLEMENTATION SCHEDULE AND COST ESTIMATES

The schedule of WDP preparation and construction is planned from 2014 to 2018, the operation period is planned to be 20 years from 2019.

The annual environmental monitoring cost of construction period is 15,000,000 VND/year, and in operation period is also 15,000,000 VND/year.

9. CONCLUSIONS, RECOMMENDATIONS AND COMMITMENT

It is acceptable to build the proposed facility in the proposed site is acceptable, if proper mitigation measures are provided. The process of construction and operation of the project may cause negative impacts on the environmental and socio - economic conditions without measures to prevent or control them. However, the project owner will implement environmental mitigation and environmental remediation measures outlined in this EIA report.

It is recommended that the local authorities support the project owner to implement the project activities, and environmental protection measures during construction and operation periods.

Project owner commits to comply with all Vietnam's environmental regulations during the construction and operation period of the project and will take full responsibility for compensation and recovery, if they may damage environment through construction or operation of the proposed facility.

INTRODUCTION

1. ORIGIN OF THE PROJECT

1.1. A summary of the project background and original context

Ho Chi Minh City is the largest city in Vietnam with total natural area of 2,095 km² and population of 7,162,864 persons (data of 2010 year). Due to the rapid economic and population growth rate, the population will reach to 13 million in 2025. At the present, the Saigon Water Corporation (SAWACO) is being supplied the tap water for Ho Chi Minh city's residents with a capacity of 1.5 million m³ per day, which is equivalent to 85% of the water supply service population. The water demand will be increased rapidly in the future. According to the Water Supply Master Plan in HCMC, the capacity of water supply facilities will reach 3.3 million m³ per day in 2025.

At the present, there are some problems related to water supply system, including low service level, high value of non-revenue water (NRW) rate, low water pressure, water pollution etc. To overcome above issues, water reservoir system will be effective solution. As proposed in the JICA previous study, 5 reservoirs are proposed, including Phu Lam park, Zoo (central), Tan Binh district, South and Tan Son Nhat (Gia Dinh).

In the first phase, the project of construction of Gia Dinh Water Distribution Plant (WDP) with a Capacity of 211,500 m³/day is selected for implementation.

According to the Law on Environmental Protection of the National Assembly of the Socialist Republic of Vietnam on November 29th, 2005, Decree No. 29/2011/ND-CP dated April 18th, 2011 of the Government on strategic environmental assessment, environmental impact assessment, environmental protection commitments and Circular No. 26/2011/TT-BTNMT dated July 18th, 2011 of the Ministry of Natural Resources and Environment detailing a number of articles of Decree No. 29/2011/ND-CP of April 18, 2011 of the Government providing for strategy environmental assessment, environmental impact assessment, environmental protection commitments, the project "Gia Dinh Water Distribution Plant (WDP) with a Capacity of 211,500 m³/day" is subject to reporting environmental impact assessment (EIA).

Therefore, Toyo Vietnam Co. Ltd have conducted EIA for the project with consultation of the Environmental Technology Centre (ENTEC)

1.2. The name of the competent authorized organization for approval of the investment project, feasibility study report, or equivalent document of the project.

Project "Gia Dinh Water Distribution Plant (WDP) with a Capacity of 211,500 m³/day" is the new project due Toyo Vietnam Co. Ltd as an investor implementation. The People Committee of Ho Chi Minh City is the State agency authorized to approve the feasibility study report and environmental impact assessment report. Department of Natural Resources and Environment of Ho Chi Minh City shall be authorized by the People's Committee to evaluate and approve the report environmental impact assessment for the project.

2. LEGAL AND TECHNICAL BASIS FOR THE EIA

2.1. List of legal and technical documents

- Construction Law issued by the National Assembly of the Socialist Republic of Vietnam on 26 November 2003;
- Fire Prevention and Fire Code issued by the National Assembly of the Socialist Republic of Vietnam on 29 June 2001;
- Investment Law issued by the National Assembly of the Socialist Republic of Vietnam on 29 November 2005;

- Law on Environmental Protection issued by the National Assembly of Vietnam on 29 November 2005;
- Law on Chemicals issued by the National Assembly of the Socialist Republic of Vietnam on 21 November 2007;
- Law on Biodiversity issued by National Assembly of the Socialist Republic of Vietnam on 13 November 2008;
- Urban Planning Act issued by the National Assembly of the Socialist Republic of Vietnam on June 17, 2009;
- Law on Water Resources issued by the National Assembly of Socialist Republic of Vietnam on June 21, 2012.
- Decree No.59/2007/NDTTg dated 09 April 2007 issued by the Prime Minister on the solid waste management.
- Decree No.29/2008/NDCP dated 14 March 2008 issued by the Government on industrial zones, export processing zones and economic zones;
- Decree No.29/2011/NDCP dated 18 April 2011 issued by the Government on strategic environmental assessment, environmental impact assessment, and environmental protection commitments;
- Decision No.53/2004/QDTTg dated 08 April 2004 issued by the Prime Minister promulgating the strategic orientation for sustainable development in Vietnam (Agenda 21);
- Decision No.81/2006/QDTTg dated 14 April 2006 issued by the Prime Minister on approving the "National Strategy of environmental protection until 2010 with a vision to 2020 (NSEP)";
- Decision No.27/2004/QDBXD on 09 November 2004 issued by the Ministry of Construction on approval TCXDVN 320: 2004 "Hazardous waste landfill - Design Standards";
- Decision No.21/2005/QDBXD dated 22 July 2005 issued by Ministry of Construction on promulgating regulations on the notation system drawings in the construction plans.
- Circular No.19/2008/TTBXD dated 20 November 2008 issued by the Ministry of Construction on "guiding the formulation, appraisal, approval and management of construction plan of the industrial zones and economic zones."
- Circular No.08/2009/TTBTNMT dated 15 July 2009 issued by the Ministry of Natural Resources and Environment on environmental protection regulations of economic zones, high-tech parks, the industrial zones and industrial clusters ;
- Circular No.01/2011/TTBXD dated 27 January 2011 issued by the Ministry of Construction guiding the strategic environmental assessment;
- Circular No.26/2011/TTBTNMT dated 18 July 2011 issued by the Ministry of Natural Resources and Environment on detailing a number of articles of Decree No. 29/2011/NDCP of the Government on the strategic environmental assessment, environmental impact assessment, environmental protection commitment.
- Circular No.04/2011/TTBTNMT dated 28 December 2011 issued by the Ministry of Natural Resources and Environment on amending and supplementing some articles of Circular No.08/2009/TT-BTNMT dated 15/07/2009 2011 issued by the Ministry of Natural Resources and Environment on regulating on management of environmental protection and economic zones, hi-tech parks, the industrial zone and industrial clusters.

2.2. List of applied standards and norms used in preparation of the EIA report.

2.2.1. Water Quality

- QCVN 08:2008/BTNMT - National technical regulation on surface water quality;
- QCVN 38:2011/BTNMT - National technical regulation on surface water quality protection of

aquatic life;

- QCVN 09:2008/BTNMT - National technical regulations on groundwater quality;
- QCVN 14:2008/BTNMT - National technical regulation on domestic wastewater quality;
- QCVN 40:2011/BTNMT- National technical regulations on industrial waste water.

2.2.2. Air Quality

- QCVN 06:2008/BTNMT - Air quality - Allowable maximum concentration of toxic substances in the ambient air;
- QCVN 05:2013/BTNMT - Air Quality - National technical regulations on ambient air quality;

2.2.3. Soil and sediment Quality,

- QCVN 03:2008/BTNMT - National technical regulation on the permissible limits of heavy metals in the soil;
- QCVN 43:2012/BTNMT - National Technical Regulation on sediment quality.

2.2.4. Solid Waste Management

- QCVN 07:2009/BTNMT - The national regulation on classification of hazardous waste;
- QCVN 50:2013/BTNMT - National technical regulation on wastewater leakage from solid waste landfills.

2.2.5. Noise and vibration

- QCVN 26:2010/BTNMT - National technical regulation on noise;
- QCVN 27:2010/BTNMT - National technical regulation on vibration.

2.2.6. Safety and Occupational Health

Decision No.3733/2002/QĐ-BYT on 10 October 2002 about applications of 21 standards for safety and health.

2.3. List and describe sources of materials and data created by or supplied by the project owner, which are used in the EIA process.

- Toyo Vietnam Co. Ltd, Feasibility Study Report on the project “Gia Dinh Water Distribution Plant (WDP) with a Capacity of 211,500 m³/day”, Ho Chi Minh City, 2014.
- Diagrams, design drawings related to the project.

3. METHODOLOGY APPLIED IN THE EIA PROCESS

3.1. EIA methodologies

The methods applied in the EIA process are explained below.

3.1.1. Checklist and matrix method

The method used to establish the relationship between the activities of the project and the environmental impact.

3.1.2. Rapid assessment method

Estimating the pollution load and concentration of pollutants from project’s activities in construction and operation phases of the WDP under the WHO’s pollution factors.

3.1.3. Public consultation method

The method is used in the interview of leaders and local residents in the project area.

3.1.4. Overmapping method

This method is used to describe the project location, location sampled before project implementation, environmental monitoring locations during the project goes into operation.

3.2. Other methodologies (survey, investigation, studies, measurements, and environmental analysis)

3.2.1. Statistical Methods:

Collecting and processing data on meteorological, hydrological conditions, socio-economic development in the project area.

3.2.2. Survey methods, field sampling and laboratory analysis

Defining the parameters of the current state of air quality, water, noise levels in the project area and surrounding areas.

Survey Method

Field surveys in the project area, including:

- Topographic survey, engineering geology, hydrogeology;
- Hydro-meteorological Survey;

Collecting documents on technical infrastructure in the project area, including:

- Survey of the current status of water supply network;
- Survey of the current status of power supply network;
- Survey of the current status of drainage network;
- Survey of the current status of waste water drainage network ;
- Survey of the current status of roads network;
- Survey of the environment status;
- Survey of ambient air quality;
- Survey of groundwater quality;
- Survey of the surface water quality;
- Survey of soil quality;
- Survey of biological resources.

Sampling and analysis methods

Determining the points of measurement, sampling of environmental parameters (status of air, water, noise, soil, sediment quality, biological resources etc. in the project area and surrounding region) for the analysis of the environmental quality state in the project area, which provide the basis for environmental impact assessment.

The method of analysis followed Vietnam standard, regulations and international standards.

3.2.3. Comparison method

Assessing the impact on the basis of comparison of the analyzed results with the Vietnam environmental standards/ regulations.

4. ORGANIZATION OF EIA IMPLEMENTATION

4.1. Summary of EIA implementation

4.1.1. Responsible agency:

TOYO ENGINEERING CORPORATION
 8-1, Akanehama 2-chome, Naradhino-shi,
 Chiba 275-0024, Japan
 Tel : +81-47-413-7301
 Fax : +81-47-454-1867
 E-mail : yagyu@is.toyo-eng.co.jp
 Mr. Yasunori Yagyu, Project Manager

4.1.2. Consulting agency

ENVIRONMENTAL TECHNOLOGY CENTRE (ENTEC).
 - Address: 439A9 Phan Van Tri, Ward 5, Go Vap Dist., Ho Chi Minh City.
 - Tel: 08. 39850540 Fax: 08. 39850541.
 - Representative: Ass. Prof. Phung Chi Sy.
 - Position: Acting Director.

4.2. List of people that directly participated in preparing the project's EIA report

Members directly involved in the EIA report preparation include:

Table 0.2. Members directly involved in the EIA report preparation

No	Full name	Position / expertise	Organization
01	Yasunori Yagyu	Project Manager	Toyo Vietnam Co.Ltd
02	Mihoko Uramoto	Environmental Expert	Toyo Vietnam Co.Ltd.
03	Phung Chi Sy	Ass.Prof.Dr. of Environmental Science and Technology.	ENTEC
04	Phạm Mai Duy Thong	Master of Environmental Science.	ENTEC
05	Vu Thanh Nam	Master of Environmental Science.	ENTEC
06	Luu Duc Trung	Environmental Engineer	ENTEC
07	Hoang Nhat Truong	Bachelor of Environmental Science	ENTEC
08	Le Van Nhat	Bachelor of Environmental Science	ENTEC
09	Truong Anh Đức	Bachelor of Chemical analysis	ENTEC
10	Nguyen Thi Thu Mien	Bachelor of Chemical analysis	ENTEC

During the EIA report preparation, the project owner have received the guidance and assistance of the following agencies:

- Department of Natural Resources and Environment of Ho Chi Minh City
- People Committee and Fatherland Front Union of Ward 9, Phu Nhuan District, Ho Chi Minh City.

CHAPTER 1: SUMMARY DESCRIPTION OF PROJECT

1.1. PROJECT'S NAME

"GIA DINH WATER DISTRIBUTION PLANT WITH A CAPACITY OF 211,500 M³/DAY"

1.2. PROJECT OWNER

TOYO ENGINEERING CORPORATION

8-1, Akanehama 2-chome, Naradhino-shi,

Chiba 275-0024, Japan

Tel : +81-47-413-7301

Fax : +81-47-454-1867

E-mail : yagyu@is.toyo-eng.co.jp

To. Mr. Yasunori Yagyu, Project Manager

1.3. GEOGRAPHIC LOCATION OF THE PROJECT

The project "Gia Dinh Water Distribution Plant with a Capacity of 211,500 M³/Day" of Toyo Engineering Corporation located in Gia Dinh park, ward 9, Phu Nhuan district, Ho Chi Minh City. The plant is near to Hoang Minh Giam street about 250 m on the Southeast. The location is shown in Figure 1.1, Figure 1.2, and Figure 1.3.

The location of the plant as below:

- On the North by the residential area of ward 2 – Tan Binh district;
- On the South by the residential area of Phu Nhuan district which near the park;
- On the West by Hang Khong Club;
- On the East by the residential area of Go Vap district.

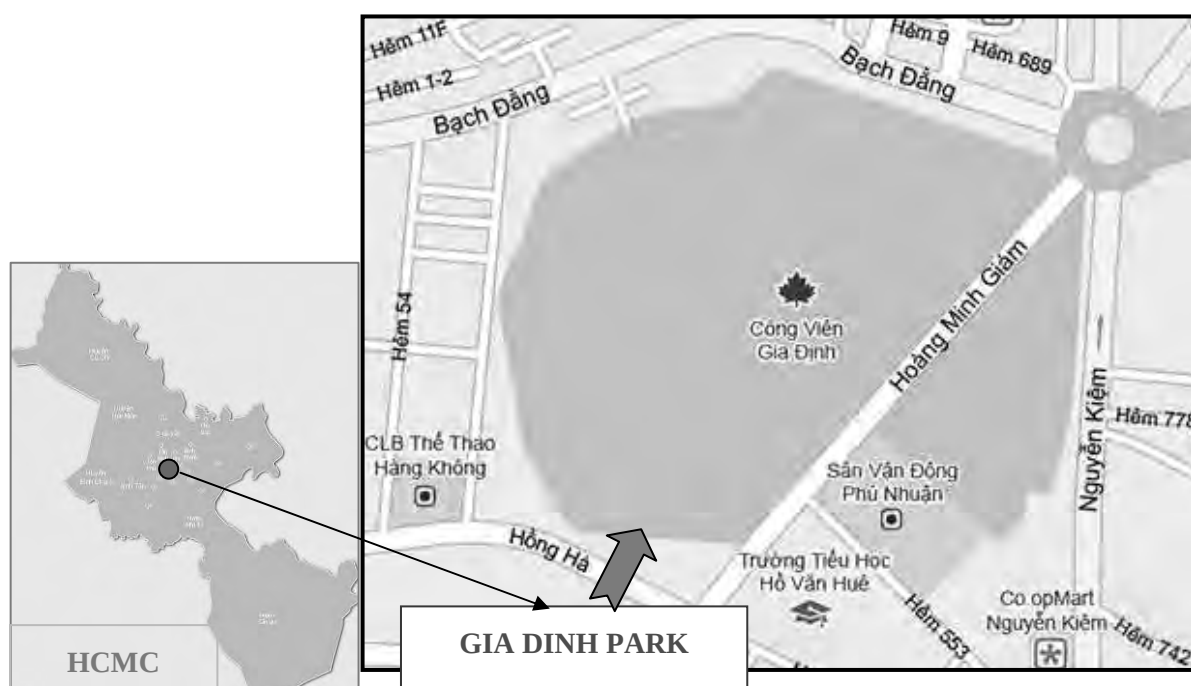


Figure 1.1. Location of Gia Dinh park in HCMC

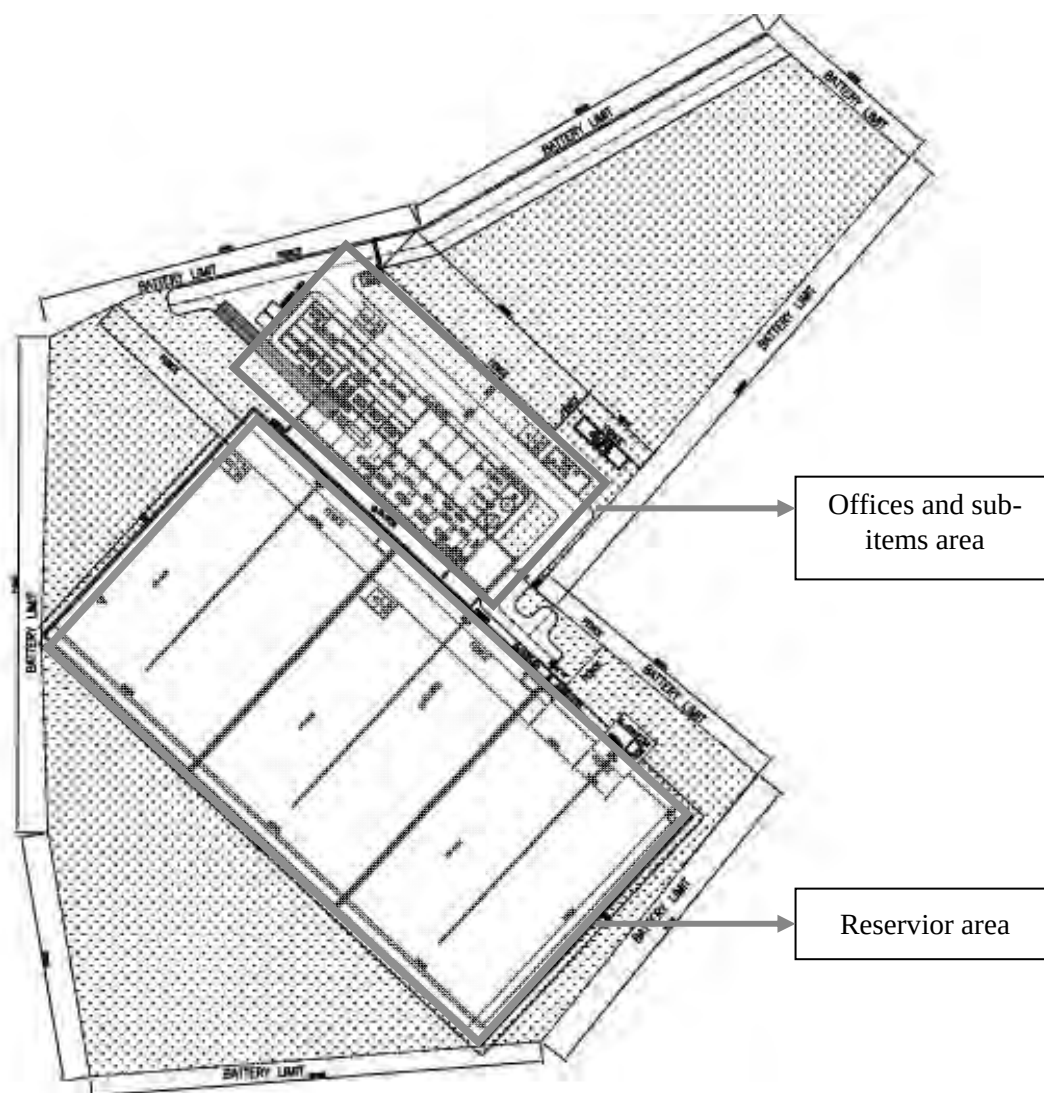


Figure 1.3. Main building diagram of project

1.4. MAIN DESCRIPTION OF THE PROJECT

1.4.1. Description of project objectives

The project objective is to implement the water distribution plant (WDP) for water supply network to improve the water pressure in the fringe of the network and realize the effective and efficient water supply network.

In particular, the period from 2014 to 2018 will build and study on business feasibility of a study on business feasibility of Gia Dinh WDP as a first step for the future network with 5 WDPs from the viewpoint of both technical and business aspects.

1.4.2. Volume and scale of construction components of the project

1.4.2.1. Scale

The scale of Gia Dinh WDP is set by the value of year 2025 proposed in the previous JICA's study.

The Gia Dinh WDP is designed to provide water to approximately 681,000 people with tank capacity of 36,000 m³ and the maximum water distribution capacity is 211,500 m³/day.

Water distribution area of Gia Dinh WDP is shown in Figure 1.4.



Figure 1.4. Conceptual Image of water distribution area of Gia Dinh WDP (in 2025)

1.4.2.2. The main categories

(1). Water reservoir

The plant consists of 03 water reservoir located adjacent, size 4 m x 70 m, capacity of 12,000 m³/reservoir. The water reservoir is placed semi-submersible with reservoir bottoms, it is buried deep 3.0 m and the rest height 1.0 m above the ground. The water reservoir will be constructed using precast concrete, thickness of 0.5 m. The foundation of water reservoir are designed as reinforced concrete foundations on piles reinforcement is stuffed piles or piles are prestressed reinforced concrete with diameter from 800 mm to 1,000 mm.

(2). Pump room

Pump room was built of reinforced concrete on an area of 475 m², inside there are 5 pumps with capacity of 450 kW/pump to pump water from the reservoirs to water with pressure required.

(3). NaClO room

NaClO room has an area of 60 m², inside there are 02 cylindrical tanks (by PVC), capacity of 25 m³/tank, contain NaClO 4%. Moreover, in the NaClO room there are 02 chemical pumps (01 working and 01 stand by) with the pump flow is 450 l/h.

(4). Control room

Control room has an area of 25 m² contains the equipment for automatic control of water distribution process, including: keep flow rate constant, keep water level of reservoir constant and control water level of reservoir according to scheduled value.

(5). Pipe line system

About the connection between the WDP and existing distribution network, 1200mm (inlet) and 1500mm (outlet) pipes need to be installed to satisfy the water demand forecast of WSMP in 2025. But for the time being, WDP is connected to the water distribution pipe of 900mm passing the park, and WDP will distribute water through the 900 mm pipelines.



Figure 1.5. Connection plan to distribution network

1.4.2.3. The sub-items

(1). Power supply system

The power source is taken from the 22(15)kV substation (Gia Dinh Substation). From that Substation to WDP, a cable is buried along the promenade in the park.

