No.

Socialist Republic of Vietnam
The People's Committee of Long An Province

The Preparatory Survey on Utility Management of Environment-Friendly Industrial Parks in Vietnam

(PPP Infrastructure Projects)

Final Report
(Full Version)

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Japan International Cooperation Agency (JICA)

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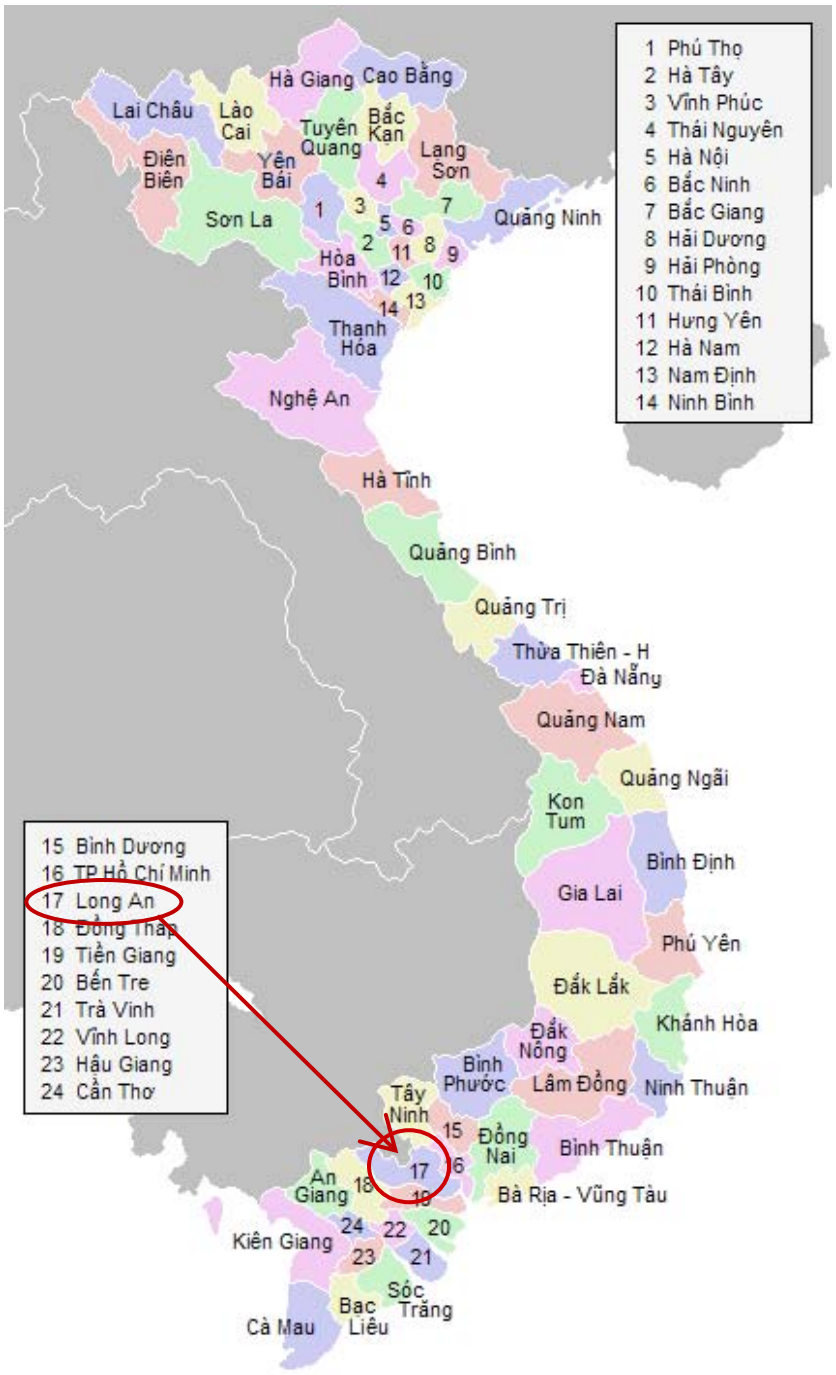
Contents



<Project area map>

<Abbreviation Index>

Abbreviation	Official Name
ACB	Asia Commercial Bank
ADB	Asian Development Bank
BOT	Build-Operate-Transfer
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
FS	Feasibility Study
GDP	Gross Domestic Product
IP	Industrial Park
IRR	Internal Rate of Return
JICA	Japan International Cooperation Agency
JV	Joint Venture
MARD	Ministry of Agriculture and Rural Development
MOIT	Ministry of Industry and Trade
MONRE	Ministry of Natural Resources and Environment
MPI	Ministry of Plan and Investment
O&M	Operation and Maintenance
PPP	Public Private Partnership
WB	World Bank

1. Executive Summary

1-1 Purpose of this survey and overview of three target projects

This survey intends to contribute to promote local economic growth in Vietnam by disseminating environment-friendly industrial parks (IPs) throughout the country which accept 17 pollution industries specified by Vietnamese government, remedying industrial wastewater treatment problem, and then developing local supporting industries which are necessary for industrial nation. As a model case, this survey proposes to build an environment-friendly industrial park (IP) in Long An province which can accept pollution industries and which provides utility services including O&M of wastewater treatment, a steady supply of power and a constant and safe supply of water with technology and capital of Japan.

In addition, industrial water is mainly supplied from groundwater in Long An province. Therefore, it is necessary to carry out water supply business as an extension of ongoing projects of World Bank (WB) and Asian Development Bank (ADB) for promoting development of environment-friendly IPs, as a countermeasure of land subsidence in Vietnam.

Moreover, it is necessary to remedy the problem of industrial wastewater treatment by setting up an industrial wastewater treatment companies to because of the structural deficiency in Vietnam that half of existing IPs are in operation without the wastewater treatment facilities.

1-1-1 Overview of an environment-friendly utility management business

An environment-friendly utility management business in this report is a business which installs utility facilities (power supply, water supply, wastewater treatment facilities, waste storage and other facilities) when developing a new IP, and charge for utility services (power supply, water supply, wastewater treatment, waste storage and other services) from tenants in the IPs

The target location of business deployment is Thuan Dao IP (Ben Luc district, Long An province) Phase2, with total area of 1,898,430sqm and leasing area of 1,302,500sqm.

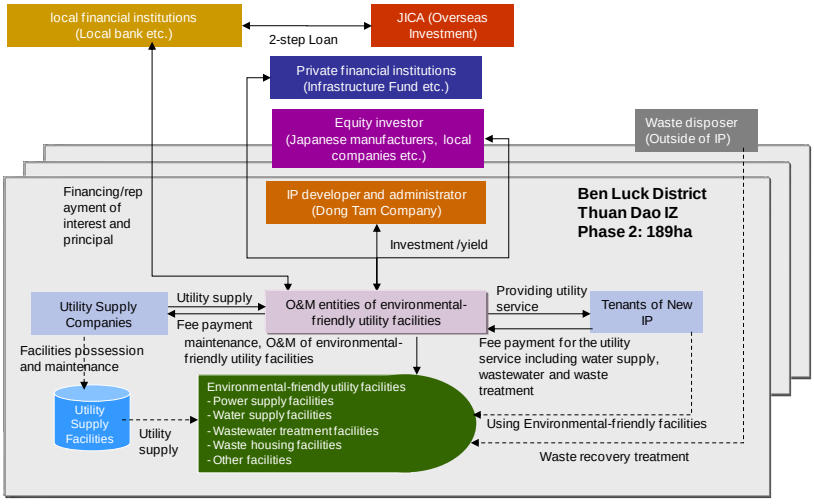


Figure 1-1 Environment-friendly utility management business

1-1-2 Overview of water supply business (clean water)

This is water (clean water) supply business which uses surface water and develops services in Duc Hoa district and Ben Luc district in Long An province. Phu My Vinh Company has already obtained water right (300,000m^3/day) from the Ministry of Agriculture and Rural Development (MARD), and with Phu My Vinh Company, some Japanese companies such as Kobelco Eco-Solutions, a water supply facilities manufactures, establish a Joint venture and constructs, owns, operates and manages water supply facilities.

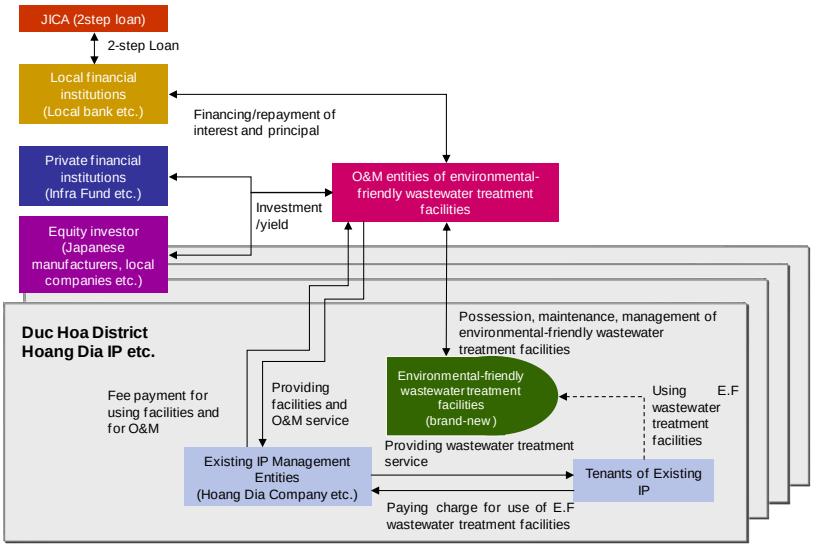


Figure 1-2 Water (clean water) supply business

1-1-3 Overview of environment-friendly Waste water treatment business

An environment-friendly Waste water treatment business in this report is not a company to set up facilities to each IP but a specialized company to set up a joint venture (JV) between Vietnamese and Japanese enterprises. This specialized company supplies equipments and services to IPs that do not have wastewater treatment system (ex.Hoang Gia), and that count more than 100 in all over the country.

However, this project did not reach an agreement in condition of partnership at the IP that was assumed as a model case and could not be commercialized. On the other hand, the survey team assumes the industrial waste water as one of the huge issues in Vietnam; it is suggested to continue the investigation to reach the solution in nearest future.

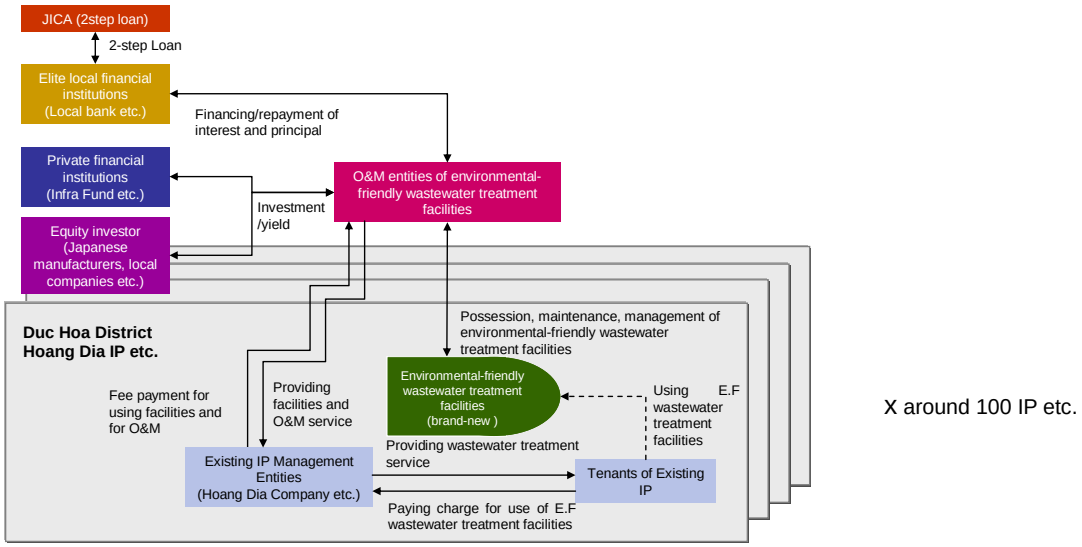


Figure 1-3 Environment-friendly Waste water treatment business

1-2 Overview of financial analysis

1-2-1 Environment-friendly utility management business

Investors (project owner)

- Infrastructure Construction Foundation of Dong Tam Group, Equipments environmental-friendly facilities Manufacturer (Kobelco Eco-Solutions etc.) and private financial organizations

Source for supporting project owner

・Japan International Cooperation Agency (JICA) and prestigious financial organization in country such as ADB; plan to use the 2 step loan from the investment and foreign loan of private Cooperation of JICA, and other financial organizations (local banks etc.)

Main service purchaser (Off-taker)

・Tenant enterprises in Thuan Dao IP

Project cost（Scale of operation）

・9.69millionUS$ (according to interviews to investing owners such as Japanese manufacturer and Vietnamese enterprises, they request to implement this project with scale around 10 million U.S.US$)
・breakdown: Infrastructure (43% : 4.17millionUS$), equipments (57%:5.52millionUS$)

Project schedule

・Construction work　: 2012～2013
・Start of operation　: 2014

Inflation rate (based on U.S. dollar)

Inflation rate used in this report is using average values of the ratio value when 1,000,000,000 VND(nominal price) at the time in 2004 increased annually by inflation of local currency (VND), during the five years from 2005 to 2010 and converted into US$ at the exchange rate VND.US$ at the end of each year(Table 1-1).

Table 1-1　Price increase rate in dollar volume

	2005	2006	2007	2008	2009	2010	Average
CPI growth rate (%)	8.3%	7.5%	8.3%	23.0%	6.9%	9.2%	10.5%
Estimated price of 1,000,000 VND (nominal price) in 2004	1,083,000	1,164,225	1,260,856	1,550,852	1,657,861	1,810,385	
Exchange rate (the end of year price of the exchange rate compared with USD (VND/US$)	15,916	16,054	16,145	16,977	17,941	18,932	
Value calculated to　US$	68.0	72.5	78.1	91.4	92.4	95.6	
Increase price rate in calculating to US$ (%)		6.6%	7.7%	17.0%	1.2%	3.5%	6.0%

Fund procurement（Initial Value which might be changed in sensitivity analysis）

・Capital from infrastructure construction foundation created by Dong Tam Group, environment-friendly utility equipment manufacturers (Kobelco Eco-Solutions, etc), and private financial organizations etc.(10% of total project cost : 0.97 million US$)
・2 step loan of the JICA through the prestigious domestic finance institutions (70% of the total

project cost: US$ 6.78 million (= 5,750 million Yen), interest rate 6.0% (in US$), 25 years to pay principal and average interest, 5 years of grace).

- Loans from local financial institutions (20% total cost of the project: 1.94 millions US$, 6.0% interest rate, 15-year average pay principal and interest)
- Short-term loans when short-term shortage of capital (interest rate 10.0% (in US$)

Primary unit of demand creation for utility (set by interview results and case research results)

- Power supply unit : 142.5(kWh/m^2・year)
- Water supply unit : 3.50(m^3/m^2・year)
- Wastewater generated unit : 2.80(m^3/m^2・year)
- Generated sludge unit after wastewater treatment : 0.0019(m^3/m^2・year)

Turnover unit (set by interview results and case research results. Initial values which might be changed in sensitivity analysis)

- Power supply : 0.054(US$/kWh)
- Water (clean water) supply : 0.200(US$/$m^3$)
- Wastewater treatment : 0.28(US$/$m^3$)
- Treatment and storage of waste : 1,571,008(VND/m^3)

Expenses unit set by interview results and case research results. Initial values which might be changed in sensitivity analysis)

- Power supply : 0.053(US$/kWh)
- Water (clean water) supply : 0.100(US$/$m^3$)
- Wastewater treatment : 0.26(US$/$m^3$)
- Treatment and storage of waste : 1,300,000(VND/m^3)
- Labor cost : Manager 10,184US$ / person x 1 person,
  Technician 4,849US$ / person x 35 persons
- Depreciation costs : Utility (infrastructure) 30 years,
  :Utility (equipments, machineries) 10 years

1-2-2 Water (clean water) supply business

Investors (project owner)

- Infrastructure Construction Foundation of Phu My Vinh, Equipments environmental-friendly facilities Manufacturer (Kobelco Eco-Solutions etc.) and private financial organizations

Source for supporting project owner

- Japan International Cooperation Agency (JICA) and prestigious financial organization in country such as ADB; plan to use the 2 step loan from the investment and foreign loan of private Cooperation of JICA, and other financial organizations (local banks etc.)

Main service purchaser (Off-taker)

- Company of IP operation and management in IPs（Thuan Dao IP in Ben Luc district, Hoang Gia IP in Duc Hoa district）where is inside water supply area.

Project cost (scale of project)

- 138.1mllion $ (based on estimates of VIWASE - the local water-supply consulting company)
- Water filter work (infrastructure) : 36.5Million $ (26.4%)
- Water filter work (equipments, machineries) : 24.3 million $ (17.6%)
- Water distribution work : 77.3 million $ (56.0%)

Project schedule

- Phase1 : Construction work : 2012 ~ 2013 · Start of operation : 2014
- Phase 2 : Construction work : 2016 ~ 2017 · Start of operation : 2018
- Phase 1 : Construction work : 2018 ~ 2019 · Start of operation : 2020

Inflation rate (based on U.S. dollar)

- 6% with the reference to Table 1-1 for environment-friendly utility management business.

Fund procurement（Initial value which might be changed in sensitivity analysis）

- Capital from infrastructure construction foundation created by Phu My Vinh company, environment-friendly utility equipment manufacturers (Kobelco Eco-Solutions, etc), and private financial organizations etc. (10% of total project cost: 13.8 million US$). 2 step loan of the JICA through the prestigious domestic finance institutions (70% of the total project cost: US$ 96.7 million (82.2 million Yen), interest rate 6.0% (in US$), 25 years to pay principal and average interest, 5 years of grace).

- Loans from local financial institutions (20% total cost of the project: 27.6 millions US$, 6.0% interest rate, 15-year average pay principal and interest)
- Short-term loans when short-term shortage of capital (interest rate 10.0% (in US$)

Water demand forecasting

- Phase 1 : 48,993m^3/day
- Phase 2 : 92,734m^3/day
- Phase 3 : 132,869 m^3/day

Primary unit of demand creation for utility (set by interview results and case research results)

- Water charge : 0.20US$/ m^3 (Initial value which might be changed in sensitivity analysis)

Expenses unit set by interview results and case research results.)

- Clean Water operating expense : 0.10US$/ m^3
- Water (clean water) supply : 0.100(US$/$m^3$)
- Labor cost : Manager 10,184US$ / person x 2 persons, Technician 4,849US$ / person x 67 persons
- Depreciation costs : water filter work (the infrastructure) 20 years, water filter work (the equipments and machineries) 10 years, water distribution work 30 years

1-3 Feasibility of project

1-3-1 Environment-friendly utility management business

Project profitability

- Accumulated loss : Transfer to profit from year 10th (2024) after going into operation
- IRR (30 years after going into operation) = 11.3%
  IRR (after 15 years in operation) = 06.05%
  IRR (after 10 years in operation) = 0.9%
- EIRR (Equity Internal Rate of Return)(*) calculated as for a reference value:
  EIRR (10 years after going into operation) = 5.4%,
  EIRR (15 years) = 16.5%, EIRR (30 years) = 18.9%.

(*) EIRR was calculated based on the assumption of capital dividend, earnings in the case of assuming the company will be sold at the evaluated year (total debt / equity - debt)

Sensitivity Analysis (conditions to satisfy IRR (15 years) ≥ 15%)

- Condition "IRR (15 years) ≥ 15%" is considered to increase motivation for private investors. Enterprise in IP will pay for the right to use is 70US US$ / ^{2} ~ 80US US$ / ^{2} (50 years). Of course this amount includes the cost of construction of utility facilities. So in this analysis, change in the value of the IRR (15 years) were observed by changing the rate (amount) included in the cost of construction of utilities from the turnover of using right (capital does not take free). The result can be satisfied IRR (15 years) ≥ 15% by taking 4.59 million US$ (3.52 US$ / m^2: equivalent to 4.4 ~ 5.0% of 70US$ / ^{2} ~ 80US US$ / ^{2}) into facilities construction costs from the turnover of using right.

Table 1-2 Mobilize capital structure satisfy IRR (15 years) ≥ 15%

Put into turnover of using right	Capital investment	2 step loan of JICA	Debt from domestic banks	IRR (15 year)	EIRR (15 year)
0%	10%	70%	20%	6.5%	16.5%
4.59MillionUS$.(3.52US$/m^2)	10%	47.0%	0%	15.0%	22.0%

1-3-2 Water supply business

(1) Project profitability

- Accumulated loss: Transfer to profit from year 28th (2024) after going into operation (the year 2015).
- IRR (30 years), IRR (15 years), IRR (10 years) , all are negative
- EIRR (Equity Internal Rate of Return) (*) was the reference value, EIRR (10 years after going into operation) EIRR (15 years) all are negative, EIRR (30 years) = 9.1%.

(*) EIRR was calculated based on the assumption of capital dividend, earnings in the case of assuming the company will be sold at the evaluated year (total debt / equity - debt)

- The reason of this result of the revenues and expenditures project as above is due to following factors:

  - The investment in the construction of water distribution is large, which is more than 50% total equipment investment.
  - Low water price

(2) Sensitivity Analysis (condition to satisfy IRR (15 years) ≥ 15%)

- Raise water price to extend the difference with the operating costs of clean water.
  - The price ≥ US$ 0.434 / m^3 (water operating expenses US$ 0.1 / m^3) enables IRR (30 years) ≥ 15% so t
  - The price ≥ US$ 0.541 / m^3 (water operating expenses US$ 0.1 / m^3) enables IRR (15 years) ≥ 15%
  - The price ≥ US$ 0.652 / m^3 (water operating expenses US$ 0.1 / m^3) enables IRR (10 years) ≥ 15%t
- Public fund injection into water supply facilities by Long An province
  - Water price is calculated to satisfy IRR (15 years) ≥ 15% in the case of public fund injection into water supply facilities by Long An province (50%, 100%)
- Water price is 0.41US$/$m^3$ in the case of 50% public burden（38.67millionUS$）
- Water price is 0.29US$/$m^3$ in the case of 100% public burden（77.33millionUS$）

(3) Project profitability consideration when object is phase 1 (50.000m^3) only

- Feasibility of phase 1 (50,000m^3)is established in terms of reducing total investment
  - Total investment : 38,975.000 US$ (Price in 2013)
  - Own capital : 10%
  - 2 step loan of JICA : 70%
  - Loan from local banks : 20%
  - At this time the water price satisfies IRR (15 years after going into operation) ≥ 15.0% is 0.412US$ / m^3.
  - If construction work goes to phase 3, the water price satisfies IRR (15 years after going into operation) ≥ 15.0% is 0.541US$/$m^3$.
  - From the above result it can establish water price satisfy IRR (15 years after going into operation) ≥ 15.0% cheaper than the case made to the stage 3 by just reducing the investing amount from phase1.
  - However this estimation does not consider the necessity to reselect suitable location of water supply in the case of supplying 50,000m^3 , and demand risk increasing by limiting target into only phase 1(risk cannot be spread because of the target area limitation). So that more detailed research is required.

(4) Founding of a holding company as a 100% subsidiary of Long An province, which will make use of JICA's 2-step loan program to keep and maintain a water distribution system.

- The water supply utilities will keep the distribution system as an off-balance-sheet entity, thereby being relieved of both investment burden and maintenance/depreciation costs.
- The water supply utility will pay a facility usage fee to the distribution system maintenance holding company (a 100% subsidiary of Long An province.)
- The distribution system maintenance holding company will raise funds for the repayment of JICA's 2-Step Loan program through usage fees charged to the water supply utility.
- The water supply company will use both investment capital and financing received from local financial institutions to purchase and maintain clean water supply facilities (both infrastructure and equipment/machinery).
- Under the above terms, by back-calculating from the water distribution utility's desired 15-year IRR of greater than 15%, the total water rate has been determined to be 37 cents U.S. per cubic meter (US$0.37/$m^3$)（Table 1-3）.

Table 1-3 Sensitivity analysis of the difference between Long An province's burden of water distribution facility cost, and water supply utility financing share

Long An province		Water Supply Company					
Percentage share, water distribution facility Cost	**Actual dollar amount, water distribution facility cost**	**Total funding raised**	**Investment**	**JICA 2-Step Loan**	**Other: local bank loans**	**Water rate, to cover 15-year IRR = 15%**	**EIRR (15-year)**
0%	0US$	138.1 million US$	10% US$13.81 million	70% 96.7 million US$ (8.2 Billion Yen)	20% 27.6 million US$	0.54 S$/$m^3$	39.4%
0%	0US$	34.5 million US$ (Phase1 only)	10% US$3.45 million .(Phase 1 only)	70% 24.2Million US$.(2.3Billion Yen) .(Phase1Only)	20% 6.9 million US$.(Phase1 Only)	0.41 US$/$m^3$	33.4%
50%	28.0% 38.7 million US$.(Subsidy)	99.4 million US$	10% US$13.81Million	62.0% 85.6Million US$.(7.26 Billion Yen)	US$0	0.41 US$/$m^3$	31.5%
100%	77.3 million US$.(JICA 2-Step Loan)	60.8 million US$	10% US$6.08Million .(Water System Off-Balance)	0% 0Million US$.(Applied to Water system subsidiary company)	90% 54.7 million US$.(Water system off-balance)	0.37 US$/$m^3$	40.0%
100%	56.0% 77.3 million US$.(Subsidy)	60.8 million US$	10% 13.81 million US$	34.0% 47.0 million US$.(3.99Billion Yen)	0 US$	0.29 US$/$m^3$	24.2%

1-4 Conclusion and general overview toward for the future

1-4-1 Environment-friendly utility management business

A utility management company will be set up at the Thuan Dao IP (owned by Dong Tam Group), through investment by corporate entities such as Kobelco Eco-Solutions, Shinsho Corporation, and World Link Japan, and through financing through JICA's general investment and loan system. However, upon review, the survey found some potential profitability issues related to industrial water supply operations for Thuan Dao Industrial Park. As these issues will take some time to resolve, an alternative proposal will be reviewed, one which involves the use of water from the Vam Co Dong River provided by Phu An Thanh (Joint Stock) Company. Kobelco and Dong Tam will apply for financing through JICA during negotiations for settlement of the industrial water supply.

1-4-2 Water supply business

As described previously, construction cost for a water delivery and distribution system is one reason for the costly water usage rate. Because of the higher rates, it seems necessary for Long An province to implement a public works project that includes some method of absorbing the difference between future and present usage rates, in such a way that takes into account new delivery and distribution costs. The predicted timeline for the supply of industrial-use water will be has been delayed by the as-yet unfinished upriver ADB project, and due to the time it will take to complete construction of a delivery and distribution system, either as a public works or ODA yen-financed project. For that reason, the environment utility management company is also required to consider different way to obtain water supply for IP. However, since without clean water operations Long An province's water demand cannot be met, Long An province must also take part in the commercialization review of these operations.

1-4-3 Waste water treatment business

As the result of this survey, following basic issues were investigated for waste water treatment business in Vietnam; 1. It is hard to collect enough fee for covering waste water treatment cost, 2. Fine of penalty for discharging untreated waste water in Vietnam is very much low, that incentive of installment of waste water facilely for IP management company is low, 3. From the investor's point of view, it is hard to obtain and evaluate the credibility of local IP management company, and conducting business is challenging at many cases. Therefore, it is concluded that preparation for business conduction require long period time, that study team has made draft of business scheme on this survey. The sturdy team suggests specific survey for conducting industrial waste water management business since it is the one of the most crucial issue in Vietnam.

2. Necessity and background of the target projects

During recent years, Vietnam is enjoying rapid economic progress, but problem of environmental pollution is becoming serious year by year. Especially in manufacturing industry, a main backbone of economic growth, two problems are emphasized. First, lack of sophisticated facilities for industrial waste and wastewater treatment, and the second, non-compliance with rules on environment even if issued.

Bearing serious environmental pollution, Vietnamese Government specified polluting enterprises in year 2009, and which are located in urban areas must be required to move to suburban areas. The relevant enterprises have to start looking for the destination where they will move to but no local government accept the polluting industries while a few number of IPs are equipped with the relevant facilities and conditions.

Inversely, Long An province is expecting its sustainable economic growth by developing environment-friendly IPs which are equipped with enough utilities such as wastewater treatment facilities for industries specified as polluting industries, and by promoting those industries to the environment-friendly IPs. In order to achieve further development and to prevent environment pollution, it is necessary to develop such environment-friendly IPs and to solve wastewater treatment problem in existing IPs, not only for Long An province, but also Vietnam.

However, Long An province has been confronting to problem of water supply and land subsidence caused by increasing demand of water at the same time. IPs in Long An province including proposed IP in this project depend on groundwater source for industrial water supply, so that Long An province has a compelling need for water supply business to promote construction of friendly environment IPs.

Long An province expects carrying this project through application of technology and operation engineering of Japan. Japanese Government and Japanese enterprises' participation into environment-friendly IP will contribute to development of Vietnam and to new business creation for Japanese enterprises.

From above background, feasibility of three relevant projects in IP, utility management business, water supply business, and Waste water treatment business, is considered in this survey. And then, two projects which are estimated to have high feasibility are put for business plan consideration.

The two are:

- Utility business project
- Water supply business

However, we decide to remove Waste water treatment business from consideration at this time

though wastewater treatment is the urgent matter and great impact on environment. Because participation of private enterprises is meeting serious difficulties and they need to have time and scale to carry out the project. However, since Waste water treatment business is clearly important for Long An province and Vietnam, we expect this project to be supported by Japanese government continuously in the future.

This survey report includes Chapter 2 as a survey report of related information that is necessary for project implementation, and Chapter 3 as business plan proposals of above two relevant projects.

2-1 Current situation and issues of the relevant projects (industrial parks, industrial water, wastewater treatment) in Vietnam and Long An province

2-1-1 Current situation of Industrial Parks in Vietnam (including industrial water, wastewater treatment)

Industrial parks in Vietnam which are called KCN (*Khu Cong Nghiep*) in Vietnamese are under administration of Ministry of Plan and Investment (MPI) and Provincial Industrial Park Authorities at each position.

In 1991, a Taiwan company has built an export processing zone oriented foreign companies in Tan Thuan district of Ho Chi Minh City, which is the first industrial park in Vietnam since the unification of South and North Vietnam. Vietnamese Government has strongly recognized the role and importance of industrial park in making new career opportunities for a large number of young people due to investments of foreign companies. Besides this, development of industrial parks is also bringing new revenue to local governments from "Land lease".

From the success case of Taiwanese company in Ho Chi Minh City, The central government as well as local governments started to simultaneously develop industrial parks throughout the country under the slogan of "Job creation". At the end of October 2009, establishments of industrial park have been approved in 223 places in the whole country. Among these, 171 places are now in operation with the total area of 57,300 ha. The development status of Industrial Parks (As of October 2009) is shown in Table 2-1.

These 223 Industrial parks include Thang Long (in Hanoi city), Nomura Haiphong (In Haiphong city), VSIP (in Binh Duong province, Bac Ninh province, Haiphong city), Amata (in Dong Nai province), LOTECO (in Dong Nai province) etc. which are invested by Japanese Corporations. However, these occupy a small land area while almost all of industrial parks are built with 100% investment from Vietnamese capital.

Table 2-1 Development Status of Industrial Parks by Provinces (October 2009) Unit: ha

No	Name of province/ city	KCNs	Planning area	Used area	Rented area	No	Name of province/ city	KCNs	Planning area	Used area	Rented area
1.	Bac Giang	5	1,239	777	195	29.	Kon Tum	2	210	44	44 *
2.	Bac Kan	1	74	51	–	30.	Lam Dong	2	359	209	112
3.	Bac Ninh	9	3,295	2.263	779	31.	Nghe An	1	60	42	30 *
4.	Cao Bang	1	62	40	–	32.	Phu Yen	3	770	770	520
5.	Ha Giang	1	255	173	–	33.	Quang Binh	2	161	112	79
6.	Ha Nam	3	571	571	245	34.	Quang Nam	3	750	529	260
7.	Ha Noi	11	2,000	1.523	732	35.	Quang Ngai	2	262	194	79
8.	Ha Dong	9	1,904	1.267	476	36.	Quang Tri	2	304	161	72
9.	Hai Phong	6	1,094	506	348	37.	Thua Thien Hue	2	369	243	84 *
10.	Hoa Binh	1	300	–	–	38.	An Giang	2	58	17	–
11.	Hung Yen	6	1,465	921	247	39.	Ba Ria-Vung Tau	10	7,900	5,297	1.871
12.	Nam Dinh	2	478	369	261	40.	Ben Tre	2	171	116	78
13.	Ninh Binh	2	496	347	318	41.	Binh Duong	23	7,010	1,819	918
14.	Phu Tho	2	506	392	138	42.	Binh Phuoc	2	309	73	2
15.	Quang Ninh	3	771	490	161	43.	Ca Mau	1	360	217	48
16.	Thai Binh	2	188	118	114	44.	Can Tho	3	562	432	226
17.	Thai Nguyen	1	320	–	–	45.	Dong Nai	28	8,816	5,832	3.554 *
18.	Thanh Hoa	1	88	60	53	46.	Dong Thap	3	253	170	139
19.	Tuyen Quang	1	170	69	27	47.	Hau Giang	1	126	80	–
20.	Vinh Phuc	5	1,395	916	426	48.	HoChiMinh city	15	2,931	1,939	1.154
21.	Yen Bai	1	138	82	–	49.	Long An	13	4,049	1,851	589
22.	Binh Dinh	2	558	418	277	50.	Soc Trang	1	251	174	130
23.	Binh Thuan	4	743	68	68	51.	Tay Ninh	2	394	259	234
24.	Da Nang	4	901	631	476	52.	Tien Giang	4	875	245	84
25.	Dac Lac	1	182	114	21	53.	Tra Vinh	1	100	62	42
26.	Dac Nong	1	181	181	141	54.	Vinh Long	2	268	185	93
27.	Gia Lai	1	109	80	77	55.	Ninh Thuan	2	777	536	16
28.	Khanh Hoa	1	136	136	87	56.	Kien Giang	2	315	–	–

Source: Ministry of Planning and Investment 2009; researched data of TCMT, 10/2009

Although industrial parks have made a huge contribution to economic development of Vietnam, serious environmental problems are being criticized after 20 years.

In case of industrial parks with 100% Vietnamese capital, development companies take charge of land reclamation and development of utility infrastructure (electricity, gas, water supply, communication system). Then using those infrastructures have been left to the direct contract with tenants.

On the other hand, in foreign industrial parks, generally investors found a management company to provide wholesale services of supplying electricity, water to tenants after park construction completed. In this case, industrial park management companies have responsibility to provide a sufficient service such as possession of private power generation to their tenants not to obstruct plant operation. And it is natural that foreign management companies take charge of installing and managing industrial wastewater treatment system while collecting the treatment fees from tenants. Meanwhile, in case of industrial parks of 100% Vietnamese capital, if tenants need the wastewater treatment equipment, they have to install, operate and manage it by themselves. As a result, there are some tenants which do not have wastewater treatment equipment or do not use it even though they have for the reason of cost savings.

This is the structural factor which causes the lack of wastewater treatment equipment in half of industrial parks in Vietnam and then problems of industrial wastewater pollution.

As a result, Vietnamese government have issued a circular regulation prescribing that “Industrial parks must be equipped with centralized wastewater treatment system and the management companies have responsibility for operations and management of the system”, (The Circulation No 08/2009/TT-BTNMT “Stipulation of management and environmental protection for the economic zone, high tech park, industrial park and industrial cluster) and made clear the responsibility of industrial park development companies and the management companies in industrial wastewater treatment. However, the problems of industrial wastewater pollution are not limited to industrial parks. In Vietnam, there are also industrial clusters called CCN (*Cum Cong Nghiep*), which are scattered throughout the country. Those industrial clusters look like IPs but actually these are only a concentration of many factories.

When moving into IPs, tenants must pay a high land rental fee as well as management fee. Therefore, there are a lot of enterprises including foreign enterprises which do not move into IPs in order to save the cost. Such industrial clusters are criticized that the problems of industrial wastewater pollution are more serious than IPs.

Whereas, Vietnamese government stipulated in prime minister’s Decision No. 64/2003/QD-TTg date 22, April 2003 on approval of “ absolute treatment plan of serious polluting enterprises” that is “Factories of polluting industries which are located in urban areas must move to suburban areas”.

However, this circular does not specify the categories of polluting industries and the circular has become ineffective. Finally, in 2009, government has published the detail list of 17 polluting industries (dyeing, plating, leather tanning etc.) (See Table 2-2). The relevant enterprises have to start looking for the destination where they will move to, but no local government accept the polluting industries while a few number of industrial parks are equipped with the relevant functions and conditions. Consequently, the efficacy of Circular of 2009 year is also low. For example, for the reason that there is no destination for relocation, a Korean company which engages in dyeing business in Ho Chi Minh City has paid a high wastewater treatment fee of 200 -300 US$ per ton to the city in exchange for the continuation of their operation in urban area until now.

Table 2-2 List of polluting industries in prime minister's circular No.64/2003/QD-TTg

1.Chemicals manufacturing (Essential chemicals, battery, pesticide, refrigerant chemicals, alum, detergent, dyes, paint, Fertilizer) 2. Buying, selling and recycling of waste (paper, plastic, waste oil) 3. Cleaning, Dyeing, washing, and printing on textile, knitting- products 4. Rubber processing 5. Leather Tanning 6. Electroplating 7. Machining (forging, casting, laminating, drawing, molding, beating, welding, painting)	8. Printing and finishing of metal packaging 9. Pulp manufacturing 10. Construction Materials, Ceramic, Glass manufacturing 11. Wood processing (Excluding Wood carving and household wood products) 12. Perishable, Seasoning, salt, cooking oil processing 13. Manufacturing of Soft drink, Alcoholic drink[1] , beverage and candies(excluding pure water) 14. Tobacco manufacturing 15. Livestock and poultry raising 16. Meat processing 17. Coal processing

As an example, Dong Nai province is of the cases that has no capacity for acceptance of polluting industries. Located on the outstanding solid base on a hill near Ho Chi Minh City, Dong Nai province already was a place where big factories have clustered before 1975. With the characteristic of being located near Ho Chi Minh City and easy to attract workers, Dong Nai currently has the biggest IP in Vietnam where the majority of IPs are gathered in. However a Japanese auto-bike part company which is operating in a foreign IP in Dong Nai had been rejected the application for approval of the new plating factory, which is necessary for manufacture of new supplies. The reason was "This is the policy that categories identified as polluting industries will not be approved".

Many local governments fearing the lawsuit of such pollution problems by citizens have set forth a policy that they will refuse all factories of polluting industries and not approve for new foreign investment in factories in polluting industries.

Even though plating plant is one of necessary supporting industries and an important basic metal processing industry for Vietnam which is aiming at being an industrial country, there is nowhere to accept it.

[1] Sapporo Holding Ltd has been starting construction of their brewery in Long An Province and going to enter manufacturing in early year 2012..(http://www.sapporoholdings.jp/CGI/newsrelease/detail/00000042/

Even Vietnamese enterprises having plant identified as polluting industry are also in difficulty. For example, when Phong Phu national textile company intends to relocate its dyeing plant in accordance with prime minister's circular, it has already called on 53 local authorities but only Long An province accepts it with condition attached. 52 other authorities have refused its relocation. With being a middle process of textile industry, dyeing is an important industry holding the key for development of textile industry in Vietnam. However, it is incomprehensible that until now, despite of being an industry needed to carefully protect and develop, its operations in urban cites are forbidden and phenomenon of nowhere destination is occurring because it is identified as a polluting industry.

Long An province has required Phong Phu Company 3 following conditions:

1. **IP which is operated and managed by a Japanese company.**
2. **Installing of Japanese wastewater treatment equipment.**
3. **Operation following to environmental management model in Japan**

Long An province express its interest in accepting factories identified as polluting industries if these 3 conditions are satisfied. The reason for this acceptance is that in comparison with other provinces such as Dong Nai or Binh Duong which are also near Ho Chi Minh City, the number of foreign enterprises invested in Long An is small.

Long An Province expects the investment of foreign and Vietnam enterprises by developing environment-friendly IPs which are equipped with industrial water supply and industrial wastewater treatment system. Especially, with the positive acceptance of polluting industries described in Circular 64 (shown in Table 1-2), Long An want to make differentiation with other neighboring provinces for creating job and increasing resettled residents, which are connecting to economic development of Long An. At the same time, by launching the slogan "Long An - Most Environment-friendly province", Long An province is aiming at improving its image. In term of realizing the slogan, Long An wants to make use of environmental technology and IP management skill of Japan. However, when building environment-friendly IPs, Long An obviously have to directly tackle industrial wastewater problem and environmental problem of land subsidence caused by large volume use of underground.

Vietnamese government is deeply aware of the importance of water resources but actions against water resources are traditionally taken by each field such as agriculture, technology, daily life and floods. According to law on water resources (Effective 1999), "National Water Resource Committee" has been established in 2000 year to revise this. By coordinating the water resource management with national strategy or action plan, Vietnamese government has strengthened its management and control of river basin. As need for agricultural water occupies 84% of water use, Ministry of Agriculture and Rural Development (MARD) was in charge of total management. However, then Ministry of Natural Resources and Environment also additionally takes charge of water resource management to realize comprehensive and cross-sect oral management and administration.

Regarding to industrial water as well as living water, a serious problem on lack of water resources has been criticized, for example 57% of enterprises in HCMC are having 65% of industrial water comes from groundwater (ADB, TA4903-VIE WATER SECTOR REVIEW PROJECT). In areas surrounding Hanoi or Ho Chi Minh City where IPs are intake, problems of land subsidence or groundwater pollution.

For example, Dong Nai River which is the important water resources to supply water for 47,300 k^2 of Ho Chi Minh City – the biggest commercial town in Vietnam and its surrounding areas has been proved by a recent investigation to be polluted by wastewater from surrounding factories. The problem becomes more serious that the mayor of Ho Chi Minh City warned National Assembly delegation when they were visiting HCMC on date 15, April, 2011 that "If Dong Nai River becomes more polluted, Saigon Water Supply Corp will not used water of Dong Nai River as a living water resources of Ho Chi Minh City. Dong Nai Province has to disclose plants which discharge wastewater exceeded standard for the punishment of immediate suspension of operations."

Moreover, due to being on a flat land, North Vietnam including Mekong Delta and regions surrounding Ho Chi Minh City according to report of Sustainable Mekong Research Network (Sumernet), in the dry season, April, May in My Tho river area will be intruded with measured salinity 3g/liter by seawater into 80km of upstream side at high tide. Besides, in dry season, lack of water from upstream side will happen. North of Vietnam where Mekong, the international river, a strong symbol on water resource is passing through is considered to be rich in water resources but in fact, it is not easy to ensure the water resources of daily life water, industrial water and agricultural water. By that reason, in Long An, in order to ensure agricultural water, a water supply business which builds the inland waterway to use surface water has been started under the support of World bank and ADB.

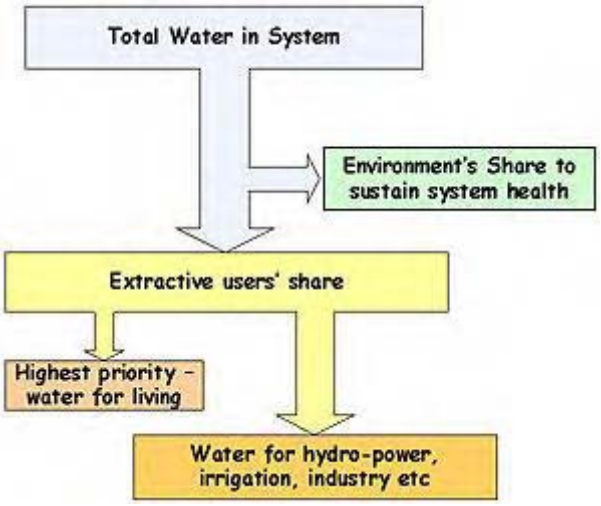


Figure 2-1 Current water using method

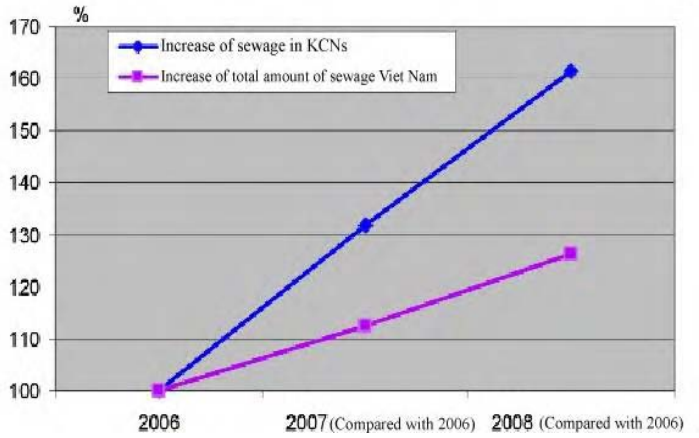
Then, the policy optimizing water use by increasing use of surface water and strictly controlling the use of groundwater, is considering in regions across the country Current law on water resources has emphasized on water for living while giving the right of surface water and groundwater use for agricultural, living and industrial use of small volume. However, use of small volume is not considered to be well controlled. Water right system for large volume water use has not been established. Besides, as described in Chart 1-1, even though water for living is given priority, use of water for hydroelectric power, irrigation or production which charges are higher is more than water for living. The reason may be that in consideration of profitability of water supply business, the one for hydroelectric power and productions having higher profit are causing effect to.

2-1-2 Issues of IPs in Vietnam (including industrial water and wastewater treatment)

At the same time with the growth of economy and industry resulted from development of IPs, serious environmental problems as well as its structural causes are also pointed out.

In term of environment, problems on wastewater, air pollution, soil pollution, land subsidence caused by large volume use of groundwater have occurred. Among those, "water problems" such as wastewater, groundwater pollution and land subsidence are much serious. Wastewater problem is that 70% of wastewater from IPs (700,000 m^3/day) has been discharged to surrounding rivers without any treatment, and damages to agriculture and fisheries are so big and increasing even could not be ignored.

Wastewater increasing of entire Vietnam and from IPs is described in Figure 2-2（increase rate of 2006 year is set as 100). Air pollution is caused from the old manufacturing technology in old IPs and the lack of waste disposal system. The main cause of soil pollution is that hazardous solid industrial wastes from IPs are illegally dumped into agricultural land or mountains and forests.



Source：copy from VEA 2009、Vietnam Industrial park Environment

Figure 2-2 Wastewater of Entire Vietnam and wastewater from IPs (IZ=KCNs)

In 2008, Taiwanese Vedan Company located in Dong Nai has been accused of discharging industrial wastewater to Thi Vai River. A large amount of compensation is required by surrounding citizens and fishermen. A state official of Dong Nai Environment Department was also impeached with conniving at Vedan's bypassing and discharging wastewater to Thi Vai River without using of wastewater treatment equipment of Vedan. Ministry of Natural Resources and Environment paying attention to this problem has made a general surprise investigation of wastewater treatment facilities of IPs and factories in the whole country in 2009. As its result, a fact that except foreign IPs, almost the rests are not equipped with "wastewater treatment equipment" and have discharged a large volume of water being much more polluted than environmental standard is clarified.

Estimated volume of hazardous pollutants in wastewater in 4 big economic regions as of 2009 is described in Table 2-3.