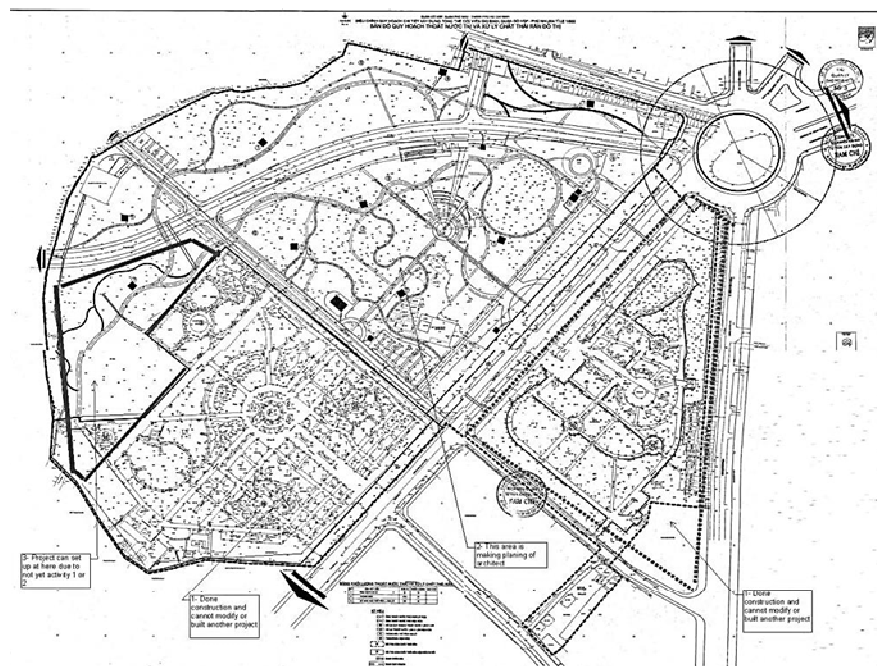
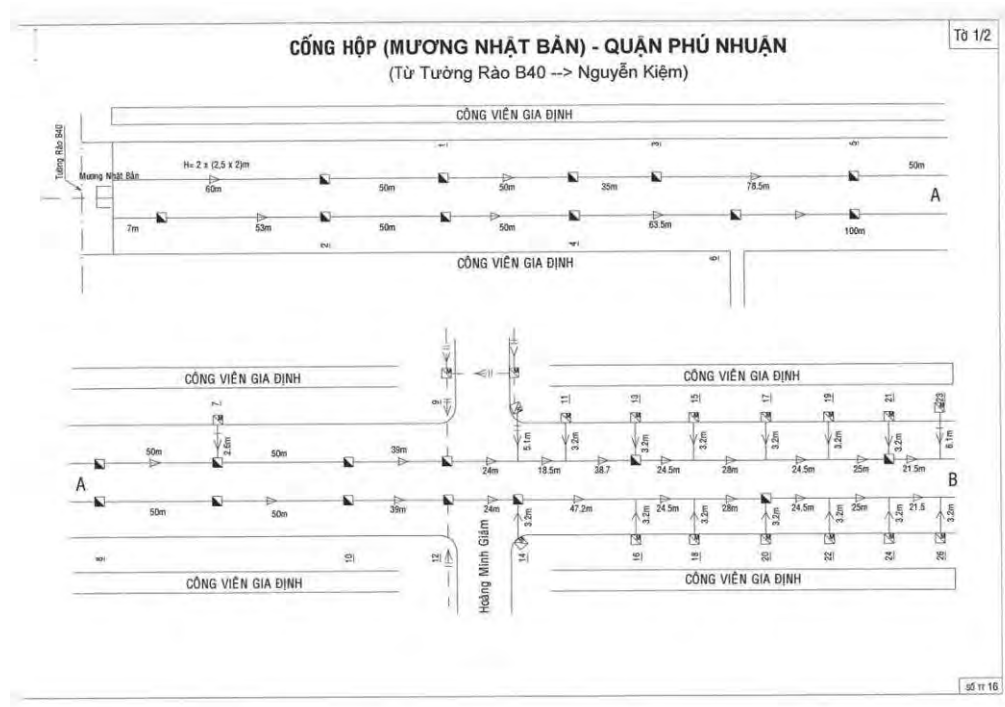


Figure 1.6. Power Source

(2). Drainage system

As for the drainage from the WDP, the SFCC (a relevant authority of drainage plan) instructed the connection by the gutter (trench) to the present drainage system under the road which crossed the park.

This present drainage system lays 2 trains (section 2.5m x 2m/train), and holds enough capacity.



1.4.3. Description of the volume of construction work for the project

The volume of construction work for the project is presented in Table 1.1 .

Table 1.1. The volume of construction work for the project

No	Work items	Unit	Quantity
01	Earth work		
	Excavation by equipment		
	D≤ 3.0 m	m ³	44,645.69
	D>3.0 m	m ³	8,702.12
	Backfilling (Excavated soil)	m ³	7,971.78
	Disposal of soil	m ³	45,376.02
02	Base course work		
	Base course for sub-structure	m ³	748.00
03	Asphalt work		
	Fine asphalt concrete	m ³	74.88
04	Underground pipe works		
	Concret pipe (d=800)	m	129.00
	Concret pipe (d=600)	m	80.00
	Concret pipe (d=400)	m	67.00
05	Re-bar work	ton	1,964.14
06	Concrete work		
	Lean concrete stone	m ³	619,04
	Concrete for sub-structure	m ³	13,442.56
07	Painting work	m ²	2,543.76
09	Steel structure work	ton	22.44

Source : Feasibility study report, 2014

1.4.4. Technology for operation and production

In the current water distribution network in HCMC, water is distributed from WTP to households directly. However, because of the distance from WTP to households, the water pressure will decrease to be insufficient level, and more energy will be necessary to maintain sufficient pressure level. But water distribution network with WDP, water can be distributed with sufficient water pressure.

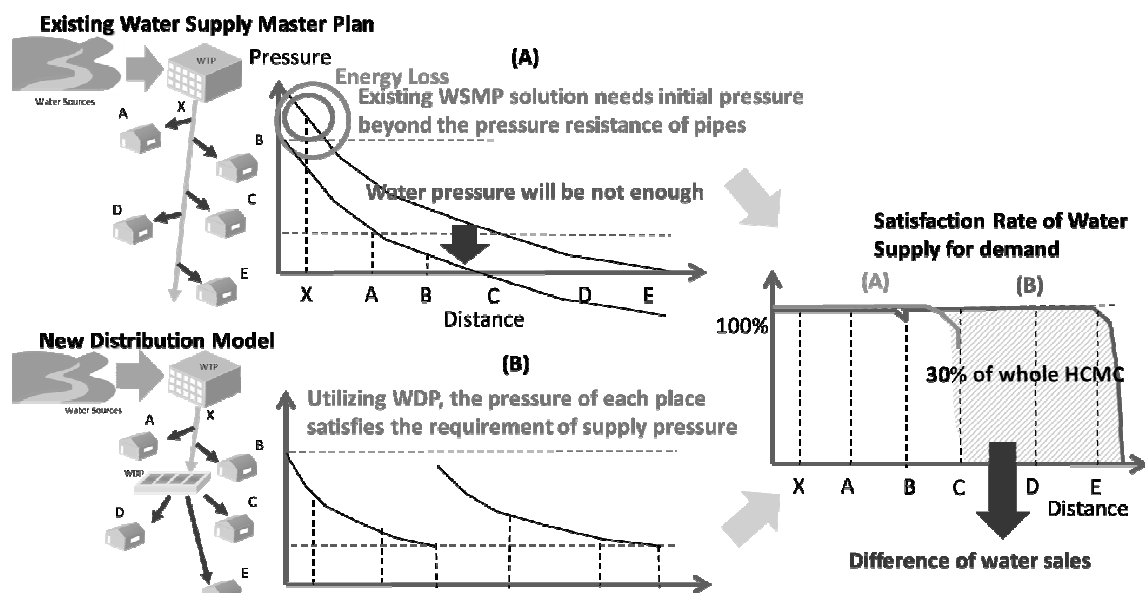


Figure 1.9. Concept of WDP's functions

The water from Thu Duc WTP is pumped into the tank through a 900 mm pipe that runs across the Gia Dinh park, the water is disinfected by NaClO by dosing pump before being pumped to water users bladder pressure pumps.

1.4.5. List of machinery and equipment

The equipment of Gia Dinh WDP is shown in the following Table 1.2.

Table 1.2. The equipment of Gia Dinh WDP

WDP Facility	Reservoir	Structure	Reinforced concrete	
		Capacity	m ³	36,000
		Number of Reservoir	Qty.	More than 3
	Outlet pipe	Diameter	mm	1,500
	Inlet pipe	Diameter	mm	1,200
	Inlet flow control valve	Type	Butterfly valve	
		Diameter	mm	1,200
		Number of valves	Qty.	1
	Water pressure	Inflow water pressure	kgf/cm ²	3.4
	Distribution pump	Head	m	40
		Flow rate	m ³ /min.	192
		Motor power	kW	450
		Number of pumps	Qty.	5
Chlorine injection	Storage tank	Variable speed control unit	Qty.	5
		By-pass valve	Type	Butterfly valve
			Diameter	mm
				1,200
	Dosing pump	Type	Chlorine contents 4%	
			Vertical cylindrical type made by FRP	
		Effective capacity	m ³	25
		Number of tanks	Qty.	2
	Dosing pump	Type	Progressive cavity type	
		Flow rate	l/hour	450
		Number of pumps	Qty.	2

Flow meter	Inlet flow meter	Type	Ultra sonic type	
		Number of meter	Qty.	1
	Outlet flow meter	Type	Ultra sonic type	
		Number	Qty.	1
	NaClO flow meter	Type	Magnetic type	
		Diameter	Mm	40
		Number of meter	Qty.	1
Pressure Gauge	Inlet water pressure	Number of gauge	Qty.	2
Level gauge	Reservoir water level	Number of gauge	Qty.	3
Water quality analyzer	Cl2 analyzer	Number of item	Qty.	2
	Turbidity analyzer	Number of item	Qty.	2
	pH analyzer	Number of item	Qty.	2
	Temperature gauge	Number	Qty.	2
Drainage	Reservoir drainage pump	Head	m	15
		Flow rate	m ³ /hour	500
Power supply	Power receiving	Voltage	kV	22(15)
		Transformer	kVA	2,500
		Number of item	Qty.	1
	UPS	Capacity	kVA	10
		Number of item	Qty.	1
Operation system	Control system	PCL for control & monitoring	Set	1
		Distribution pump control system	Set	1
		Inlet flow control system	Set	1
		NaClO injection control system	Set	1
Monitoring system	Monitoring system	SCADA system	Qty.	2

1.4.6. Materials, fuels, input (raw materials) and output products of the project

1.4.6.1. Chemical

NaClO 4% is used to disinfect water, the amount used is 60 tons/month.

1.4.6.2. Water demand

With the number of officials and employees of the Gia Dinh WDP about 15 people, the total amount of water about 1.8 m³/day with the norm used to be 120 l/person/day.

1.4.6.3. Timeline and description of implementation

Implementation progress of project is shown in Table 1.3.

Table 1.3. Implementation progress of project

No.	Implementation content	2014 - 2019					
		2014	2015	2016	2017	2018	2019
1	Survey						
2	Approval of HCMC and revise						
3	Approval of Prime Minister						
4	Proposal and contract						
5	Detail design						
6	Construction						
7	Operation						

1.4.7. Total investment for the project

The initial investment of project is 20,181,000 USD (equivalent 432.098 billion VND, rate 1 USD = 21,400,000 VND). The investment will be borrowed from international cooperation agencies like World Bank, Japan International Cooperation Agency (JICA), Asia Development Bank (ADB), Japan Bank of international cooperation (JBIC) and Private Commercial Bank.

1.4.8. Organization management and project implementation

According to the operating function of the plant, maintaining the water distribution pipes is SAWACO responsibility.

The number of worker in operation phase is about 15 workers, working in 3 shift/day, alternate working to ensure the consecutive operation of plant.

**CHAPTER 2:
NATURAL ENVIRONMENT, ECONOMIC, AND SOCIAL CONDITIONS
IN THE PROJECT AREA**

2.1. NATURAL ENVIRONMENT

2.1.1. Geographic and geologic conditions

2.1.1.1. Geographical conditions

Gia Dinh Water Distribution Plant (WDP) located in Gia Dinh Park, Ward 9, Phu Nhuan district, Ho Chi Minh City (HCMC).

Gia Dinh Park near to three street, that are: Nguyen Kiem, Hoang Minh Giam and Ho Van Hue. Project boundary:

- On the North by the residential area of Ward 2 – Tan Binh district;
- On the South by the residential area of Phu Nhuan district which near the park;
- On the West by Hang Khong Club;
- On the East by the residential area of Go Vap district.

According to Decision No. 4999/QĐ-UBND dated October 10th, 2014 of HCMC People's Committee about approval the adjust task of detailed planning overall Gia Dinh park rate 1/500 in Go Vap district and Phu Nhuan district, the area of Gia Dinh park is 325,715.64 m².

2.1.1.2. Topography

The Gia Dinh Park terrain is relatively flat with the topographic characteristics of the Phu Nhuan district. The terrain is low, the average elevation is from 2 - 4 m. The North is higher than the South, the West is higher than the East.

2.1.1.3. Geological conditions

Geological drilling results geological shows details of each layer as follows:

- Layer 1: Mixed clay, pale brown, the hard state, located in a depth of 0.3 - 8.0 m thickness layers from 7.7 m-8.0 m.
- Layer 2: Mixed clay, yellow-grey, located at a depth of 8.0 - 12.0 m thickness 4.0 m.
- Layer 3: Mixed sand, yellow-pink, appear from the 12.5 m and less.

Physical properties of the soil layer are presented in Table 2.1.

Table 2.1. Physical properties of the soil layer

No.	Parameter	Symbol	Unit	Layer 1	Layer 2	Layer 3
1	Gravel		%	7.13	2.50	3.50
2	Sand		%	50.75	72.50	72.63
3	Dust		%	13.50	8.00	9.50
4	Clay		%	29.13	18.00	14.38
5	Natural humidity	W	%	13.34	15.75	16.80
6	dry density	γ_k	g/cm ³	2.06	2.02	2.02
7	Saturated density	γ_{bh}	g/cm ³	1.06	1.02	1.02
8	Empty Coefficient	e _o		0.48	0.53	0.54
9	Angle of internal friction	ϕ	Angle	27°43'	31°34'	29°54'
10	Adhesive force	C	kG/cm ²	23.01	31.58	30.27

2.1.2. Meteorological conditions

According to meteorological data collected from the Southern Meteorological and Hydrographic Center from 2005 to 2012, the climate in the project area has the general characteristics of a tropical monsoon. The climate is mild and homogeneous with two seasons in a year, including a rainy season from May to November and a dry season from December to April. It is warm and sunny in the whole year, and less affected by storms.

When the project will be implemented, the climate factors will have influence by the dispersing and transforming of the pollutants to the surrounding environment. Therefore, it is essential to monitor the climate's characteristics in the project area. Based on the observed meteorological data at Tan Son Hoa Station, the climate data can be described as follows:

2.1.2.1. Temperature

The monthly average air temperature is approximately 28.16°C. The highest temperature is 34.2°C (2000), the lowest temperature is about 20.8°C (2000). The monthly average temperature from 2005 to 2012 is presented in Table 2.2.

Table 2.2. Monthly Average Temperature (°C)

Year	Month												Yearly average
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
2005	26.2	27.7	28.4	29.8	29.7	28.9	27.5	28.4	27.9	27.6	27.5	26.2	28.0
2006	27.2	28.2	28.6	29.5	29.2	28.4	27.9	27.6	27.6	27.7	28.9	27.3	28.2
2007	27.3	27.2	28.8	30.1	28.9	28.7	27.7	27.7	27.7	27.5	26.9	27.6	28.2
2008	27.2	27.3	28.2	29.5	28.2	28.6	28.3	27.7	27.7	28.0	27.2	26.9	27.9
2009	25.9	27.7	29.3	29.4	28.5	29.2	28.0	28.6	27.6	27.7	28.4	27.5	28.1
2010	27.3	28.4	29.4	30.3	31.3	29.3	28.3	27.9	28.6	27.5	27.2	27.4	28.6
2011	26.9	27.6	28.3	29.1	29.5	28.5	27.9	28.4	28.1	28.1	28.1	27.2	28.1
2012	26.7	27.5	28.7	29.3	29.1	28.2	27.5	28.8	28.4	28.3	28.5	27.3	28.2

Source: Ho Chi Minh City Statistical Yearbook 2012, Tan Son Hoa Station.

The climate change has a strong impact on Vietnam with an increase of the average temperature of approximately 3°C during 100 years. By 2060, HCM City will not have temperature below 21°C and an extreme temperature to 44 - 45°C can occur. Temperature increase within different scenarios of climate change in HCM City is presented in Figure 2.1.

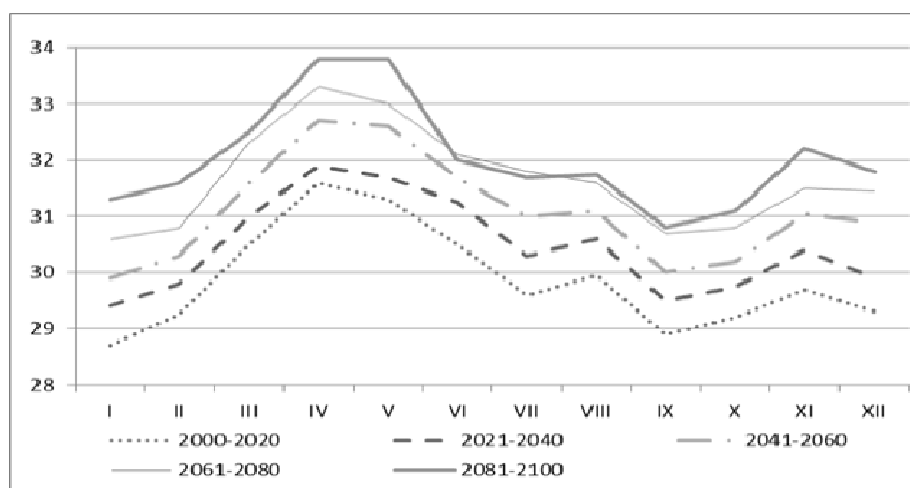


Figure 2.1. Temperature increase within different scenarios of climate change in HCM City ($dT = 3^{\circ}\text{C}/\text{year}$)

2.1.2.2. Sunshine hours

Total annual sunshine hours are 2,073.7 hours. April is the month, which has the highest number of monthly average sunshine hours (i.e. 240.8 hours) (See Table 2.3). The total of daily average radiation is about 110-160 Kcal/cm².

Table 2.3. Monthly average sunshine hours in Ho Chi Minh City

Year	Month												Yearly average
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
2005	164.8	215.3	252.9	225.6	200.4	185.6	153.1	178.1	142.2	138.8	124.6	90.5	2,071.9
2006	131.0	157.7	221.6	213.4	208.7	161.5	140.2	157.2	141.4	127.2	142.1	121.2	1,923.9
2007	113.3	193.6	229.5	213.5	182.5	128.0	147.7	135.8	130.8	147.0	127.5	141.8	1,891.1
2008	156.3	135.6	216.7	188.3	165.7	172.8	218.7	161.0	142.6	152.4	145.4	134.1	1,989.6
2009	174.4	168.1	236.9	186.7	155.9	191.6	149.2	155.7	116.9	132.3	147.7	187.6	2,003.2
2010	157.1	245.3	239.6	240.8	210.4	177.0	150.0	141.2	155.2	102.7	130.6	123.8	2,073.7
2011	120.1	188.9	157.8	187.0	165.0	163.6	162.6	198.1	144.8	154.3	141.0	109.7	1,892.9
2012	130.3	205.7	215.2	222.2	178.5	193.2	168.1	184.3	154.7	134.5	131.4	112.5	2,030.6

Source: Ho Chi Minh City Statistical Yearbook 2012, Tan Son Hoa Station

2.1.2.3. Humidity and evaporation

The monthly average humidity measured in Tan Son Hoa Meteorological Station is 74%, the difference between the highest wet and dry places is about 10 to 12%. The highest humidity in the rainy months is around 83% (September) and the lowest one in the dry months is 68% (February) (See Table 2.4).

Table 2.4. Monthly Average Humidity in Ho Chi Minh City (%)

Year	Month												Yearly average
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
2005	69	69	67	70	74	77	81	78	80	82	79	77	75
2006	73	68	71	73	75	81	81	82	81	81	75	73	76
2007	69	68	71	69	80	80	83	82	83	82	76	72	76
2008	71	69	71	73	81	78	79	83	83	81	79	73	77
2009	70	73	71	76	81	77	79	80	83	80	73	74	76
2010	71	70	68	70	70	76	79	80	76	79	80	73	74
2011	70	68	67	70	75	77	79	80	81	80	77	70	75
2012	72	69	71	72	74	73	79	82	80	83	78	71	75

Source: Ho Chi Minh City Statistical Yearbook 2012, Tan Son Hoa Station

Recorded data from Tan Son Hoa meteorological station for many years show that during the dry months (February- March) the monthly average evaporation may reach to 170-180 mm; the lowest evaporation one is from 54 to 58 mm in September, October.

2.1.2.4. Rainfall

In the city area, the rainfall is uneven, which tends to increase along the Southwest – North East. The rainfall in the suburban and northern districts is higher than that in the rest regions. Annual rainfall of the city is high, that varies from 1,742.8 to 2,340.2 mm/year (See Table 2.5).

Table 2.5. Monthly Average Rainfall in Ho Chi Minh City

Unit: mm

Year	Month												Yearly average
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
2005	-	-	-	9.6	143.6	273.9	228.0	146.3	182.9	388.6	264.5	105.4	1,742.8
2006	-	72.7	8.6	212.1	299.2	139.4	168.6	349.0	247.7	256.1	16.1	28.9	1,798.4
2007	0.4	-	59.3	7.7	327.9	188.8	414.3	301.0	495.4	391.2	147.1	7.1	2,340.2
2008	9.5	1.5	58.9	127.0	246.9	147.2	331.2	297.8	202.6	165.6	167.1	57.8	1,813.1
2009	0.3	21.4	57.8	187.0	318.5	83.2	223.0	323.9	325.1	249.0	141.2	49.5	1,979.9
2010	23.0	-	3.9	9.9	8.8	160.0	294.3	400.6	373.7	321.8	379.9	40.3	2,016.2
2011	9.4	-	40.3	181.9	124.4	213.1	281.5	244.4	232.1	232.6	321.1	73.0	1,953.8
2012	8.4	-	41.3	167.9	224.4	243.1	284.5	246.4	322.1	275.6	341.1	75.1	2,229.9

Source: Ho Chi Minh City Statistical Yearbook 2012, Tan Son Hoa Station

The rainfall concentrates on the rainy months, accounting for 90% of annual rainfall. Thereby, heavy rains usually occur from August to October. In January to March there is a very low rainfall or no rainfall. Monitoring data indicates that the highest rainfall is 2,340.2 mm in 2007.

Unevenly distributed rainfall, rainy season often causes local flooding, whereas the dry season is water scarcity in some regions.

Rainfall in the future will not be changed significantly. The rainfall in the dry season will decrease while that in rainy season increases. The highest rainfall in the future may be increased by 20% compared to that in the present.

2.1.2.5. Wind regime

HCMC is influenced by two main wind directions, including West - Southwest and North - Northeast. The West - Southwest wind with average speed of about 2.4 m/s blows from the Indian Ocean in the rainy season (from June to October) and the strongest one with average speed of about 4.5 m/s in August. By while, the North - Northeast wind with average speed of about 2.4 m/s blows from the East Sea in the dry season (from November to February). Besides, Trade wind with average speed of about 3.7 m/s blows from South - Southeast during March to May (See Table 2.6 and Figure 2).

Table 2.6. Monthly Average Wind Speed in Tan Son Hoa Station

Year	Month												Yearly average
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Wind speed (m/s)	2.5	2.8	3.2	3.2	2.7	3.1	3.2	3.3	2.9	2.5	2.3	2.3	2.8
Wind direction	NE	SE	SE	SE	S	SW	SW	WSW	W	W	N	N	

Source: Ho Chi Minh City Statistical Yearbook 2012, Tan Son Hoa Station

In the project area, the prevailing wind direction is southwest from May to October, bringing moisture air from Thailand Bay. From November to March, the main wind direction is northeast; it is cool and less disturbed.

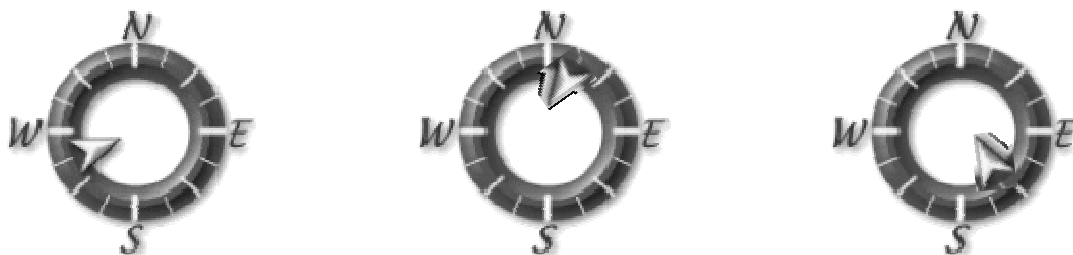


Figure 2.2. Main wind directions in HCM city

2.1.3. Hydrographic conditions

Ho Chi Minh City is located in the downstream of the Dong Nai River system and has an interlacing network of rivers and canals.