Table 2-3 Estimated volume of pollutions in wastewater in 4 big economic regions of 2009

No.	Area	Amount of waste (m^3/day)	Total quantity of hazardous pollutants				
			TSS	BOD	COD	Total N	Total P
A.	**KTTD areas in the North**	155,055	34,112	21,243	49,463	8,994	12,404
1	Ha Noi	36,577	8,047	5,011	11,668	2,122	2,926
2	Hai Phong	14,026	3,086	1,922	4,474	814	1,122
3	Quang Ninh	8,050	1,771	1,103	2,568	467	644
4	Hai Duong	23,806	5,237	3,261	7,594	1,381	1,904
5	Hung Yen	12,350	2,717	1,692	3,940	716	988
6	Vinh Phuc	21,300	4,686	2,918	6,795	1,235	1,704
7	Bac Ninh	38,946	8,568	5,336	12,424	2,259	3,116
B	**KTTD areas in the Central**	58,808	12,937	8,057	18,760	3,411	4,705
1	Da Nang	23,792	5,234	3,260	7,590	1,380	1,903
2	Thua Thien Hue	4,200	924	575	1,340	244	336
3	Quang Nam	13,024	2,865	1,784	4,154	755	1,042
4	Quang Ngai	3,950	869	541	1,260	229	316
5	Binh Dinh	13,842	3,045	1,896	4,416	803	1,107
C	**KTTD areas in the South**	413,400	90,948	56,636	131,875	23,977	33,072
1	Ho Chi Minh City	57,700	12,694	7,905	18,406	3,347	4,616
2	Dong Nai	179,066	39,395	24,532	57,122	10,386	14,325
3	Ba Ria- Vung Tau	93,550	20,581	12,816	29,842	5,426	7,484
4	Binh Duong	45,900	10,098	6,288	14,642	2,662	3,672
5	Tay Ninh	11,700	2,574	1,603	3,732	679	936
6	Binh Phuoc	100	22	14	32	6	8
7	Long An	25,384	5,585	3,478	8,098	1,472	2,031
D.	**KTTD areas in Mekong River Delta**	13,700	3,014	1,877	4,371	794	1,096
1	Can Tho	11,300	2,486	1,548	3,605	655	904
2	Ca Mau	2,400	528	329	766	139	192
Total		**640,963**	**640,963**	141,012	87,812	204,467	37,176

Source: VEA 2009, Vietnam Industrial park E

Beside the wastewater treatment problem, problems on disposal of solid waste and collection of hazardous waste after treatment of wastewater also come to a head. For wastes such as heavy metal which are difficult in treatment, disposal companies permitted by provincial authority have directly signed a contract with each factory to collect and dispose the wastes. However, many damage reports regarding disposal companies without approval maneuvering to illegally dispose wastes causing soil pollution for farmland, mountains and forests are submitted by farmers. As a result, Dong Nai has issued a circular that "Management companies of IP have responsibility for solid industrial waste disposal". However, only companies approved by Dong Nai authority are accepted. This circular is effective from 15 January 2011. By this, Dong Nai wants to make use of IP Management Company to trace the waste disposal. The same circular is also issued and eventually comes into force in Long An and the whole country.

2-1-3 Industrial Parks Development Plans of Vietnamese Government and Long An province

In Vietnam, about 115 new IPs are going to be invested from 2006 to 2015 and in 5 years later, more 91 IPs are also planned to develop but the utilization rate of land in IPs in operation is not over 50−60%. Especially, after Lehman shock, new investment in IP is reducing. According to report of Ho Chi Minh City Export Processing and Industrial park Authority (Hepza), it decreased by 15.71% in Vinh Loc IP and 12% in Tay Bac Cu Chi IP.

However, in other side, destructive land development by local governments considering IPs as real estate development would be pointed out as one of the causes of environmental problems.

IPs are not only creating job for young people but also new source of revenue from land rent for local governments. IPs are not only creating job for young people but also new source of revenue from land rent for local governments.

As its result, destructive development regarding using farmland, mountains and forests for building IPs has occurred in every region and there remain lawsuits of citizens in some land Among IPs which are planned, developed and built by planners without the concept of industrial location, there are a lot of so-called "Catalog IPs" which have no electric, water and telecommunication facilities, no port or airport surrounding as well as access road to cities. Naturally, tenants do not easily come to these IPs. It is the fact hidden behind rate of land utilization of 50-60%

Moreover, among local governments which are unable to build IPs by themselves due to financial difficulties, some have started to cutting farmland for sale as industrial land. If these areas are expanded and factories gather into there, factory concentrating areas looking like IPs have appeared. Those are small scale industrial clusters called (CCN) in Vietnamese. In these small scale industrial clusters, due to lack of clear regulation, management actors are not clarified. Ministry of Industry and Trade (MOIT) has pointed out that if the management authority of local government does not manage those

appropriately, risks of environmental pollution will be increased.

In the interview with MOIT, MOIT has stated as below:

> In case of CCN, factory owner has directly signed land leasing contract with local government and all from land preparation including surrounding water ways to factory building and necessary infrastructures such as electric power, water supply, and wastewater will be treated by themselves. Professional land development company does not exist. And there is no direct regulation managing CCN. In case of normal IPs, because there are national regulation, electric power, water supply, and wastewater has been so effectively controlled that even though problem happens, it will be handled. However, in case of CCN, groundwater has been exploited for industrial water by digging well by them. Land subsidence is feared. Therefore, it is obviously the environmental problem in CCN is much more serious.

In this situation, Ministry of Planning and Investment intends to cease the current policy which stimulates the quantitative expansion of IPs and to change to policy of giving priority to qualitative substantiality in consideration of environment. In this situation, Ministry of Planning and Investment (MONRE) intends to cease the current policy which stimulates the quantitative expansion of IPs and to change to policy of giving priority to qualitative substantiality in consideration of environment.

After the Lehman shock, besides the tight-money policy, there is also a brake on foreign investment. The time is gone when IP is salable right after it is built. On the other side, it comes to a period that environmental problem has become big social problem and that supervision of environmental destruction is held responsible. Vietnam tries to steer quantitative expansion to qualitative substantiality in every field.

Long An province has engaged in industrial development based on social economic development master plan until 2020 with the direction that industry occupies 50% of GDP. Putting industrial enhancement at first as an important item of economic development and promoting environment friendly IPs are one of important policies(Table 2-4).

Table 2-4 Draft of master plan study on Socio - Economic development of Long An 2020, Vision 2030

Sustained growth	Main factors
Economy	・ Industrial commodities through the use of technologies/ knowledge for the entire economy. ・ To improve the agricultural sector by increasing productivity, diversification of products, quality. ・ To create new industries (environmental, health, training, eco-tourism) ・ Provide high quality and efficiency services ・ To create an attractive investment environment ・ Strengthening regional cohesion. ・ Strengthening the links between urban and rural area
Society	・ To eliminate poverty and satisfy basic needs ・ To improve capabilities ・ Improving living conditions in urban and rural areas ・ Improve cultural value ・ Strengthening network of urban centers / services
Environment	・ Pollution issues ・ Conservation ecology ・ To improve capabilities of disasters response ・ Raising awareness of environmental ・ Awareness and interest in climate change issues
Management	・ Strengthen and stabilize financial capacity ・ Ensure better coordination among stakeholders ・ Ensure the effectiveness of state management
Images of the province	・ Typical image of Long An province to be specified ・ Competitive society and harmony ・ Building the urban landscape and balancing rural area ・ Ensure the role of gateway for the two regions of Cuu Long Delta Region and the Southern key economic region

2-2 PPP regulation in Vietnam

"Decision No.71/2010/QD-TTg Regulation on pilot investment using Public – Private Partnership model" (Hereafter called PPP regulation) has been signed on November 9, 2010 and would become into effect from Jan 1, 2011.This article reports outline of this regulation, pilot projects in Vietnam, estimated issues and applicability for this project, with the result of an interview to officer of Ministry of Planning and Investment.

2-2-1 Outline of PPP Regulation

(1) Framework of PPP regulation

Ministry of Planning and Investment (MPI) is the presiding ministry of the PPP regulation. The PPP regulation is composed of nine chapters and 52 articles, and the chapters are shown in Table 2-5.

Table 2-5 Framework of PPP Regulation

Chapter	Outline
1 General Provision	Provision includes general provisions such as scope of application, definition of terms, project selection criteria, interagency task force
2 State Contribution	Provision related to state contribution such as proportion of capital investment by State and its purpose
3 Project Preparation	Provision related to project preparation such as project proposal, creation of project and portfolio, investigation of project implementation feasibility, evaluation and approval by State.
4 Selection of Investors and Signing of Project Contracts	Provision related to bid for investor selection and negotiation before signing contract
5 Project Contract	Provision related to content and form of contract, right to receive project, transfer right and obligation, amendments and contract period
6 Issuance of Investment Certificates and Implementation of Projects	Provision related to procedure of investment certificate issuance, selection and procurement of contractors, land acquisition, registration of specification, project management, and progress report.
7 Final Account Works and Hand-Over of Project Facilities	Provision related to financial report, project achievement transfer
8 Incentives and Investment Guarantees	Provision related to Investment incentives (exemption of corporate income tax), right on foreign currency exchange, and guarantee of entities for service supply, guarantee of obligation of investor, project companies.
9 Organization of Implementation	Provision stipulates obligation of relevant authority of Vietnam commencing with Ministry of Planning and Investment.

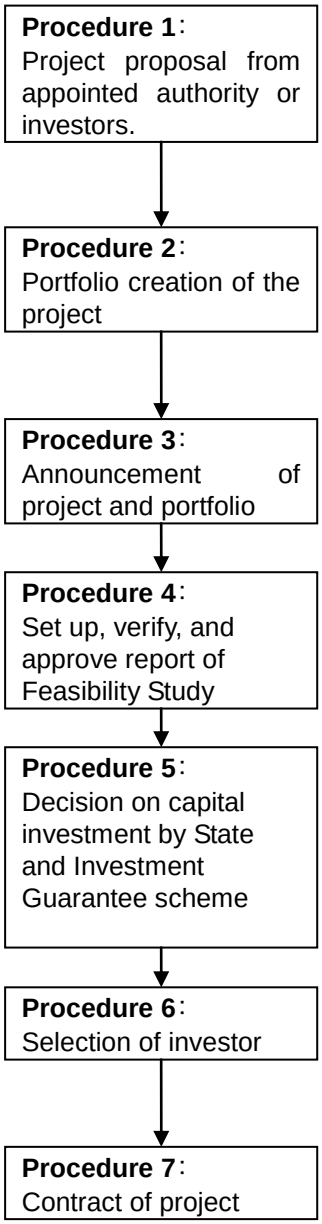
(2) **Application area**

Investment pilot area in the State-Private partnership model comprises 9 areas as follows (From Article 4 of this Regulation).

1. Roads, bridges, tunnels, ferry
2. Railway, railway bridges, railway tunnels
3. Urban transport
4. Airports, seaports, river ports
5. Fresh water supply system
6. Power plant
7. Health.(Hospital)
8. Environmental.(Wastewater treatment plant)
9. Other infrastructure development and public services supply projects as decided by Prime Minister.

(3) **Project implementation procedure**

Project implementation procedure according to this regulation is described as follows. This procedure is mainly extracted from Chapter 3 and 4 of the PPP regulation



In this regulation, PPP project will be started by proposal from appropriate authority, or investors.

Project proposal includes scope of project, location, application technology, construction period, estimate expenditure, effective comparison between investment project in State-Private partnership model and whole investment by state capital.

After receiving project proposal, Ministry of Planning and Investment will assess the proposal's content and create the project portfolio.

Ministry of Planning and Investment will ask each authority, relevant organization and provincial people's committee for their opinions within 30 days about these project portfolios as found to submit Prime Minister deciding to pass project into project list.

Publish and announce the project list which was approved as rule of article 14 of this Regulation on the advertisement for tender and on the websites of Ministry of Planning and Investment, and relevant authorities, and People's Committee, and other public communication facility (if necessary)

Appropriate authority holds bidding to select consultant for making Report of Feasibility study, and assesses and approves feasibility study

Appropriate authority submits Prime Minister proposal of portion of participation of state, investment guarantee scheme. Ministry of Planning and Investment resides co-coordinating with Ministry of Finance, relevant authorities to hold assessment of portion of participation of state, investment guarantee scheme. Finally, Prime Minister shall make decision and reflect the result into F/S.

Competent authority of each project makes guideline for bid basing on approved F/S and makes a national and international general bid. Competent authority evaluates the bidders and after asking Ministry of Planning and Investment for opinion of evaluation result, decides the investor

Within 30 days after making decision of investor by bid, competent authority and investor will go to contract negotiation and conclude a contract

Moreover, in case that the authority issuing investment certificate has required to adjust content of the contract, appropriate authority and investor must adjust respective content of the contract before official signature

2-2-2 Application example

This regulation has just come into effect from January 2011 and according to an officer of ministry of planning and investment, it is under process of project selection but some application examples have been reported.

Before this regulation has been decided, in July 2010, the adoption of Dau Giay – Phan Thiet high way project has been announced as the first pilot project of this regulation (in article of Baomoi.com). Investors are Bitexco.（Binh Minh Import-Export Production and Business Limited Liability Company）and IFC and total amount of investment is 14billions VND.

Beside, among high priority infrastructure investment projects according to 2007 prime minister's decision No. 412 QD-TTg in Vietnam such as highways.（Cau Gie – Ninh Binh、Ninh Binh – Than Hoa, except for the above Dau Giay – Phan Thiet）, seaports .（Lack Nhuyen (Hai Phong), Van Phong）, airports (Terminal 2 of Noibai international airport, Dong Nai international airport), bridges (Vam Cong, Cao Lanh), Railway (Lao Cai – Hanoi – Hai Phong、 Dong Dang – Hanoi), airport is reported as a PPP pilot project (According to Article of VnEconomy).

2-2-3 Issues expected for applying regulation

There are some concerns such as project selection process and bidding requirement under PPP regulation, when this project will be regarded as one of the pilot projects of the regulation. Here will organize these concerns, based on interviewing results from the persons in charge of Ministry of Planning and Investment (MPI).

(1) MPI's project selection

Generally in Japan and some countries, the investors - local governments and private businesses - will negotiate and determine whether they implement PPP projects or not.

Vice versa, according to PPP Regulation of Vietnam, after receipt of proposal from appropriate authority and relevant investors, MPI will build a project's list and select the projects to implement. Therefore, it is concerned that also this project, in addition to negotiations with the Long An provincial government, can be selected through a process of MPI project

In this regard, person in charge of MPI told: "This Regulation is to implement PPP pilot project in Vietnam. Need to conform this procedure if want to implement as a pilot project". Based on this comment by MPI, some projects under PPP scheme could be done without following this PPP regulation procedure, if they are not proposed as pilot projects.

(2) **Projects approval by Prime Minister**

Similar problems as in Clause (1), in Japan and some countries, the approval for PPP projects is a process between local governments investors and private enterprise. While according to Vietnam's regulations, the Prime Minister empowered to approve the project.

In this regard, as the issues already mentioned in Clause (1), based on the comment by the person in charge of MPI, at least this project is not proposed as a pilot one, the project can be done without following this procedure.

(3) **Investor selection – bidding system**

Under this PPP regulation, the investors for project will be selected by general competitive bidding, regardless whether project proposed by the managing ministry or by investor. On the other hand, according to the BOT decree, in the case projects proposed by investors and within 30 days after advertisement of bidding, if there is no investor who has additional proposals except the original project proposer, the original proposed investor will have the right to negotiate. Meanwhile, in some countries such as Korea, Chile, if a project proposed by private companies (Unsolicited proposal), then the proposed investor will be given many preferential conditions when assessing the bid. In the Philippines, the competitive mechanism named “Swiss Challenge System” was applied. Accordingly, the content of the project suggested by investors will be published within a certain time to receive suggestion from the third parties (Challenge). Then the investor will be proposed to improve the content of his own proposals for competition. In recent years, the "competitive negotiation" also applied in Japan. So many countries applied the preferential conditions to investors who had given the investment proposals.

As content in Clause (1) and Clause (2), if this project is not proposed as a pilot project then the project may not need to follow the process of this PPP regulation. However, mechanism to provide incentives to procurement should be considered during the review of this regulation as PPP’s rule in Vietnam.

2-2-4 Applicability to this project

As mentioned in section2-2-3, there are some concerns when this rule applies to this project. However, interview of the person in charge of MPI shows that it is not necessary for any project to comply with this rule even though a project uses PPP method.

In case of not to follow this PPP regulation then it is necessary to build the project framework under the BOT regulation and other application field regulations, so investigation of the related regulations should be continued.

For reference, we would quote the interview summary of the person in charge of MPI.

Interview note : Ms Lei MPI Public Procurement Department
Interview date : 21/12/2010 14: 00 -
Location : MPI
Summary： ● This rule applies to pilot projects ● Project list prepared as proposed by the ministries, departments, then a pilot project will be selected ● The pilot project, 1 ~ 2 typical projects for each region, is expected to select ● Now in process of intake proposals from ministries, departments ● An inter-ministries-departments taskforce team will be formed as on regulation, now members are in selection. ● Projects, have already negotiated with local authority and businesses like implemented by Japan, are out of application scope of PPP regulation.

2-3 Intention of Vietnam MPI and MONRE with regard to relevant projects

After starting this project, on the late of December 2010, we had explained the content and confirmed the intention of project with Ministry of Planning and Investment (MPI) and Ministry of Natural Resources and Environment (MONRE). MPI has agreed on the significance of this project, based on the recognition that half of the 171 parks in operation do not have wastewater treatment plants and the environmental concern has become the one of important points to attract foreign companies to build factories.

With a similar awareness, World Bank[2] has plan to kick off some Waste water treatment businesses in some area as Dong Nai, Ha Nam, Nam Dinh v.v from 2012.

Long An province is not the target area of the WB project, therefore this province expressed the expectation that projects will be implemented by JICA. Mr. Dong, the Director of Industry Management Department also expressed the endorsement of this opinion when visiting IPs.

Even MONRE also fully recognized the seriousness of wastewater treatment problem at IPs and has introduced the improvement initiatives such as environmental monitoring act. As the same explanation from MPI, half of IPs had not installed wastewater treatment plants, and wastewater and solid waste have become the problem. Today, Ministry has regular meetings with the People Committee of these areas. The environmental monitoring with Dong Nai People Committee shows that, 19 of 21 IPs have installed the wastewater treatment plants and the situation has improved. But, if the treatment facility made by Vietnam partners, there would be similar problems happening at Dong Hoa IP, Long An province. Specifically, Sapporo Beer had refused to use the integrated wastewater treatment facility because they think it did not meet their internal standards. MONRE also remarks that the situation in

[2] *Website of World Bank Projects：
http://web.worldbank.org/external/projects/main?pagePK=64283627&piPK=73230&theSitePK=40941&menuPK=228424&Projectid=P113151

northern Vietnam such as Hai Duong, Hung Yen, still remain serious.

Besides, MONRE also participated into the World Bank projects, and Head of Economic zones management Department, Mr. Dong from MPI was elected as the leader of Vietnam side and Ms Phuong, a World Bank Hanoi office member, was assigned as the coordinator. The project contents are institutional improvements (information publishing, and system building), monitoring, training and financial assistance v.v...in the project.

The Center for Environmental Monitoring is established by MONRE, and to conduct environment monitoring. The monitoring of IP is authorized by IP management committee. The report of wastewater discharged from IP, must be submitted to province and MONRE to monitor the situation. Data is automatically collected, and sometimes is collected by human. Commonly, they put the checkpoints in some appropriate locations of rivers to check the water quality, but they also consider some ways to put checkpoints in locations, where the wastewater drainages from IPs to check the water quality.

The target of this JICA project focuses on IPs and was decided by Prime Minister. There is common consciousness on circumstance that not only at IPs, but there are also significant differences at integrated regional small-scale plants. Therefore it cannot solve these circumstances.

MONRE emphasis the following two regulations as most important

- MONRE's Circular 08/2009/TT-BTNMT, environment management and protection in economic zones, hi-tech zone, IP and industrial clusters
- This Circulation stipulates on IP business according to viewpoint of environmental protection in each phase from project planning to construction of IP etc.
- Government's Decree 29/2008/ND-CP on stipulation of Industrial parks, Export processing Zones and Economic zones

This Decree limits development of IP, of which has low sufficiency and attractiveness materiality from investor's point of view.

Ministry of Industry and Trade .（MOIT）indicates their desire as an opinion on this project as follows: The previous approach in Vietnam allowed the development companies to perform the utility. It is preferable to consider the possibility to implement utilities in collaboration with IP developing companies even though this project propose that utilities will be undertaken by other companies. In addition, the industrial clusters authorized by the local People's Committee should be taken into consideration as well as the IP decided by Prime Minister.

In this regard, Investigation team recognized that the IP's Waste water treatment business cannot be implemented without the cooperation from the developing companies, which develop the infrastructure

of IP. About the industrial clusters, investigation team said that it should first focus on the environmental issues of IPs, and bases on its achievements, the environmental issues of industrial cluster will be solved by the side of Vietnam.

2-4 Actual state and trend of foreign companies in regarding to projects

In Vietnam, the wastewater treatment equipments and technologies from European have been highly appreciated historically. The Japanese IP LOTECO is also adopted Belgian equipments for the first wastewater treatment plant. It is unable to confirm the statistical data of equipment supplied by foreign capital companies, but Duc Hoa IP is under construction of the wastewater treatment plant imported from Vietnam. The technical superiority of Japanese-made wastewater treatment equipments still remains unknown in Vietnam. This low awareness is unavoidable, because Japanese manufacturers of wastewater treatment facilities had just joined their operation in Vietnam market few years ago. Under the immature situation of Vietnam market that half of IP have no wastewater treatment plants, equipped with the formal systems, the late coming advance of Japanese companies is understandable.

As aforementioned, the policies of Vietnamese government against environment issues have changed a lot. Environmental issues had become social issues like in Japan in the 1950s, and may become the political issues in some certain extent. The Vietnamese enterprises and Japanese wastewater treatment manufacturers also have changed their realization that this area is a large market.

The preferential interest rate policy for environment business in Vietnam shows the concerns raised by the Government that environmental issues could develop into political The annual interest rate of Bank lending rate is 14% -15% (up to 20% interest), but in case of environmental projects, the preferential interest rate of 6%/year was announced. It seems to be that there is strong leadership of the Communist Party to protect people's lives and property, as it is considered to be the party’s principle. Some Vietnamese enterprises have started to move their business on environment to take advantage of low interest rates.

IPs establishment boom, real estate’s boom with apartment building, stocks boom and bubble were born but disappeared and now it shows some aspects of similar boom in environment business with low interest rates available. It is worried that whether a sound environmental business will be established or not.

In the process of survey, we came to visit some IPs and checked status of wastewater treatment plants. As a result, there are many places where using products of Vietnam and China by low price. According to information on the press, England is under construction of wastewater treatment plant following PPP mechanism, but it’s unable to confirmed specific operation situation.

2-5 Supports receiving situation from other donors in the relevant sectors of the project

By 2009, with the cooperation of World Bank, Denmark has conducted a nationwide survey of IPs' wastewater treatment plants.

As mentioned above, 100% Vietnam capital development companies develop electricity, water and other infrastructure, but Wastewater treatment facilities were entrusted to production companies (customers). Therefore, a large majority of the existing IPs, have financial limitation to install new wastewater treatment plants. In order to solve this problem, World Bank have advanced the Vietnam Industrial Pollution Control Project as a comprehensive support program, including institutional enhancement, granting license to entrepreneurs, financial support for construction and operation (total amount is 50 million U.S. dollars), which begin from 2012. Executive staffs of relevant government agencies have participated in this project.

Water supply business in Long An province, World Bank is planning to build a canal from the mountains down to Dau Tieng Lake, and ADB is planning to build a main canal from the Dau Tieng lake to Long An province. In addition, South Korea is planning to build a clean water treatment plant of 80,000 m^3/day in Long An province funded by South Korea ODA..（See the details in 3-4Water supply business）

The outline of Vietnam Industrial Pollution Control Project

Project Construction
Component 1: Institutional Strengthening and Enforcement.
Component 2: Pilot Financing for Wastewater Treatment.
Component 3: Technical Assistance for Industrial Estates and Project Implementation.

Project area
Basin of Nhue Day river: Hanoi, Nam Dinh and Ha Nam
Basin of Dong Nai river: Ho Chi Minh, Dong Nai, Binh Duong, Binh Phuoc and Ba Ria-Vung Tau

Project budget

Source:	(US$m.)
BORROWER/RECIPIENT	10
International Development Association (IDA)	50
Total	60

※ It needs 360 millions US$ to install Integrated wastewater treatment plants in all IPs of the target area.

Person in charge of project
Contact: Jiang Ru Title: Operations Officer Tel: (202) 473-8677 Fax: (202) 477-2733
Email: jru@worldbank.org

In addition, for industrial wastewater treatment, ADB is planning to approve and start a technical cooperation project in February 2011.

The outline of Industrial Wastewater Management

The project outlines

- The sustainable provision of safe water in the Hanoi area by developing alternative water resources (e.g. Red River) to meet water demand in future and improve service quality.
- Reducing NRW (in collaboration with World Bank)
- Promoting public private partnership through corporatization and management and performance contracts for project financing, operation and maintenance.

Project area Hanoi area

Project's purpose To improve environmental sustainability through industrial water pollution control

Project's result
Agreed design for a sector loan for industrial wastewater management in Viet Nam in existing IPs

Project's budget

Source:	(US$.)
Technical Assistance Special Fund	1.28 million
To be determined-Others	225,000

Person in charge
Contact: Hubert M. Jenny Southeast Asia Department Email: hjenny@adb.org

2-6 Surrounding natural conditions of the project site

Long An province is located in the Mekong Delta. Its total area is 4,491k^2, population is 1.5 million, working population is 800,000 peoples (working population in Mekong Delta is 17:5 million people). Long An province is the window of overland route and waterways between Cambodia and the Mekong Delta provinces. In terms of location, it has a convenience, that is adjacent to the largest city in southern Ho Chi Minh City, about 25km to Tan Son Nhat Airport, and about 30km to New port and Saigon port, about 30km from the center of Ho Chi Minh City. About transport infrastructure, it has highway Route 1A, Saigon-Trung Luong Highway, No. 830 Provincial Highway No. 10, Vam Co Dong river.

Every year flood firstly converges to the Northern districts in Dong Thap Muoi, starting from the beginning or mid August and lasting to November, flooding by water containing salt, and contaminating land, announced by Long An official government[3].Securing water resources is difficult in Long An province and there is only way to use groundwater or use water from the lakes of other provinces.

[3] http://www.longan.gov.vn/english/Pages/Natural-condition.aspx

2-7 Demand on projects (current status and perspective)

As outline above, there are various IP in Vietnam, and will be developed more in future. There is only a few environment-friendly IP, which can accept specified pollution industries, except some IPs developed by foreign capital. There is no local authority that wants to receive environment-friendly IPs like Long An province.

IPs developed by foreign capital like LOTECO, have provided wastewater treatment plants when establishing IPs, and have gradually increased capacity and capability to meet the demand of tenants. But IPs developed by foreign capital is already full, and can hardly receive the new pollution-specified plants.

Among the IPs developed by 100% Vietnamese capital companies, such as Duc Hoa IZ-target of this project, it began to appear some IPs that installed wastewater treatment plants from the beginning, but its capacity and treatment ability is limited. And it seems that such cases are extremely limited throughout the country.

As shown below, there are many potential candidates for tenants and effects caused by this project, are also high.

- Plants of certain industries which are stated as polluting industries and especially the 13 dyeing companies in Ho Chi Minh City may be moved. There are many Vietnamese enterprises such as plating factory, tannery, silk plants and chemical manufacturing plants (See attached table of Related Industry Association and its member companies)
- There are many companies being forced to move among foreign companies (for example, South Korea dyeing plant, etc)

In order to get support frequently by stakeholders for this project, we need to consider the management of Long An province's IZ in the perspective of governments industry as a whole, It means corporations　Vietnamese people, and on the effective vision using Japanese technology(Table 2-6).

Table 2-6　Viewpoint to confirm the project's needs

	Vietnam	Japan
Government, industry as a whole	Contributing to industrial development Accumulating operational method of "polluting industries"	Maintenance of investments Infrastructure for Japanese companies Expansion of environmental technology overseas
Enterprise	Transferring enterprises inside Vietnam Cornerstone of business development for polluting industries	Expansion of Japanese SMEs Increasing opportunities for advanced machinery exports Increasing investment opportunities
Vietnamese people	Safe and secure life by pollution reduction Jobs guaranteed	Improving Japanese brands

2-8 Risk analysis (mainly on the legislative system)

This section shows out risks of projects on legal system. Since Vietnam is a officially WTO member on January 11, 2007, various national laws has been promoted.

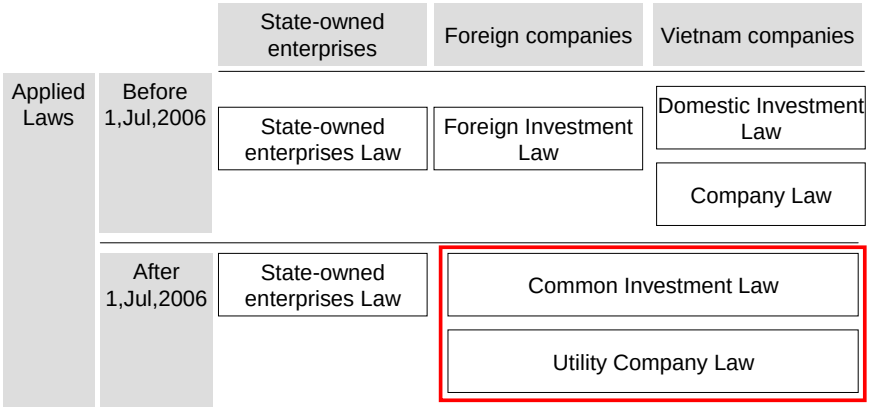
For foreign investment, replaced the old Foreign Investment Law, today Vietnam has been promulgated The Common Investment Law and The Unify Company Law. Therefore, the Vietnamese enterprises and foreign enterprises have treated under the same rule.

2-8-1 Risks related to legal system

Regulation document related to foreign enterprises investment.

(1) Common Investment Law

Important laws related to foreign investment are Common Investment Law replaced the old Foreign Investment Law, and Unity Company Law. The Common Investment Law replaced the old Foreign Investment Law (2006), and for foreign companies, the freedom to invest to Vietnam has been improved. The Unify Company Law has treated the Vietnamese enterprises and foreign enterprises under the same rule.



(source : JETRO)

Figure 2-3 Extent of Common Investment Law and Utility Company Law

Law on investment No. 59/2005/QH11.(Law No. 59/2005/QH11 on Investment).(Common Investment Law)has enacted on 1 July of 2006. The Common Investment Law has been established to provide a unified legal framework for both Vietnamese investors and foreign investors in Vietnam to be complied with, when making investment in Vietnam. Specifically, this law stipulates the area of investment incentives or restrictions, investment forms that investors can be invested, permit requirements, disputes settlement, and general conditions of investment security by Vietnam. The

Common Law is the document law which is special priority in specific investment sectors, however all investment activities in Vietnam have to comply with the terms of Investment Law.

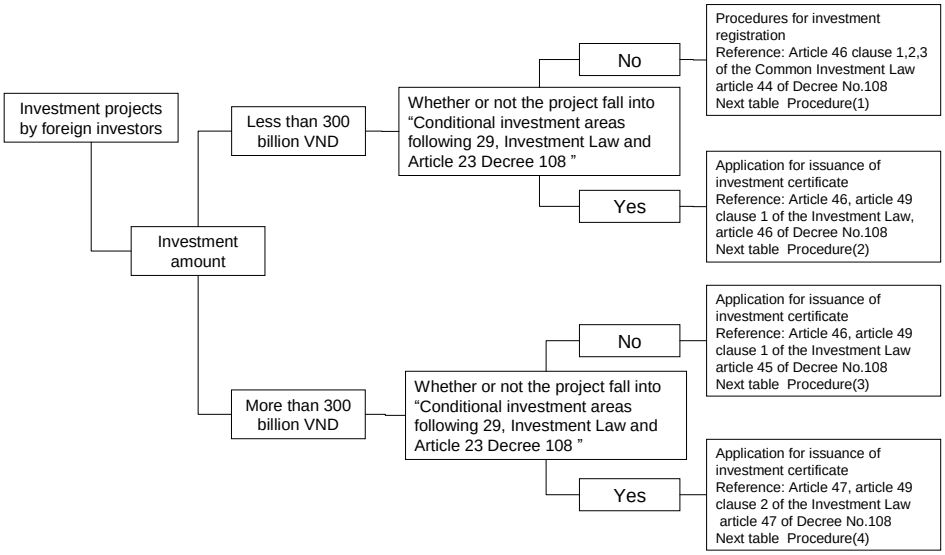
<Investment incentives, conditional investment areas and investment prohibit areas>

Common Investment Law stipulates the areas and industries, which investment incentives are guaranteed, and the conditional investment areas and investment prohibit areas. Investment in service areas such as banking, finance, health, publishing, education, entertainment and real estate must have conditions. (Article 23 Decree 108).

Licensing authority and procedure shall be different according to investment capital which is in the conditional investment areas with 300 billion VND or not. This project is not in conditional area, so it shall be implemented. If investment capital under 300 billion VND, apply to procedure (1), if above 300 billion VND, is for procedure (3) as mentioned above.

Table 2-7 Facile- Difficult degree of application for issuance of formation following per area

Plan	Content outlines	Risk of application for foundation permission .(Facile- Difficult degree)
1.Clean water supply business plan; formation of construction, own, management, operation of water supply work companies	construction, own, management, operation of water supply work companies are all not in conditional investment areas and prohibit investment areas. Not meeting difficulties in application for issuance of company formation.	Not type of limited business so easy to apply for permission.
2.New utility work environment-friendly project plan	Not in conditional investment areas and prohibit investment areas, can invest 1005 with foreign capital and there is not special difficulties in application for issuance of management company formation. Practically, there are lot examples about waste water projects as lot investment of Thailand companies.	Not type of limited business so easy to apply for permission.
3. Environment-friendly wastewater plant rent plan (or business)	・If rent out wastewater treatment facilities, need to receive license of financial operations, bank is a limited business. There is example of renting company formation with 100% of Korea capital, however, 7 years ago, there was not example of formation with 100% of foreign capital, so it seem losing time in application for issuance of permission. ・In case wastewater treatment plant construction plan don't carry out renting plan, without special difficulties in company formation permission due to it's not in limited business. In such case, wastewater facilities are not for renting but for selling.	Rent project (financial, bank license) is a limited business, difficulty in investment 110% of foreign capital. In case installation, operation of facility is easy to apply for permission.



(source : JETRO)

Figure 2-4 Procedures for investment in accordance with Vietnam Common Investment Law (Foreign investors)

Table 2-8 Conditional investment areas for foreign companies only

*1 Conditional investment areas for foreign companies only	
(1)	Broadcasting, program producing
(2)	Production, publishing, distribution of cultural products.
(3)	Mineral exploitation and processing.
(4)	Construction, installation, operation and maintenance of communication and internet facility
(5)	Postal network building, home delivery service establishing.
(6)	Construction and operation of river ports, seaports and airports.
(7)	Rail transport, air transport, marine transport, waterborne transport and passenger transport.
(8)	Fisheries.
(9)	Tobacco production.
(10)	Real estate.
(11)	Import, export and distribution.
(12)	Education and training.
(13)	Hospital, surgery
(14)	Investment areas which are subjects of international treaties joined by Vietnam or access restriction for foreign investors.
*2 Investment areas required Prime Minister's approval ((1) to (9) are applied regardless of sources of financing or amount. (10) to (12) are applied to only in case of projects which the investment amount is more than 1500 billion VND. (13) to (16) are applied to foreign investment projects only.	
(1)	Construction and operation of airports, air transport facility
(2)	Construction and operation of harbors
(3)	Exploration, exploitation and refinery of oil
(4)	Mineral exploration and exploitation
(5)	Radio and television broadcasting
(6)	Casino business
(7)	Tobacco production
(8)	University education
(9)	Establishment of industrial parks, export processing zones, hi-tech parks and special economic zones
(10)	Electricity, mineral processing and metallurgy
(11)	Infrastructure building such as railways, roads and waterways
(12)	Production of alcohol and beer
(13)	Marine transportation
(14)	Network building and providing of postal delivery, communication services.
(15)	Newspaper, publishing and printing business
(16)	Establishment of independent scientific research centers
*3 Conditional investment areas following 29, Investment Law	
(1)	Areas affected national defense, national security and public security;
(2)	Finance, banking;
(3)	Areas affected people's health;
(4)	Culture, information, newspaper and publishing;
(5)	Entertainment services;
(6)	Real estate business;
(7)	Survey, exploration, exploitation of natural resources, ecological environment;
(8)	Development of education, training;
(9)	Other areas provided by laws.

(Source): JETRO (Article 23 Decree 108)

Procedure (1) Application for investment registration in case under 300 billion VND and not in "conditional investment"	Procedure (2) Application for issuance of investment license in case under 300 billion VND and in "conditional investment"	Procedure (3) Application for issuance of investment license in case above 300 billion VND and not in "conditional investment"	Procedure (4) Application for issuance of investment license in case above 300 billion VND and in "conditional investment"
Licensing authority: Case A: Project in IP, EPZs, High tech zones, Economic zones → Management board of IP, EPZs, High tech zones, Economic zones Case B: Project is not in areas above → Department of Planning and Investment Project in case A, B and Premier approve under Decree 108 article 37 Number of submitted file in case approved by Premier is 10			Number of file 4 8
[Filing] (1)Procedure of investment registration (i) File for investment registration (Reference Decree 1088) (ii) File related to stipulation in article 45 item 3 of this law. + Corporate capacity of investor + Intention, scope and location of investment project + Investment amount and progress of project + Expectation of land use and engagement of environmental protection + Petition for incentive investment (if any) (iii) Financial capacity report of investor (iv) Contract BCC (2) In case investment related to economic organization formation (i) Business investment file + Suggestion for business registration + Draft of Company regulations + List of founder shareholders + Certificate of legal capital (if there is stipulation of legal capital) +Work certificate (if project requires work certificate) (Reference article 18 and 19 the Unity Company Law). + Joint venture contract (Refer regulations, article 22 the Unity Company Law)	[Filing] (1)Application for issuance of investment license (i) Đơn xin cấp giấy phép đầu tư (Reference Decree 1088) (ii) File related to stipulation in article 45 item 3 of this law. + Corporate capacity of investor + Intention, scope and location of investment project + Investment amount and progress of project + Expectation of land use and engagement of environmental protection + Petition for incentive investment (if any) (iii) Financial capacity report of investor (iv) Contract BCC (v) Statement of capacity meeting conditions (2)Same as content in the left	[Filing] (1)Application for issuance of investment license (i) Application for issuance of investment license (Reference Decree 1088) (ii) Certification of corporate capacity of investor (iii) Financial capacity report of investor (iv) Contract BCC (v) Statement of economy, technology (include following content) +Intention of investment, location, expectation of land use, scale of production, investment amount, progress of project, main technical measure, environment standard (2)Same as content in the left	[Filing] (1)Application for issuance of investment license (i) Application for issuance of investment license (Reference Decree 1088) (ii) Certification of corporate capacity of investor (iii) Financial capacity report of investor (iv) Contract BCC (v) Statement of economy, technology (include following content) +Intention of investment, location, expectation of land use, scale of production, investment amount, progress of project, main technical measure, environment standard (vi) Statement of capacity meeting conditions (2)Same as content in the left

Figure 2-5 Specific investment procedure according to the Common Investment Law of Vietnam

(2) **Utility Company Law**

Forms of company defined in this law are shown below:

- Limited liability company with single member
- Limited liability company with two or more members
- Joint stock company
- Limited partnership
- Private company
- Mother company and subsidiary, joint venture company and group including lot other forms

Table 2-9 Necessary procedure to found a company

Type of papers	Remark
Application for issuance of investment license	Business activities by limited in allowed scope of Government, there is also case of associated business in extensive scope.
Limited partnership contract (joint venture company) (respective case)	Need to have signature of legal representative of limited partnership
Regulation of limited partnership or company with 100% of foreign capital	Pay attention for regulation so that it's not contradiction with Vietnam Law
Report of feasibility study (FS)	May use basic outline for applying
Materials prove financial capacity and corporate capacity of application for investment license or relevant person in the contract	To have lawful file set, need letter of representative of company and financial data in last 2 years, and financial report.
+	
Financial report of foreign investor	
The first leader of company (materials on representative, director, comptroller board act.)	
Copy of passport of leaders	
Decision writing as report of Board of Directors' meeting act.	

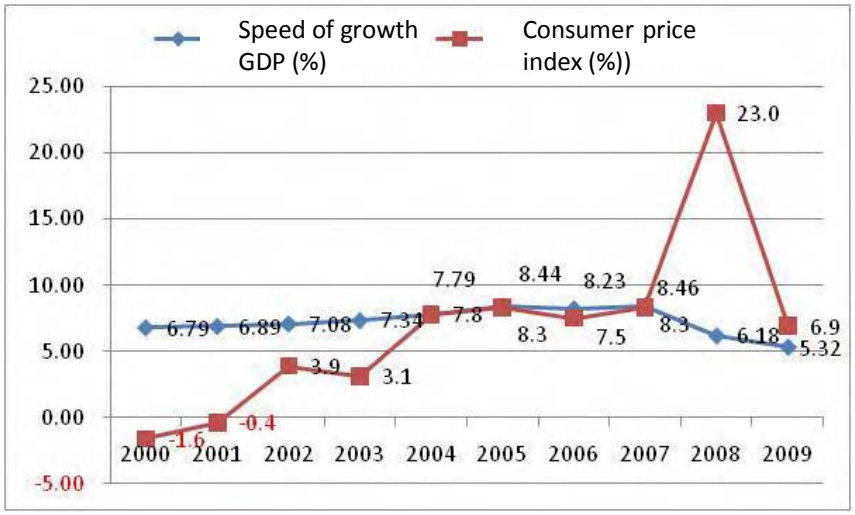
(3) **Stipulation of foreign exchange control.(Ordinance No. 28/2005/PL-UBTVQHII on Foreign Exchange Control dated 21 December 2005)**

Overseas remittance of dividend is allowed in Vietnam. Up to year 2004, there was consigning profit tax and collected income tax; however this law is abolished today.

2-8-2 Other risk factors

(1) Risks of price fluctuation and foreign exchange rate

Speed of growth of GDP within last 10 years almost retained from 6-8%, except year 2009 was 5.32%. CPI 2008 retained high standard exceeding 20% by increasing oil price is high, investment flow money had property of jobbing real estate etc, but then always fluctuation at rate 6-8%. In the last years, CPI trends crossing speed of growth of GDP.



Source) JETRO

Figure 2-6 Speed of growth of GDP, change of index CPI

Transition of Investment value and quantity of project in Vietnam are shown in Figure 2-7 and average value of exchange rate (US$-VND) is shown in Figure.

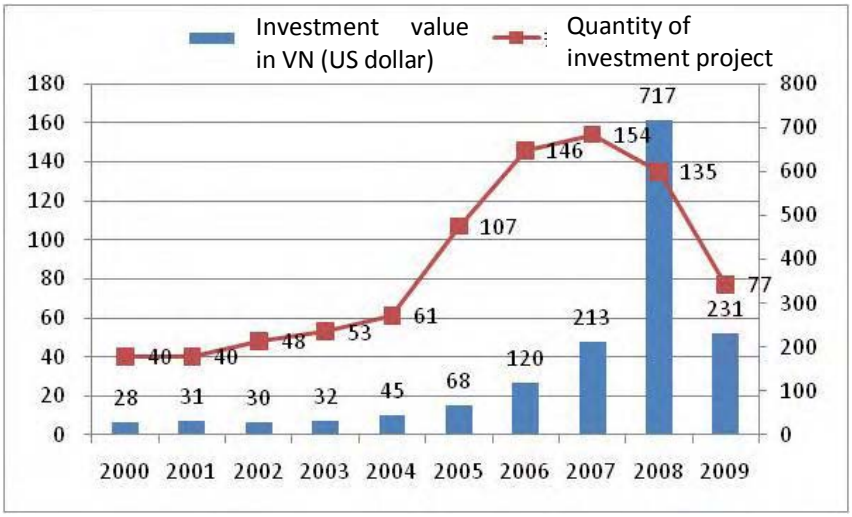


Figure 2-7 Transition of Investment value and quantity of project in Vietnam

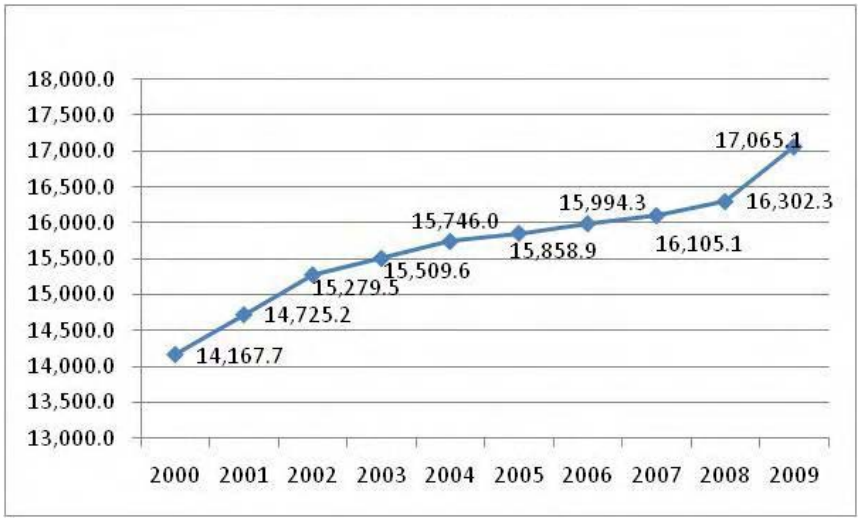


Figure 2-8 Exchange rate (US$-VND) – Average value

(2) **Risks of government support**

Co-agreement and support of local government will be necessary during the project. Through the survey, we have been conducting ongoing contacts with the local governments (especially are Long An and Dong Nai provinces). For mean of project implement, they express their knowledge and approval, for project implement, they will extremely support to implement the project, suppose, during the project, a matter arising as issuance of license, it shall be discussed together.

2-9 Environmental and social consideration

2-9-1 Overview of the components which have an impact on environmental society

(1) Overview of the target projects

There are three issues in industrial parks (IPs) in Vietnam. Following three businesses were planned and investigated as solution for each issue.

Issue 1: Reservation of the location place of pollution type industry

Issue 2: Issue on Waste water Treatment

Issue 3: Land subsidence by large volume use of groundwater

1) Environment-friendly utility project (Utility project)

It is the business planned in order to cope with the above issues, the issue 1, and the issue 2. An environment-friendly utility management company provides a low environmental impact utility service (Electric supply, water supply, liquid waste treatment, and waste storage, in addition to this) in the prepared IP-site. The company reserves the location of polluting industries by improving and managing the IP as an environment-friendly IP.

Thuan Dao industrial park in Long An province has already acquired EIA from DONRE (Department of Natural Resources and Environment) of the Long An province in 2009. In the IP, the preparing construction of phase 2 (189ha) has been completed and it acquires the permission as a normal IP by people's committee Long An province in the same time.

The Director of DONRE has commented at the presentation meeting in Long An province, that the switch of the licnence is not required, but each tenants are required to be confirmed with EIA.

2) Clean water supply business

It is the business planned in order to cope with a subject 3. The IPs in Long An province use groundwater as industrial water in general, and land subsidence of about 20cm takes place every year. Long An province (people's committee) makes improvement of the water-filtering institution using surface water most important. Moreover, they applied the private-sector capital, and constructed and managed the water service institution quickly.