The Dong Nai River originates from Lang Biang Plateau (Da Lat) and has many tributaries such as the La Nga River, the Be River with a large basin of 45,000 km². Its average flow is 20-500 m³/s and the highest flow during floods is up to 10,000 m³/s. It annually supplies about 15 billion m³ of water for Ho Chi Minh City.

The Sai Gon River originates from Cambodia (specifically, in Hon Quan District, Binh Phuoc Province at the border between Vietnam and Cambodia) and flows through Thu Dau Mot city to HCM city with a length of about 200 km. Its length in the territory of the city is 80 kilometers.

The system of tributaries of the Sai Gon River is too interlaced with its average flow of about 54m³/s. The width of the Sai Gon River in the city ranges from 225m to 370m and its depth is 20 meters. The Dong Nai River connects with the Sai Gon River through the expansion area of the inner city by the system of Rach Chiec Canal. The Nha Be River had formed from the confluence of the Dong Nai and Sai Gon River, located in distance of about 5km from the center in the South-East direction. It flows into the East Sea by two streams: the Soai Rap River with 59km length and average width of 2km is a shallow one with slow flow rate.

Another stream is the Tau Bay River with 56 km length and 0.5 km width, which is flowing into Ganh Rai Bay. Nha Be is a deep river and is also the major waterway for the ships coming and leaving from Sai Gon Port.

The river network in the project is presented in Figure 3. Most of the rivers in Ho Chi Minh City are influenced by semi-diurnal variation of the East Sea tide. Each day, tides rise up and down twice a day, so they penetrate into the canals in the city, causing impact on agricultural production and limiting the water drainage in the urban areas. Hydrological results measured in Phu An station (located in the Sai Gon river) in the year of 2010 shown that the highest tide level in the Saigon River is 1.385 m. The highest water level is 1.55 m in November and the lowest is -2.22 m in July. In dry season, the river flow is small, salinity of 0.4 ‰ isoline can intrude on the Saigon River to Lai Thieu, in some years that can intrude on the Dong Nai River to Thu Dau Mot and Long Dai. In rainy season, the river flow is huge, so the salinity will be strongly diluted.

The lowest and highest monthly average water levels of the Saigon River are presented in Tables 2.7.

Table 2.7. The lowest monthly average water level of the Saigon River

Year	Month (Unit: m)											
	I	II	III	IV	V	IV	VII	VIII	IX	X	XI	XII
2005	-1.94	-2.12	-1.80	-2.10	-2.28	-2.50	-2.56	-2.39	-2.18	-1.72	-1.86	-1.83

2006	-1.86	-1.70	-1.92	-1.82	-2.11	-2.38	-2.48	-2.40	-2.23	-1.83	-1.97	-1.80
2007	-1.83	-2.06	-1.87	-1.90	-2.10	-2.37	-2.46	-2.33	-1.97	-1.74	-1.74	-1.88
2008	-1.83	-1.70	-1.80	-1.92	-2.08	-2.27	-2.33	-2.06	-2.20	-1.64	-1.72	-1.72
2009	-1.65	-1.80	-1.78	-1.80	-2.06	-2.27	-2.21	-2.13	-1.80	-1.80	-1.63	-1.80
2010	-1.75	-1.94	-1.66	-1.63	-2.06	-2.11	-2.22	-2.18	-1.99	-1.71	-1.61	-1.65
2011	-1.70	-1.47	-1.45	-1.77	-2.05	-2.27	-2.16	-2.11	-	-1.69	-1.52	-1.47
									1.91			
2012	-1.72	-1.56	-1.42	-1.73	-2.07	-2.25	-2.23	-2.15	-1.93	-1.67	-1.55	-1.45

Source: Ho Chi Minh city Statistical Yearbook 2012, Phu An Station

Table 2.8. The highest monthly average water level of the Saigon River

Year	Month (Unit: m)											
	I	II	III	IV	V	IV	VII	VIII	IX	X	XI	XII
2005	1.42	1.32	1.13	1.13	0.99	1.03	1.04	1.17	1.33	1.39	1.41	1.35
2006	1.39	1.35	1.41	1.19	1.13	1.02	0.99	1.16	1.32	1.42	1.47	1.44
2007	1.29	1.21	1.37	1.21	1.30	1.09	1.03	1.35	1.45	1.49	1.48	1.39
2008	1.41	1.43	1.37	1.28	1.25	1.23	1.16	1.27	1.32	1.48	1.54	1.55
2009	1.54	1.43	1.39	1.37	1.26	1.17	1.28	1.37	1.37	1.42	1.56	1.46
2010	1.47	1.44	1.42	1.32	1.29	1.18	1.25	1.35	1.35	1.49	1.55	1.49
2011	1.45	1.47	1.40	1.29	1.19	1.12	1.13	1.34	1.50	1.57	1.58	1.59
2012	1.48	1.47	1.42	1.30	1.21	1.16	1.14	1.37	1.51	1.57	1.56	1.57

Source: Ho Chi Minh city Statistical Yearbook 2012, Phu An Station

With increasing of climate change impacts, the Dong Nai River basin will be flooded over 12% in 2050 (See Figure 2.3 and 2.4).

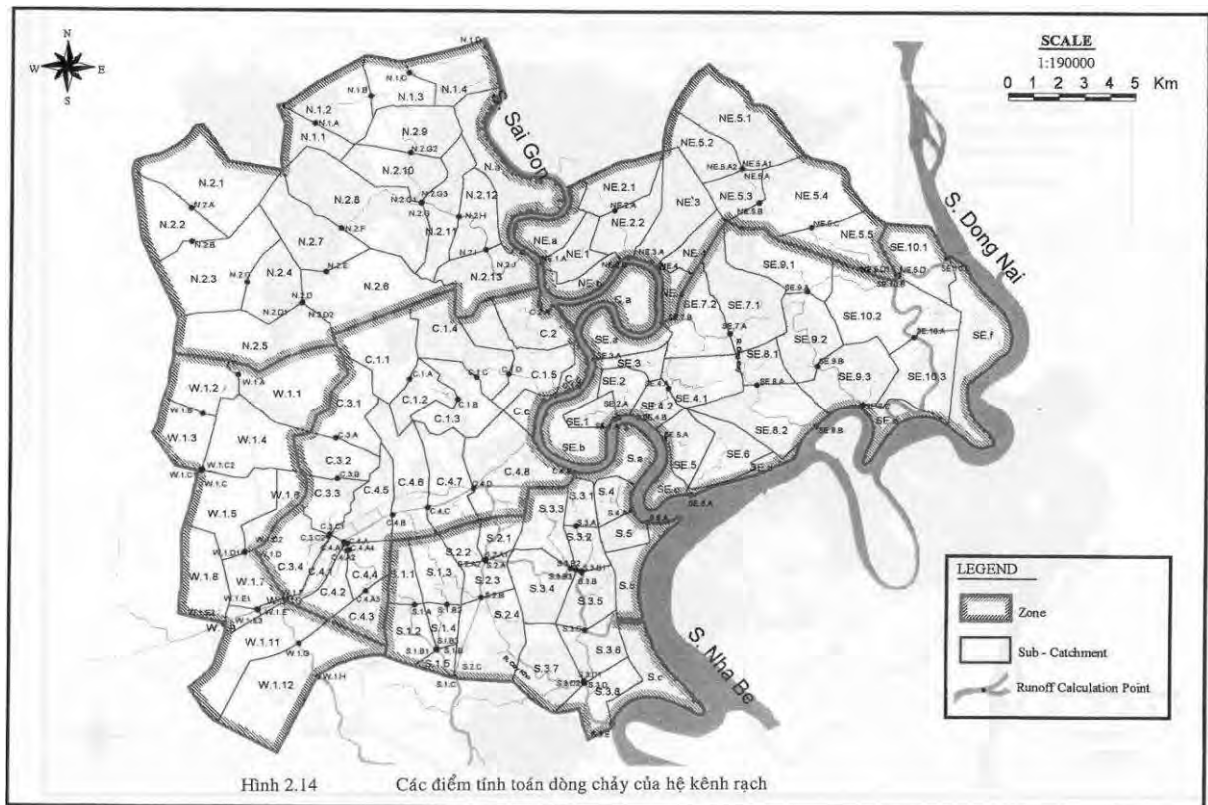


Figure 2.3. Map of rivers network in the project

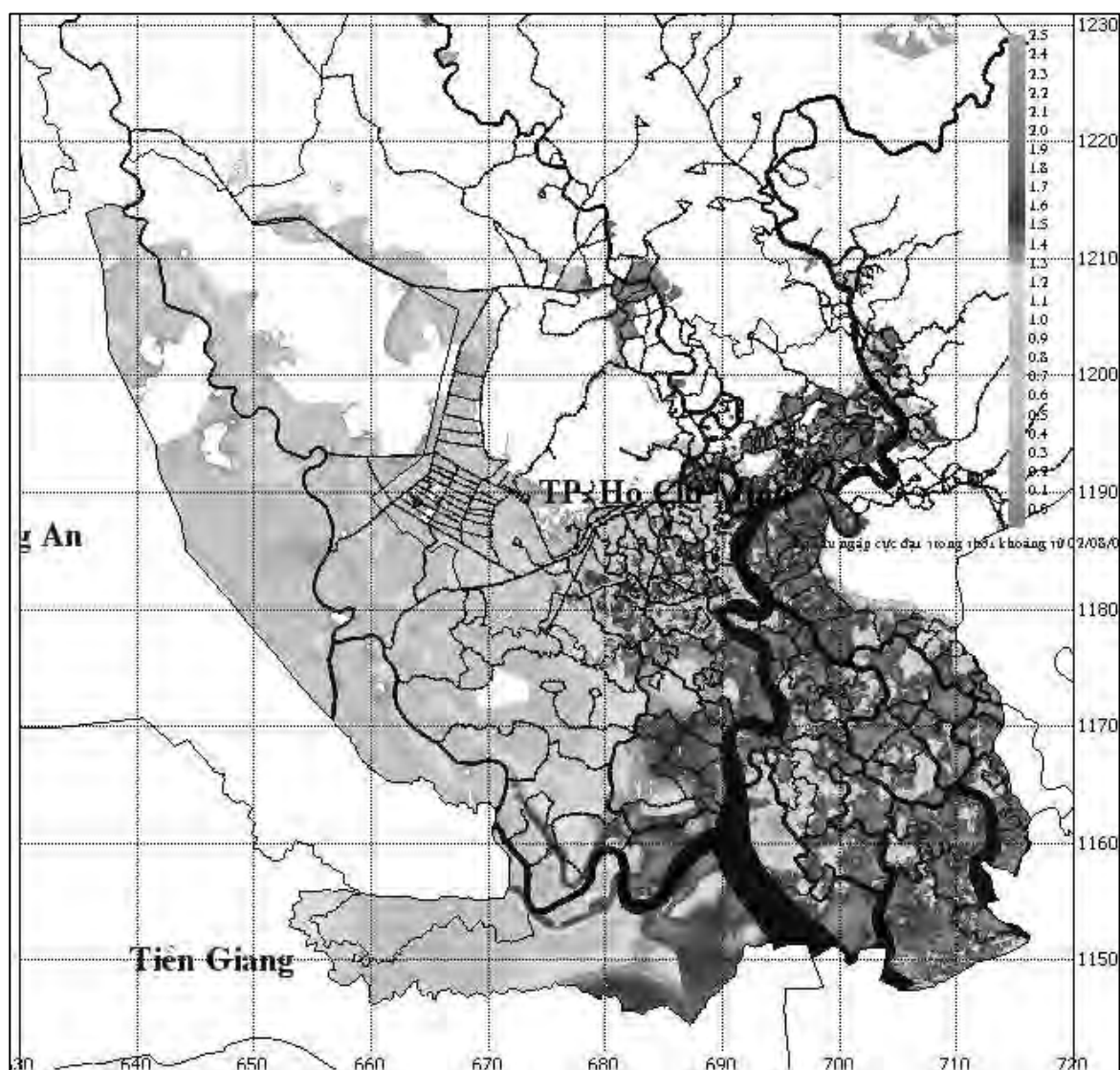


Figure 2.4. Water level rise scenarios in the Dong Nai River Basin by climate change
(Sources: Impact of Climate Change on Water Resources and Adaptation Measures, Academy of Sciences Hydrometeorology and Environment – Embassy of Denmark)

2.1.4. Current state of natural environment

2.1.4.1. Current status of air quality, noise and vibration

(1). Location of air sampling, measurement noise and vibration levels

Air sampling, measurement noise and vibration levels was done in five locations in and around the Project Area as shown in Figure 2.5 and Table 2.9.



Figure 2.5. Location of air sampling, measurement noise and vibration levels

Table 2.9. Location of air sampling, measurement noise and vibration levels

Sign		Time sampling	Sampling Location	Coordinates	
Station	No.			Latitude	Longitude
KK1	1	06h00, 11/05/2014	Bare land in the construction site of the project	10°48'43.12"	106°40'21.80"
	2	12h00, 11/05/2014		10°48'43.12"	106°40'21.80"
	3	18h00, 11/05/2014		10°48'43.12"	106°40'21.80"
KK2	1	06h00, 11/05/2014	At the end of 56 alley, Bach Dang St, residential bordering the park	10°48'46.70"	106°40'19.30"
	2	12h00, 11/05/2014		10°48'46.70"	106°40'19.30"
	3	18h00, 11/05/2014		10°48'46.70"	106°40'19.30"
KK3	1	06h00, 11/05/2014	Children's play area in the park	10°48'46.51"	106°40'25.82"
	2	12h00, 11/05/2014		10°48'46.51"	106°40'25.82"
	3	18h00, 11/05/2014		10°48'46.51"	106°40'25.82"
KK4	1	06h00, 11/05/2014	At the end of the 74 (74/48) alley, Bach Dang St, bordering the park	10°48'51.59"	106°40'23.04"
	2	12h00, 11/05/2014		10°48'51.59"	106°40'23.04"
	3	18h00, 11/05/2014		10°48'51.59"	106°40'23.04"
KK5	1	06h00, 11/05/2014	121/29, Hong Ha St, bordering the park	10°48'38.66"	106°40'20.04"
	2	12h00, 11/05/2014		10°48'38.66"	106°40'20.04"
	3	18h00, 11/05/2014		10°48'38.66"	106°40'20.04"

Source: Environmental Technology Center (ENTEC), 2014

5 sampling locations (named KK01 – KK02) were selected because of the following reasons:

- KK01 is at center of project area. It helps assessing environmental quality in the project area.
- KK02 – KK05 was chosen on base of yearly wind directions at project area:

From November to January, the main wind directions are North and Northeast, so the location KK05 was chose at households located southwest of the project.

Form February to May, the main wind directions are Southeast and South, so the location KK02 was chose at households located Northwest of the project.

From June to October, the main wind directions are Southwest and West, so the location KK03 was chose at Children's play area located Northeast of the project.

In addition, from May to July, the main wind directions are South and Southwest, so households at North and Northeast may be effected. That's reason why the location KK04 was chose.

(2). Status of air quality

Results of air quality analysis is presented in Table 2.10.

Table 2.10. Results of air quality analysis

		Result (mg/m ³)						
		TSP	SO ₂	NO ₂	CO	H ₂ S	NH ₃	THC
Acceptable Standards *		0.3	0.35	0.2	30	0.042	0.2	5
Station	No.							
KK1	1	0.09	0.038	0.021	2.18	<0.002	0.017	ND
	2	0.15	0.093	0.086	1.87	<0.002	0.012	ND
	3	0.20	0.074	0.054	1.72	<0.002	0.016	ND
KK2	1	0.09	0.062	0.047	1.64	<0.002	0.126	ND
	2	0.21	0.051	0.033	1.94	<0.002	0.131	ND
	3	0.31	0.065	0.051	2.83	<0.002	0.128	ND
KK3	1	0.11	0.043	0.025	1.15	<0.002	0.028	ND
	2	0.25	0.042	0.037	1.84	<0.002	0.031	ND
	3	0.39	0.038	0.027	2.15	<0.002	0.015	ND
KK4	1	0.09	0.026	0.015	2.76	<0.002	0.074	ND
	2	0.15	0.071	0.063	2.05	<0.002	0.094	ND
	3	0.27	0.041	0.034	1.23	<0.002	0.081	ND
KK5	1	0.10	0.062	0.047	1.82	<0.002	0.120	ND
	2	0.24	0.071	0.058	2.34	<0.002	0.120	ND
	3	0.33	0.058	0.045	2.16	<0.002	0.122	ND

Source: Environmental Technology Center (ENTEC). 2014.

Notes:

ND: Not detected;

(*) Standard for TSP, SO₂, NO₂ and CO are from QCVN 05:2013/BTNMT: National technical regulation on ambient air quality, average 1 hours column; Standards for H₂S, NH₃, and THC are from QCVN 06:2009/BTNMT: National Technical Regulation on certain hazardous substances in ambient air.

(3). Noise

Results measured noise levels is presented in Table 2.11.

Table 2.11. Noise level measurement results (dBA)

Position Measurement		Hours	Parameter	LA50	QCVN 26:2010/BTNMT
Station	No.				
KK1	1	06h-08h	Max	56.0	70
			Min	51.7	
	2	11h-13h	Max	49.4	
			Min	47.8	
	3	16h-19h	Max	58.0	
			Min	53.4	
KK2	1	06h-08h	Max	66.0	
			Min	47.2	
	2	11h-13h	Max	50.2	
			Min	47.1	
	3	16h-19h	Max	58.0	
			Min	47.1	
KK3	1	06h-08h	Max	58.8	
			Min	55.5	
	2	11h-13h	Max	49.7	
			Min	47.3	
	3	16h-19h	Max	66.7	
			Min	58.8	
KK4	1	06h-08h	Max	56.5	
			Min	50.8	
	2	11h-13h	Max	50.3	
			Min	47.5	
	3	16h-19h	Max	54.9	
			Min	53.6	
KK5	1	06h-08h	Max	56.0	
			Min	53.7	
	2	11h-13h	Max	49.8	
			Min	47.2	
	3	16h-19h	Max	53.0	
			Min	51.1	

Source: Environmental Technology Center (ENTEC), 2014

Note:

- QCVN 26:2010/BTNMT: National Technical Regulation on noise (at normally area from 6h to 21h). It regulated that the noise level at normally area from 6h to 21h is 70 dBA. Where:
- Normally areas include: apartments, houses is located individual or adjacent, hotels, guesthouses, administrative.
- The source of the noise caused by the operation, construction, trade, service and activities.

(4). Vibration

Results measured vibration levels is presented in Table 2.12.

Table 2.12. Vibration level measurement results (dB)

Position Measurement		Hours	Parameter	X- Lva50	Y- Lva50	Z- Lva50	QCVN 27:2010/BTNMT
Station	No.						
KK1	1	06h-08h	Max	27.0	27.8	28.6	70
			Min	24.9	24.8	27.4	
	2	11h-	Max	25.7	25.3	27.7	

	3	13h	Min	24.0	23.4	26.4
		16h-19h	Max	30.3	30.9	29.7
			Min	23.0	24.6	24.0
KK2	1	06h-08h	Max	46.8	35.6	38.2
			Min	26.4	18.7	22.1
	2	11h-13h	Max	25.2	25.8	27.8
			Min	24.2	24.2	22.5
	3	16h-19h	Max	33.2	33.4	38.7
			Min	26.1	25.4	31.6
KK3	1	06h-08h	Max	27.3	28.3	27.7
			Min	24.6	25.0	24.6
	2	11h-13h	Max	25.5	25.2	27.9
			Min	24.4	24.3	22.3
	3	16h-19h	Max	42.4	42.0	44.5
			Min	27.9	23.3	25.0
KK4	1	06h-08h	Max	26.5	26.3	23.7
			Min	23.5	23.8	20.3
	2	11h-13h	Max	28.2	24.4	38.1
			Min	21.1	22.5	25.9
	3	16h-19h	Max	24.5	22.7	30.6
			Min	22.9	21.2	28.4
KK5	1	06h-08h	Max	25.2	25.0	32.5
			Min	22.9	23.1	28.6
	2	11h-13h	Max	24.6	24.8	31.6
			Min	23.7	23.5	29.1
	3	16h-19h	Max	24.7	25.3	29.7
			Min	23.7	24.1	28.7

Source: Environmental Technology Center (ENTEC), 2014

Note:

QCVN 27:2010/BTNMT: National Technical Regulation on vibration (production, trade and services at normally area). It regulated that the vibration level at normally area from 6h to 21h is 70 dB. Where:

- Normally areas include: apartments, houses is located individual or adjacent, hotels, guesthouses, administrative.
- The source of the noise caused by the operation, construction, trade, service and activities.

– Air quality: Compared with QCVN 05:2013/BTNMT, QCVN 06:2009/BTNMT, it is shown that measurement results meet the regulations allow. Only TSP parameter higher than standard about 0.09 mg/m³ at the road going into Gia Dinh park (KK03) on 18h00 mainly due to the increased amount of vehicles on Hoang Minh Giam Street.

– Noise and vibration: Compared with QCVN 26:2010/BTNMT and 27:2010/BTNMT it is shown that measurement results meet the regulations allow.

2.1.4.2. Current status of surface water quality

(1). Surface water

The sampling locations are presented in Figure 2.6 and Table 2.13 and The analysis results of surface water quality is presented in Table 2.14.



Figure 2.6. Surface water sampling locations

Table 2.13. Surface water sampling locations

No	Sign	Location Samples	Coordinates	
			Latitude	Longitude
1	NM1	Nhieu Loc canal, near by Hai Duc pagoda	10°47'49.75"	106°41'07.92"
2	NM2	From NM1 about 300m forward to upstream of Nhieu Loc canal	10°47'38.73"	106°41'06.18"
3	NM3	From Kieu bridge about 120m forward to upstream of Nhieu Loc canal	10°47'32.96"	106°41'05.73"
4	NM4	From NM1 about 300m forward to downstream of Nhieu Loc canal (near by Rach Mieu pool)	10°47'42.60"	106°41'15.97"
5	NM5	From Tran Khanh Du bridge about 60m forward to upstream of Nhieu Loc canal	10°47'45.22"	106°41'24.17"

Source: Environmental Technology Centre ENTEC, 2014.

Because the plant is located in the region have the sewage system leading to Nhieu Loc canal at culvert (NM01), so one location was chose in there. Other locations are about 300 m upstream and downstream from NM01. The sampling will help assess background environmental quality and pollution monitoring in the future.

Table 2.14. The analysis results of surface water quality

No	Parameters	Unit	Results					Acceptable Standards *
			NM1	NM2	NM3	NM4	NM5	
01	pH	-	6.9	7.0	7.0	7.0	6.9	5.5 - 9

No	Parameters	Unit	Results					Acceptable Standards *
			NM1	NM2	NM3	NM4	NM5	
02	DO	mgO ₂ /l	6.1	5.8	6.3	6.0	6.2	≥4
03	COD	mgO ₂ /l	15	15	12	15	12	30
04	BOD ₅	mgO ₂ /l	8	8	6	7	6	15
05	TSS	mg/l	17	15	18	23	18	50
06	Nitrate	mg/l	0.025	0.019	0.026	0.017	<0.01	10
07	Nitrite	mg/l	0.016	0.015	0.046	0.016	0.014	0.04
08	Ammonia	mg/l	0.61	0.59	0.46	0.86	0.63	0.5
09	Sulfate	mg/l	28	26	15	24	22	-
10	Fluoride	mg/l	0.71	0.61	0.91	0.59	0.69	1.5
11	Total Fe	mg/l	1.41	0.78	0.77	1.52	1.50	1.5
12	Lead	mg/l	<0.001	0.001	<0.001	<0.001	<0.001	0.05
13	Grease	mg/l	0.01	0.02	0.01	0.02	0.02	0.1
14	Phenol	mg/l	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	0.01
15	Total N	mg/l	1.12	0.95	0.74	1.31	0.82	-
16	E. Coli	MPN/100ml	30	20	20	20	30	100
17	Total Coliform	MPN/100ml	3200	3300	2100	3500	3600	7500

Source: Environmental Technology Centre ENTEC, 2014.

Notes:

"-": not regulated;

(*) QCVN 08:2008/BTNMT: National technical regulation on surface water quality, column: B1: used for irrigation purposes or other purposes.