Moreover, they will apply the private-sector capital, construct and manage the water service institution quickly. They have announced the basic policy that they will forbids usage of groundwater

extensively after the completion (Official letter No.1717/UBND-NN).

At first, this business supplies industrial water for the above-mentioned business 1 and gives top priority to a realization of the management as an IP independent on usage of groundwater. Moreover, when a surplus is made to capacity, it is also assumed that this business supplies water for the residents in the area in the following phase.

3) Waste water treatment business

It is the business planned in order to solve an issue 2 fundamentally. However, from a financial viewpoint, it was proved to be difficult to carry out this business immediately.

In this report, this business is out of the environmental scoping.

This business will install waste treatment function in many existing IPs and contribute to pollution mitigation.

(2) Setting area of the impact

The three businesses currently planned aim at mitigation and improvements of the three environmental issues as above-mentioned. By carrying out those businesses, it is not assumed fundamentally that the natural environment gets worse.

However, in this report, the environment and social impacts by these businesses and the prepared industrial park (Than Dao IP Phase 2 in Long An province・189ha) are considered indivisible and analyzed.

In this report, the business 1 and the business 2 are carried out a scoping object. The business 3 is out of scoping. The impact range is set up in order to evaluate the environment and social impact in these businesses (Figure 2-9).

The series of process from water supply to drainage, raw water is acquired in DauTieng Lake, passes along an irrigation canal and a pipeline, is sent to a water filtering plant, and is supplied through pipelines as industrial water to the business 1, is considered indirect impact range. The waste water primarily is processed in the factories, is processed secondarily in a wastewater treatment plant installed with the business 1 and is drained to the Vam Co Dong River flows on the side of the IP.

The waste treatment in the IP is only temporary storage. Since waste is processed by the outsourcing

contractor outside the IP, the waste treatment is taken as the secondary impact range.

On electric supply service of business 1, the on-site electrical power facilities will be used in case of emergency for backup. It accepts normally the power through networks. It is included in a direct impact range as an element which influences air quality.

In the future, when taking the waste water business (business 3) into consideration, it will become possible to apply a part of the utility project's study. That is because it is specializing in the wastewater treatment function included in the utility project.

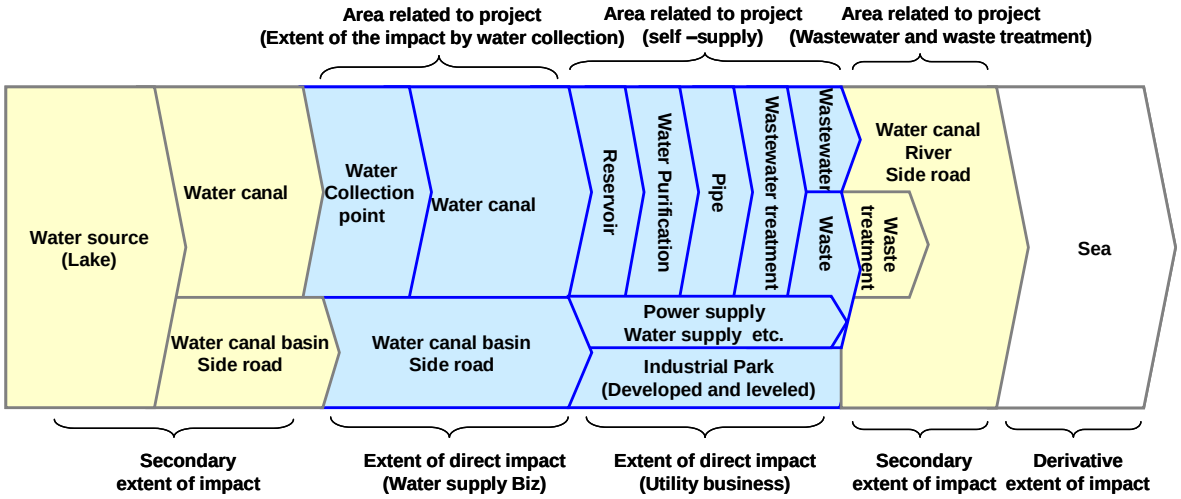


Figure 2-9 Range of impact set in this project

(3) Location of target project

1) Environment-friendly utility project.(Utility project)

Utility projects are targeted at the 189 hectare (ha) which is the Second Phase of Thuan Dao IP located at Ben Luc District in Long An Province (TINH LONG AN). This IP is located at a distance of approximately 23 km or about one hour away from the center of Ho Chi Minh City. Expressway construction and the infrastructure development by Long An Province is moving ahead and this IP is located within five minutes distance from Bour Bon port, this IP has higher competitive advantage in terms of geographical conveniences and logistic cost.

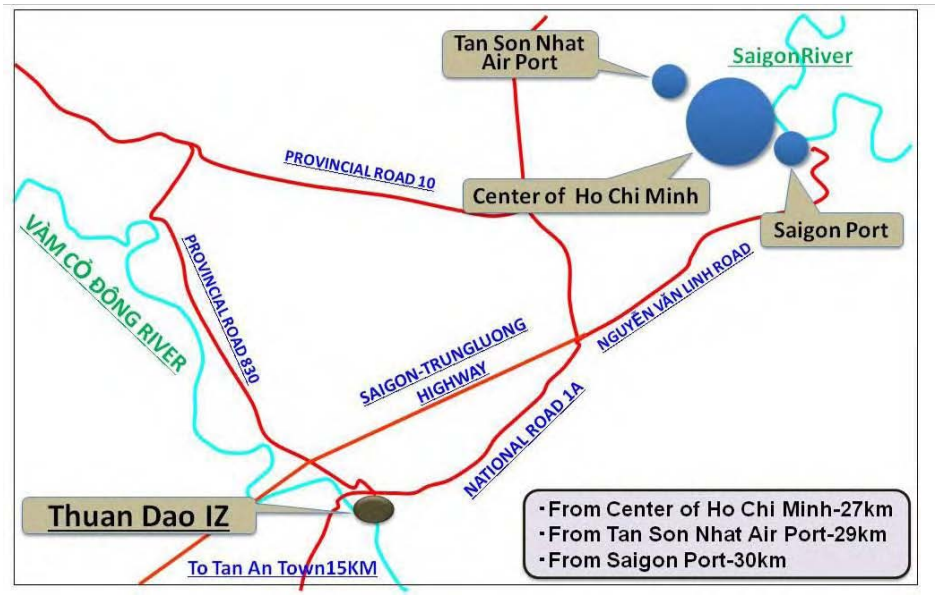


Figure 2-10 Location of ThuanDao IP

2) Water supply business

In the water project, the water shall be sourced from the Lake Dau Tieng located at a distance of 120 km northwest from Ho Chi Minh City. After the sourced water go through Dau Tieng East Waterway and Duc Hoa Major Waterway, the water will be supplied to Duc Hoa District and Ben Luc District from Duc Hoa Thuong and Binh Huu 2 which are water intake points.

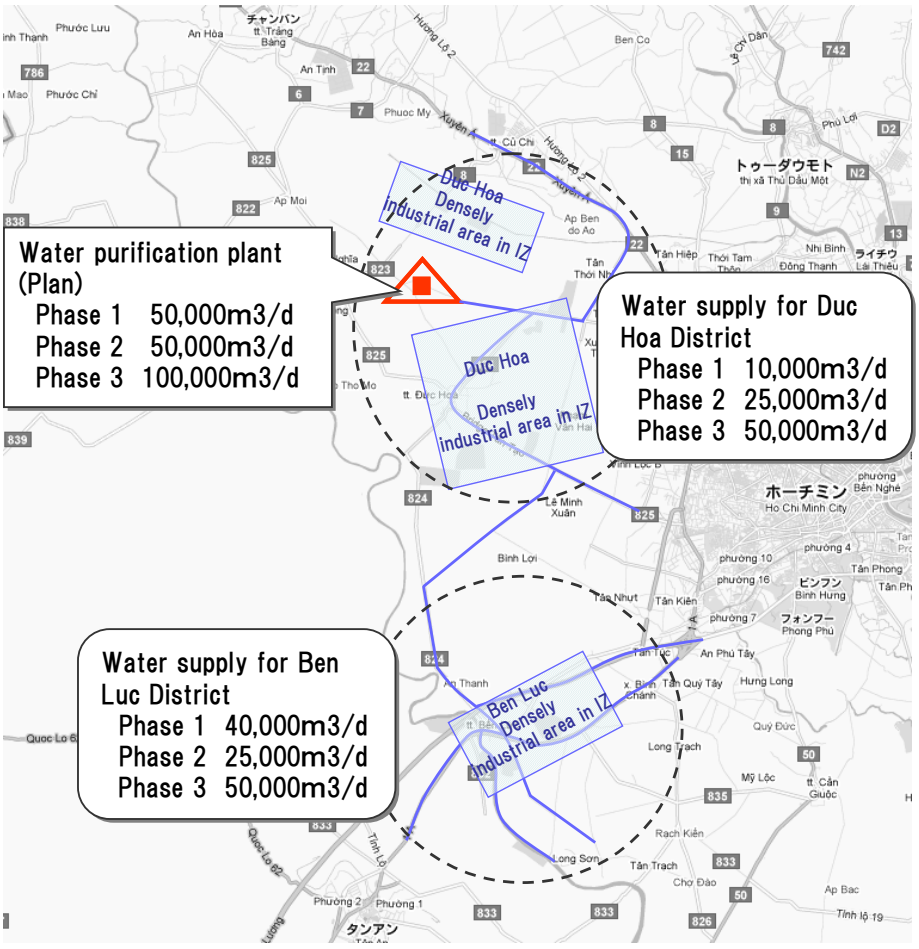
The Lake Dau Tieng was developed in 1985, as the lake having the functions of flood countermeasures and water reservoir at the upper river basin of Saigon river in the east of TayNinh town. Subsequently, this lake started to be utilized as the source of irrigation water. And Dau Tieng East Waterway was constructed through the project funded by the World Bank and has been already placed in service.

Duc Hoa Major Waterway (approximately 17 km) is under construction aimed at transmitting the water to Duc Hoa District from the point (Cu Chi) located at upstream on Dau Tieng East Waterway by 20 km from Ho Chi Minh City. Duc Hoa Major Waterway is part of Phuoc Hoa Water Resource Project to be implemented by MARD (Vietnamese Ministry of Agriculture and Rural Development) by getting the loans from ADB. The board of directors of ADB has already approved this project. The implementation period of the whole project is planned to be three years from the year 2011 to the year 2014. According to what we have heard from the person responsible for this project in ADB, Duc Hoa Major Waterway is scheduled to be completed by the end of the year 2013.

The water intake facilities for this project shall be located over Duc Hoa Major Waterway. According to the information materials for the water right granted by MARD to Long An province

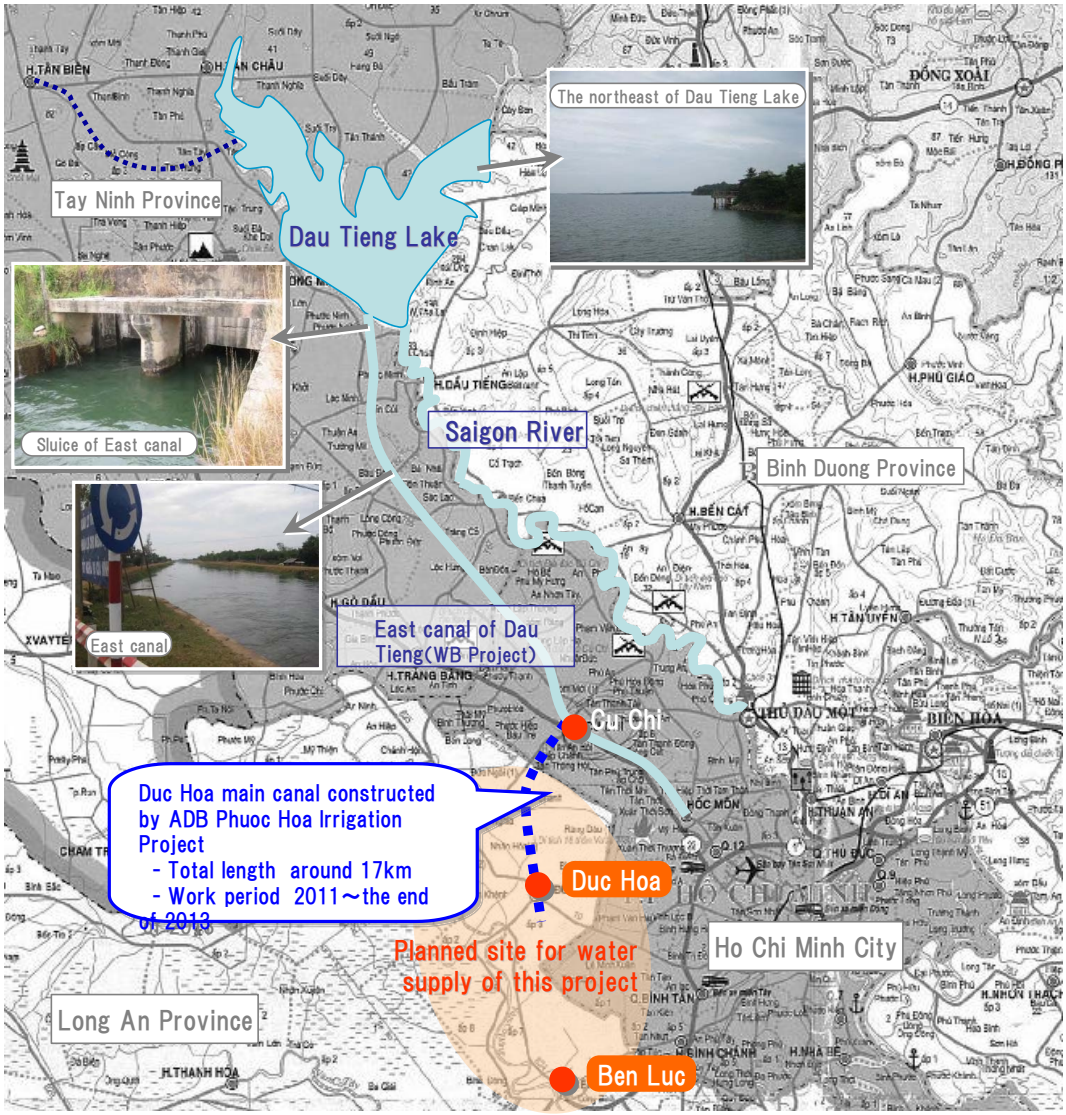
(Official Letter No. 633/BNN-TL), the point K15+340 along Tan My Commune located within the Duc Hoa District was originally designated as the water intake point. But subsequently, the water intake point was changed to Duc Hoa Thuong and Binh Huu 2 located within Duc Hoa District, due to the issues of site acquisition and so forth.

After negotiating with MARD, Long An Province obtained the water right under which the Major Waterway originally intended for "securing agricultural water" shall be used for supplying water to the IP in Long An Province and the residents living in the vicinity (Official letter No.633/BNN-TL).



.(Source)Geographic name map：GoogleMaps

Figure 2-11 Project overview



.(Source)base map –GTVT publisher, ADB project information

Phuoc Hoa Water resources Project" November 2010, ADB. Image：taken by project team.

Figure 2-12 Phuoc Hoa water source project overview

2-9-2 Basic of the Environment and Social Situation

The environment and social situation concerning the area of the impact of this project is summarized on the Table 2-10.

(1) The source of water and waterways

The Dau Tieng Lake serving as the water source area was developed in 1985 with the aim of achieving water reservoir and flood control functions. Subsequently, this lake started to be utilized as the source of water for irrigation. And Dau Tieng East Waterway was developed and placed in service. Since then, there has no major change seen in the surrounding environment and society.

The development of Duc Hoa Major Waterway shall be implemented during the period from the year 2011 to the year 2014, since part of the site for this waterway has been already acquired.

(2) Water intake point and waterways

The site for water intake points directly associated with the water project is allotted from part of the farmland fronting on a road distant from the center of villages. And the site fronting on a road shall be primarily utilized, as for the waterways from water intake points to water supply area. In Long An province, road maintenance and improvement has been undergoing evolution with the progress of urbanization, unlike the upper river basin area. Therefore, in this province, it has been a common practice that pipes are laid underneath public roads, when water supply businesss including the projects undertaken by water works public corporations are implemented.

(3) Industrial park

With regards to the IP (Thuan Dao IP <Phase Two>) directly associated with utility projects, this IP got through with the land development construction, with the EIA (Environment Impact Assessment) already acquired by the business owners. And the permit for constructing factories as general IPs has been acquired from Long An province.

(4) Canal, river and ocean

We set canal, river and ocean as the area of the impact from the treated water through the wastewater treatment functions to be implemented by utility projects.

Table 2-10 The Environment and Social Situation Becoming the Basis

	Scope	Classification	Region/Point	Environment and Social Situation
1	Upper river basin/Water source	Secondary	Dau Tien Lake	• It was already developed in 1985 as the lake intended to achieve water reservoir and flood control functions
2	Waterways	Secondary	Dau Tieng East Waterway	• Majority of project site consists of farmland. The site for Duc Hoa Major Waterway is primarily fronting on a road. • The area where projects are implemented has the population of about 200,000 people. • Majority of the population is engaged in farming and forms villages in the hillside along waterways and rivers. The downstream basin area near Ho Chi Minh City is showing the trend of urbanization. • The expanded project area includes a number of protected zones.
			Duc Hoa Major Waterway	• This waterway is under development during the period from 2011 to 2014, after the site primarily fronting on a road is partly acquired.
3	Water Intake Point	Direct	Duc Hoa Thuong, Binh Huu 2	• Since Duc Hoa Major Waterway has been put in place along a road, the planned area for water intake points shall be part of farmland abutted on a road (the point distant from residential district).
4	Waterway	Direct	Duc Hoa District Ben Luc District	• The planned area for waterway is fronting on a road (publicly-owned land). • The road is mainly surrounded by farmland, but the waterway passes through villages of these two districts and the neighborhood of IP.
5	IP	Direct	Thuan Dao IP (Phase Two)	• The business owners acquired part of farmlands and pasture area as the site for IP, and has already completed the land development. • The IP is surrounded by farmlands and pasture area, and partly close to villages.
6	Waterway/ River	Secondary	Ben Luc District downstream basin area	• Agricultural area extending to the coastal area along waterways and rivers • Port and harbor is located in part of the coastal area.
7	Ocean	Derivative	South China Sea	(Establish the scope of impact as successive water area.)

.(Source) created based on the EIA of the related projects and on-site investigation.

2-9-3 Legislative and organization system on social environment protection in Vietnam

(1) Law related with social environment protection in Vietnam

New Environmental protection law was established in July 2006 that is a basis of law system of environment in Vietnam. Table 2-11 shows the contents of New Environmental protection law and relevant law documents.

Table 2-11 Environment Law system and relevant law documents

№	Name of Law document	Content outlines
1	New environment protection law	New Environmental protection law was established in July 2006 replaces former Environmental protection law. This law has 3 chapters from article 14~27 dealing with environment impact assessment report (ĐTM (Vietnamese) /or EIA (English). The first specification of this law is detailed rules of a project which is a subject must be prepared EIA, quantity of such subject increased from 25 to 102. The second is to make clear mechanism of strategy environment assessment (SEA), mention definition of SEA and stipulating in detail on EIA –project.
2	Decree No 80/2006/NĐ (Decree No.80/2006/ND-CP)	Decree stipulates that relevant authorities must establish, verify and supervise environment influence assessment report (EIA) and strategy environment assessment (SEA).
3	Decree No 140 promulgated 22 Nov 2006 (Decree No.140/2006/ND-CP)	This decree stipulates environmental protection in phases of establishment, assessment, approval and implement organization of strategies, schemes, plans, programs and development projects.
4	Decree No 112/2006/NĐ-CP	Stipulation on construction investment management.
5	Bridge-road design standards (22TCN 242-98)	Stipulation on procedure application to prepare environment influence assessment report (EIA) when setting up feasible project and design brand new construction or improve, upgrade traffic road work issued by Ministry of Communications.
6	Decree No 81/2006/NĐ-CP promulgated 9, Aug 2006	Stipulation on penalty for acts of administrative breach in environmental protection.
7	Law on forest protection and development No 29/2004/QH11	Stipulation on management, protection, development and deforestation prevention. Besides, encourage forest protection and development by individual and organization.
8	Land Law 13/2003/QH11	This law stipulates on rights and obligations to land, right of land use and this is the supreme law document on land use.
9	Decree No 181/2004/NĐ-CP directions on land law implement	Stipulation on land law implement.
10	Decree No 197/2004/NĐ-CP promulgated Dec 2004	Stipulation on compensation, support and resettlement when land was withdrawn by state.
11	Decree No 84/2007/NĐ-CP date 25, May 2007	Stipulation on procedure of resettlement.
12	Decree No 123/2007/NĐ-CP promulgated 27, July 2007	Stipulation on Method of determining land price and price range for kind of lands.
13	Circulation 69/2006/TT-BTC of ministry of Finance promulgated date 02, Aug 2006	Directions on compensation, support and resettlement when land was withdrawn by state.
14	Decision No 33/2007/QĐ-TTg promulgated 5, Mar 2007	Stipulation on policy of emigrant support to implement settled agriculture, settlement to ethnic minority in phase 2007 – 2010.
15	Decision No 170/2005/QĐ-TTg promulgated date 8, July 2005	Stipulation on poverty standard applying in phase 2006 - 2010 issued by prime minister
16	Cultural Heritage Law No 28/2001/QH10	Stipulation on operations and promotions of cultural heritage value issued date 29, June 2001.
17	Decree No 92/2002/NĐ-CP Promulgated date 11, Nov 2002	Stipulation on detailed implementing some articles of Cultural Heritage Law.

(Notes) Foregoing law documents were established based on data year 2008, so may be there were some changes in decrees, circulations.
(Source) prepared based on type of reports

(2) **General relevant boties**

MONRE (Ministry of Natural Resources and Environment) is the organization of environmental administration in Vietnam. Table 2-27 shows organization structure of MONRE.

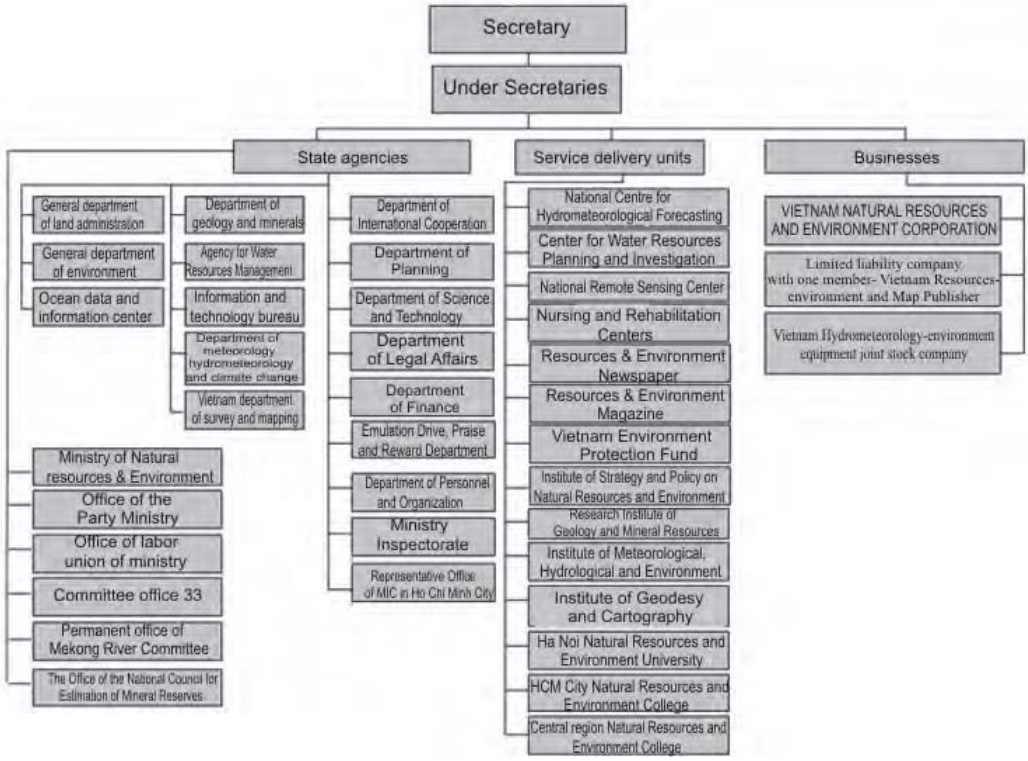


Figure 2-13 Organization structure of MONRE

DONRE (Department of Natural Resources and Environment) takes charge of the environmental administration of the city of province and centrally governed cities. DONRE (Department of Natural Resources and Environment) takes charge of the environmental administration of province and a central direct control city. DONRE issues the environmental license to factories and carries out monitoring, such as a river and the atmosphere. DONRE actually regulates the drainage, the exhaust gas, and waste which are discharged from factories and carries out the duty which exposes the factories when their violation becomes clear by the on-site inspection etc.

MARD (Ministry of Agriculture and Rural Development) is one of the related organizations in connection with this business. MARD is a government organization taking change of agriculture and forestry management, and rural development. The Center for Water-resources planning and Investigation having belonged to MARD shifted to the MONRE when establishing MONRE. On the managements and use of water resources concerning agricultural product, such as dams for irrigation and reservoirs, the Dyke Management and Flood Control Department and the Water Resources Department of MONRE are taking charge.

(3) Environmental Standards

1) Environmental Standards of Vietnam

In Vietnam, based on the Environment Protection Law enforced in January 1994, the government ordinance for the law practice (Government Decree No.175/CP) was enacted on October in the same year. Furthermore, many regulations regarding the penalty to violation, an environmental impact assessment, etc. were enacted. After 2008, QCVN which have a role of regulation accompanied by a penalty.and become a new standard was applied instead of TCVN. Some parts of TCVN were replaced for QCVN, and TCVN itself became invalid.

Since the environmental standards of Vietnam are applying correspondingly that of the highest level in Europe, they are so severe as to be difficult to keep. For this reason, the environmental standards of Vietnam have cleared the international level as a standard, and even if they compare with environmental standards of Japan, they are in an appropriate level.

Table 2-12 Environmental standards (QCVN) of Vietnam

Target	No.	Item	QCVN	TCVN (Old Standards)
Air	1	Ambient air quality	QCVN**05**:2009/BTNMT	TCVN593**7**:2005
	2	Hazardus substans in ambient air	QCVN**06**:2009/BTNMT	TCVN593**8**:2005
	3	Industrial emission of inorganic substances and dusts	QCVN**19**:2009/BTNMT	TCVN593**9**:2005
	4	Industrial emission of organic substances	QCVN**20**:2009/BTNMT	TCVN594**0**:2005
	5	Exhaust fume standard from the incinerator of medical solid waste	QCVN**02**:2008/BTNMT	
	6	Exhaust fume standard from chemical fertilizer manufacture industry	QCVN**21**:2009/BTNMT	
	7	Exhaust fume standard from power station	QCVN**22**:2009/BTNMT	
	8	Exhaust fume standard from cement manufacture industry	QCVN**23**:2009/BTNMT	
Water	1	Surface water quality	QCVN**08**:2008/BTNMT	TCVN594**2**:1995
	2	Coastal water quality	QCVN**10**:2008/BTNMT	TCVN594**3**:1995
	3	Underground water quality	QCVN**09**:2008/BTNMT	TCVN594**4**:1995
	4	Industrial wastewater	QCVN**24**:2009/BTNMT	TCVN594**5**:2005
	5	Sewerage from household	QCVN**14**:2008/BTNMT	
	6	Sewerage from rubber processing industry	QCVN**01**:2008/BTNMT	
	7	Sewerage from the aquatic-food processing industry	QCVN**11**:2008/BTNMT	
	8	Sewerage from pulp paper industry	QCVN**12**:2008/BTNMT	
	9	Sewerage from a textile industry	QCVN**13**:2008/BTNMT	
	10	Sewerage from a solid waste landfill disposal place	QCVN**25**:2009/BTNMT	
Land	1	Maximum permissible dose of the sewerage containing a heavy metal	QCVN**03**:2008/BTNMT	
Waste	1	Hazardous-wastes management rule (Decision No.23/2006-/QD-BTNMT)		
	2	Act about solid waste management (59/2007-/ND-CP)		
	3	Decision regarding the list of the permitted importing waste (Decision No.12/2006-/QDBTNMT)		
Noise	1	Noise standard		TCVN594**9**:1998

(Notes) The new standard of noise was applied in January, 2011.

2) Comparison of the important environmental standards of Vietnam

Ambient Air Quality

As compared with the standard concerning air pollution of Japan, figures equivalent to the standard are set to the standard of ambient air quality of Vietnam.

Table 2-13 Ambient Air Quality (QCVN05:2009/BTNMT)

	Air quality Standard (1μg/Nm^3)							(Reference) Japan's Standard
	Average in an hr.	Equivalent (Unit)	Average in 8 hr.	Equivalent (Unit)	Average in 24 hr.	Equivalent (Unit)	Aunual Average	
SO_2	350	0.155 (ppm)	–	–	125		50	The daily average for hourly values shall not exceed 0.04 ppm, and hourly values shall not exceed 0.1 ppm (Notification on May 16, 1973)
CO	30,000	31 (ppm)	10,000	10 (ppm)	5,000	5.2 (ppm)	–	The daily average for hourly values shall not exceed 10 ppm, and average of hourly values for any consecutive eight hour period shall not exceed 20ppm (Notification on May 8, 1973)
NOX	200	0.093 (ppm)	–	–	100	0.05 (ppm)	40	The daily average for hourly values shall be within the 0.04-0.06 ppm zone or below that zone (Notification on July 11, 1978)
O_3	180		120	–	80		–	–
Dust (TSP)	300	0.30 (mg/m^3)	–	–	200	0.20 (mg/m^3)	140	The daily average for hourly values shall not exceed 0.10 mg/m3, and hourly values shall not exceed 0.20 mg/m3 (Notification on May 8, 1973)
PM10	–		–	–	150		50	–
Pb	–		–	–	2		1	–

(Notes 1) Converted as mg/l = ppm.

(Notes 2) The previous version is TCVN5937: 2005.

Industrial Emission of Inorganic Substances and Dusts

As compared with the regulation and outline for the quality of air pollutant discharged from factories and offices of Japan, equivalent or severer figures are set to the standard of industrial emission of inorganic substances and dusts of Vietnam.

Table 2-14 Industrial Emission of Inorganic Substances and Dusts (QCVN19:2009/BTNMT)

Item	Max allowable concentration (mg/Nm^3)		(Reference) The regulation and outline for the quality of air pollutant discharged from factories and offices (Japan)
	A	B	
1 **Fume and dust**	0.40	0.20	Emission standard for every institution and scale (concentration) : General emission standard : 0.04 - 0.7g/Nm^3 / Special emission standard : 0.03 - 0.2g/Nm^3
2 **Dust containing silic**	0.05	0.05	Emission standard for every institution and scale (concentration) : General emission standard : 0.04 - 0.7g/Nm^3 / Special emission standard : 0.03 - 0.2g/Nm^3
3 **Ammoniac and its compounds**	76	50	Measure in case of an accident is specified : Business unit's Duty of restoration and report to the prefectural governor, etc.
4 **Antimon and its compounds, as Sb**	20	10	–
5 **Arsenic and its compounds, as As**	20	10	–
6 **Cadmium and its compounds, as Cd**	20	5	Emission standard for every institution : 1.0mg/Nm^3
7 **Lead and its compounds, as Pb**	10	5	Emission standard for every institution : 10 - 30mg/Nm^3
8 **CO**	1,000	1,000	–
9 **Chloride**	32	10	Emission standard for every institution : Chlorine 30mg/Nm^3 Hydrogen chloride 80,700mg/Nm3
10 **Copper and its compounds, as Cu**	20	10	–
11 **Zinc and its compounds, as Zn**	30	30	–
12 **HCl**	200	50	–
13 **Flo, HF, or inorganic compounds of Flo, as HF**	50	20	Emission standard for every institution : 1.0 - 20mg/Nm^3
14 **H_2S**	8	8	–
15 **SO_2**	1,500	500	1) Regulation value set up with the value of the constant K determined as the height (He) of an outlet for every area (quantity) Allowable emission (Nm3/h) = K x 10－3 x He2 General emission standard : K = 3.0 - 17.5 / Special emission standard : K＝1.17 - 2.34 2) Fuel usage standard for every season : Sulfur in fuel is set up for every area. Sulphuric content :0.5-1.2% or less 3) Regulation of total emission : Based on a total amount reduction plan, set to the evry area and plant
16 **NO_x, as NO_2**	1,000	850	Establising : 60 - 400ppm / Existing : 130 - 600ppm
17 **NO_x (acid manufacturers), as NO_2**	2,000	1,000	1) Emission standard for every institution and scale Establishing : 60 - 400ppm Existing : 130 - 600ppm 2) Regulation of total emission Based on a total amount reduction plan, set to the evry area and plant
18 **Vapor of H_2SO_4 or SO_3, as SO_3**	100	50	–
19 **Vapor of HNO_3 (other sources), as NO_2**	1,000	500	–

(Notes 1) 1. Type A is applied to the factory and institution under operation now, and Type B is applied to the constructed newly.

2. To the exhaust fumes from particular production, management, and service activity, the exhaust fume standard is specified separately.

3. In order to measure the dust in industrial exhaust fumes, and the concentration of inorganic matters, the method related with sample extraction, analysis, and the measurement calculation for every concrete figure follows the method specified by corresponding ″TCVN″, or the authorities3.

(Notes 2) The previous version is TCVN5937: 2005.

Industrial Emission of Organic Substances

The Standard of industrial exhaust fume (organic substance) of Vietnam is in agreement with U.S. environmental standards in general.

Table 2-15 Industrial Emission of Organic Substances (QCVN20:2009/BTNMT)

No.	Item	Maximum permissible dose (mg/Nm3)	No.	Item	Maximum permissible dose (mg/Nm3)
1	Acetylene tetrabromide	14	51	n-Hexane	450
2	Acetaldehyde	270	52	Isopropylamine	12
3	Acrolein	2.5	53	n-buthanol	360.0
4	Amyl acetate	525	54	Methyl mercaptan	15
5	Aniline	19	55	Methyl acetate	610
6	Benzidine	Undectectable	56	Methyl acrylate	35
7	Benzene	5	57	Methanol	260
8	Benzyl Chloride	5	58	Methyl acetylene	1,650
9	1,3- Butadiene	2,200	59	Methyl bromide	80
10	n-Butyl acetate	950	60	Methyl cychlohexane	2,000
11	Butylamine	15	61	Methyl cychlohexanol	470
12	Cresol	22	62	Methyl cychlohexanone	460
13	Chlorobenzene	350	63	Methyl chloride	210
14	Chloroform	240	64	Methylene cloride	1,750
15	ß-Chlopren	90	65	Methyl chloroform	2,700
16	Chloropicrin	0.7	66	Monomethylaniline	9.0
17	Cyclohexane	1,300	67	Methanol amine	31
18	Cyclohexanole	410	68	Naphthalene	150
19	Cyclohexanone	400	69	Nitrobenzene	5
20	Cyclohexen	1,350	70	Nitroethane	310
21	Diethylamine	75	71	Nitroglycerin	5
22	Difluorodibromomethane	860	72	Nitromethane	250
23	o-Dichlorobenzene	300	73	2-Nitropropane	1,800
24	1,1-Dichloroethane	400	74	Nitrotoluene	30
25	1,2-Dichloroethylene	790	75	2-Pentanon	700
26	1, 4 -Dioxan	360	76	Phenol	19
27	Dimethylaniline	25	77	Phenyl hydrazine	22
28	Dichloroethyl ether	90	78	n-Propanol	980
29	Dimethylformamide	60	79	n-Propylacetate	840
30	Dimethyl sulfate	0.5	80	Propylene	350.0
31	Dimethylhydrazine	1	81	Propylene oxide	240
32	Dinitrobobenzene	1	82	Pyrindine	30
33	Ethyl acetate	1,400	83	Pyrene	15
34	Ethyl amine	45	84	p-Quinol	0
35	Ethyl benzene	870	85	Styrene	100
36	Ethyl bromua	890	86	Tetrahydrofural	590
37	Ethylene diamine	30	87	1,1,2,2-Tetrachloroethane	35
38	Ethylendibromua	190	88	Quinone	670
39	Ethylacrilat	100	89	Tetrachlormethane	65
40	Ethylen clohydrin	16	90	Tetranitromethane	8
41	Ethylene oxide	20	91	Toluen	750
42	Ethyl ether	1,200	92	o-Toluidine	22
43	Ethyl chloride	2,600	93	Toluene-2,4-diisocyanate	1
44	Ethyl silicate	850	94	Triethylamine	100
45	Ethanol amine	45	95	1,1,2-Trichloroethane	1,080
46	Furandehyde	20	96	Trichloroethylene	110
47	Formaldehyde	20	97	Xylene (o-,m-,p-)	870
48	Furfuryl (2-Furylmethanol)	120	98	Xylidine	50
49	Fluorotrichloromethane	5,600	99	Vinyl chloride	20
50	n-Heptane	2,000	100	Vinyltoluene	480

(Notes 1) In this standard, "1m^3 of standard gas" refers to "1m^3 of exhausted gas" under the conditon of a temperature of 0 °C and an absolute pressure of 760mmHg.

(Notes 2) The previous version is TCVN5940: 2005.

Surface Water Quality

As compared with the water quality standard of the river and lake of Japan, the figures in "A1"and "A2" of the surface water quality standard of Vietnam are equivalent to “B” and “C” of the Japan.

Table 2-16 Surface Water Quality (QCVN08:2008/BTNMT)

	Item	Unit	Concentration (Vietnam Standard)				Reference (Japan's Standard for River)						Reference (Japan's Standard for Lake)			
			A1	A2	B1	B2	AA	A	B	C	D	E	AA	A	B	C
1	**pH**	–	6 - 8.5	6 - 8.5	5.5 - 9	5.5 - 9	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.0 - 8.5	6.0 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5
2	**DO**	*mg/l*	≥ 6	≥ 5	≥ 4	≥ 2	≥ 7.5□	≥ 7.5□	≥ 5□	≥ 5	≥ 2	≥ 2	≥ 7.5	≥ 7.5□	≥ 5□	≥ 2□
3	**TSS**	*mg/l*	20	30	50	100	25	25	25	50	100	*	1	5	15	*
4	**COD**	*mg/l*	10	15	30	50										
5	**BOD5(20 °C)**	*mg/l*	4	6	15	25	1.0	2.0	3.0	5.0	8.0	10.0	1.0	3.0	5.0	8.0
6	**Ammonia(NH4)**	*mg/l*	0.1	0.2	0.5	1.0										
7	**Chlorine(Cl)**	*mg/l*	250	400	600	-										
8	**Fluoride(F)**	*mg/l*	1.000	1.500	1.500	2.000	0.8	←	←	←	←	←	←	←	←	←
9	**Nitrite(NO2)**	*mg/l*	0.01	0.02	0.04	0.05										
10	**Nitrate(NO3)**	*mg/l*	2	5	10	15	10	←	←	←	←	←	←	←	←	←
11	**Phosphate(PO4)**	*mg/l*	0.1	0.2	0.3	0.5										
12	**Cyanide(CN)**	*mg/l*	0.005	0.010	0.020	0.020	Undetectable		←	←	←	←	←	←	←	←
13	**Arsenic**	*mg/l*	0.010	0.020	0.050	0.100	0.01	←	←	←	←	←	←	←	←	←
14	**Cadmium**	*mg/l*	0.005	0.005	0.010	0.010	0.01	←	←	←	←	←	←	←	←	←
15	**Lead**	*mg/l*	0.02	0.02	0.05	0.05	0.01	←	←	←	←	←	←	←	←	←
16	**Chromium III (Cr_3)**	*mg/l*	0.05	0.10	0.50	1.00										
17	**Chromium VI (Cr_6)**	*mg/l*	0.01	0.02	0.04	0.05	0.05	←	←	←	←	←	←	←	←	←
18	**Copper**	*mg/l*	0.10	0.20	0.50	1.00										
19	**Zinc**	*mg/l*	0.5	1.0	1.5	2.0										
20	**Nickel**	*mg/l*	0.1	0.1	0.1	0.1										
21	**Iron**	*mg/l*	0.5	1.0	1.5	2.0										
22	**Mercury**	*mg/l*	0.001	0.001	0.001	0.002	0.001	←	←	←	←	←	←	←	←	←
23	**Surfactants**	*mg/l*	0.1	0.2	0.4	0.5										
24	**Oils**	*mg/l*	0.01	0.02	0.10	0.30										
25	**Phenol**	*mg/l*	0.005	0.005	0.010	0.020										
26	**Chlorinated organic pesticides**															
	Aldrin + Dieldrin	*µg/l*	0.002	0.004	0.008	0.010										
	Endrin	*µg/l*	0.010	0.012	0.014	0.020										
	BHC	*µg/l*	0.050	0.100	0.130	0.015										
	DDT	*µg/l*	0.001	0.002	0.004	0.005										
	Endosunfan(Thiodan)	*µg/l*	0.005	0.010	0.010	0.020										
	Lindan	*µg/l*	0.30	0.35	0.38	0.40										
	Chlordane	*µg/l*	0.01	0.02	0.02	0.03										
	Heptachlo	*µg/l*	0.01	0.02	0.02	0.05										
27	**Organophosphate pesticides**	*µg/l*														
	Paration	*µg/l*	0.10	0.20	0.40	0.50										
	Malation	*µg/l*	0.10	0.32	0.32	0.40										
28	**Herbicides**															
	2,4D	*µg/l*	100	200	450	500										
	2,4,5T	*µg/l*	80	100	160	200										
	Paraquat	*µg/l*	900	1,200	1,800	2,000										
29	**Total Radiation α**	*Bq/l*	0.100	0.100	0.100	0.100										
30	**Total Radiation β**	*Bq/l*	1.000	1.000	1.000	1.000										
31	**E. coli MPN**	*MPN/100ml*	20	50	100	200										
32	**Coliform MPN**	*MPN/100ml*	2,500	5,000	7,500	10,000	50	1,000	5,000				50	1,000	–	–

(Notes 1) * Floating of garbage etc. is not detected.
(Notes 2) The previous version is TCVN5942: 1995.

Underground Water Quality

As compared with the underground water quality standard of Japan, the figures of the Vietnam are set up to the same level of the Japan in general

Table 2-17 Underground Water Quality (QCVN09:2008/BTNMT)

	Item	Unit	Standard	Ref.(Japan's)
1	**pH**		5.5 - 8.5	–
2	**Hardness（as CaCO3）**	*mg/l*	500	–
3	**Total Solids**	*mg/l*	1,500	–
4	**COD**	*mg/l*	4	–
5	**Ammonia(NH_4)**	*mg/l*	0.1	–
6	**Chlorine(Cl)**	*mg/l*	250	–
7	**Fluoride(F)**	*mg/l*	1	1
8	**Nitrite(NO_2)**	*mg/l*	1	–
9	**Nitrate(NO_3)**	*mg/l*	15	10
10	**Sulfat (SO_4^{2-})**	*mg/l*	400	–
11	**Cyanide(CN)**	*mg/l*	0.01	Undetectable
12	**Phenol**	*mg/l*	0.001	–
13	**Arsenic**	*mg/l*	0.05	0.01
14	**Cadmium**	*mg/l*	0.01	0.01
15	**Lead**	*mg/l*	0.01	0.01
16	**Chromium VI (Cr_6)**	*mg/l*	0.05	0.05
17	**Copper**	*mg/l*	1.0	–
18	**Zinc**	*mg/l*	3.0	–
19	**Manganese**	*mg/l*	0.5	–
20	**Mercury**	*mg/l*	0.001	0.001
21	**Iron**	*mg/l*	5.0	–
22	**Selen (Se)**	*mg/l*	0.01	0.010
23	**Total Radiation α**	*Bq/l*	0.1	–
24	**Total Radiation β**	*Bq/l*	1.0	–
25	**E. coli MPN**	*MPN/100ml*	Undetectable	–
26	**Coliform MPN**	*MPN/100ml*	3	3

(Notes) The previous version is TCVN5944: 1995.

Coastal Water Quality (QCVN10:2008/BTNMT)

As compared with the water quality standard of Japan, the figures of the aquaculture area of the coastal water quality in Vietnam are set up in general to the same level of "B" standard of Japan.

Table 2-18 Coastal Water Quality (QCVN10:2008/BTNMT)

Item	Unit	Standard			Reference (Japan's)		
		Beach / Sightseeing	Aquaculture	Others	A	B	C
1 Temperature	℃	30	–	–	–	–	–
2 Smell		tolerable	–	–	–	–	–
3 pH		6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	7.8 - 8.3	7.8 - 8.3	7.0 - 8.3
4 Dissolved solid	mg/l	>or= 4	>or= 5	>or= 4	–	–	–
5 COD	mg/l	4	3	–	2	3	8
6 Ammonia(NH4)	mg/l	0.51	0.1	0.5	–	–	–
7 Fluoride(F)	mg/l	1.5	1.5	1.5	0.8	←	←
8 sulfide(S^{2-})	mg/l	0.01	0.005	0.01	–	–	–
9 Cyanide(CN)	mg/l	0.005	0.005	0.01	undetecgable	←	←
10 Arsenic	mg/l	0.04	0.01	0.05	0.01	←	←
11 Cadmium	mg/l	0.005	0.005	0.005	0.010	←	←
12 Lead	mg/l	0.02	0.05	0.1	0.01	←	←
13 Chromium III (Cr_3)	mg/l	0.1	0.1	0.2	–	–	–
14 Chromium VI (Cr_6)	mg/l	0.05	0.02	0.05	0.05	←	←
15 Copper	mg/l	0.5	0.03	1	–	–	–
16 Zinc	mg/l	1.0	0.05	2.0	–	–	–
17 Manganese	mg/l	0.1	0.1	0.1	–	–	–
18 Iron	mg/l	0.1	0.1	0.3	–	–	–
19 Mercury	mg/l	0.002	0.001	0.005	0.001	←	←
20 Oils	mg/l	undetecgable	undetecgable	–	–	–	–
21 Mineral oil and fat	mg/l	0.1	undetecgable	0.2	–	–	–
22 Phenol	mg/l	0.001	0.001	0.002	–	–	–
23 Chlorinated organic pesticides							
Aldrin + Dieldrin	μg/l□	0.008	0.008	–	–	–	–
Endrin	μg/l□	0.014	0.014	–	–	–	–
BHC	μg/l□	0.13	0.13	–	–	–	–
DDT	μg/l□	0.004	0.004	–	–	–	–
Endosunfan(Thiodan)	μg/l□	0.01	0.01	–	–	–	–
Lindan	μg/l□	0.38	0.38	–	–	–	–
Chlordane	μg/l□	0.02	0.02	–	–	–	–
Heptachlo	μg/l□	0.06	0.06	–	–	–	–
24 Organophosphate pesticides							
Paration	μg/l□	0.40	0.40	–	–	–	–
Malation	μg/l□	0.32	0.32	–	–	–	–
25 Herbicides							
2,4D	mg/l	0.45	0.45	–	–	–	–
2,4,5T	mg/l	0.16	0.16	–	–	–	–
Paraquat	mg/l	1.80	1.80	–	–	–	–
26 Total Radiation α	Bq/l	0.1	0.1	0.1	–	–	–
27 Total Radiation β	Bq/l	1.0	1.0	1.0	–	–	–
28 E. coli MPN	MPN/100 ml	1,000	1,000	1,000	1,000	–	–

(Notes) The previous version is TCVN5943: 1995.