- The organic pollution parameters (DO, BOD, COD, Oil, phenol): meet the regulations allow.
- The nutrient pollution parameters (Nitrite, Nitrate, Ammonia, Total N): Nitrite higher than regulations about 0.006 mg/l at NM3. Ammonia higher than regulations about 0.9 – 0.36 at all sample.
- Heavy metals in water (Total Fe, Pb): Total Fe higher than regulations about 0.02 mg/l near by Rach Mieu pool.
- The physicochemical parameters (pH, TSS, sulfate, fluoride): meet the regulations allow.
- The parameters of microbial contamination (Total Coliform, E. Coli): meet the regulations allow.

(2). Groundwater quality

Sampling locations are shown in Table 2.15 and Figure 2.7. and the results of groundwater quality analyzes are presented in the Table 2.16



Figure 2.7. Location of groundwater sampling

Table 2.15. Location of groundwater sampling

StationNo.		Sampling Location	Coordinates	
			Latitude	Longitude
NN1	1	Nguyen Thi Huyen households , 74 alley, Bach Dang St, Ward 2, Tan Binh Dist	10°48'52.49"	106°40'24.73"
	2			
NN2	1	Phan Van Sy households, 74 alley, Bach Dang St, Ward 2, Tan Binh Dist	10°48'51.27"	106°40'22.44"
	2			
NN3	1	Bui Thi Thanh households, 56 alley, Bach Dang St, Ward 2, Tan Binh Dist	10°48'47.55"	106°40'19.06"
	2			
NN4	1	Tran Van Hai households, Hong Ha St, Ward 2, Tan Binh Dist	10°48'38.06"	106°40'20.21"
	2			
NN5	1	Mai Van Long, 29 Hong Ha St, Ward 2, Tan Binh Dist	10°48'38.56"	106°40'20.12"
	2			

Source: Environmental Technology Centre ENTEC, 2014.

Because the project can impact on groundwater quality, so five households using well water were chose (the majority households use tap-water) around the project area to assess groundwater quality.

Table 2.16. The analytical results of groundwater quality

No	Parameters	Unit	Results										QCVN 09:2008/ BTNMT
			NN1		NN2		NN3		NN4		NN5		
			1	2	1	2	1	2	1	2	1	2	
01	pH	-	5.8	5.9	5.7	5.8	5.7	6.0	6.0	5.9	5.9	6.1	5.5 - 8.5
02	The color	Pt-Co	1	1	5	4	1	1	1	1	1	1	-
03	Hardness	Mg CaCO ₃ /l	25	25	25	25	25	25	15	15	25	25	500
04	TDS	mg/l	179	182	180	178	178	185	155	161	210	212	-
05	Fluoride	mg/l	1.06	1.08	0.61	0.65	0.46	0.48	0.51	0.55	0.61	0.64	1.0
06	Chloride	mg/l	84.5	54.8	84.6	84.8	84.6	84.4	40.9	50.5	86.4	86.2	250
07	Nitrate	mg/l	1.70	1.70	6.80	6.94	5.16	4.84	0.59	0.63	1.12	1.18	15
08	Nitrite	mg/l	0.006	0.006	0.003	0.003	0.004	0.004	0.003	0.003	0.005	0.005	1.0
09	Sulfate	mg/l	27	27	52	53	9	10	2	2	8	8	400
10	Mn	mg/l	0.014	0.015	0.039	0.041	0.042	0.04	0.057	0.057	0.024	0.026	0.5
11	Total Fe	mg/l	1.112	1.114	1.105	1.105	1.115	1.095	1.326	1.122	0.541	0.562	5.0
12	Pb	mg/l	0.008	0.008	0.005	0.05	0.007	0.007	0.002	0.002	0.003	0.003	0.01
13	Zn	mg/l	0.016	0.016	0.027	0.027	0.067	0.067	0.012	0.014	0.021	0.018	3.0
14	Hg	mg/l	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.001
15	E. Coli	MPN/ 100ml	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
16	Total Coliform	MPN/ 100ml	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3

Source: Environmental Technology Centre ENTEC, 2014.

Notes:

KPH: not detected;

“- “: not regulated;

QCVN 09:2008/BTNMT: National technical regulation on groundwater quality;

Limit of detection regulated in the standards: Nitrite = 0.001 mg/l; Fluoride = 0.05 mg/l; Hg = 0.0001 mg/l.

Compared with QCVN 09:2008/BTNMT shows that almost groundwater quality in the area meet the standard allow. Only Fluoride, Mn, Pb parameter higher than the standard at some location.

Fluoride at locations NN1-1 and NN1-2 is higher than the standard (about 0.06 – 0.08 mg/l). Manganese (Mn) is higher than the standard about 0.007 mg/l at locations NN4-1, NN4-2. The sample at NN2-2 has Pb parameter 5 times higher than the standard.

2.1.4.3. Current status of soil quality

Sampling locations are shown in Table 2.17 and Figure 2.8. The results of analysis of soil quality are presented in Table 2.18.



Figure 2.8. Location of groundwater sampling

Table 2.17. Location of soil sampling

Station	No.	Sampling Location	Coordinates	
			Latitude	Longitude
D1	1	Nguyen Thi Huyen households , 74 alley, Bach Dang St, Ward 2, Tan Binh Dist.	10°48'52.49"	106°40'24.73"
	2			
D2	1	Phan Van Sy households, 74 alley, Bach Dang St, Ward 2, Tan Binh Dist.	10°48'51.27"	106°40'22.44"
	2			
D3	1	Bui Thi Thanh households, 56 alley, Bach Dang St, Ward 2, Tan Binh Dist.	10°48'47.55"	106°40'19.06"
	2			
D4	1	Tran Van Hai households, Hong Ha St, Ward 2, Tan Binh Dist.	10°48'38.06"	106°40'20.21"
	2			
D5	1	Mai Van Long, 29 Hong Ha St, Ward 2, Tan Binh Dist.	10°48'38.56"	106°40'20.12"
	2			

Source: Environmental Technology Centre ENTEC, 2014.

Five locations selecting for assessing status of soil and groundwater are same locations. It will help us to assess pollution of groundwater vertically in the future.

Table 2.18. The analytical results of soil quality

Sign		Results							
		Cd (mg/kg)	Cr (mg/kg)	As (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	Zn (mg/kg)	TOC	Oil (mg/kg)
QCVN 03:2008/ BTNMT		5	-	12	120	-	200	-	-
Station	No.								
D1	1	1.24	2.86	1.01	18.12	1.64	0.65	2.8	1.1
	2	1.26	2.84	0.97	17.25	1.52	0.67	2.7	1
D2	1	1.31	3.18	0.83	13.42	0.76	0.33	3.2	0.8
	2	1.34	3.14	0.71	11.24	0.71	0.29	3	0.9
D3	1	51.47	0.22	0.57	14.73	2.06	1.11	4.1	1.2
	2	1.35	0.28	0.61	13.34	2.11	1.17	4.2	1.1
D4	1	1.39	3.21	0.72	7.84	3.78	0.39	3.5	0.9
	2	1.43	3.54	0.78	6.97	2.93	0.35	3.7	0.9
D5	1	1.28	2.14	0.83	4.55	0.75	0.41	2.9	0.7
	2	1.25	2.01	0.94	4.79	0.81	0.47	2.7	0.8

Source: Environmental Technology Centre ENTEC, 2014.

Note:

“-”: Not regulation;

QCVN 03:2008/BTNMT: National technical regulation on permissible limits of heavy metals in soil (people's land);

Comparison of analysis results with QCVN 03:2008/BTNMT showed that soil quality at the sampled location has no signs of pollutions.

2.1.5. Current state of biological resources

The Gia Dinh Park is considered one of the Ho Chi Minh City's green lung. It has an area of lawns is 34,410 m², bed of flowers cover area of 647 m², with many types of flowers, plants. Combining over 300 plants blossoming and nearly 250 assorted flowerpots. The Green plate has the number about 700 trees include several categories such as: Monkey Skull, Yellow Flamboyant, French tamarind, Cassia fistula Linn, etc.

The Project Area has some trees account for a large number of individuals such as *Senna siamea* (23 individuals), *Khaya senegalensis* (39 individuals), *Eucalyptus camaldulensis* (123 individuals). Some birds and animals: *Copsychus malabaricus*, *Dicaeum erythrorhynchos*, *Passer domesticus*. Details are provided in the Table 2.19:

Table 2.19. Main species in the Project Area

No.	Scientific name	Quantity	No.	Scientific name	Quantity
TREES			14	<i>Zoysia Tenuifolia</i>	
FABALES			ASTERALES		
Fabaceae			Asteraceae		
1	<i>Senna siamea</i>	23	15	<i>Bidens pilosa</i>	
2	<i>Mimosa pudica</i>		16	<i>Eclipta alba</i>	
3	<i>Delonix regia</i>	1	ZINGIBERALES		
ROSALES			Musaceae		

	Moracea		17	<i>Musa acuminata</i>	12
4	<i>Ficus religiosa</i>	2			
	SAPINDALES		BIRDS		
	Meliaceae			PASSERIFORMES	
5	<i>Khaya senegalensis</i>	39		Muscicapidae	
	Anacardiaceae		18	<i>Copsychus malabaricus</i>	2
6	<i>Mangifera laurina</i>	1		Dicaeida	
	ARECALES		19	<i>Dicaeum erythrorhynchos</i>	2
	Arecaceae			Pycnonotidae	
7	<i>Cocos nucifera</i>	6	20	<i>Pycnonotus jocosus</i>	1
	MALVALES			Passeridae	
	Muntingiaceae		21	<i>Passer domesticus</i>	5
8	<i>Muntingia calabura</i>	2			
	MYRTALES		MAMMALS		
	Myrtaceae			RODENTIA	
9	<i>Eucalyptus camaldulensis</i>	123		Sciuridae	
10	<i>Terminalia catapa</i>	1	22	<i>Sciurus carolinensis</i>	1
GRASSES					
	POALES				
	Poaceae				
11	<i>Phyllostachys aureosuncata</i>				
12	<i>Axonopus compressus</i>				
13	<i>Setaria pallide-fusca</i>				

Notes:

- Quantity: number of individuals in Project Area.

Among the species of the project area, no species is prioritized for protection or endemic. There are no ecologically sensitive areas near the Project Area.

2.2. ECONOMIC AND SOCIAL CONDITIONS IN PHU NHUAN DISTRICT

Ho Chi Minh City has 19 urban districts and 5 suburban districts.

Gia Dinh Park is located in Ward 9 of Phu Nhuan district, Ward 3 of Go Vap district and is adjacent to Ward 2 of Tan Binh district. The districts of Phu Nhuan, Go Cap, and Tan Binh have 15, 16, and 15 Wards respectively. The Project Area belongs to Ward 9 of Phu Nhuan District.

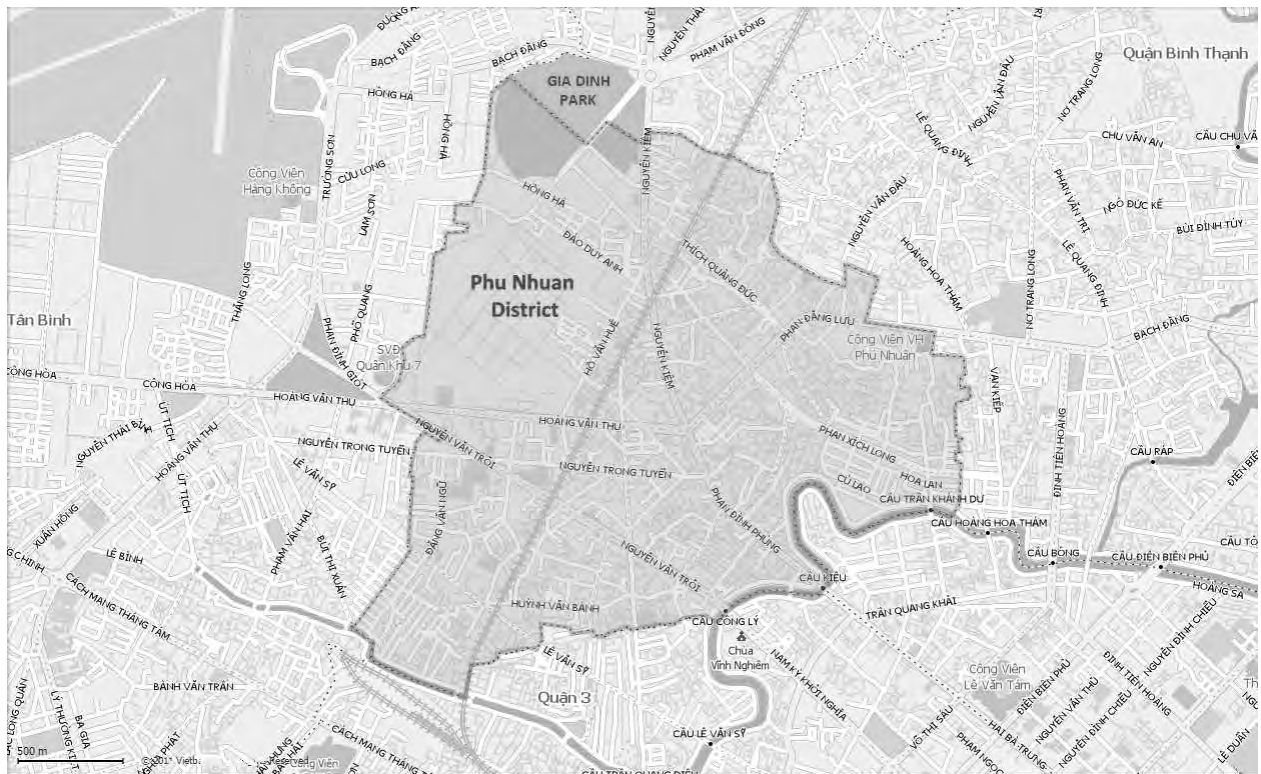


Figure 2.9. Location of Gia Dinh Park

Phu Nhuan District is located 4.7 km from the city center and is considered the north gateway of the Ho Chi Minh City center.

2.2.1. Economic conditions

The economic structure of Ward 9 has developed in the direction of service-trade, industry and handicraft industry. In particular, the service developed the kind of high-grade services such as credit and finance, Office for rent, senior housing, tourism services etc. Industry is developed in clean production and high-tech production. Gross output of industry – handicraft industry estimated in the first 9 months of 2014 reached 487.4 billion Dong. In particular, the export value was estimated to be 247.3 billion Dong; the collective is estimated at 3.9 billion Dong, the private is estimated at 439.7 billion Dong, the household estimated at 5.1 billion Dong.

Trade and service sales (in the first 9 months of 2014) are estimated to be 87,127.4 billion Dong. The breakdown is: trade (74,979.2 billion Dong), restaurant business (7591.2 billion Dong), and services (4556.9 billion Dong).

Total household business registration is 5,249 households with registered capital is 116.7 billion Dong (*Report No. 140 of People's Committee of Phu Nhuan District - Report on economic – social situation in 9 months and focused program in 3 months end of 2014*).

The administrative center of the Phu Nhuan district was deployed in Nguyen Van Troi Street axis. The commerce – service – trade center develops at the main roads: Nguyen Van Troi St., Hoang Van Thu St., Phan Dang Luu St., Nguyen Kiem St., Phan Dinh Phung St.. The big trade center of the District is Phu Nhuan Market in Ward 17.

Some of structures surrounding the project are:

- Phu Nhuan Building – 20 Hoang Minh Giam Str., Ward 9, Phu Nhuan District;
- Pearl Tower – 311 Dao Duy Anh Str., Ward 9, Phu Nhuan District;

- 675 Apartment building, 675 Nguyen Kiem Str, Ward 9, Phu Nhuan District;
- Co-op Mart Supermarket, 571 Nguyen Kiem Str., Ward 9, Phu Nhuan District.
- Phu Nhuan District Public Services Company Limited, 553/73 Nguyen Kiem Str., Ward 9, Phu Nhuan District.

About tourism, as of 2008, Phu Nhuan district has 97 hotels of all types. Including one 5 star hotel, 4 star hotel 2. The number of international tourists staying in hotels reached 110,504 visitors, guests staying inland reached 91.136 visitors. Ward 9 in which there are about 6.265 international visitors and 16,409 domestic tourists. International tourists to Phu Nhuan district occupy 3.9% and domestic tourists accounted for only 2% of the total number of tourists to HCMC (*People's Committee of Phu Nhuan District (2010). Tourism planning and development in local of Phu Nhuan District until 2020*).

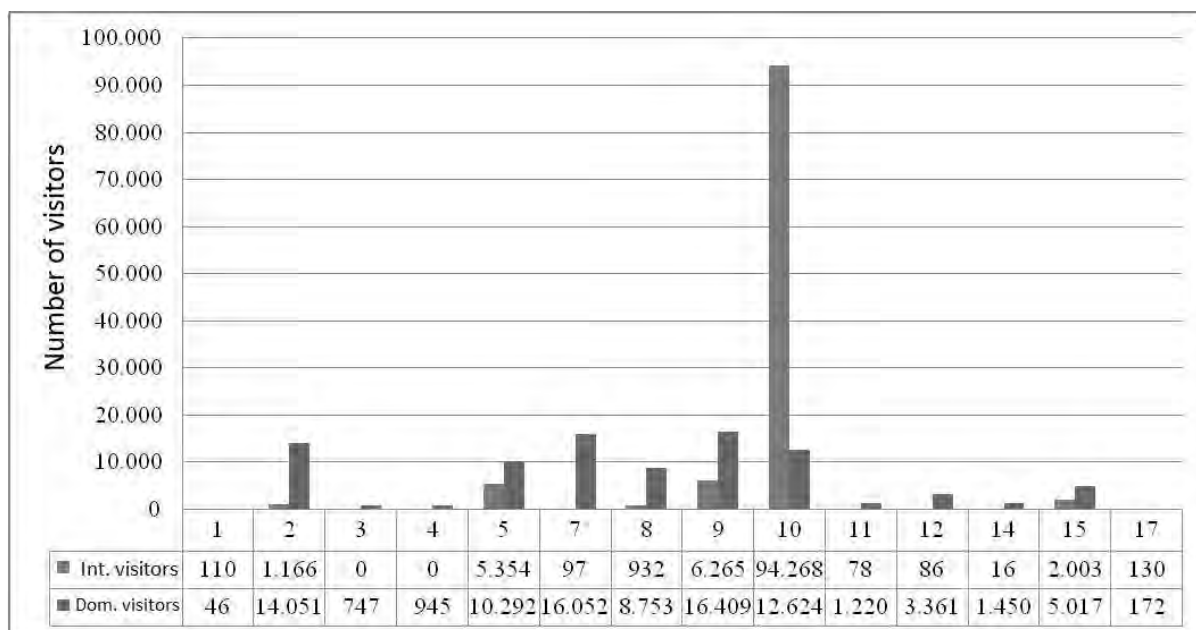


Figure 2.10. Distribution of Tourists by Ward in Phu Nhuan District in 2008

2.2.2. Social conditions

The district consists of 15 Wards with a total area of 4.88 km² and a total population statistics in 2011 is 175,631 people with a density of 35,990 people/km². In particular, male population is 81.601 persons (46.46%), female population is 94.030 persons (53.54%) (*Report No. 140 of People's Committee of Phu Nhuan District - Report on economic – social situation in 9 months and focused program in 3 months end of 2014*).

Ward 9 is in northern Phu Nhuan District with a total area of 1.39 km² and a population of approximately 18,588 people, the population density is 13,373 people/km². Around the area of the project in addition to residential households are also Nguyen Kiem Apartment building located east of the Gia Dinh Park. In 2008, Phu Nhuan District completed the goal that the poor do not exist based on the standards of HCMC (the border is 6 million Dong/person/year).

2.2.2.1. Education facilities

Phu Nhuan district currently has 50 kindergartens, in which 34 of them are private kindergarten. Particularly in Ho Chi Minh City there are 3 kindergartens reaching national second and third level. All of them are in the Phu Nhuan district. Numbers of educational establishments at all levels are:

- Primary school Level: 12 schools, 2 private school;
- Middle School Level: 12 schools, 6 private schools

- High School Level: 6 private schools;
- Vocational College Level: 4 Intermediate colleges;
- College Level: 5 colleges;
- University Level: 2 universities.

Around the area of the project are the College of Finance Customs (base 2), Open University of Ho Chi Minh City, Khoi Viet Tourism and Hospitality School, Phu Nhuan High school, Ho Van Hue Primary school, etc.

2.2.2.2. Health facilities.

Statistics to 2013, Phu Nhuan district has 1 public health establishments: the Phu Nhuan Hospital; 2 private medical establishments: Ngoc Linh General Hospital and An Sinh Hospital; 1 polytechnical department: Phuoc An polytechnical department -branch 3.

2.2.2.3. Culture and sport facilities

The Ward 9 area of the Phu Nhuan district, around the Gia Dinh Park also focus many sport center such as: Phu Nhuan sport stadium, Aircraft Sports Club, etc.

Phu Nhuan District have large number of pagodas, up to 40 pagodas, including some big pagoda like Avalokitesvara Bodhisattva Pagoda, Quang Minh Pagoda, Phap Hoa Pagoda, Zen operators, Hue Nghiem Pagoda. There is also the grave of Vo Di Nguy – Nationally Architectural - Art monument. There are the places attract more tourists.

CHAPTER 3: ASSESSMENT OF ENVIRONMENTAL IMPACTS

3.1. ASSESSMENT OF IMPACTS

The environmental impact of the project arises primarily in two periods:

- Preparation and construction period;
- Operation period.

On that basis, the project's activities which may cause negative environmental impacts to natural and socio-economic development can be identified and evaluated.

3.1.1. Assessment of impacts during preparation and construction periods

3.1.1.1. Impact Sources

(1). Impact source relate to waste

The project's activities and related to waste impact sources in preparation and construction period are presented in Table 3.1.

Table 3.1. Impact source related to waste in preparation and construction period

No.	Activity	Impact Source
1	Land clearance, Soil excavation, Ground leveling	- Dust and emission arising from the transportation, excavating and leveling - Rainwater runoff
2	Material transportation - Developing technical infrastructure	- Dust arising from leveling the ground. - Dust and emission from material transportation such as iron, sand, bricks, cement, iron, steel etc. - Solid waste arising from the construction site. - Rainwater runoff over the entire Project Area swept by the soil, rocks, greasy water.
3	Welding, cutting, painting, etc. Installation of equipment	- Dust, fumes arising from the construction process with heating: cutting, welding metal etc. - Dust and emission from the transport device. - Solid waste such as viscous oily rags, chemicals containers, metal blanks etc.
4	Worker' activities	- Household solid waste, domestic wastewater.

(2). Impact sources not related to waste

The impact sources not related to waste in the preparation and construction period are shown in Table 3.2.

Table 3.2. Impact sources not relate to waste in preparation and construction period

No.	Activity	Impact Source
1	-Construction activities, -Equipment installation	-Change of land use, -Noise and vibration, - Fire incidents, accidents
2	Inflow of workers	Disturbance in vicinity

(3). Affected objects and scales

Relation of activities and affected objects is presented in Table 3.3.

Table 3.3. Affected subjects and scale in preparation and construction period

No	Activity	Affected Object
1	Land clearance, Soil excavation, Ground	- Impact on the ambient air environment - Impact on water: rainwater runoff entrained dirt,

No	Activity	Affected Object
	leveling	garbage, oil spillage, domestic wastewater of workers - Impact on land: Construction solid waste generation , domestic solid waste from activities of workers - Impact on flora, fauna and biodiversity
2	Material transportation - Developing technical infrastructure	- Air pollution (dust, gases, noise and vibration) - Environmental pollution to water: rainwater runoff entrained dirt, garbage, oil leakage or spillage of materials - Health workers and community around the Project Area
3	Welding, cutting, painting, etc., Installation of equipment	- Air pollution (dust emission) - Pollution of water: rainwater runoff, domestic wastewater - Impact on land environment: Solid waste generation, solid waste of workers - Health workers and community around the Project Area
4	Worker' Activities	- Water pollution - Soil pollution

For all the activities,

- The affected scale: The Project Area and surroundings
- Duration of impact: During construction period (temporary)
- Level of impact: Insignificant

3.1.1.2. Impact on air

(1). Dust by soil excavation, land clearance and ground leveling

Dust by soil excavation, land clearance and ground leveling pollutes air environment in Project Area.

The Project Area is about 27,438 m². When soil excavation, land clearance and ground leveling, the organic soil layer will be dug into the depth of about 3.0 m on the surface at water reservoir area (about 9,450 m²), and about 7.0 m at pump machine area (about 475 m²). In the other area (about 17,513 m²), the organic soil layer will be dug into the depth of about 0.1 m and backfill about 0.5 m. Therefore, total volume of digging soil is 33,426 m³; total volume of backfilling soil is 8,757 m³. Project owner will use the digging soil to backfill, so the volume of remain soil have to move to treat is 24,669 m³.