Industrial Wastewater

As compared with the uniform wastewater standard in the public water area shown by the Ministry of Environment of Japan, the equivalent or severer figures are set up to the industrial-waste-water standard of Vietnam. Even if compared with an international level, it is said that the regulation "degree of color =20 (A standard)" is a very severe level.

In addition, “A” standard specifies the value of the contaminant in the industrial wastewater discharged into the domestic water area, and “B” standard specifies the value discharged into the area except for the domestic water area.

Table 2-19 Industrial Wastewater (QCVN24:2009/BTNMT)

Item	Unit	C Value		Reference	Remaks
		A	B	Japan's Standards (Uniform Wastewater Standards)	
1 Temperature	℃	40	40	－	
2 pH	－	6 - 9	5.5 - 9	5.8 - 8.6	
3 Smell	－	No bad smell	No bad smell	－	
4 Color	－	20	70	－	※Old standard's(B) is 50
5 BOD5(20℃)	mg/l・	30	50	160	
6 COD	mg/l・	50	100	160	※Old standard's(B) is 80
7 SS	mg/l・	50	100	200	
8 Arsenic	mg/l・	0.05	0.10	0.10	
9 Mercury	mg/l・	0.005	0.010	0.005	
10 Lead	mg/l・	0.1	0.5	0.1	
11 Cadmium	mg/l・	0.005	0.010	0.100	
12 Chromium(Ⅵ)	mg/l・	0.05	0.10	0.50	
13 Chromium(Ⅲ)	mg/l・	0.2	1.0	2.0	
14 Copper	mg/l・	2	2	3	
15 Zinc	mg/l・	3	3	2	
16 Nickel	mg/l・	0.20	0.50	－	
17 Manganese	mg/l・	0.50	1.00	10.00	
18 Iron	mg/l・	1.00	5.00	10.00	
19 Cyanide	mg/l・	0.2	1.0	－	
20 Tin	mg/l・	0.07	0.10	1	
21 Phenol	mg/l・	0.10	0.50	－	
22 Mineral oil and fat	mg/l・	5	5	5	
23 Animal-vegetable fat and oil	mg/l・	10	20	30	
24 Residual Chlorine	mg/l・	1.0	2.0	－	
25 PCBs	mg/l・	0.003	0.010	0.003	
26 Organic phosphorous	mg/l・	0.3	1.0	－	
27 Organic chlorine	mg/l・	0.1	0.1	－	
28 Sulfide	mg/l・	0.2	0.5	－	
29 Fluoride	mg/l・	5	10	8	
30 Chloride	mg/l・	500	600	－	
31 Ammonia	mg/l・	5	10	40	
32 T-N	mg/l・	15	30	－	
33 T-P	mg/l・	4	6	8	
34 Coliforms	MPN/100ml・	3,000	5,000	3,000	
35 Gross α	Bq/l・	0.1	0.1	－	
36 Gross β	Bq/l・	1	1	－	

(Notes 1) Standard A specifies C value of the contaminant in the industrial waste water discharged in the water area used for domestic water.

(Notes 2) Standard B specifies C value of the contaminant in the industrial waste water discharged in the water area used except for domestic water.

(Notes 3) The item of a chloride is applied to neither a salt water region nor brackish water area.

(Notes 4) "Measurement by biological indicator" appropriate for the old standard is deleted.

(Notes 5) The previous version is TCVN5945: 2005.

(4) Legislative system on Environment Impact assessment (EIA)

1) Regulation regarding EIA

Table 2-20 shows outline of rule documents related to EIA in Vietnam.

Table 2-20 Rule document related to EIA in Vietnam

Item	Content outlines
Project name	• National important work project; • Projects are possible to use part of area of land or to cause bad influence on graded natural preserve area, national garden, historical, cultural monument areas, natural heritage, landscapes; • Projects are likely to cause bad influence on water source in basin, coastal, protected ecosystem areas; • Construction project of infrastructure economic zones, IPs, high tech zones, export processing zones, trade village clusters; • Brand new construction project of urban, centralized residential area; • Project of exploitation, usage of groundwater, natural resources with large scope; • Others have large potential danger causing bad influence on environment. [Article 18 Item 1 Environmental protection law]
Term	Environment influence assessment report must be prepared same time with feasibility study of project. [Article19 Item 2 Environmental protection law] • Projects were stipulated in Article 18 of this law approved only, issued investment, exploitation license after Environment influence assessment was approved. [Article 22 Item 4 Environmental protection law]
Content	1. Enumerate, describe in detail of works of project attached scope of space, Time and volume of execution; running technology or per work and whole project. 2. General assessment on actual state of environment where implement project in and adjacent areas; sensitivity level and bearing capacity of environment. 3. Detailed assessment on happening capacity environmental influences when implementing project and environment's compositions, socio-economy factors are influenced of project; forecast risks of environmental problem caused by work. 4. Specific measures minimize bad influence on environment; prevent, cope with environmental problem. 5. Engagement to implement environmental protection measures during construction and operation. 6. List of works, management and supervision program on environmental matters during implementing. 7. Estimate expenditure of construction of environmental protection works in total expenditure of project. 8. Opinion of People's Committee Village, ward, Town (hereafter as People's Committee village), representative of community residence where project is implemented; Opinion unapproved on placing project in local or unapproved in regarding to environmental protection measures must be mentioned in Environment influence assessment reports. 9. Direct supply source of figures, data and method of assessment. [Article 20 Environmental protection law]

Item	Content outlines
Assessment	1. Verifying Environment influence assessment is implemented through assessment council or assessment service organization. Important works are belong to jurisdiction of national assembly, government, prime minister. Ministry of Resources and Environment stipulates conditions and directions of Environment influence assessment of assessment service organization. 2. Composition of assessment council of project is stipulated in point a and point b item 7 this article including representative of approved authority, appropriate authority on environmental protection of approved authority; provincial appropriate authority on environmental protection where project implemented; specialist have experience, qualification suitable with content and property of project; representative of other organization, individual decided by appropriate authority on assessment council formation. 3. Composition of assessment council for project is stipulated in point c item 7 this article including representative provincial People's Committee, professional body on environmental protection and relevant departments of province; specialist have experience, qualification suitable with content and property of project; representative of other organization, individual decided by appropriate authority on assessment council formation. In necessary case, provincial People's Committee may invite representative of Ministry of Resources and Environment, Crossing-ministry agency, relevant governmental agency to join assessment council. [Article 21 item 1-3 Environmental protection law]
Assessment organization, Authority for assessment council formation or assessment service organization	Professional body establishes assessment council or assessment service organization as specified in item 1-3 in above assessment. Within 15 working days as from the date of receipt of report, must conduct assessment and put forth decision. ① MONRE stipulates conditions and directions of Environment influence assessment of assessment service organization. ② Central ministries etc. ③ Provincial People's Committee; professional body on environmental protection and relevant departments of province; [Article 21 Item 7 Environmental protection law][Article 22 Item 1,3 Environmental protection law
Term of assessment	① Project in jurisdiction, approval of prime minister, government, national assembly and inter-department. Inter-province projects have term of assessment not more than 45 (forty five) working days as from the date of receipt of valid file. ② Projects are not classified in stipulation in item 1 this article shall have term of assessment not more than 30 (thirty) working days as from the date of receipt of valid file. [Article 12 Decree No 80/2006/NĐ-CP]
Adding report of environment influence assessment	• Having change of location, scope, design power, technology of project • After 24 months as from the date of approved Environment influence assessment, project can be implemented [Article 13 Decree No 80/2006/NĐ-CP]
Benefit of organization, community, individual	Organization, community, individual have right to submit requirement, petition for environmental protection to assessment body and assessment body has responsibility for considering such requirement, petition prior putting forth conclusion, decision. [Article 21 Item 6 Environmental protection law]
Announcement and meeting	Clearly post at project site on environmental protection measures. [Article 23 Item 1b Environmental protection law]

(Notes1) Foregoing law documents were established based on data year 2007, so may be there were some changes in decrees, circulations.
(Notes 2) An underline part is an item to which this project corresponds.

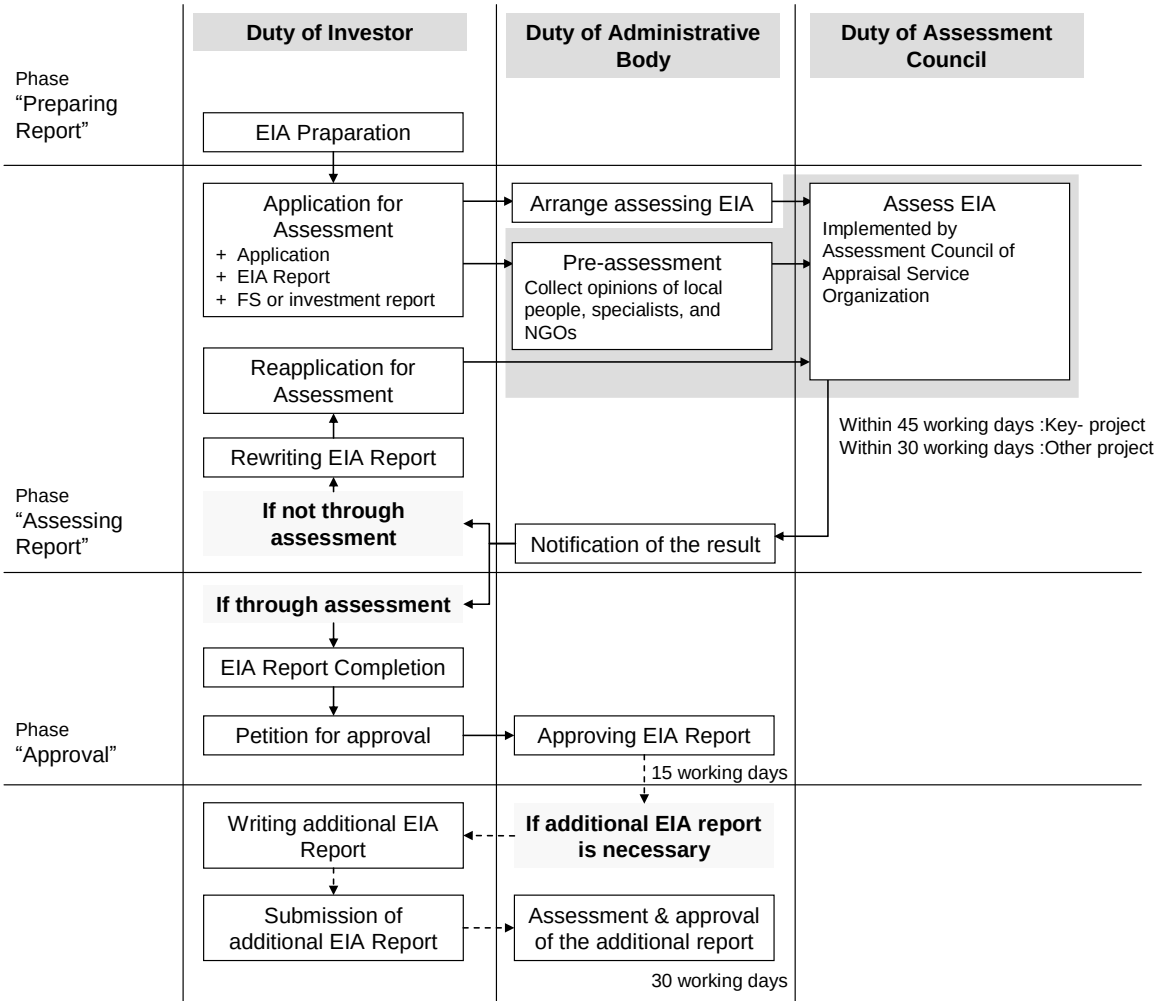
2) Procedures of EIA assessment and approval

Table 2-21 shows procedures of EIA assessment and approval

After preparing first Environment Impact Assessment report, project owner applies for assessment in the first time. Then reflect assessment result into report and applies for approval in the second time. Only when revised EIA report may be approved in the second time of assessment, project owner shall obtain the operation license and construction license.

In the case of the project which will be carried out together with the prepared IP, which has already acquires EIA corresponds to "Having change of location, scope, design power, technology of project." (Article 13 Decree No 80/2006/NĐ-CP the 13th) Then it is required to make an additional EIA on the portion additional impacts are assumed to be with changes among the applicable items of EIA acquired in the IP.

Table 2-21 Flowchart of EIA approval

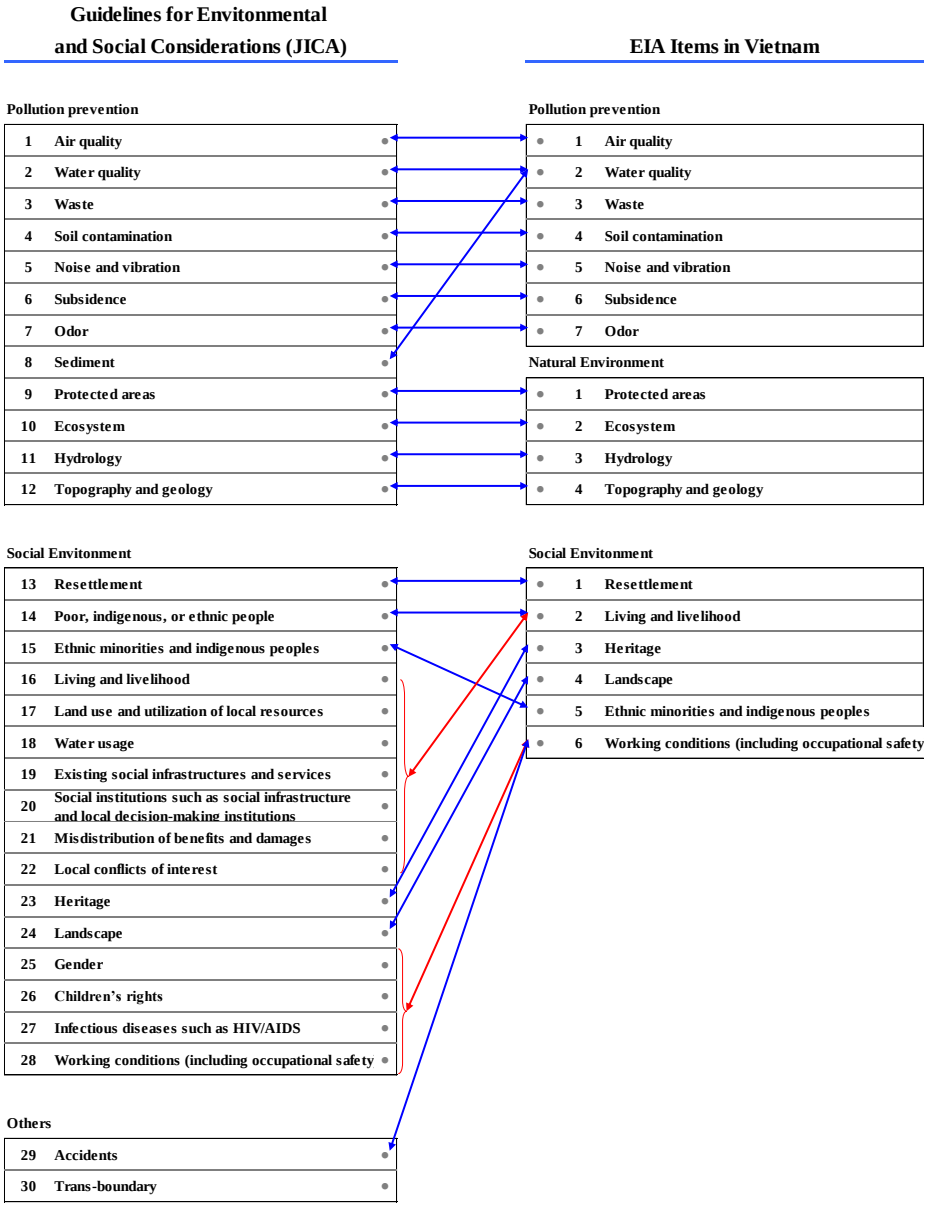


3) Impact items and structure of EIA

Impact Items of EIA

Correspondence of the impact items by the environmental guideline of JICA and the impact items in Vietnam is a table. It becomes a passage of 6. About the item applicable to "a life and the livelihood", and "labor environment" of Vietnam, it is segmented by the items JICA. For this reason, if it takes into consideration according to the influence items of JCIA, all the influence items that should be made the object in Vietnam are included

Table 2-22 Correspondence of the impact item of JICA and Vitenam



Structure of EIA

With this business, since neither the institution nor the detail design of equipment is completed at the present stage, it is not a time of carrying out additional EIA. Additional EIA will be made towards practice of business in the stage from which the institution and the detail design of equipment become clear. Besides, Decree No 08/2006 stipulation defined structure of chapter, section of EIA as Table 2-23.

Table 2-23 Structure of EIA Report

Section		Outline
Preface	1. Origin of project	・ Outline of origin, appearing circumstance of investment project, in there specify type of new project, adding project, extending project, upgrading project or other type of project. ・ Appropriate Body, organization approve investment project F/S
	2. base of law and technique of EIA assessment implementation	・ Enumerate law documents and technical documents to base for EIA implementation and EIA preparation of project.
	3. Implement organization ĐTM	・ EIA Implement organization name (Consulting body name) ・ List of persons who directly attend preparing EIA.
Chapter 1 Project outline	1. Project name	・ Right name of project
	2. Project owner	・ Project owner name, address and contact facilities with project owner etc
	3. Point of project	・ Clearly describe point of project in correlation with natural environment, urban environment, cultural works etc.
	4. Essential content of project	・ Significantly enumerate, Describe in detail of volume and scope of all works which need to implement during the project and construction technology, manufacturing technology, operation technology per work.
Chapter 2 Nature, environment, Socio-economy conditions	1. Nature, environment conditions	・ Conditions on geography, geology, hydrography ・ Actual state of natural environment composition
	2. Socio-economy conditions	・ Socio-economy conditions ・ Conditions on society
Chapter 3 Effect environment assessment	1.Pollution	・ Source causing influence on human ・ Source causing influence on nature, environment ・ Assess influence of project on environment
	2.Effect scope of project	・ Scope and source causing influence
	3. Influence assessment	・ Assess in detail of factors, subjects causing influence.
	4. application method assessment	・ Confidence level of such method
Chapter 4 Measures minimize bad influence, prevent and cope with environmental problem		・ Measure minimize per influence ・ General project in regarding to environmental matter.
Chapter 5 Responsibility for protecting environment		・ Responsibility for implementing minimizing measure, principle, solution to protect environment.

Section		Outline
Chapter 6 Program of environmental management and supervision	1. List of environment treatment work	・ Specify waste treatment work and implementation schedule of project ・ Specify waste treatment work and implementation schedule of natural factor
	2. Program of environmental management and supervision	・ Build program of environmental management ・ Build program of environmental supervision
Chapter 7 assess cost of environmental protect work		・ Build cost of necessary facilities for protecting environment
Chapter 8 Collect opinion of local	1.Opinion of People's Committee	・ Specify in article 2 item 3
	2. Opinion of village fatherland front's Committee	・ Specify in article 2 item 3
Chapter 9 Specify source and methods of assessment	1.Source	・ Specify reference source
	2. Methods of assessment	・ Specify list of application in EIA
	3. Concrete and trustworthy opinion	・ Objective, detailing, trustworthy opinion on EIA
Conclusion and petition	1.Conclusion	・ Conclude all matters
	2.Petition	・ Petition to relevant body to support in settlement

(Notes) Foregoing law documents were established based on data year 2007, so may be there were some changes in decrees, circulations.

4) Resident conference

Regarding the resident conference, which is essential at the time of practice of additional EIA and EIA, is regulated by "the Environment Protection Law (52/2005-/QH1)" and "the Detailing, the Guiding the Implementation of a number of Articles of the Law on Environmental Protection (Decree No. 80/2006/ ND-CP of August 9, 2006)" including regulations on the rights and standards of organizations, communities and individuals.

Table 2-24 Matters regarding the resident conference specified the Law

Law No. 52/2005/QH11 on environmental protection

Article 20.- Contents of environmental impact assessment reports

8. Opinions of the commune/ward or township People's Committees (hereinafter collectively referred to as commune-level People's Committees) and representatives of population communities in the place where the project is located; opinions against the project location or against environmental protection solutions must be presented in the environmental impact assessment report.

Article 21.- Appraisal of environmental impact assessment reports

6. Organizations, population communities and individuals may send petitions and recommendations concerning environmental protection to the appraisal -organizing agency defined in Clause 7 of this Article, which shall have to consider such petitions and recommendations before making conclusions or decisions.

7. Responsibilities for organizing the appraisal of environmental impact assessment reports of projects are defined as follows:

a/ The Ministry of Natural Resources and Environment shall organize councils or choose service organizations for appraisal of environmental impact assessment reports of projects decided or approved by the National Assembly, the Government or the Prime Minister; inter-branch or inter-provincial projects;

b/ Ministries, ministerial-level agencies or Government-attached agencies shall organize councils or choose service organizations for appraisal of environmental impact assessment reports for projects falling under their respective deciding or approving competence, excluding inter-branch or inter-provincial projects;

c/ Provincial-level People's Committees shall organize councils or choose service organizations for appraisal of environmental impact assessment reports for projects located in their localities and falling under their respective deciding or approving competence and under the competence of the People's Councils of the same level.

Article 23.- Responsibilities to implement, and supervise the implementation of, contents of environmental impact assessment reports

1. Project owners shall have the following responsibilities:

a/ To report on contents of decisions approving environmental impact assessment reports to People's Committees of places where projects are executed;

b/ To publicly post up at project sites information on kinds of wastes, treatment technologies, standard parameters of wastes and environmental protection solutions for population communities to know, inspect and supervise;

(Note) Underlined relevant to resident conference

(Source) Environment Protection Law (52/2005-/QH1)

In “Guidelines for Environmental and Social Considerations” issued by JICA, it is described, “For projects with a potentially large environmental impact, sufficient consultations with local stakeholders, such as local residents, must be conducted via disclosure of information at an early stage, at which time alternatives for project plans may be examined. The outcome of such consultations must be incorporated into the contents of project plans.”

However, there is no regulation of the standardized formal procedure in the EIA process in Vietnam. In accordance with the “Guidelines for Environmental and Social Considerations”, it is necessary to observe the legal system of Vietnam and to have sufficient conference with the local resident on the stage before construction and operation.

Table 2-25 Matters regarding the resident conference specified the Decree

Decree no. 80/2006/ND-CP 09/08/2006 Detailing and guiding the implementation of a number of articles of the law on environmental protection

Article 11.- Appraisal of environmental impact assessment reports

1. Heads of agencies specified in Clause 7, Article 21 of the Law on Environmental Protection shall issue decisions to set up appraisal councils for environmental impact assessment reports of projects.

2. Heads of agencies specified in Clause 7, Article 21 of the Law on Environmental Protection shall base themselves on the technical, technological and environment complexity of projects to decide on the form of appraisal either by an appraisal council or appraisal service organization. For projects in the security and defense domain and projects involving national secrets, only service organizations within the security or defense branch shall be selected.

3. Appraisal councils or appraisal service organizations shall have the function of giving advice to assist competent agencies in examining and assessing the quality of environmental impact assessment reports serving as the basis for consideration and approval according to regulations.

4. In case of necessity, before the opening of official meetings of appraisal councils, agencies responsible for conducting the appraisal may conduct auxiliary appraisal in the following forms:

a/ Survey of the project’s execution site and adjacent areas;

b/ Taking samples for analysis and verification;

c/ Gathering opinions of the population community in the place where the project is to be executed;

d/ Collecting comments of related experts outside the appraisal council, related scientific and technological institutions, socio and professional organizations, and non-governmental organizations;

e/ Holding appraisal seminars.