Medium load of the sandy soil is 1.45 ton/m³, so total volume of soil will be digged, backfilled is 48,467.7 tons. The average dust pollution coefficient is 0.134 kg/ton. Total volume of dust which was generated in soil excavation, land clearance and ground leveling is about 6,494.67 kg.

Preliminary estimated results of the dust concentration in soil excavation, land clearance and ground leveling based on dust pollution coefficient of World Health Organization (WHO) is shown in Table 3.4.

Table 3.4. Pollution coefficient and dust estimated concentration in foundation digging and backfilling process

Load * (kg/day)	Surface dust coefficient of pollution ** (g/m ² /day)	Average dust concentration *** (mg/m ³)
72.16	2.63	10.96

Source: Environmental Technology Center (ENTEC), 2014

Notes:

*: Load (kg/day) = Total dust load (kg)/ Number of construction day (day);

**: Surface dust coefficient of pollution (g/m²/day)= Load (kg/day) x 10³ / Area (m²);

***: Average concentration (mg/m³) = Load (kg/day) x 10⁶ / 24 / V (m³).

Where:

Number of construction day is 90 days (3 months);

Construction area is 27,438 m²;

The impact volume on the project premises $V = S \times H$ with $S = 27,438 \text{ m}^2$ and $H = 10 \text{ m}$ (height measurement of meteorological parameters is 10m)

According to Table 3.5, the average dust concentration is 10.96 mg/m^3 . Comparison of dust concentration estimation results with Viet Nam technical standard QCVN 05:2013/BTNMT (1-hour average: 0.3 mg/m^3) indicates that the average dust concentrations in the Project Area is beyond the standard by 36.53 times. However, in fact the suspended dust particle concentration in the Project Area will be lower because the process of sedimentation due to gravity and diluted due to wind from time to time (average wind velocity is 2.4 - 4.0 m/s). In addition, impact of dust decreases with distance from the source because of the surrounding trees and short digging time. Sphere of impact is only locally in the construction area, and therefore, it is considered that the impact on the workers and the households in vicinity is not significant.

(2). Pollution caused by emission

1). Pollution caused by emission from transportation in soil excavation, land clearance and ground leveling

Remaining soil mass of soil excavation, land clearance and ground leveling is about 35,770 tons, and using trucks with payload of 15 tons to transport. The total time is about 2,385 times to go in and out the site. The average transport distance for one time is estimated at 0.5 km.

Based on the pollution coefficient caused by the World Health Organization (WHO) set up for the transportation and to use oil with capacity 3.5 - 16.0 tons, it is estimated the total volume of emissions caused the operations in Table 3.5.

Table 3.5. Air pollutants load from transport in soil excavation, land clearance and ground leveling

Pollutant	Load (kg/1,000km)	Total length (1,000 km)	Total load (kg)	Average load (kg/day)
Suspended particulates	0.9	1.19	1.071	0.012
SO ₂	4.15S	1.19	0.013	0.0001
NO _x	14.4	1.19	17.136	0.190
CO	2.9	1.19	3.451	0.038
VOC (volatile organic compounds)	0.8	1.19	0.952	0.011

Notes:

- S: Sulfur content in DO is 0.25%;
- The total construction time is 03 months = 90 days.

2). Pollution caused by emission from equipment, machinery

Pollutants emission coefficient from equipment, machinery such as bulldozers, excavators, vibration are shown in Table 3.6, based on General Emission Standard of Diesel Engines by EPA set up for the diesel engine has capacity from 37 - 560 kW (50 – 750 HP) in Tier 3.

Table 3.6. Pollutants emission coefficient from equipment, machinery

Engine capacity kW/(HP)	Pollution coefficient g/kWh (g/bhp·hr)				
	CO	Hydro carbon	Hydrocarbon contains no metal and NO _x	NO _x	Suspended Particle
37 ≤ kW < 75 (50 ≤ hp < 100)	5.0 (3.7)	-	4.7 (3.5)	-	0.4 (0.3)
75 ≤ kW < 130 (100 ≤ hp < 175)	5.0 (3.7)	-	4.0 (3.0)	-	0.3 (0.22)
130 ≤ kW < 225 (175 ≤ hp < 300)	3.5 (2.6)	-	4.0 (3.0)	-	0.2 (0.15)
225 ≤ kW < 450 (300 ≤ hp < 600)	3.5 (2.6)	-	4.0 (3.0)	-	0.2 (0.15)
450 ≤ kW < 560 (600 ≤ hp < 750)	3.5 (2.6)	-	4.0 (3.0)	-	0.2 (0.15)

Source: EPA Tier 3 Emission Standards

The pollutants load from the emission of construction equipment, machinery is shown in Table 3.7, based on the assumption that operating time of machinery is 8 hours/day.

Table 3.7. Pollutants load in the emission of construction equipment, machinery

Vehicle	Engine capacity	Pollutant load (kg/day)		
		CO	Hydrocarbon contains no metal and NO _x	Suspended Particle
Bulldozer	110hp	0.407	0.330	0.0242
Road-roller	120hp	0.444	0.360	0.0264
Spreader	130hp	0.481	0.390	0.0286
Compactor	110hp	0.407	0.330	0.0242

Source: Environmental Technology Center (ENTEC), 2014

However during this period, the construction equipment, machinery are typically not used at the same time and in dilute windy conditions, disperse the exhaust, then the impact due to emission of the equipment, machinery is only locally from time to time, completely insignificant on the Project Area and surroundings.

3) Pollution caused by welding, cutting, painting, etc.

Toxic welding emissions generated during welding will impact on the surrounding air quality and impact directly on the health of workers. Most of the toxic emissions contains heavy metals such as Zn, Cu, Hg, Cr with highly toxicity and very persistent.

Also the materials used in the coating, plating processes such as metal particles, chemicals, paints, solvents, etc. will emit the vapor, mist, dust, rust, and little of substance chemical, which also cause negative impacts on the ambient air quality and health of construction workers.

(3). Impacts by air pollutants

The impacts by air pollutants are shown in Table 3.8.

Table 3.8. Impacts by air pollutants

No.	Parameter	Impact
01	Dust	- Respiratory stimulates, lung inflammation, lung cancer; - Injury to skin, cornea, digestive diseases.
02	Acid gases (SO _x , NO _x).	- Influencing the respiratory system, blood scattered on; - SO₂ poisoning through skin, reducing blood, alkaline reserve; - Acid rain adversely affect the growth of vegetation and crops; - To enhance the corrosion, material degradation of concrete and buildings; - Bad influence on climate, ecosystems and the ozone layer.
03	Carbon oxide (CO)	Reducing ability of blood to transport oxygen organizations cells due to CO combines with hemoglobin-hemoglobin cacboxy.
04	Carbon dioxide (CO ₂)	- Causing pulmonary respiratory disorders; - Causing the greenhouse effect; - Impact on ecosystems.
05	Hydrocarbons	Induction of acute poisoning: debilitating, dizziness, headache, senses disturbances sometimes fatal.

3.1.1.3. Impact on surface water

(1). Impact caused by domestic wastewater

Impact sources on water quality during preparation and construction periods are mainly due to domestic wastewater of workers. Composition of the major pollutants in domestic wastewater include: solid residue,

suspended solids (SS), organic compounds (BOD/COD), nutrients (N, P) and pathogens (Coliform, E. Coli), which can lead to contamination of surface water and groundwater if that is not treated.

During the project's construction daily average number of workers can be estimated about 150 workers. The amount of water to be supplied is about 120 liters/person/day (based on TCXDVN 33:2006 Water Supply - Distribution System and Facilities Design Standard) and the wastewater will be almost the same as the supplied water. Thus, the total flow of wastewater generated in the process of the project's construction is approximately 18 m³/day. This is considered maximum because all the workers always will not stay at the construction site.

According to statistical calculations, for the developing countries, the pollution factors per person daily discharging into the environment (when the wastewater is untreated) are shown in Table 3.9.

Table 3.9. Pollutants of untreated domestic wastewater

No.	Pollutants	Coefficient of pollution (g/person/day)
01	BOD ₅	45 – 54
02	COD (Dicromate)	72 – 102
03	SS	70 – 145
04	NH ₃	2.4 – 4.8
05	Total nitrogen (N)	6 – 12
06	Total phosphorus (P)	0.8 – 4.0

Source: Rapid Environmental Assessment, WHO, 1993

Based on the values in Table 3.9, the pollutant loads generated from domestic wastewater are calculated as shown in Table 3.10.

Table 3.10. Estimated concentration of pollutants of wastewater in a day

No.	Pollutants	Load (kg/day)	Concentration of pollutants (mg/l)	QCVN 14: 2008/BTNMT (Column B)
01	BOD ₅	4.5 – 5.4	375 - 450	50
02	COD (Dicromate)	7.2 – 10.2	600 - 850	-
03	SS	7.0 – 14.5	584 - 1209	100
04	NH ₃	0.24 – 0.48	20 - 40	10
05	Total nitrogen (N)	0.60 – 1.2	50 - 100	50
06	Total phosphorus (P)	0.08 – 0.3	7 - 25	10

$Load = Quantity (g/person/day) \times 100 \text{ persons}$

$Concentration \text{ of pollutants} = Load/Volume, \text{ volume} = 12 \text{ m}^3$

QCVN 14:2008/BTNMT - National technical regulation on domestic wastewater, column B, with $K = 1.0$

Table 3.10 shows the pollutants concentration exceeded National Technical Regulation on domestic wastewater.

(2). Impact caused by wastewater from cleaning processes, machinery maintenance

The process of cleaning and maintenance of machinery and equipment in the construction area will generate wastewater containing organic matter, suspended solids and oil. Volume and loads of pollutants are shown in Table 3.11.

Table 3.11. Pollution concentration of cleaning process, machinery maintenance wastewater

Process	Volume (m ³ /day)	Pollution concentrations (mg/l)		
		COD	Oil and grease	SS
Machinery maintenance	1	20 – 30	-	50 - 80

Cleaning machines		50 – 80	1.0 - 2.0	150 - 200
QCVN 40:2011/BTNMT Column B		150	10	100

Source: EIA report of project "Building central wastewater treatment plant with capacity of 3000 m³/day at Ong Keo industrial zone-phase 1 (module 1)", 2014

The pollution indicators of COD, oil and grease are lower than the regulation QCVN 40:2011/BTNMT, column B. SS is beyond the regulation, but the volume of wastewater is small and frequency of cleaning & maintenance process is not often. Thus, the impact of SS is insignificant.

3.1.1.4. Impact on groundwater

Gas, oil, organic solvents, etc. can leak from vehicles, equipment and storage in the field, and it penetrate into the soil causing groundwater contamination. In addition, water leaks from concrete mixing and piles, cleaning equipment can also contaminate groundwater.

3.1.1.5. Impact on soil

In the construction period, solid waste, wastewater of workers, construction wastes, oil from vehicle and machine, etc. will be generated at the construction site. If management is not done properly, these kinds of waste and/or wastewater will pollute soil.

3.1.1.6. Impact caused by noise and vibration

(1). Impact caused by noise

The following construction activities will cause noise pollution:

- Ground leveling, soil excavation (by graders, rollers);
- Developing technical infrastructure (concrete mixers, trucks, forklifts, bulldozer, bucket back, spreaders)

Noise from construction equipment, machinery is generally not continuous, depending on the type of activities and machinery or equipment that is used. Specific noise levels for the machinery and equipment used for traffic works "U.S. Environmental Protection Agency- Noise from construction equipment and construction machinery NJID, 300.1, 31 - 12-1971 " are presented in Table 3.12.

Table 3.12. Noise levels from machinery and equipment located in 8 m distance from the construction area

	Machinery and equipment	Noise level (dBA)
1. Ground leveling		
	Bulldozers	80
	Truck	83 – 94
	Grabs	72 – 93
	Scaler	80 – 93
2. Asphalt the surface road		
	Paver	86 – 88
	Truck	83 – 94
	Compactors	74 – 77
3. Cleanup and making landscape		
	Bulldozers	80
	reverse Bucket	72 – 93
	Truck	83 – 94
	Forklift	72 – 84
4. Soil excavation and transportation		
	Bulldozers	80
	Truck	83 – 94
	Grabs	72 – 93

	Machinery and equipment	Noise level (dBA)
	Scaler	80 – 93
5. Developing technical infrastructure		
	Cranes	75 – 77
	Welder	71 – 82
	Concrete mixers	74 – 88
	concrete Pump	81 – 84
	Concrete vibrator	76
	Air Compressors	74 – 87
	Pneumatic tools	81 – 98
	Bulldozers	80
	Truck	83 – 94
	Forklift	72 – 84
	Paver	86 – 98
	Punchers	81 – 98

Source: Environmental Protection Commission U.S

Integrated noise levels of multiple noise sources can be calculated by the following formula:

$$L_{\Sigma} = 10 \lg \sum_i^n 10^{0,1 \cdot Li}$$

- L_{Σ} : Is the total noise level;
- Li : is the noise source i ;
- n : the total number of noise sources.

Calculated results of the noise level of the source are presented in Table 3.13.

Table 3.13. Calculated results of noise level (dBA) during construction period

No.	Activity	Noise 8 m distance from the construction site (dBA)
1	Ground leveling	87 – 96
2	Asphalt the surface road	88 – 95
3	Cleanup and making landscape	89 – 97
4	Soil excavation and transportation	86 – 98
5	Developing technical infrastructure	86 – 93

Noise levels are usually identified at an altitude of 1.2 to 1.5 m above the road surface at a range of noise sources usually from r_1 m (usually 8 m) from the noise source. The noise level will be reduced if the distance from the noise source is more than 8m. The noise level can be calculated based on the following formula:

$$\Delta L = 20 \lg \left(\frac{r_2}{r_1} \right)^{1+a} \text{ (dB)}$$

Among them: a system is affected by the topography of the ground to absorb and reflect noise, with:

- $a = -0.1$ with asphalt and concrete;
- $a = 0$ for bare ground without vegetation;
- $a = 0.1$ with grazing land.

Results of noise reduction with distance from the source of noise in construction, in the case of empty ground, no barriers, presented in Table 3.14.

Table 3.14. Calculated noise levels from construction activities.

No.	Description of activities	Source noise level (dBA)	Noise levels decrease by distance (dBA)			
			32 m	64 m	128 m	256 m
1	Ground leveling	87 – 96	81 – 90	75 – 84	69 – 78	63 – 72
2	Asphalt the surface road	88 – 95	82 – 89	76 – 83	70 – 77	64 – 71
3	Cleanup and making landscape	89 – 97	83 – 91	77 – 85	71 – 79	65 – 73
4	Soil excavation and transportation	86 – 98	80 – 92	74 – 86	68 – 80	62 – 74
5	Developing technical infrastructure	86 – 93	80 – 87	74 – 81	68 – 75	62 – 69

In Viet Nam, there are no specified standards for noise levels for construction work in general. However, according to standards issued for allowable noise level in the labor workplaces (According to Decision No. 3733/2002/BYT-QD) and the maximum permissible limit of noise in public and residential areas (QCVN 26:2010/BTNMT), the maximum allowable noise level is 70 dBA in residential areas, private homes, motels, administrative agencies and the lowest noise level of 45 dBA at hospitals, libraries, nursing homes, school from 21 pm to 6 am.

Overall, the Project Area from the nearest residential area of about 150 m, according to the above table, with this distance, the noise propagation was significantly reduced (less than 69-79 dBA), under the limit of TCVS 3733/2002/BYT (85 dBA). On the other hand, there are lots of trees around the Project Area, and therefore, the noise levels are expected to be decreased further.

(2). Impact cause by vibration

The vibration emission characteristics of equipment used in construction are shown in Table 3.15. This is the source of vibration generated from the operation of equipment and machinery for the construction works of the WDP.

Table 3.15. Vibration level of typical construction equipment, machinery

No.	Activity	Reference vibration level (dB)	
		10m away from the sources	30m away from the sources
01	Dredges	80	71
02	Bulldozers	79	69
03	Truck freight service	74	64
04	Wheelchairs	82	71
05	Compressors	81	71

Source: Mackernize, 1985

According to QCVN 27:2010/BTNMT – National technical regulation on vibration, the regulations on vibration level for construction activities in the residential areas, vibration shall not exceed 75 dB in the areas for commercial, manufacturing and services. The above table shows that, vibration meet the standard at the point 30 m away from the source, and accordingly, no significant impact is expected on the households nearby.

3.1.1.7. Impact caused by waste

(1). Impact caused by household solid waste

A worker working for the Project is estimated to discharges waste of 0.3 - 0.5 kg/day. So with 100 workers at the construction site each day, the total amount of garbage is about 30 - 50 kg/day. Organic waste (vegetables, fruit, rice surplus, etc.) makes up approximately 75%, and the rest is inorganic components (packaging, paper scrap, etc. according to the CEETIA, 2001.

(2). Impact caused by construction solid waste

In the construction period, construction solid waste to be generated includes cement, bricks, sand, rock, wood, paper. Estimated daily waste can be estimated based on the estimated material used (or weight) and estimated percentage of waste (Table 3.16).

Table 3.16. Estimated daily waste during construction period

No.	Type of material	Estimated daily waste
1	Coarse sand	0.86 m ³ /day
2	Fine sand	0.01 m ³ /day
3	Cables	-
4	Paint	-
5	Pebble, stone	1.57 m ³ /day
6	Iron, steel	0.15 tons/day
7	Cement	0.47 tons/day
8	Wooden tip	-
9	Plank	3.53 m ² /day

Source: Estimated base on EIA report of project Building WWTS of Ong Keo industrial zone

The building solid wastes are inert, but if it not managed properly, they may disturb construction activities on site.

(3). Impact caused by hazardous waste

The hazardous solid wastes include oil, grease, glue, paint, paint containers, gasoline, and batteries. As some practical experience, hazardous solid waste occupies about 5% of construction waste, which estimate about 01-02 kg/day. The amount of this waste contains harmful ingredients that can cause negative impacts on human health and the environment if it is not collected and properly disposed.

3.1.1.8. Impact on flora, fauna, and landscape

In preparation and construction period, almost trees in Project Area will be sawn, but the species that are prioritized for protection and endemic species are not included. Cutting trees will impact on habitats of some birds and animals. However, they can move to new habitats in other area of the park, and planting trees are planned after construction based on the regulation that at least 20% of the Project Area should have green area. Therefore, the impact on flora, fauna and biodiversity on preparation and construction period is insignificant.

The landscape will deteriorate, but it does not affect people much because the Project Area is new sapling and growing area, not the area to be visited. Addition, after the construction, the landscape will be rearranged according to the design of WDP.

3.1.1.9. Impact on social conditions

(1). Positive impacts

Construction period of the project could bring positive impact to the socio-economic development as follows:

- Mobilizing idle workforce in the area nearby,
- Contributing increasing temporary income for workers, and
- Stimulating development of some types of food services, activities, and other entertainment to serve to the demand of the workers staying in and around the Project area.

(2). Negative impacts

- Concentration workers, approximately 100 workers per day, during the construction period may cause negative impacts such as affray, gamble, drug evil, etc., that will affect people who live near construction site.

- Number of vehicles going in and out the Project Area will be increased, which may to increase traffic accidents risk.

3.1.2. Assessment of impacts during the operation period

3.1.2.1. Impact sources

(1). Impact sources relate to waste

During the project's operation period, related waste impact sources are presented in Table 3.17.

Table 3.17. Sources of waste related environmental impacts in the operation period

No.	Activity	Impact Sources
1	Daily operation with regular maintenance	Domestic waste, Domestic wastewater
2	Cleaning of reservoir (beginning of operation and once per 10 years)	Cleaning water, which may have concrete debris

(2). Impact sources not relate to waste

During the project's operation period, the non-waste related impact sources are identified in Table 3.18.

Table 3.18. Sources of none-waste related environmental impacts in the operation period

Activity	Impact Sources
Daily operation with regular maintenance	Noise from the water pumps

(3). Affected objects and scales

Relation of activities and affected objects is presented in Table 3.19.

Table 3.19. Affected objects and scale in the operation period

No.	Activity	Affected Object	Duration
1	Daily operation with regular maintenance	Generated waste Generated wastewater Noise pollution to neighborhood	Operation period
2	Cleaning of reservoir	Generated wastewater	One per 10 years

Remark: for all the activities,

-The affected scale: The Project Area

-Level of impact: Insignificant

3.1.2.2. Impact on air

(1). Air emissions from transportation activities

Transport of staff, chemicals, sewage sludge, garbage, etc. into or out of the Project Area will generate dust emissions. However, the impact to air is not significant.

(2). Chemical Vapor

Sodium hypochlorite (NaClO) and liquid chlorine will be used during operation, but it does not affect the environment significantly because the forecasted evaporation rate of about 0.05 to 0.1%.

3.1.2.3. Impact on surface water

(1). Production wastewater

Production wastewater: because almost water will be pump to plant, after adding NaClO and store in tank, the expected volume of wastewater is very small.

(2). Domestic wastewater

Essential components of the contaminants causing domestic wastewater including impurities, suspended solids (SS), organic compounds (BOD/COD), nutrients (N, P) and harmful bacteria.

When the project is put into operation stability, the maximum number of employees is 15 persons. If the average 1 employee use 120 liters/day of water, the wastewater flow of the project is about 1.8 m³ (water flow for 100% of water use).

Based on the coefficient of pollution each daily activities into the environment by the World Health Organization (WHO) set up as shown in Table 3.9, can predict pollutant load wastewater generated from operating activities of workers in Table 3.20.

Table 3.20. Estimated concentration of pollutants of wastewater in a day

No.	Pollutants	Load (kg/day)	The concentration of pollutants (mg/l)	QCVN 14:2008/BTNMT, column B
01	BOD ₅	0.68 – 0.81	370 - 450	50
02	COD	1.08 – 1.53	600 - 850	-
03	TSS	1.05 – 2.18	583 – 1,211	100
04	Oil and grease	0.15 – 0.45	83 - 250	-
05	Total nitrogen (N)	0.09 – 0.18	50 – 100	50
06	Ammonia (N-NH ₄)	0.04 – 0.07	22 – 39	10
07	Total phosphorus (P)	0.012 – 0.060	6.7 – 33.3	10

$Load = Quantity (g/person/day) \times 15 \text{ persons}$

$Concentration \text{ of pollutants} = Load/Volume, \text{ volume} = 1.8 \text{ m}^3$

QCVN 14:2008/BTNMT - National technical regulation on domestic wastewater, column B, with $K = 1.0$

Table 3.20 shows the pollutants concentration exceeded National technical regulation on domestic wastewater.

3.1.2.4. Impact caused by noise

During the operational period of the project, noise arising from sources such as pumps, compressors, generators. The noise level generated relatively frequent and continuous higher (average 80 - 85 dBA). Also, depending on the operational life cycle of equipment, the local noise can exceed 90 dBA, permitted standards.

Frequent exposure to 80 dBA noise source inhibits central nervous system, causing fatigue state of discomfort and reducing labor productivity.

3.1.2.5. Impact caused by waste

With the number of operators in the WDP is 15 people, with the generating coefficient is 0.3 - 0.5 kg/person/day, estimated volume of solid waste activities range from 4.5 to 7.5 kg/day.

Domestic solid wastes contain organic matter and non-biodegradable components such as papers, glass, metal, etc.. Management of solid wastes will be contracted with the functional units in Ho Chi Minh City.

3.1.2.6. Impact on social conditions

The followings are expected as positive impacts through realization of suitable water supply pressure and others, and no special negative impacts are predicted.

- Realization of water quality suitable for drinking water,
- Saving Energy,
- Reduction of facility cost in each household,
- 24h stable water supply, and
- Water storage for emergency.

3.1.2.7. Integrated assessment of environmental impacts

Impacts on environment in the preparation, construction, and operation periods are summarized using a matrix as shown in Table 3.21.

Table 3.21. Summary of environmental impacts

		Preparation & construction period	Land clearance	Soil excavation	Ground leveling	Material transportation	Developing technical infrastructure	Welding, cutting, painting, etc.	Installation of equipment	Workers' activities	Operation period	Daily operation with regular maintenance	Cleaning of reservoir
	Pollution												
1	Air pollution		A-	A-	A-	A-	A-	A-					
2	Water pollution						A-	A-		A-		B-	B-
3	Waste				A-	A-	A-	A-		A-		B-	
4	Soil contamination		B-	B-	B-		B-	A-					
5	Noise and vibration		A-	A-	A-	A-	B-	A-				A-	
6	Ground subsidence			A-	B-								
	Natural Environment												
1	Flora, fauna and biodiversity		A-	A-									
2	Hydrological situation												
3	Topography and geographical features		B-	B-			B-						
	Social Environment												
1	Local economy such as employment and livelihood		B+	B+	B+	B+	A+	B+		A+		A+	
2	Water use						B-	B-		A-		A+	
3	Social infrastructure and social service											A+	
4	Landscape		B-	B-			B-						
5	Working conditions including security for workers		B-	B-	B-	B-	B-	B-					
6	Accidents		A-	A-	A-	A-	A-	A-	B-			B-	

A+/-: Significant positive/negative impact is expected.

B+/-: Positive/negative impact is expected to some extent.

Blank: No impact is expected.

3.1.3. Risk assessment

3.1.3.1. Possible incidents during preparation and construction periods

(1). Work accidents

Overall, accidents can occur at any stage of the construction project. The cause of the accident on the construction site are:

- Environmental pollution can cause fatigue, dizziness, or fainting while working;
- Installation works, execution and materials transportation with high vehicle density can cause accidents, traffic accidents, ...

- Accidents due to the negligence of workers, lack of protective equipment, or due to lack of awareness about the strict compliance with safety rules of construction workers.

Investors will be interested in the application of measures to ensure the worker safety.

(2). Explosion incident

Fire incidents can occur in the case of transportation and storage of fuels, or due to the lack of safe temporary power supply system, causing loss of life and property during construction period. The reason may be determined as follows:

- The fuel storage serve to temporary construction (gasoline, diesel oil, fuel oil, paint, glue, etc.) are possible sources of explosion. When problems occur that can cause serious damage to life, economy and environment;
- Temporary power supply system for the machinery, construction equipment can cause electrocution, shock, fire ... economic damages or accidents to workers;
- The use of heating equipment during construction (heating, asphalt, welding, etc.) can cause fire, burns or accidents if no preventive measures.

These incidents can happen any time, so investors will apply measures to prevent, control effectively to minimize the negative impact.

(3). Traffic accidents

Traffic accident can occur in the construction process, damage to property and lives. The cause may be due to vehicle is not technical insurance or non-compliance with the control of traffic safety rules. This accident was entirely preventable by checking the technical condition of transportation and propagating to raise awareness complying with traffic rules of drivers and workers.

(4). Risk of collapsed subsidence during the construction works

The process of construction such as tank and pump chamber will exist subsidence risks. When incidents occur, not only harmful effects on the environment and also threatens human lives.

Incidents landslides during the rainy season may occur during excavation, foundation construction of tanks.

3.1.3.2. Possible incidents during operation period

(1). Work accidents

Work accidents can occur during operation at the WDP. The main cause of accidents is:

- The observance of safety rules is poor;
- The carelessness of workers in control machinery process, equipment and vehicles;
- Health status of workers are not well (or due to overwork) lead to fall asleep at work.

(2). Leaking fuel and raw material

Leaking fuel, liquid or gas chemicals will affect human health, impact on flora and fauna. Leaks can lead to accidents such as fire, explosion, oil spills, chemical spills etc. causing major damage to economic - social as well as ecological systems in the region and surrounding areas.

(3). Fuel and chemical fire incidents

Fire incidents can occur in the case of transportation and storage of fuel or electric shock, causing loss of life and property of the business and residential communities around. It is possible to identify the source of explosion as follows:

- The storage of fuel (gasoline, diesel oil, fuel oil, natural gas ...), the storage of chemicals (paints, glues, varnishes ...);
- Transformers, Power Supply System in the WDP.

Investors will apply the integrated measures to prevent and timely rescue incidents to minimize the negative impact on the environment.

3.2. REMARKS ON THE LEVEL OF DETAIL AND RELIABILITY OF ASSESSMENTS

The used assessment methods and levels reliability of the methods in this report are given in Table 3.22.

Table 3.22. Used assessment methods and levels reliability

	Method	Applied in	Purpose	Reli- ability	Cause
1	Statistical methods	Mainly in 2.1.1, 2.1.2, 2.1.3, 2.2, etc.	Synthesis of data and information	High	Based on official statistics of the province.
2	Field sampling and laboratory analysis method	2.1.4	Assess the current state of environment	High	- Equipment for sampling and analysis of new and modern - Based on standard sampling methods
3	Rapid assessment method by WHO, 1993	3.1.1.2, 3.1.1.3, 3.1.2.3	Assess the impact on air and water environment	Medium	Based on the pollution coefficient of World Health Organization set up is not really consistent with the conditions of Vietnam
4	Comparison method	2.1.4, 3.1.1.2, 3.1.1.3, 3.1.1.6, etc.	Compare to The National Technical Regulation	High	The analytical results have high reliability
5	The method of checklist and matrix	Mainly in 3.1.1.1, 3.1.1.7, 3.1.1.8, 3.1.2.1, 3.1.2.7, etc.	Listing and setting matrix to easily review and assess	Medium	The method evaluates only semi-quantitative or qualitative, based on the subjective evaluation
6	Public consultation method	Chapter 6	Assess the opinion of public about project	High	Based on the opinion of the Fatherland Front Union and People Committee of commune

CHAPTER 4: MEASURES TO PREVENT OR MITIGATE NEGATIVE ENVIRONMENTAL IMPACTS AND TO PREVENT AND COPE WITH ENVIRONMENTAL INCIDENTS

4.1. MEASURES FOR THE PREVENTION AND MINIMIZATION OF THE PROJECT'S NEGATIVE IMPACTS ON ENVIRONMENT

4.1.1. During the preparation and construction period

The following measures are proposed to mitigate the impacts described in Chapter 3.

4.1.1.1. Air Pollution Control

- To use only registered vehicles, which has met the standards and regulations on air emissions;
- To spray water 2 times/day at the construction site, surrounding the transport route and gathering of materials, machinery, construction entrances, dumping area and traffic hubs. This reduces loose dust, soil sand which can be dispersed by wind into the air (especially during the dry season in sunny and windy days);
- To cover the top of the transport equipment, construction materials storage sites and rinsed through before leaving the site;
- To make schedule to avoid transport during sensitive hours (e.g. peak hours, mid-night), and to regulate the speed for vehicles (<30km/h) to minimize noise generation, especially when passing through residential areas during such hours;
- To carry out maintenance on vehicles and construction equipment to acquire valid inspection certificate, and minimize noise, vibration and emissions arising out;
- To organize systematically the traffic in and out the field in accordance with regulation and of real-time local traffic;
- To plan transportation routes to and from the Project Area so as to minimize the dust pollution;
- To prohibit incineration of wastes in and around the Project Area.

4.1.1.2. Water Pollution Control

- To make it a basic rule not to discharge directly wastewater into Nhieu Loc - Thi Nghe canal;
- To store wastewater in concrete tanks which are temporary built,
- To separate oil of cleaning wastewater before store in this tank;
- To make the licensed unit to vacuum wastewater and carry it to a designated area for treatment;
- To demolish the tanks after completion of construction;
- To let rainwater drain into the collecting system and filter the rainwater before discharging into Nhieu Loc-Thi Nghe canal.

4.1.1.3. Soil Contamination Control

- To manage wastes properly shown in 4.1.1.5.

4.1.1.4. Noise and vibrations control

- To use well-maintained vehicles and construction machines, which are licensed by the Registration Stations and do not generate noise and vibrations above allowable limits;
- To comply with the standards and maintenance schedules of machines;
- To comply with the speed of vehicles and machineries, which operating within the construction area to less than 5km/h;
- To install noise isolation devices into the machines with high noise levels, such as excavators,

compressors, excavator etc.;

- To use appropriate noise protection gears (helmet, ear plug) to avoid noise impact;
- To comply with freight tonnage regulations;
- To check the level of noise, vibration during construction, thereby setting the appropriate schedule to achieve noise levels, vibration as permitted by regulations QCVN 26:2010/BTNMT, QCVN 27:2010/BTNMT;
- To avoid intensive use of heavy machines in the same time and space, because this may cause resonance of noise and vibration.

4.1.1.5. Solid Waste Management

(1). Domestic solid waste

- To install 2-3 waste bins with a capacity of 100-liter each at construction areas, construction camp and canteens;
- To contract with a local licensed unit/company to collect, transport and process solid wastes as regulated.

(2). Construction solid waste

- To collect waste such as damaged wood planking, broken protective devices, cement bags, protective gear, head piece of steel, welding rods, etc. at the specified location on the site, and sell them to be recycled as much as possible.
- To use some types of waste such as rubble, rocks etc. for foundation levelling.

(3). Hazardous waste

- To collect hazardous wastes such as oily rags, wasted oil, packaging containing oil, paint, glue in special tanks or cans with lids, in a warehouse with roof and waterproofing.
- To transport and store in compliance with Circular 12/2011/TT-BTNMT on hazardous waste regulations.

4.1.1.6. Flora, fauna protection

- To plan to cut trees not to affect the surrounding landscape;
- To use barrier to cover construction site;
- To design WDP that green area is the largest (>20%) and rearrange to make new landscape.

4.1.1.7. Mitigation of social negative impacts

- To ban scuffle, gambling, etc. related to workers inside and outside the Project Area;
- To propagate laws/regulations to workers;
- To coordinate with authorities if necessary.

4.1.2. During the operation period

The following measures are proposed to mitigate the impacts described in Chapter 3.

4.1.2.1. Air Pollution Control

- To build the WDP in accordance with industry safety, industrial hygiene, to maintain the necessary ventilation with natural ventilation and cooling fans;
- To provide labor protection under the provisions for workers and supervise the use of personal protective equipment during work;
- To provide sufficient information about sanitation, occupational safety for workers;

- To plant widespread high trees to create landscapes and dispersion of air pollution;
- Not to start the engine of the car while waiting for materials, chemicals, sewage sludge, garbage;
- To use a lid or veil to cover when transporting waste and chemicals;
- To ensure well technical condition of vehicle;
- To use NaClO only in laboratory with vapor absorption system.

4.1.2.2. Water pollution control

- To install a concrete tank to collect all wastewater from operation, and to make arrangement so as to vacuum the wastewater periodically to be treated properly by a licensed unit/company.

4.1.2.3. Noise control

- To install anti-vibration cushion around machinery that produce loud noise. Compressors will be located in soundproof chambers;
- To soundproof the major noise source;
- To maintain devices properly (normally every 4-6 months for new devices, every 3 months for old ones)
- To plant trees on the campus to spread out the sound waves.

4.1.2.4. Solid and hazardous waste control

- To employ the same methods as in the construction period, as for the domestic waste and the hazardous waste.

4.2. MEASURES FOR PREVENTION AND RESPONSE TO ENVIRONMENTAL RISKS AND INCIDENTS

4.2.1. During the preparation and construction period

4.2.1.1. Work accident prevention

- To train workers about workplace safety in construction. Project owner will also cooperate with the Occupational Safety Division within Department of Labor, War Invalids and Social Affairs of Ho Chi Minh city to organize the training in construction;
- To enforce the wearing of protective gear for employees in accordance with the specific works in the work site;
- To develop the plan to reduce the impact of pollutants on worker's health at the WDP;
- To ventilate and to light in confined and narrow areas to ensure the microclimate factors and working conditions for workers.

4.2.1.2. Explosion prevention

- To train to response to fire-related incidents; fully equip with fire prevention equipment in accordance with the applicable law;
- To store types of solvents and flammable fuel in separate isolation repositories, away from potential sources of ignition and spark-ignition;
- To promulgate rules on prohibiting employees to no smoking, or cause ignition in these areas with high risk of flammable;
- To apply explosive mitigation devices at the fuel storage area at the project's site;
- To cooperate with Fire Prevention and Fighting Department of Ho Chi Minh City when the fire and explosion incident happens.

4.2.1.3. Traffic Control

- Only to use the vehicle with the valid registration certificate to meet the standards and regulations;
- To promulgate that the speed of vehicles and machinery within the construction area is limited to 5 km/h;
- Not to exceed freight tonnage regulations;
- To set up transportation plan, with coordination of vehicle traffic within the appropriate area to avoid the high concentration of transportation at the same time or the same location

4.2.2. During the operation period

4.2.2.1. Work accident prevention

(1). Safety equipment

- To install lightning protection system at the highest position of the WDP. This will ensure safety against lightning strikes during the rainy season;
- To prepare fully security system, wiring and grounding safety, inspected prior to operation.

(2). Labor safety for workers

- To train workers about labor safety in each operating stage of WDP;
- To coordinate with the Safety Committee of the Department of Labor, War Invalids and Social Affairs of Ho Chi Minh City training safety rules and operation of specific equipment WDP;
- To check periodically health's workers in the WDP.

4.2.2.2. Measures to prevent and respond to fuel leaks

- To check regularly the safety of the fuel tank to repair, replace and fix leaks promptly fuel;
- To put fences surrounding areas fuel tank, tank placement by 5-10m. Placing warning signs, prohibition signs of fire, combustible materials close to the area;
- To have sufficient legal status in transportation of petroleum, chemicals such as trucks, etc., as well as to meet safety standards, technical regulations applicable to transportation on roads;
- To remind employees to comply with Fire Prevention and Fighting (FPF) regulations during work;
- To prepare for prevention, rescue incidents, under supervision and strict inspection systems.

4.2.2.3. Fire and explosion prevention

(1). Fire safety measures

- To provide fire-fighting equipment; fire protection systems around the area;
- To train to handle and response against fire and explosion threats;
- To store the combustible fuels in separate isolated locations, away from potential sources of ignition. Installing safety valves, temperature monitoring devices degrees, fire alarm and automatic fire sprinkle in the solvent storage tank;
- To check and maintaining regularly fire alarm systems, communication systems, the fire fighting vehicles;
- To prevent smoking in the areas with explosive or flammable risks.

(2). Equipment

- To prepare water valves for fire-fighting; including the water tower and pond with fire pumps;

- To prepare personal foam extinguisher; and other fire-fighting equipment in all functional areas;
- To prepare hood and exhaust fan for ventilation;
- To design and install safety devices for electrical system, regular inspection to prevent short-circuit in areas where flammable such as raw material warehouse, chemical warehouse;
- To install fire alarm systems, water tanks, sand bags, fire extinguishers and protection gears in the storage area of flammable materials and chemical etc..

(3). Fire and explosion incident's rescue

- To install fire alarm systems at places having flammable risks, testing and maintaining periodically communication systems, alarm, and always in a state of operational readiness;
- To check and registering the machinery working at high temperatures and pressures;
- To store fuel in isolated repositories, far away from potential sources of ignition and spark. Safe distance between the buildings is 12-20m for fire truck to easily access.

(4). Lightning protection

- To install lightning protection systems on the highest position of the WDP to attract lightning as rain storm;
- To install improved lightning system, static electricity buildup and collection system under the new technology to a high level of safety for the operation of the project;
- To install ground shock resistance $<10\ \Omega$ when the soil resistivity of $<50,000\ \Omega/\text{cm}^2$, and ground resistors shock $>10\ \Omega$ when the soil resistivity of $>50,000\ \Omega/\text{cm}^2$;
- To install general lightning protection systems for the entire Project Area.

CHAPTER 5: ENVIRONMENTAL MANAGEMENT PROGRAM

5.1. ENVIRONMENTAL MANAGEMENT PROGRAM

Environmental management will be included in the contract between the Project owner and the contractor. So the contractor is required to assign a responsible person as the Project Environmental Manager.

After construction period, DONRE of Phu Nhuan district will examine real environmental management program in the Project Site. Additionally, the Project Environmental Manager will write environmental monitoring report every 3 months periodically to DONRE of Phu Nhuan district. DONRE of Phu Nhuan district will monitor the environment of project through this report, and control it if it has problems.

Environmental Management Program in the preparation and construction period, and the operation period are shown in Table 5.1 and 5.2 respectively.

Table 5.1. Environmental management program (Preparation and Construction period)

Activity	Environmental impact	Main measures to mitigate negative impact	Expenditure	Agency responsible for monitoring
Land clearance; Soil excavation; Ground leveling	Air pollution Noise and vibration Waste Flora, fauna and biodiversity	To use only registered vehicles To spray water 2 times/day at the construction site To plan transportation routes to and from the Project Area To prohibit incineration of wastes in and around the Project Area To store wastewater in concrete tanks which are temporary built To use appropriate noise protection gears To install 2-3 waste bins at construction areas To contract with a local licensed unit/company to collect, transport and process solid wastes To design WDP that green area is the largest	7,000,000 VND	Department of transport Environment police PC36
Material transportation	Air pollution Noise and vibration Waste	To use only registered vehicles To spray water 2 times/day at the construction site To plan transportation routes to and from the Project Area To store wastewater in concrete tanks which are temporary built To install 2-3 waste bins at construction areas To contract with a local licensed unit/company to collect, transport and process solid wastes		Department of Construction DONRE
Developing technical infrastructure	Air pollution Water pollution Waste Landscape	To carry out maintenance on vehicles and construction equipment To build concrete tanks to collect waste water. To contract with agency, which has periodical collecting function To plan to cut trees not to affect the surrounding landscape	30,000,000 VND	DONRE
Welding, cutting, painting, etc.	Air pollution Water pollution Waste Soil contamination Noise and vibration	To carry out maintenance on vehicles and construction equipment To build concrete tanks to collect waste water. To contract with agency, which has periodical collecting function To use appropriate noise protection gears	Belong to project's expenditure	DONRE
Installation of equipment	Waste Accidents	To install 2-3 waste bins at construction areas To enforce the wearing of protective gear To develop the plan to reduce the impact of pollutants on worker's health	Belong to project's expenditure	DONRE
Workers' activities	Water pollution Waste	To build concrete tanks to collect waste water. To install 2-3 waste bins at construction areas To contract with agency, which has periodical collecting function		DONRE

Remark: Responsible for implementation is Project Environmental Manager for all the activities.

Table 5.2. Environmental management program (Operation period)

Activiy	Environmental impact	Main measures to mitigate negative impact	Expenditure	Agency responsible for monitoring
Daily operation with regular maintenance	Air pollution Water pollution Waste Noise and vibration Accidents	To build the WDP in accordance with industry safety, industrial hygiene To provide labor protection under the provisions for workers To plant widespread high trees to create landscapes To use a lid or veil to cover when transporting waste and chemicals To install a concrete tank to collect all wastewater from operation To maintain devices properly To install anti-vibration cushion around machinery To install 2-3 waste bins at construction areas To contract with agency, which has periodical collecting function	30,000,000 VND	DONRE
Cleaning of reservoir	Water pollution	To install a concrete tank to collect all wastewater from operation To filter dregs before discharge out.		

Remark: Responsible for implementation is Project Environmental Manager for a the activities.

5.2. ENVIRONMENT MONITORING PROGRAM

Project Environmental Manager will carry out the periodical environmental quality monitoring. Environmental condition will be monitored regularly and the obtained data will be stored. The following environmental quality monitoring program will be applied.

5.2.1. In construction period

5.2.1.1. Air monitoring

Selective indicator: Dust, SO₂, NO₂, CO, H₂S, NH₃, noise;

Monitoring site: 2 sites at project's construction area.

Monitoring and analysis frequency: 6 months per time.

Collecting equipment and analysis method: standard method.

Comparative standard: Vietnam environmental regulation (QCVN 05:2013/BTNMT, QCVN 06:2009/BTNMT, QCVN 26:2010/BTNMT).

The Monitoring sites in construction period are presented in Figure 5.1.

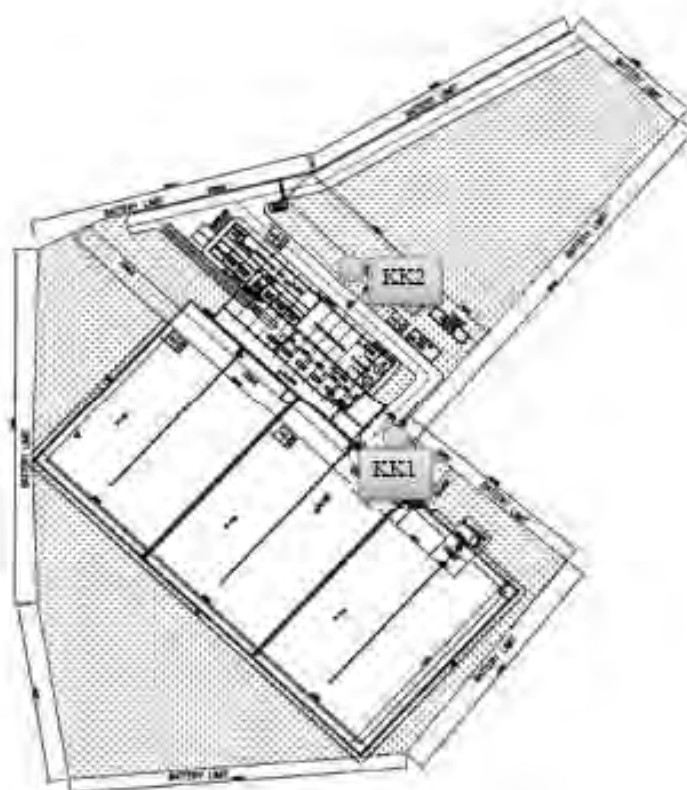


Figure 5.1. Monitoring Sites for Air Quality

5.2.1.2. Water monitoring

All the wastewater will be collected in concrete tanks and vacuumed periodically to be treated properly by a licensed unit/company, therefore, there is not need to monitor surface water quality. The Project Environmental Manager monitors just to ensure the entire wastewater will be collected into tanks, not leaked and discharged to environment.

5.2.1.3. Solid waste monitoring

The domestic solid waste will be weighed daily. The periodic report (every 3 months) will be sent to DONRE of Phu Nhuan district.

5.2.2. In operation period

5.2.2.1. Air monitoring

Selective indicator: Dust, SO₂, NO₂, CO, H₂S, NH₃, noise

Monitoring site: 2 sites around project's area

Monitoring and analysis frequency: 6 months per time

Collecting equipment and analysis method: standard method

Comparative standard: Vietnam environmental regulation (QCVN 05:2013/BTNMT, QCVN 06:2009/BTNMT, QCVN 26:2010/BTNMT).

5.2.2.2. Water monitoring

All the wastewater will be collected in concrete tanks and vacuumed periodically to be treated properly by a licensed unit/company, therefore, there is not need to monitor surface water quality. The Project Environmental Manager monitors just to ensure the entire wastewater will be collected into tanks, not leaked and discharged to environment.

5.2.2.3. Solid waste monitoring

The domestic solid waste will be weighed daily. The periodic report (every 3 months) will be sent to DONRE of Phu Nhuan district

CHAPTER 6: PUBLIC CONSULTATION

As specified in paragraph 8, article 20 of the Law on Environmental Protection passed on November 29th 2005 by National Assembly of Socialist Republic of Vietnam and is effective from July 1st 2006 and as the request of Circular No. 26/2011/TT-BTNMT, owner of the project submitted the Document No. 2612/TOYO-JP on Dec 26th 2014 regarding the suggestion of environmental impact assessment of the project "Gia Dinh water distribution plant of capacity 211,500 m³/day" in Gia Dinh Park in Ward 9, Phu Nhuan district, Ho Chi Minh City. Content of document is informed about the basic content of the project, the environmental impact of the project, the mitigation measures applied and suggest the Agency for comments in document.

The following is the comments of the Agencies on the project.

6.1. COMMENTS OF COMMUNAL LEVEL PEOPLE'S COMMITTEES

After reviewing the notice of the categories of major investment, environmental issues, the solution of environmental protection projects, representative of People's Committee of Ward 9 – Mr. Phe Van Nguyen replied directly as follows:

- Ward 9 appreciate the purpose of the project, the benefits that the project brings. However, the owner of the project only provides a report on the agreement between the People's Committee of Ho Chi Minh City with the Japan International Cooperation Agency (JICA) for the preparation of the project.
- The project owner should provide a full of legal documents related to the project, then Ward 9 will respond to consultations about the impact of the project in writing as prescribed by law.

6.2. COMMENTS OF MANAGEMENT BOARD OF GIA DINH PARK

Management Board of Gia Dinh Park has not written replies, because official decision has not been made yet.

6.3. COMMENTS OF REPRESENTATIVE OF COMMUNITY

A household survey was conducted for 20 households who live near the Gia Dinh Park, through interview with respective household representatives. The results can be summarized as below.

- Supply water: all households (20/20) were using well tape waters. The Nhieu Loc - Thi Nghe canal is absolutely not used for domestic, irrigation and livestock purposes;
- Status of air pollution: according to feelings of the majority of household (16/20), the air is not polluted. Among those, there are some people (4/20) living downstream along The Nhieu Loc-Thi Nghe canal have felt unpleasant odors, but odors arising primarily from seafood processing odor;
- State of water pollution of the Nhieu Loc Thi Nghe canal: According to the majority of household (15/20), the Nhieu Loc Thi Nghe water canal is polluted.
- For groundwater quality: According to the majority of household (20/20), who extracted and used the ground water, there was no groundwater pollution problem.
- For health situation: the majority of household (15/17) have no respiratory-related issues, intestinal or skin diseases. But there are some household (2/17) to have sinus disease;
- For proposals: the majority of household (19/20) who did not have recommendations about the state of the environment in which they live. One household (1/20) living near the project area have proposed to improve the stream before the rainy season to avoid flooding when heavy rains happened and to strictly treat the wastewater before discharging into the receiving water body.

6.4. RESPONSE FROM PROJECT OWNER TO OPINIONS, RECOMMENDATIONS, AND REQUESTS LISTED ABOVE, INCLUDING COMMITMENTS TO ADDRESS SPECIFIC CONCERNS.

6.4.1. Undertaking Measures for Adverse Impacts Mitigation

Toyo Engineering Corporation - The project owner of WDP commits to implement the measures to control and minimize the adverse impacts on the environment and the socio-economic development during construction and operation phases as specified in the EIA report.

Project owner will adopt the measures to prevent incidents and reduce pollution as outlined in the EIA report, while to enhance the staff training to improve the environmental management capacity of the project, to ensure that no environmental pollution problems arising .

During the project operation, Toyo Engineering Corporation will establish a management board, which is responsible for the activities such as management of project activities, ensuring environmental sanitation and repairing infrastructure systems, ensuring regional security etc.

The project owner will coordinate with agencies specializing in the design and construction of pollution control systems to achieve the level of pollution in accordance with environmental regulations and response against environmental incidents.

During the project construction as well as operation phases, if the incident arise and cause the damage to residential areas surrounding the project, the project owner will commit to compensate the damage caused by the project.

The project owner commits to obey the legal regulations on the management of waste and hazardous waste before the project went into operation.

The project owner commits to complete the environmental pollution treatment facilities and the environment pollution control systems before the project went into operation.

The project owner commits to seriously operate the WDP, regularly monitor and report to the functional agencies.

6.4.2. Commitment for Implementation of Environmental Protection Measures and Provisions

6.4.2.1. Commitment to meet Vietnam environmental standards/regulations during construction and operation phases:

The project owner commit to ensure the Vietnam environmental standards/regulations compliance during the project's construction and operation, including:

(1). Wastewater

After wastewater is treated in septic tanks and SBR tank will lead to sewage system to Nhieu Loc canal.

(2). Domestic solid waste and hazardous waste

- Collecting and transporting the solid wastes to the disposal area in compliance with requirements on environment sanitation;

- Solid waste: All solid waste volume (domestic and production solid wastes) will be collected, sorted and contracted with Ho Chi Minh City Urban Environment Service Company Limited or authorised companies for collecting, transporting and processing in accordance with safety requirements;

- Hazardous and non-hazardous solid wastes will be collected and transported to the disposing site in accordance with safety requirements to commit compliance with Decree 59/2007/ND-CP on the management of solid waste; Circular 12/2011/TT-BTNMT dated 14 April 2011 on hazardous waste

management;

- Sludge from the WDP will be tested in the analysis laboratories then be disposed according to the regulations.

6.4.2.2. *Commitment to implement all environmental protection measures and general provisions*

Project owner commits to meet the requirements on environmental protection as follows:

- To implement fully and accurately the contents of the approved environmental impact assessment report;
- To protect public and worker's health;
- To set up a professional division qualified to perform the task of environmental protection;
- To undertake the environmental protection measures and monitoring during the construction and operation phases according to Circular No. 26/2011/TT-BTNMT passed on July 18th 2011 of the Ministry of Natural Resources and Environment;
- To commit the compensation and remediation of environmental pollution in case of environmental risks occurred when implementing the project;
- To commit the environmental restoration in accordance with the law on environmental protection after the project operation ended.

Project owner commits to take full legal responsibility before Vietnam law for violations of the International Convention, Vietnam Standards and Regulations if incident happened to cause environmental pollution.

CHAPTER 7: ANALYSIS OF ALTERNATIVE

There are two alternatives for the type of the WDP: semi-underground WDP and Underground WDP. Comparison between those two alternatives is shown in Table 7.1.

Table 7.1. Comparison between Two Alternatives

	Semi-underground WDP	Underground WDP
Overview	Half of building and reservoir is located underground and the other half is above ground (See Figure 6.1).	The building and reservoir are located underground. Only respective entrances for the vehicles and people are above ground (See Figure 6.2).
Initial Cost	432 Bilion VND (20,181,000 USD)	509 Bilion VND (23,781,000 USD) *17.8% higher than Semi-underground WDP
O & M Cost	Required costs are the same.	
Impact on landscape	The outlook of the WDP is different from other part of the Park, but the impact is considered to be insignificant.	Change of landscape is small.
Mitigation measures for above issue	To make the outlook design so as to fit the surrounding environment	No measures are needed.
Impact on other environment	All the trees in the construction site will be cut first. Then trees will be planted, but the area planted with trees is smaller compared to the case of Underground WDP.	All the trees in the construction site will be cut first. Then trees will be planted, and much area of the construction site will be covered with trees.
Mitigation measures for above issue	No special measures are needed, because there is a rule that 20% of the project site should be covered with trees, and this rule will be observed.	No measures are needed.
Institutional, training and monitoring requirements	Requirements are the same.	



Figure 7.1. Conceptual Drawing of Water Distribution Plant (WDP) at Gia Dinh Park

Source: Osaka Municipal Waterworks Bureau



Figure 7.2. Example of an Underground Water Distribution Plant

As shown in Table 7.1 the impacts on environment including landscape is larger for semi-underground WDP, but the the impacts are not significant. On the other hand, as for cost, underground WDP is higher than semi-underground one by 17.8%. Therefore, it has been decided to adopt semi-underground type, judged in a comprehensive manner.

Those are both ‘with project’ consition. In the ‘without project’ situation, no cost will be required, no environmental impact including change of landscape will occur. However, the two major problems on water distribution in HCMC: low water pressure in distribution system, and difficulty to control water flow and pressure remains, which should be avoided.

CHAPTER 8: IMPLEMENTATION SCHEDULE AND COST ESTIMATES

8.1. IMPLEMENTATION SCHEDULE

The implementation schedule is shown in Figure 8.1. The operation period of the WDP is planned to be 20 years.

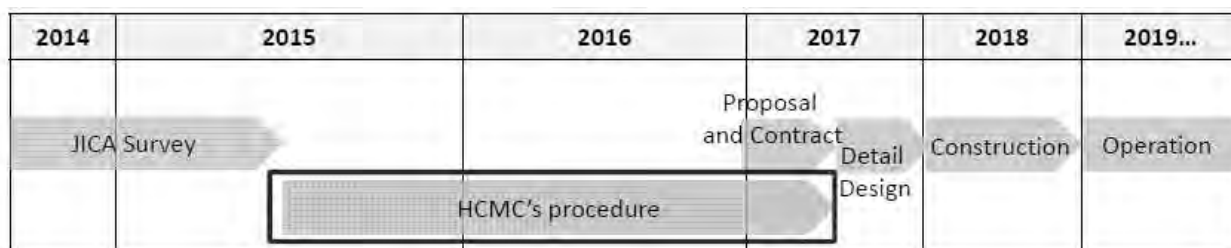


Figure 8.1. The implementation schedule

8.2. COST ESTIMATES OF ENVIRONMENTSL MONITORING PLAN

8.2.1. Environmental monitoring plan

Environmental monitoring plan is shown in Table 8.1.

Table 8.1. Environmental monitoring plan

Component monitoring	Selective indicator	Monitoring site	Monitoring time
Construction period			
Air	Dust, SO ₂ , NO ₂ , CO, H ₂ S, NH ₃ , noise	2 sites at the Project Area	Once per 6 months
Solid waste	Weight of solid waste	All of the Project Area	Daily (once per 3 months)
Operational period			
Air	Dust, SO ₂ , NO ₂ , CO, H ₂ S, NH ₃ , noise	2 sites at the Project Area	Once per 6 months
Solid waste	Weight of solid waste	All of the Project Area	Daily (once per 3 months)

8.2.2. Environmental monitoring cost during construction period

8.2.2.1. Air monitoring cost

Air monitoring cost is shown in Table 8.2.

Table 8.2. Air monitoring cost in construction period

No.	Parameters	Unit price (VND)	Number of samples (sample)	Frequency of monitoring (time/year)	Total cost (VND/year)
1	Dust	200,000	2	2	800,000
2	SO ₂	300,000	2	2	1,200,000
3	NO ₂	300,000	2	2	1,200,000
4	CO	300,000	2	2	1,200,000
5	H ₂ S	300,000	2	2	1,200,000
6	NH ₃	300,000	2	2	1,200,000
7	Noise	50,000	2	2	200,000
Total					7,000,000

8.2.2.2. Solid waste monitoring cost

Total expenditure of solid waste monitoring: 8 million VND/year.

8.2.3. Cost for environmental monitoring during operation period

8.2.3.1. Air monitoring cost

Air monitoring cost is shown in Table 8.3.

Table 8.3. Air monitoring cost in operation period

No.	Parameters	Unit price (VND)	Number of samples (sample)	Frequency of monitoring (time/year)	Total cost (VND/year)
1	Dust	200,000	2	2	800,000
2	SO ₂	300,000	2	2	1,200,000
3	NO ₂	300,000	2	2	1,200,000
4	CO	300,000	2	2	1,200,000
5	H ₂ S	300,000	2	2	1,200,000
6	NH ₃	300,000	2	2	1,200,000
7	Noise	50,000	2	2	200,000
Total					7,000,000

8.2.3.2. Solid waste monitoring

Total cost of solid waste monitoring: 8 million VND/year.

8.2.4. Total cost of Environmental Quality Monitoring

Annual environmental monitoring cost of the project is summarized in the Table 8.4.

Table 8.4. Annual environmental monitoring cost of the project

No.	Contents	Cost (VND/year)
I	Construction Period	15,000,000
1	Air monitoring	7,000,000
2	Solid waste monitoring	8,000,000
II	Operation Period	15,000,000
1	Air monitoring	7,000,000
2	Solid waste monitoring	8,000,000

The total cost of environmental monitoring during construction period is 15,000,000 VND/year. The total cost of environmental monitoring during operation period is 15,000,000 VND/year.

8.3. IMPLEMENTATION FORMS AND REPORTING REGIME

Environmental monitoring plan will be implemented by Project owner in collaboration with the consultant. The results of environmental quality monitoring will be periodically reported 02 times/year to the Division of Natural Resources and Environment of Phu Nhuan district and the relevant agencies during construction and operation period.

CHAPTER 9: CONCLUSIONS, RECOMMENDATIONS, AND COMMITMENTS

9.1. CONCLUSIONS

The conclusion based on the analysis and evaluation of the impacts of the project is as follows.

- It is acceptable to build the proposed facility in the proposed site is acceptable, if proper mitigation measures are provided.
- The process of construction and operation of the project may cause negative impacts on the environmental and socio - economic conditions without measures to prevent or control them.
- However, the project owner will implement environmental mitigation and environmental remediation measures outlined in this EIA report.
- The project owner will consult with the authorities in the process of engineering design and construction of pollution control systems.

9.2. RECOMMENDATIONS

It is recommended that the local authorities support the project owner to implement the project activities, and environmental protection measures during construction and operation periods.

9.3. COMMITMENTS

9.3.1. Commitment in construction period

The project owner commits to implement measures to mitigate or prevent adverse impacts in the construction period, as described in Chapter 4. Those measures are:

- Air Pollution Control
- Water Pollution Control
- Soil Contamination Control
- Noise and vibrations control
- Solid Waste Management
- Flora, fauna protection
- Mitigation of social negative impacts
- Work accident prevention
- Explosion prevention
- Traffic Control
- Air monitoring
- Water monitoring
- Solid waste monitoring.

9.3.2. Commitment in operational period

The project owner commits to implement measures to mitigate or prevent adverse impacts in the operation period, as described in Chapter 4. Those measures are:

- Air Pollution Control
- Water Pollution Control
- Noise Control
- Solid Waste Management

- Work accident prevention
- Measures to prevent and respond to fuel leaks
- Fire and explosion prevention
- Air monitoring
- Water monitoring
- Solid waste monitoring.

9.3.3. Commitment to comply with the environmental standard and regulations

The project owner commits to comply with all Vietnam's environmental regulations during the construction and operation period of the project, as shown below.

- Ambient air quality:
 - QCVN 05:2013/BTNMT: National Technical Regulation on Ambient Air Quality;
 - QCVN 06:2009/BTNMT: National Technical Regulation on hazardous substances in ambient air.
- Noise
 - QCVN 26:2010/BTNMT: National Technical Regulation on Noise;
 - Decision No. 3733/2002/QĐ-BYT of 10 October 2002, providing for 21 occupational safety standards, five principles, and seven indicators on occupational hygiene.
- Vibration
 - QCVN 27:2010/BTNMT National Technical Regulation on Vibration ;
- Solid waste
 - Circular No. 12/2011/TT-BTNMT dated April 14th, 2011, stipulating hazardous waste management;
 - QCVN 07:2009/BTNMT - National Technical Regulation on Hazardous Waste Thresholds.

9.3.4. Commitment for compensation and recovery

The project owner will take full responsibility for compensation and recovery, if they may damage environment through construction or operation of the proposed facility.

REFERENCE MATERIALS AND DATA

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5. Small--Scale Domestic Wastewater Treatment Technology, Tran Duc Ha, Scientific and Technical Publishers, 08/2006;
6. Hazardous Waste Managementi, Lam Minh Triet – Le Thanh Hai, Build Publisher, năm 2006;
7. Statistical Yearbook of Ho Chi Minh City 2013, Ho Chi Minh City Department of Statistics, 2013.

添付7-1. Study for SAWACO 1/2 grade pipeline installation plan

SAWACO Planning Pipelines												JICA Study Model for 2025			
No.	Route	Budget	Diameter	Unit Price	Revised Budget	Difference	Remarks	District	Grade	Diameter	Length	Diameter	Length	JICA Study Team's comments	
SAWACO's Investment Plan															
TD3-1	Duong Ung Van Khien	75,211	800	24	50,141	25,070	calculated as 2/3	Q.BT	1	800	3,200	800		Partly, no need, *Distribution network for Phuong27, 28 in Binh Thanh District might be studied with TD3-12. EX-2	
TD3-2	Duong Vanh Dai 2	854,904	1,800	93	591,273	263,631	1800 > 1500	Q.9	1	1,800	9,200	1,500		The Diameter might be decreased	
TD3-3	Duong Vanh Dai 2	346,386	1,500	64	346,386	0		Q.9	1	1,500	5,400	1,500		From Nguyen Tri Dinh to Cau Phu My might be inflow pipeline to South WDP	
TD3-4	Xa lo Ha Noi	49,357	800	24	49,357	0		Q.9	1	800	2,100	800			
TD3-5	Duong Vanh Dai 3	89,300	750	21	59,533	29,767	calculated as 2/3	Q.9	1	750	4,200	750		Partly, the diameter might be decreased	
TD3-6	Duong Nguyen Thi Minh Khai	147,000	1,000	41	147,000	0		Q.3	1	1,000	3,550	1,000			
TD3-7	Duong Nguyen Van Linh	192,243	600		128,162	64,081	calculated as 2/3	Q.7, 8, H.BC	1	600	1,200	600		Partly, no need, *To be studied with 2020-4	
			1,000			0				1,000	12,000	1,000		Same as above	
TD3-8	Duong Kha Van Can noi dai	24,447	400	11	24,447	0		Q.TD	2	400	2,300	400		To be studied with regional water demand forecast	
TD3-9	Tinh lo 43 - Giai doan II	30,243	500	20	30,243	0		Q.TD	2	500	1,516	-----		To be studied with regional water demand forecast	
TD3-10	Tinh lo 43 - Giai doan III	11,130	500	19	0	11,130	count as items which can be postponed	Q.TD	2	500	600	-----		No need as a distribution pipeline, but need to be studied with regional water demand forecast	
TD3-11	Duong No Trang Long	18,000	400	10	18,000	0		Q.BT	2	400	1,767	-----			
TD3-12	Duong Quy Hoach Thao Dien	86,753	600	14	86,753	0		Q.BT	2	600	6,000	600		Distribution network for Phuong27, 28 in Binh Thanh District might be studied with TD3-1. EX-2	
TD3-13	Duong Xo Viet Nghe Tinh	14,117	500	15	0	14,117	count as items which can be postponed	Q.BT	2	500	925	-----		No need as a distribution pipeline, but need to be studied with regional water demand forecast	
TD3-14	Dunog Nguyen Van Tang	29,700	400	11	0	29,700	count as items which can be postponed	Q.9	2	400	2,700	-----		No need as a distribution pipeline, but need to be studied with regional water demand forecast	
TD3-15	Dunog Le Van Viet	33,752	400	11	54,643	-20,891	need to be improved	Q.9	2	400	3,050	600		The diameter might be increased.	
TD3-16	Duong Hoang Huu Nam	70,000	400	18	0	70,000	count as items which can be postponed	Q.9	2	400	3,800	-----		No need as a distribution pipeline, but need to be studied with regional water demand forecast	
TD3-17	Duong Vanh Dai 3	70,147	500	11	64,133	6,014	500 > 400	Q.9	2	500	6,300	400		The diameter might be decreased	
TD3-18	Nam Tren Duong Noi Vao Duong Vanh Dai 3	28,917	600	14	28,917	0		Q.9	2	600	2,000	600			
TD3-19	Duong Ten Lua	12,559	400	7	0	12,559	count as items which can be postponed	Q.BTan	2	400	1,700	-----		No need as a distribution pipeline, but need to be studied with regional water demand forecast	
TD3-20	Duong QH Binh Tan	25,262	400	8	0	25,262	count as items which can be postponed	Q.BTan	2	400	3,100	-----		No need as a distribution pipeline, but need to be studied with regional water demand forecast	
TD3-21	Duong Long Thoi - Nhon Duc	42,984	560	12	42,984	0		H.NB	2	560	3,600	-----		Distribution network for Nha Be area might be studied	
TD3-22	Duong Nguyen Van Tao	44,540	400	9	44,540	0		H.NB	2	400	4,930	-----		Distribution network for Nha Be area might be studied	
TD3-23	Duong Nguyen Binh	23,675	400	10	23,675	0		Q.7	2	400	2,300	-----		Distribution network for Nha Be area might be studied	
TD3-24	Duong To Hien Thanh	14,668	400	8	0	14,668	count as items which can be postponed	Q.10	2	400	1,800	-----		To be studied with existing pipeline *The existing D300 is set to D400 in VIWASE model	
TD3-Added	Duong Hoang Sa - Nguyen Thi Minh Khai		2,000					Q.1	1	2,000	1,000	-----			
TH2-1	Nguyen Cuu Phu	611,500	1,500		80,340	65,002	1500 > 1000	H.HM, BC,	1	1,500	2,200	1,000		The diameter might be decreased	
			1,200		466,158				1	1,200	9,900	1,200			
TH2-2	Au Co	500,000	1,000	51	333,333	166,667	calculated as 2/3	H.HM, BC,	1	1,000	9,900	1,000		Partly, no need: TPWDP/CentralWDP dist.area boundary	
TH2-3	Duong Phan Van Tri	17,172	400	11	0	17,172		Q.GV	2	400	1,600	-----		No need: TPWDP/GDWDP dist.area boundary	
TH2-4	Duong Thong Nhat	12,000	400	7	0	12,000		Q.GV	2	400	1,720	-----		No need *To be studied with regional water demand forecast	
TH2-5	Duong Le Duc Tho	10,920	400	14	13,974	-3,054	need to be improved	Q.GV	2	400	780	600		The diameter might be increased *D600 in VIWASE model	
TH2-6	Duong Nguyen Huy Dien	11,900	400	14	15,228	-3,328	need to be improved	Q.GV	2	400	850	600		The diameter might be increased *D600 in VIWASE model	
TH2-7	Duong Le Duc Tho (Trung My Tay - Tay Ky Tan Quy)	2,281	400	10	1,521	760	calculated as 2/3	Q.GV, 12, BTan	2	400	221	400		Partly, no need (northern side): THWTP/TPWDP dist.area boundary	
TH2-8	Duong Ta Uyen	2,631	400	7	0	2,631		Q.5	2	400	360	-----		TH2-8, 9, 11: If existing D450(1910, 1924, 2010) is sound, no need.	
TH2-9	Duong Phu Huu	3,892	400	10	0	3,892		Q.5	2	400	385	-----		TH2-8, 9, 11: If existing D450(1910, 1924, 2010) is sound, no need.	
TH2-10	Duong Le Hong Phong	8,070	400	9	0	8,070	count as items which can be postponed	Q.5	2	400	880	-----		No need as a distribution pipeline, but need to be studied with regional water demand forecast	
TH2-11	Duong Ngo Nhan Tinh	4,659	400	9	0	4,659		Q.6	2	400	505	-----		TH2-8, 9, 11: If existing D450(1910, 1924, 2010) is good, no need.	
TH2-12	Duong so 11	7,470	300	8	0	7,470	count as items which can be postponed	Q.6	2	300	995	-----		No need as a distribution pipeline, but need to be studied with regional water demand forecast	
TH2-13	Duong Le Quang Chieu	2,170	400	11	0	2,170	count as items which can be postponed	Q.TP	2	400	200	-----		No need as a distribution pipeline, but need to be studied with regional water demand forecast	
TH2-14	Au Co tai giao lo Au Co - Lac Long Quan va dau noi voi	2,320	400	9	0	2,320	count as items which can be postponed	Q.TP	2	400	250	-----		No need as a distribution pipeline, but need to be studied with regional water demand forecast	
TH2-15	Duong Vuon Thom- Duong doc bo kenh Rau Ram	11,181	400	9				H.BC	2	400	1,200	400		To be studied with estimated demand for bulk supply	
TH2-16	Tinh lo 10	18,657	500	12				H.BC	2	500	1,500	500		To be studied with estimated demand for bulk supply	
TH2-17	Duong Lai Hung Cuong	23,024	500	15				H.BC	2	500	1,500	400		Same route as KD-16 (D400)	
TH2-18	Duong Bui Thanh Khiet	28,420	400	14	20,665			H.BC	2	400	2,030	400			
TH2-19	Duong Hung Nhon	28,420	400	14	0	28,420	count as items which can be postponed	H.BC	2	400	2,030	-----		No need as a distribution pipeline, but need to be studied with regional water demand forecast	
TH2-20	Duong Dinh Cuc	33,180	400	14	0	33,180	count as items which can be postponed	H.BC	2	400	2,370	-----		No need as a distribution pipeline, but need to be studied with regional water demand forecast	
2020-1	Duong Le Van Khuong	40,133	800		0	40,133		Q.12	1	800	1,500	-----		No need: THWTP/TPWDP dist.area boundary	
2020-2	Duong Xuyen a - Kha Van Can	422,733	800		281,822	140,911	calculated as 2/3	Q.12, TD, GV	1	800	15,800	800		Partly, no need: TPWDP/TDWTP dist.area boundary	
2020-3	Dai lo Dong Tay	544,124	1,000		362,749	181,375	calculated as 2/3	Q.1, 5, BTan	1	1,000	14,900	1,000		Partly, no need: TDWTP/CentralWDP/PLPWDP dist.area boundary	

SAWACO Planning Pipelines													JICA Study Model for 2025			
No.	Route	Budget	Diameter	Unit Price	Revised Budget	Difference	Remarks	District	Grade	Diameter	Length	Diameter	Length	JICA Study Team's comments		
SAWACO's Investment Plan																
2020-4	Duong Nguyen Van Linh	569,686	1,000		379,791	189,895	calculated as 2/3	Q.7, H.BC, NB	1	1,000	15,600	1500-600		Partly, the diameter might be increased and decreased, no need *To be studied with TD3-7		
2020-5	Duong Tinh lo 15	163,207	800		163,207			Q.7	1	800	6,100	800				
2020-6	Duong doc song Nha Be	69,564	800		0	69,564	count as items which can be postponed	H.NB	1	800	2,600			Road Plannning is unsure, distribution network for Nha Be area might be studied		
2020-7	Duong Truc Bac	144,370	700		0	144,370	count as items which can be postponed	Q.BT	1	700	6,500			Road Plannning is unsure, distribution network for Nha Be area might be studied		
2020-8	Duong Ung Van Khiem - Nguyen Xi		800					Q.BT	1	800	3,200			Same as TD3-1		
2020-9	Duong Vanh Dai 2		1,800					Q.9	1	1,800	9,200			Same as TD3-2		
2020-10	Duong Vanh Dai 2		1,500					Q.9	1	1,500	5,400			Same as TD3-3		
2020-11	Duong Xa lo Ha Noi		800					Q.TD	1	800	2,100			Same as TD3-4		
2020-12	Duong Vanh Dai 3		750					Q.9	1	750	4,200			Same as TD3-5		
ADB: ADB Project D2400mm pipeline																
ADB	Xa lo Ha Noi - Dien Bien Phu		2,400					Q.TD, 2, BT, 1	1	2,400		2,400				
KD: Kenh Dong Project pipelins from AutoCAD data from Transmission Enterprise																
KD-1	Nguyen Anh Thu - Phan Van Doi - Vo Van Van	125,324	1,500		0	125,324		H.BC	1	1,500		1,500	1,950	No need		
		241,008										1,500	3,750			
		67,559			45,039	22,520	calculated as 2/3					1,000	1,850	Partly, the diameter might be decreased		
KD-2	Nguyen Anh Thu	105,683	800		144,248	-38,564	need to be improved	Q.12	1	800		1,000	3,950	Partly, the diameter might be increased		
		62,875			62,875	0						800	2,350			
KD-3	Nguyen Van Bua	67,184	600		67,184	0		Q.12	1	600		600	3,750			
KD-4	Duong Cong Khi - Quach Dieu	73,454	600		109,697	-36,242	need to be improved	H.BC	1	600		800	4,100	Partly, the diameter might be increased (D800) *To be studied		
		40,310			40,310	0						600	2,250			
KD-5	Huong Lo 80 - Vinh Loc	49,268	600					H.BC	1	600		600	2,750			
		58,226			0	58,226							3,250	no need		
KD-6	Dang Thuc Vinh	72,252	500		139,127	-66,875	need to be improved	Q.12	2	500		800	5,200	The diameter might be increased.		
KD-7	Huong Lo 80B	26,977	400					Q.12	2	400		400	2,650			
KD-8	Le Van Khuong	37,666	400					Q.12	2	400		400	3,700			
KD-9	To Ky	27,995	400					Q.12	2	400		400	2,750			
KD-10	Ly Thuong Kiet - Quang Trung	13,895	500		36,518	-22,624	need to be improved	Q.12	2	500		1,000	1,000	The diameter might be increased.		
		11,116			21,404	-10,289	need to be improved					800	800	The diameter might be increased.		
KD-11	Le Loi	25,450	400		44,789	-19,339	need to be improved	Q.12	2	400		600	2,500	Partly, the diameter might be increased (D600) *To be studied		
KD-12	Duong Cong Khi	37,666	400					H.HM	2	400		400	3,700			
KD-13	Pham Van Hon	70,168	500					H.HM	2	500		500	5,050			
KD-14	Thoi Hoa - Duong So 7	36,648	500					Q.BTan, H.BC	2	500		400	3,600			
KD-15	Nguyen Thi To	34,042	500					Q.BTan	2	500		500	2,450	No need *Same route as JICA-8		
KD-16	Lai Hung Cuong	18,833	400					H.BC	2	400		400	1,850	Same as TH2-17		
KD-17	Lien Ap	33,594	400					Q.BTan	2	400		400	3,300			
KD-18	Lang Le bau Co - Tran Dai Nghia	145,893	500					H.BC	2	500		500	10,500			
KD-19	Tran Van Giau (TL10)	92,399	500		61,599	30,800	calculated as 2/3	H.BC	2	500		500	6,650	Partly, no need *Same route as JICA-10		
KD-20	Nguyen Huu Tri	188,347	1,200					H.BC	1	1,200		1,200	4,000	Main pipeline from PLPWDP		
KD-21	Quoc lo 1A	53,306	600		0	53,306	count as items which can be postponed	H.BC	1	600		700	2,400	No need as a distribution pipeline, but need to be studied with regional water demand forecast		
KD-22	Nguyen Van Bua	43,073	500		0	43,073	count as items which can be postponed	H.HM	2	500		500	3,100	No need as a distribution pipeline, but need to be studied with regional water demand forecast		
JICA: New pipelines proposed by JICA team																
JICA-1	Phan Huy Ich - Pham Van Chieu	327,771			327,771	0		Q.GV	1			1,500	5,100	new installation		
JICA-2	Pham Van Chieu - To Ngoc Van	77,693			77,693	0		Q.GV	1			1,200	1,650	new installation		
JICA-3	Ly Thuong Kiet	124,162			124,162	0		Q.TB, Q.10, Q.11	1			1,000	3,400	new installation		
JICA-4	Nguyen Thai Son - Hoang Minh Giam	47,087	-----		47,087	0		Q.TB	1	-----		1,200	1,000	Inflow to GDWDP		
JICA-5	Hoang Minh Giam - Pham Van Dong , Phan Van Tri	179,953	-----		179,953	0		Q. GV	1	-----		1,500	2,800	Outflow from GDWDP *The diameter might be studied 2,800m x D1500, 1,500m x D1500, 850m x D1500		
JICA-6	Truong Chinh - Che Lan Vien	119,974			119,974	0		Q.TP	1			2,000	1,250	Inflow to TPWDP *Upstream side is D1800; to be studied with new transmission pump capacity 1 250m x D1800 or D2000		
JICA-7	Che Lan Vien - Luu Chi Hieu	123,755			123,755	0		Q.TP	1			2,400	1,000	Outflow from TPWDP (To be connected to existing D1500 x 2, New D1500), Independent D1500 x 3 are recommended.		
JICA-8	Tay Thanh - Le Trong Tan - Nguyen Thi Tu	356,692			356,692	0		Q.TP, Q.BT	1			1,500	5,550	Outflow from TPWDP		
JICA-9	Kinh Duong Vuong	49,300			49,300	0		Q.BT	1			1,000	1,350	Inflow to PLPWDP *The diameter might be studied.		
JICA-10	An Duong Vuong - So7	249,559			249,559	0		Q.BT	1			1,200	5,300	Outflow from PLPWDP		
		111,034			111,034	0						800	4,150	5 300m x D1200, 4 150m x D800		
JICA-11	An Duong Vuong	65,921			65,921	0		Q.BT	1			1,200	1,400	Outflow from PLPWDP		
JICA-12	Dien Bien Phu - Dinh Tien Hoang - Vo Thi Sau - Ba thang Hai	268,742			268,742	0		Q.3, Q.10	1			2,000	2,800	Replace or new installation		
		183,166			183,166	0						1,500	2,850			
JICA-13	Tran Hung Dao - Chau Van Liem - Hai Thuong Lan Ong	214,244			214,244	0		Q.1, Q.5	1			1,200	4,550	Replace or new installation		
Planned pipeline in WSMP based on VIWASE model																

SAWACO Planning Pipelines												JICA Study Model for 2025		
No.	Route	Budget	Diameter	Unit Price	Revised Budget	Difference	Remarks	District	Grade	Diameter	Length	Diameter	Length	JICA Study Team's comments
SAWACO's Investment Plan														
UP-1	The Street name is not clear (Future Plan)							H.NB	2			500		Distribution network for Nha Be area might be studied
UP-2	Binh Loi - Vuon Lai							Q. BT, Q.12	1			600		Main pipeline from GDWDP
UP-3	The Street name is not clear (Future Plan)							Q.12, Q.GV	1			600		Main pipeline from GDWDP
UP-4	Ha Huy Giap							Q.12	1			800		Main pipeline from TPWDP
UP-5	Ha Huy Giap - Bui Cong Trung							Q.12	1			600		Main pipeline from TPWDP
UP-6	Nguyen Van Cu							Q.1	1			600		Main pipeline from CentralWDP
UP-7	Cao Van Lau							Q.6	1			1,000		Main pipeline from CentralWDP
UP-8	Nguyen Huu Tho							Q.7	1			600		To be studied with regional water demand forecast
UP-9	Nguyen Van Linh							Q.7	1			600		Main pipeline from SouthWDP
UP-10	Pham Hung							H.BC, Q.8	1			800		Main pipeline from SouthWDP
UP-11	Quoc lo 50							H.BC, Q.8	1			1,000		Main pipeline from SouthWDP *To be studied for islands in District 8
UP-12	Quoc lo 1A							Q.TD	2			400		Main pipeline from TDWTP
UP-13	Quoc lo 1A							Q.TD	1			600		To be studied with estimated demand for bulk supply
UP-14	Vo Van Kiet							Q.BTan	1			800		Main pipeline from PLPWDP
UP-15	Nguyen Duy Trinh							Q.2	2			400		The diameter might be increased
UP-16	Nguyen Duy Trinh - Nguyen Thi Dinh							Q.2	1			1,000		Main pipeline from TDWTP
UP-17	Dong Van Cong							Q.2	1			600		To be studied with regional water demand forecast
UP-18	Mai Chi Tho							Q.2	1			1,200		Main pipeline from TDWTP
UP-19	Mai Chi Tho							Q.2	1			1,000		Main pipeline from TDWTP
UP-20	Quoc lo 13							Q.TD	2			500		Main pipeline from TDWTP
UP-21	Hiep Binh							Q.TD	2			500		Main pipeline from TDWTP
UP-22	Huynh Tan Phat							H.NB	1			800		Distribution network for Nha Be area might be studied
UP-23	Nguyen Binh							H.NB	1			800		Distribution network for Nha Be area might be studied
Existing pipeline to be considered (Different diameter in VIWASE WSMP model)														
EX-1	Truong Chinh		1,800					Q.TP	1	1,800		2,000		Inflow to TPWDP *To be studied with new transmission pump capacity, with JICA-6
EX-2	Xo Viet Nghe Tinh - Binh Quoi		400					Q.BT	2	400		500		Distribution network for Phuong27, 28 in Binh Thanh District might be studied with TD3-1, TD3-12
EX-3	Hung Phu - Pham Hung		500					Q.8	2	500		600		
EX-4	Nguyen Binh		300					H.NB	2	300		400		Distribution network for Nha Be area might be studied
EX-5	Quoc lo 1A		300					Q.BTan	2	300		400		
EX-6	Tan Ky Tan Quy		300					Q.BTan	2	300		400		To be studied with regional water demand forecast
EX-7	Huong lo 2		300					Q.BTan	2	300		400		To be studied with regional water demand forecast
EX-8	Thoai Ngoc Hau		300					Q.TP	2	300		400		To be studied with regional water demand forecast
EX-9	So 23 - Ly Chieu Hoang - An Duong Vuong		800					Q.BTan	1	800		1,000		Outflow from PLPWDP *To be studied

Risk Allocation Sheet

Stage	Risk	No	Reason of risk	Explanation	Risk owner (Proposal)	Issues	Discussion Results
Before Contract	Opex/Capex increase	1	Price fluctuation	In case Price increase, water tariff will also increase, therefore service fee shall be modified accordingly.	SPC, HCMC, SAWACO	Estimation will be revised considering actual Price fluctuation in each estimation phase.	
		2	Estimation Accuracy	After the contract, detail design will be conducted, therefore Capex will change for some reasons	SPC, HCMC, SAWACO	Estimation will be revised considering detail design. Both party need to agree to the estimation procedure and accuracy	
		3	Change of design basis	In case, design basis changes according to the laws and regulations, the costs shall be changed	HCMC	In case the design basis is changed for HCMC's reason, the costs need to be compensated(defined by MOM)	
		4	Change of site	In case site location changes, the costs will be changed	HCMC	Need to be guaranteed by HCMC (Set by MOM)	
		5	Change of performance	In case design performance of WDP changes, the costs will be changed	SPC, SAWACO	SAWACO or SPC (Set by MOM but depends on the reason of change)	
		6	Change of business area	In case business area changes, the costs will be changed	N/A	In case the requirements for WDP is not changed, SPC can analyze the optimum distribution area of WDP. (set by MOM)	
		7	Change of site conditions	In case site conditions changes, the costs will be changed	SPC, HCMC	- HCMC need to permit soil survey as soon as possible - SPC shall execute soil survey and adjust costs before the contract.	
	Fail to establish SPC	8	Lack of investors	In case SPC can't find investors, SPC cannot join water sector business in HCMC	SPC, HCMC, SAWACO	- SPC and investors need to make an agreement for investment '- SPC need to clear all the risks for investors, therefore, HCMC, SAWACO and SPC need to discuss risk allocation as soon as possible	
		9	Delay of permission for SPC	late permission need additional cost for SPC	HCMC	- Requirements for permission can be clarified by HCMC - SPC need to comply the application procedure	
		10	Lack of Equity	Equity from some investors cannot be prepared before the contract.	SPC	Equity is owing to SPC's preparation	

Risk Allocation Sheet

Stage	Risk	No	Reason of risk	Explanation	Risk owner (Proposal)	Issues	Discussion Results
		11	Lack of loans	Loans for WDP implementation cannot be executed by funding sources	SPC	- Loan execution need to be controlled by SPC's responsibility - Requirements of funding source need to be reflected on the contract	
EPC	Cancellation of the construction	12	Bankrupt of EPC contractor	EPC costs will be increase to secure the alternative EPC contractor	SPC	SPC can control by confirming EPC contractor's credit	
		13	Lack of loans	The construction will be cancelled and or postponed by SAWACO's business prospects	HCMC	HCMC's guarantee would be necessary for funding sources	
		14	Lack of SAWACO's income prospect	In case SAWACO's tariff increase plan is declined, SPC needs to stop implementation work	HCMC	This issue needs to be guaranteed by HCMC to support SAWACO's business (it is base conditions for the contract)	
		15	Others	The construction is cancelled by SAWACO's business restructuring, or policy changes, etc.	HCMC	HCMC's guarantee would be necessary for funding sources	
		16	Disaster	In case of large disaster, the construction will be stopped or postponed	SPC, HCMC, SAWACO	Need to consider the utilization of some insurance or contract terms	
	Schedule Delay	17	Delay of SPC's establishment	described in no.8 to 11	-	-	
		18	Change of laws and regulations	EPC costs will be increase if new SPC comply the new laws and/or regulations	HCMC	The original conditions needs to be kept by HCMC (set in the contract)	
		19	Change of design requirements	In case of change, the costs shall be changed	HCMC, SAWACO	SAWACO's requirements is restricted by the contract	
		20	Design Faults	In case of design faults, the construction costs will be increased	SPC	SPC can control with EPC contractor by its contract	
		21	Lack of construction management	In case of insufficient EPC management, the schedule will be delay	SPC	SPC can control with EPC contractor by its contract	
		22	Lack of EPC's skill	In case of insufficient EPC skills the schedule will be delay	SPC	SPC can control with EPC contractor by its contract	
		23	Differences of pre-conditions	In case of wrong conditions, the schedule will be delay	SPC, HCMC, SAWACO	SPC need to clarify the pre-conditions for estimation. HCMC need to issue soil survey investigation	
		24	Delay of SAWACO's construction	In case of the delay of SAWACO's scope of work, operation cannot start and costs will be increased	SAWACO	As for SAWACO's delay, SPC and SAWACO need to discuss in advance about the penalty (defined in the contract)	

Risk Allocation Sheet

Stage	Risk	No	Reason of risk	Explanation	Risk owner (Proposal)	Issues	Discussion Results
		25	Delay of commissioning	Lack of performance of EPC, the schedule will be delay	SPC	SPC need to control the construction schedule	
		26	Delay of application procedure	Delay of application makes the construction schedule longer	SPC, HCMC, SAWACO	SPC needs to use experienced EPC contractor. HCMC need to support WDP business for application	
		27	Disaster	In case of large disaster, the construction will be stopped or postponed	SPC, HCMC, SAWACO	Need to consider the utilization of some insurance or contract terms	
	Cost Increase	28	Schedule delay	Already described in no.XX			
		29	Design faults	In case of design faults, the construction costs will be increased	SPC	SPC can control with EPC contractor by its contract	
		30	Misunderstanding of boundary conditions	Service fee for WDP will be increased	SPC, HCMC, SAWACO	SAWACO and SPC need to confirm the boundary conditions	
		31	Change of requirements	In case of change, the costs shall be changed	HCMC, SAWACO	SAWACO's requirements is restricted by the contract	
		32	Price increase	In case of Price increase, total cost(service fee will be increased)	HCMC, SAWACO	Inflation costs shall be compensated by HCMC	
		33	Interest increase	in case of interest increase, SPC's profit will decrease	SPC	SPC need to clarify and confirm the loan agreement with funding sources	
		34	Change of construction basis	the construction basis makes total cost higher	SPC, HCMC, SAWACO	SPC is responsible for the estimation basis. Therefore, HCMC needs to clarify and guarantee the conditions	
		35	Disaster	In case of large disaster, the construction will be stopped or postponed	SPC, HCMC, SAWACO	Need to consider the utilization of some insurance or contract terms	
Operation and Maintenance	Operation Stop	36	Accident	In case of accident, operation will be stopped	SPC, SAWACO	For technical matters, work flow need to be prepared. For business issues, the responsibility need to be defined	
		37	Disaster	In case of large disaster, operation will be stopped?	SPC, HCMC, SAWACO	Need to consider the utilization of some insurance or contract terms	
		38	Labor strike	In case of labor strike, operation will be stopped	SPC, SAWACO	SPC need to care for the strike by utilizing SAWACO's resource	
		39	Facilities' trouble	In case of facility trouble, operation will be stopped	SPC	SPC needs to measure this issue by the contract with maintenance company	

Risk Allocation Sheet

Stage	Risk	No	Reason of risk	Explanation	Risk owner (Proposal)	Issues	Discussion Results
	Cost Increase	40	Increase of utility consumption	In case consumption increase, operation cost will also increase	SPC	SPC is responsible for utility consumption in case operation conditions are same as contract base. (set by the contract)	
		41	Increase of utility unit price	In case Price increase, operation cost will also increase	HCMC, SAWACO	Inflation costs shall be compensated by HCMC (set by the contract)	
		42	Increase of maintenance item	In case of item increase, the cost will increase accordingly	SPC	SPC is responsible for maintenancing WDP. Before the contract, SPC needs to clarify its costs with vendors.	
		43	Increase of maintenance cycle	In case of cycle increase, the cost will increase accordingly	SPC	SPC is responsible for maintenancing WDP. Before the contract, SPC needs to clarify its costs with vendors.	
		44	Increase of maintenance unit price	In case Price increase, operation cost will also increase	HCMC, SAWACO	Inflation costs shall be compensated by HCMC (set by the contract)	
		45	Increase of material consumption	In case of material increase, the cost will increase accordingly	SPC	There are not so many materials for operation. Therefore there are not so big impact for the fee	
		46	Increase of material unit price	In case Price increase, operation cost will also increase	HCMC, SAWACO	There are not so many materials for operation. Therefore there are not so big impact for the fee	
		47	Increase of human resources	in case of scope of work increase, operation cost will also increase	SPC, SAWACO	SPC and SAWACO need to define scope of work before the contract	
		48	Increase of cost of human reasources	In case Price increase, operation cost will also increase	HCMC, SAWACO	Inflation costs shall be compensated by HCMC (set by the contract)	
		49	Insufficient operation time	Insufficient operation time cannot improve water distribution system	SPC	- SPC need to keep WDP's functions based on the contract and/or discussion with SAWACO - Ises based on the EPC's factors need to be guaranteed by EPC contractor	
	Insufficient performance	50	Insufficient operation quiality	Insufficient operation quiality cannot improve water distribution system	SPC	- SPC need to keep WDP's functions based on the contract and/or discussion with SAWACO - Ises based on the EPC's factors need to be guaranteed by EPC contractor	
		51		already described in "EPC stage"	-	-	
Business continuity	EPC	51		already described in "EPC stage"	-	-	

Risk Allocation Sheet

Stage	Risk	No	Reason of risk	Explanation	Risk owner (Proposal)	Issues	Discussion Results
	Operation	52		Already described in "Opetaion stage"	-	-	
	SPC's operation	53	Change of laws and regulations	Changes of laws and regulations effect on SPC's business continuity	HCMC	The original conditions needs to be kept by HCMC (set in the contract) in case SPC need to comply with new laws and regulation, HCMC needs to compensate its costs.	
		54	Change of governmental policy	Changes of Government policies effect on SPC's business continuity	HCMC	The original conditions needs to be kept by HCMC (set in the contract) in case SPC need to comply with policies, HCMC needs to compensate its costs.	
		55	Lack of human resources	Already described in no.XX	-	-	
	Cost Increase	56	Increase of SPC's business costs	In case SPC business costs increase, SPC's profit will decrease.	SPC	Investors need to discuss in detail about governance of SPC from the point of vietnamese rule and SPC's controllability	
		57	Increase of SPC's EPC and Operation costs	Already described in no.XX	-	-	
	Sales decrease	58	Failure of tariff increase	Tariff increase cannot be accepted by HCMC after the contract	HCMC, SAWACO	in case of failure, service fee need to be guaranteed by HCMC (Tariff increase is necessary for the first several years of WDP's business.)	
		59	Insufficient SAWACO's revenue	In case SAWACO's sales increase less than is expected	HCMC, SAWACO	Service fee need to be compansated by HCMC based on the contract	
		60	Insufficient performance	Already described in no.XX			
	Risks of repayment	61	Loan Interest increase	The different interest conditions between proposal stage and contract stage	SPC, HCMC, SAWACO	HCMC and SPC need to discuss the estimation procedure	
		62	Unable for repayment (sales decrease)	Already described in no.XX			
		63	Unable for repayment (cost increase)	Already described in no.XX			
	Risks of remittance	64	unable to send remittance because of sales decrease	Already described in no.XX			
		65	unable to send remittance because of cost increase	Already described in no.XX			
		66	Fluctuation of exchange rate	The exchange rate will effect on the amount of dividend	SPC	SPC need to control fluctuation of exchange rate by the exchange reservation	

Risk Allocation Sheet

Stage	Risk	No	Reason of risk	Explanation	Risk owner (Proposal)	Issues	Discussion Results
		67	Restriction of foreign exchange by governmental policy	SPC cannot exchange to foreign currency because of currency policy	HCMC, SAWACO	Guaranteed by HCMC or Vietnamese Government	
		68	Restriction of foreign exchange by economical reason	SPC cannot exchange to foreign currency because of drastic inflation	HCMC, SAWACO	Guaranteed by HCMC or Vietnamese Government	
	Contract Termination	69	Disaster	In case of large disaster, SPC cannot continue its business	SPC, HCMC, SAWACO	Defined by the contract based on the Vietnamese standards	
		70	Due to SAWACO's reason	SPC business stop because of SAWACO's certain reasons	HCMC, SAWACO	Cancellation fee need to be guaranteed by the contract	
		71	Lack of effect caused by insufficient facility performance	In case of facility trouble, SPC cannot continue its business	N/A	Such big issues cannot be assumed	
		72	Lack of effect caused by analysis mistakes	In case of analysis fault, SPC cannot continue its business	N/A	Such big issues cannot be assumed	
		73	Lack of methods to measure the effects	SAWACO cannot measure WDP's effect and don't pay for its service	SPC, HCMC, SAWACO	WDP's function and its effect, split of work need to be discussed with SAWACO before the contract.	
		74	Lack of SAWACO's affordability	In case of SAWACO's lack of payment, contract will be terminated	HCMC, SAWACO	SAWACO's payment need to be guaranteed by HCMC	
		75	Change of laws and regulations	Changes of laws and regulations effect on contract termination	HCMC, SAWACO	The original conditions needs to be kept by HCMC (set in the contract) in case SPC need to comply with new laws and regulation, HCMC needs to compensate its costs.	