5. Appraisal councils and appraisal service organizations appraising environmental impact assessment reports shall operate according to regulations issued by the Minister of Natural Resources and Environment.

(Note) Underlined relevant to resident conference

(Source) Decree No. 80/2006/ ND-CP of August 9, 2006

2-9-4 Review of related EIA

(1) Review of related EIA

1) EIA of Thuan Dao IP

Outline of EIA

Thuan Dao IP is a common IP where received construction license and finished EIA. Besides, there is no necessity of applying for new license for alteration into environment- friendly IP, however, for EIA which petitioning opinion from Long An province are each companies will petition when moving in.

In this report, outline on EIA acquired by Thuan Dao IP can be shown Table 2-26. When implementing project, it is need to consider solutions particularly for each phase (calling upon enterprises, construction, and operation) base on particular solution as specified in EIA.

Table 2-26 EIA for Than Dao IP

Item	Contents
Title of the Report	REPORT OF EVALUATING ON ENVIRONMENTAL IMPACT – INVESTMENT PROJECT OF THUAN DAO EXTENDED INDUSTRIAL ZONE LOCATION: LONG DINH COMMUNE CAN DUOC DISTRICT LONG AN PROVINCE
Issued Date	August 2009
Issuing Organization	Investor: Dong Tam industrial park (IP) Joint stock Company
Implementing Organization	Center of Environmental Monitoring and Engineering

Table 2-27 Table of contents of EIA for Than Dao IP

OPENING
1. SOURCE OF PROJECT
2. PURSUANT TO LAW AND TECHNIQUE OF EVALUATION ON ENVIRONMENTAL IMPACT (DTM)
3. ORGANIZED TO PERFORM THE EVALUATION ON ENVIRONMENTAL IMPACTS

1 DESCRIBED PROJECT BRIEFLY
1.1. PROJECT NAME
1.2. Project manager
1.3. GEOGRAPHICAL POSITION OF PROJECT
1.4. PRIMARY CONTENT OF PROJECT

2 NATURAL, ENVIRONMENTAL AND SOCIO-ECONOMICAL CONDITIONS
2.1. NATURAL AND ENVIRONMENTAL CONDITIONS
2.2. SOCIO-ECONOMIC CONDITION

3 ENVIRONMENTAL IMPACT ASSESSMENT
3.1. CAUSES OF IMPACT
3.2. IMPACT ASSESSMENT

4 MEASURES TO MINIMIZE NEGATIVE IMPACT, PREVENTION AND RESPONSE TO ENVIRONMENTAL INCIDENTS
4.1. REDUCE POLLUTION IN SURFACE PREPARATION PHASE IN CONSTRUCTION WORKS
4.2. STAGE leveling and INFRASTRUCTURE CONSTRUCTION
4.3. STAGE OF EXTRACTION AND OPERATION

5 COMMITMENT TO ENVIRONMENTAL PROTECTION

6 ENVIRNMENTAL TREATMENT WORKS, ENVIRONMENTAL MONITORING AND MANAGEMENT PROGRAM
6.1. LIST OF ENVIRONMENTAL TREATMENT WORKS
6.2. ENVIRONMENTAL MONITORING AND MANAGEMENT PROGRAM
6.3. SUPPORTING MEASURES IN THE PRORAM OF ENVIRONMENTAL QUALITY MONITORING

8 COMMUNITY CONSULTATION
8.1. IN THE OPINIONS OF PEOPLE'S COMMITTEE OF LONG DINH COMMUNE
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10 CONCLUSION AND PROPOSALS
1. CONCLUSION
2. PROPOSALS

Standard for each factor in EIA

EIA of Thuan Dao IP coordinate systematically the standard of emission and treatment related with noise,, air quality, water quality, waste and all that and shown with standard value.

Along with waste water treatment is directly implemented in utility project which is not direct treatment object, for treating waste, air pollution, noise and waste water base on standard of per factor as stated in EIA

Not only the wastes water treatment that is directly implemented in utility project but also waste management, air pollution and noise associated with wastes water treatment should be implemented base on standard of each individual factor in EIA when utility project operation, call up favorable plant, construction and maintenance of equipment are carried out .

Standard for each individual factor in EIA as follows:

Table 2-28 Standard for each factor in EIA of Thuan Dao IP

Table 3.1	Pollution due to the exhaust gas by the transportation means, machineries
Table 3.2	Maximum noise level from operation of cargo vehicle and executing machine.
Table 3.3	Pollution coefficient due to burning oil
Table 3.4	Pollution coefficient of electric generator use DO oil
Table 3.5	Coefficient of air pollution by burning gas
Table 3.6	Tonnage and concentration of pollution substances when burning gas.
Table 3.7	Pollution coefficient due to coal
Table 3.8	Coefficient contamination of the manufacturing industry typical
Table 3.9	The composition of pollutants in automobile exhaust
Table 3.10	Pollution coefficient when burning fuels
Table 3.11	Polluted material concentration in rain water
Table 3.12	Standard of using water in estimated
Table 3.13	Weight of average pollution substances
Table 3.14	Nature of activities wastewater compared with standard Waste
Table 3.15	Characteristics of wastewater produced some of the industry
Table 3.16	Component of domestic waste
Table 3.17	Ingredients solid waste in some industries
Table 3.18	Characteristics of solid waste produced in some industries
Table 3.19	Harmful wastes can be generated from manufacture sections

Commitment shown to EIA of the Thuan Dao IP

In the EIA of Thuan Dao IP, the measure for preventing the environmental pollution in each stage of construction, development, and operation of the IP is mentioned as a "commitment", regarding air quality, water quality, waste, noise, etc. that the environmental standards of Vietnam will be satisfied.

In general, each standard of Vietnam was set up based on European environmental standards, has cleared the international level, and even if compared with environmental standards of Japan, it is in an appropriate level.

For this reason, also in the executive phase of the utility business, it is necessary to apply this "commitment" and to add the updating contents to the monitoring plan, etc. Since the environmental standards of Vietnam were changed in 2008, it is also necessary to apply the up-to-date standard of corresponding in the phase.

Table 2-29 Commitment shown to EIA of the Thuan Dao IP

In the time to operate, it's unavoidable for the industrial zone to generate environmental impact factors. Understanding the importance of environmental protection, relation between industrial development and clean environment preservation; in order to ensure the development goals without polluting the environment, the Company commits to:

- Afford the environmental protection of the Industrial area in line with article 36, chapter V of the Environmental protection act no. 52/2005/QH11 on November 29th, 2005.
- Carry out the pollution control measures in the stages of leveling, infrastructure construction, as well as in the operation period of the industrial zone as proposed in chapter IV of the report.
- Require the investors in the industrial area to give the evaluation report on environmental impacts or the commitment to environmental protection for each project.
- Invest to build the centered sewage disposal station of the industrial zone in parallel with the infrastructure construction of industrial area; and finish the sewage disposal system before plants in the industrial area put into operation. Demand the secondary investors to link their own system to the common system of the industrial area.
- Install the electricity and water meters in the centered sewage disposal system to observe and run the system. Install the automatic monitoring station on waste and exhaust emissions when the industrial area attracts investment and puts into action with over 80% its plants.
- Manage the hazardous waste in accordance with the Circular no. 12/2006/TT-BTNMT on December 26th, 2006 of Ministry of Natural resources and Environment and the Decision no. 23/2006/QĐ-BTNMT on December 26th, 2006 of Ministry of Natural resources and Environment.
- Implement the environmental monitoring program in the process of construction and operation and send the environmental monitoring report to the Department of Natural resources and Environment to observe.
- In the process of operation, the project commits to do the pollution control measures effectively and they must satisfy Vietnam environmental standards as follows:
- For the quality of air environment: ensure to satisfy the environmental standards TCVN 5937-2005; TCVN 5938-2005; TCVN 5939-2005; TCVN 5940-2005; the noise standard TCVN 5949-1998.(Necessary to satisfy the update versions)
- For the quality of air environment: Wastewater from the centered sewage disposal station satisfies the standard TCVN 5945-2005, limit A, Kq=1.1, Kf=0.9 before flowing into the receiving source.
- Cooperate closely with State management agencies in the area and comply with their requirements in the process of project's construction and operation; and automatically obey the current rules of Vietnamese Law.

(Note) Underlined relevant to the business execution

Table 2-30 Application standards of the commitment shown to the EIA

Target	No.	Item	QCVN	TCVN (Old Standards)
Air	1	Ambient air quality	QCVN**05**:2009/BTNMT	TCVN59**37**:2005
	2	Hazardus substans in ambient air	QCVN**06**:2009/BTNMT	TCVN59**38**:2005
	3	Industrial emission of inorganic substances and dusts	QCVN**19**:2009/BTNMT	TCVN59**39**:2005
	4	Industrial emission of organic substances	QCVN**20**:2009/BTNMT	TCVN59**40**:2005
Water	1	Surface water quality	QCVN**08**:2008/BTNMT	TCVN59**42**:1995
	2	Coastal water quality	QCVN**10**:2008/BTNMT	TCVN59**43**:1995
	3	Underground water quality	QCVN**09**:2008/BTNMT	TCVN59**44**:1995
	4	Industrial wastewater	QCVN**24**:2009/BTNMT	TCVN59**45**:2005
Noise	1	Noise standard		TCVN59**49**:1998

(Note) Necessary to replace and apply to the QCVN standards set up in 2008

Resident discussion

In EIA, the interview with the leader of the area and residents is shown as a method for grasping the opinion from a local resident. As for an object, the people committee of a Long Dinh area and a CanDuoc area and a homeland battle line conference correspond. The result of resident deliberations is submitted to the industrial complex enterprising body as a request document on November 10, 2008 (Table 2-31).

Since the utility project is accompanied with the location of pollution type industry, it is needed for implementation of additional EIA on the mitigation measures (eg. advanced waste water treatment function) and possibility of the location of pollution type industry.

Through dialogues with the IP's business unit, the fatherland front committee of Long Dinh commune expressed "highly approves the spirit of the company's management board which pays attention to environmental protection during the time from capital construction to operation."

The committee said "Being a group of people, the Fatherland Front Committee recognizes that the environment is now a commonly concerned problem of the residents; it has been seriously affected by the emissions from the companies. Therefore, when the company puts into operation, although in the short term it provides employments for local labors and the outside, in the long term the company must minimize its effect to the environment. As the results, the company will develop more and more rapidly." and concluded "Some opinions share with the company. Warmly welcome!"

Table 2-31 Request Document from People's committee of Long Dine Commune

On community consultation for investment project of
the Extended Thuan Dao Industrial zone"

To: **Dong Tam industrial zone Joint-Stock Company**

(Omission)

FOR THE ENVIRONMENT:

- In the process of capital construction:

- Before the ground leveling work, construction units should make contracts with engineering units those who demine for the overall project so as to keep the process of operation in safe.

- Because the construction works is next to the village road 16 and the road of Hamlet 4 with the high population density, it is necessary to carefully count and design the water outlet system, the building foundation bed (written in the report) will be higher than the ground level of populated area, though lower than the road Long Dinh – Long Can.

- In case the land clearing work done by motorized transport, the investor needs to require the construction units to commit about transport velocity without dropping for the purposes of absolute safety of people's properties and lives.

- In the process of operation:

- Because the population density of surrounding areas is high, the investor should not locate highly polluted industries such as the aluminum, accumulator production, etc.

- Because of a large project, the building of sewage disposal plant needs to apply the most modern equipments and technologies.

- For the industries easy making odors, it is necessary to treat thoroughly so as not to spread over surrounding areas.

(OTHER OPINIONS) Nothing

IN CONCLUSION:
Through the brief description of environmental impact assessment report of the investment project of Extended Thuan Dao Industrial zone, we affirm that this repot is feasible and require the investor to follow the disposal processing and the commitments to environmental protection during the time to carry out the project.

Monitoring program

In the EIA, noise and dust will be monitored during construction, water quality, air quality, waste, microclimate and soil environment will be monitored after operation in every three month. In order to predict the environmental quality of the IP, samples will be collected at the main points in the IP and some production plants. The monitoring program will be promptly carried out immediately after the business start.

Table 2-32 Monitoring program shown to the EIA

Item / Objects		Places for monitor	Method	Frequency	Standards
6.2.1. Process of construction implementation					
Noise Dust		2 places in the area where the project is being constructed, 2 places in surrounding populated areas in line with the wind direction	Standard	Every 3 month	TCVN 5937-2005 TCVN 5949-1998
6.2.2 Process of operation					
Water quality **Sewage (drain-water)**	Temperture / pH / BOD4/ COD / SS/ TotalP / Total N / .$(NH4)2SO_3$ / mineral oils, plant and animal oils, Coliform	2 places: 1 allocated in the in-put and the other allocated in the out-put of the centered sewage disposal station	Standard	Every 3 month	TCVN 5945-2005 Kq ＝1.1、 Kf ＝0.9 Applied "A" standard
Water quality **Surface water**	Temperture / pH / BOD4/ COD / SS/ TotalP / Total N / .$(NH4)2SO_3$ / mineral oils, plant and animal oils, Coliformx	2 places: the first is 200m away from discharge sewer (NM01) to lower stream and the second is 200m away from discharge sewer (NM02) to upper stream of Chanh river	Standard	Every 3 month	QCVN 08:2008/BTNMT

Item / Objects		Places for monitor	Method	Frequency	Standards
Air quality	NO_2 / SO_2 / CO / Noise NH_3 / H_2S / NH_3 /	4 monitoring places inside the industrial zone, but they are outside the area of production facilities; 1 place is next to sewage disposal area and rubbish-transport shaft; 4 places outside the industrial area, lie in Southeast, Northwest, Southwest, and Northeast.	Standard	Every 3 month	TCVN 5937 – 2005, TCVN 5938 – 2005, TCVN 5939 – 2005, TCVN 5940 – 2005, TCVN 5949 – 1998.
Solid-waste sources	• Examine and monitor the transport, storage of solid waste in the industrial waste transport site: quantity, types of waste (living, industrial and hazardous waste). • Living and industrial solid-waste are collected and carried to the waste transport site by the organization of investors; in case the industrial waste is recyclable and reusable, it will be sold to demanded units, the remains will be treated along with living waste. This is the content in the contract signed with the One-member Limited Liability Company (LLC) on public buildings of Ben Luc district, who is responsible for transporting and treating the waste. • For hazardous waste, the plants in the industrial zone will directly cooperate with specialized waste disposal companies, which are legally issued under the guidance of Department of natural resources and environment. For example: Limited Liability Company of Sao Mai Xanh, LLC on Production and Trading Service of Moi Truong Xanh, LLC on Trading and Service of Tuong Lai Xanh.etc. • Hazardous waste is collected, transported, stored and treated in accordance with Circular no. 12/2006/TT-BTNMT on 26/12/2006 of Ministry of Natural resources and Environment and Decision no. 23/2006/QD-BTNMT on 26/12/2006 of Ministry of Natural resources and Environment.			Every 3 month	
Microclimate	Humidity, Temperature, Windy speed	Outside the areas of facilities in the industrial area.	Standard	Every 3 month	
Soil environment	Cd / Cu / Pb / Zn.	1 place in landfill site	-	Every 3 month	QCVN 03:2008/BTNMT National technical standards on allowable limit of heavy metals in the soil

2) EIA on Dau Tieng Lake East Canal Project (World Bank)

Outline of EIA on Dau Tieng East Canal Project (WB) is below with publicly available information.

About the negative impacts on the household and community by construction work, and the impacts of the resettlment to land acquisition, all are estimated "mitigable." Moreover, impacts on the employment and household income expantion, and whole economic activity are estimated "positive".

Impact on social environment by this project is appraised positively for relevant matters with contribution to agricultural production.

Fishery is worried in this area, in water resource area, after recognizing number of persons supported by fishing has propensity to knock off, besides, catching quantity equivalent to one person is decreasing, it has negative impact to aquatic resource which is appraised [may lighten]

Table 2-33 EIA on Dau Tieng East Canal Project (WB)

Item	Content
Report Title	ENVIRONMENTAL IMPACT ASSESSMENT FOR VIET NAM WATERRE SOURCES ASSISTANCE PROJECT
Issued Date	APRIL 2003
Issuing Organization	THE SOCIALIST REPUBLIC OF VIET NAM MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT CENTRAL PROJECT OFFICE
Version	VOLUME 2: REPORT No. 7: DRAFT FINAL ENVIRONMENTAL IMPACT ASSESSMENT OF DAU TIENG SUB-PROJECT
Implementing Organization	GEC GLOBAL ENVIRONMENTAL CONSULTANTS LTD. CENTER FOR BIOTECHNOLOGY FOR LIFE AND PRODUCTION
Web Site	http://www-wds.worldbank.org/external/default/main?pagePK=64193027&piPK=64187937&theSitePK=523679&menuPK=64187510&searchMenuPK=64187283&siteName=WDS&entityID=000094946_0310090401301

Table 2-34 Contents of EIA on Dau Tieng East Canal Project (WB)

1:Introduction
1.1 Background and Objectives
1.2 Overview of the Dau Tieng Sub-Project
1.3 Legal, Policy, and Regulatory Context for Dau Tieng Sub-Project EIA
1.4 Approach to VWRAP Definition ,Preparation, and Implementation
1.5 General Approach to EIA Preparation
1.6 Outline of the EIA for the DAU TIENG Sub-Project

2:Description of Dau Tieng Sub-Project
2.1 Summary of Current Situation
2.2 Description of Sub-Project
2.3 Expected Changes in Agricultural Land Use

3:Description of Existing Environment
3.1 Location of Sub-Project
3.2 Physical Resources
3.3 Biological Resources
3.4 Socioeconomic Resources

4:Impact Assessment
4.1 Employment Impact Assessment Methodology
4.2 Application of IDA Operational Policies
4.3 Activities with Consistent Impacts on All Environmental Resources
4.4 Environmental, Social Resources with Uniform Environmental Impacts
4.5 Sub-Project Impacts of Pre-Construction
4.6 Sub-Project Impacts of Construction
4.7 Impacts During Operational Phase
4.8 Main Conclusion of Impact Assessment

5:Environmental Management Plan
5.1 Vietnam Legal and Administration Framework
5.2 IDA Environmental Requirements
5.3 Overall Approach to Implementation
5.4 Institutions Responsible for Implementation the Dau Tieng EMP
5.5 Environmental Mitigation Program for Dau Tieng Sub-Project
5.6 Dau Tieng Environmental Mitigation Compliance Monitoring Program
5.7 Environmental Effect Monitoring Program
5.8 Reporting Requirements for Dau Tieng EMP
5.9 Organization Framework for Implementing the Dau Tieng EMP
5.10 Policy Guidelines for Detailed Testing
5.11 Training and Capacity Upgrading Requirements for EMP Implementation
5.12 Requirements for Flexibility and Adaptability in EMP Implementation
5.13 Costs of Dau Tieng Sub-Project Environmental Management Plan

3) Phuoc Hoa Water Resources Project.(ADB)

Phuoc Hoa water resources project financed by ADB is a project concerning guarantee of water resources of water supply project which has been checked actual state upon hereafter EIA and announced publicly.

The resident resettlement plan of this project was recognized by MARD in 2003, and the problem involving geographical dividing of communes was mitigated.

Especially, impact on fisherman being worried in related area has been treating as MT4 (environmental flow and fisheries management) in the process of continuation of monitoring and when water resources are guaranteed, impact on fisherman shall be limited.

Table 2-35 EIA on Phuoc Hoa Water Resources Project (ADB)

Item	Content
Report Title	Proposed Supplementary Loan Socialist Republic of Viet Nam: Phuoc Hoa Water Resources Project(Project Number: 29296-02) Supplementary Appendix K: Addendum to the Environmental Management Plan
Issued Date	August 2010
Issuing Organization	Asian Development Bank
Web Site	http://www.adb.org/Documents/Supplementary-Appendixes/29296/29296-02-vie-sa.pdf

Table 2-36 Contents of EIA on Phuoc Hoa Water Resources Project (ADB)

SUMMARY I. Introduction A. Background B. The Project C. Environmental Category D. EIA and EMP E. Applicability for Review of Supplemental Loan II. Mitigation A. Summary of Potential Adverse Environmental Impacts B. Description of Mitigation Measures III. Monitoring and Reporting A. EMP Contracts	IV. Public Consultation and Grievance Procedure A. Grievance Redress Mechanism V. Implementation Arrangements A. Training Programmers B. Assurances C. Summary of Recommendations and Contract Amendments D. Summary of Costs E. Implementation Schedule VI. Findings, Recommendations and Conclusion

2-9-5 Consideration for Alternative Proposals (including Zero Option)

Three undertakings assumed to be implemented under this project have the nature of indenpendent alternative proposals for achieving the goal to solve the issue of wastewater treatment in IPs in Viet Nam. And each of these undertakings (projects) shall primarily contribute to reducing and ameliorating environmental burdens. The alternative proposals on the Table 2-37 can be derived as options, when a comparison is made comprehensively from the perspectives of consideration for environmental society combined with the aspects of cost and technology.

In these alternative proposals, it would be take into account that it will be difficult to ensure profitability of Waste water treatment business without pursuing an economy of scale from cost perspectives, and it is possible that continuous use of groundwater as industrial water will cause new environmental burdens such as ground subsidence if two other projects will be implemented without implementing water project. Therefore selectable combination of alternative proposals is limited compared with multiple alternative proposals shown Table 2-37.
In the case where neither of the projects proposed under this project will not be implemented (Zero Option), the environmental burdens associated with wastewater will be expanded cautiously in the future, because the issues of wastewater treatment in IPs in Viet Nam can not solved through the transfer of Japanese-style environmental technology and management knowhow. Besides, business opportunities could be possibly missed, due to the failure to respond to the needs of eco-minded companies that are planning to relocate to environment-friendly IP.

From the aforementioned points, it is considered that an alternative proposal 2 (implement utility projects and water projects in combination) should be selected.

In addition, since water supply needed for implementation of the utility business of alternatives 2 corresponds to expansion of the demand accompanying the increase in the companies located in an industrial complex, it needs to guarantee additional amount of water.
When reservation of the water rights from the original water source is difficult, applying other surface running water as a water source is also considered. Reservation of a water source takes time towards business expansion.

Table 2-37 Consideration for Alternative Proposals (including Zero Option)

Alternative Proposal	Biz1	Biz2	Biz3	Pros	Cons
1	○	○	○	● Advancement of wastewater treatment in multiple IPs. ● Reduction of Land subsidence by use of groundwater	● Unlike other two projects, Waste water treatment business need to be financially viable through an economy of scale that may possibly deteriorate the project's earnings. ● Restrictions of the surplus of supply capacity and supply area of a water supply project
2	○	○	―	● Advancement of wastewater treatment and Reduction of Land subsidence by use of groundwater ● Financially viable of Utility project, by making charge setup be a black box	● Restrictions of the surplus of supply capacity and supply area of a water supply project
3	―	○	○	● Reduction of Land subsidence by use of groundwater ● Installation simply of Waste water treatment business	● Restrictions of the surplus of supply capacity and supply area of a water supply project makes Waste water treatment business difficult financially viable through an economy of scale that may possibly deteriorate the project's earnings.
4	○	―	○	● Advancement of wastewater treatment ● Financially viable of Utility project, by making charge setup be a black box.	● If the industrial water by surface water is not supplied appropriately, there is a possibility of causing land subsidence ● Unlike other two projects, Waste water treatment business need to be financially viable through an economy of scale that may possibly deteriorate the project's earnings.
5	○		―	● Advancement of wastewater treatment ● Financially viable of Utility project, by making charge setup be a black box.	● If the industrial water by surface water is not supplied appropriately, there is a possibility of causing land subsidence
6	―	―	○	● Advancement of wastewater treatment ● Financially viable of Utility project, by making charge setup be a black box.	● Waste water treatment business need to be financially viable through an economy of scale that may possibly deteriorate the project's earnings ● If the industrial water by surface water is not supplied appropriately, there is a possibility of causing land subsidence
7	―	○	―	● Reduction of Land subsidence by use of groundwater by supplying surface water for industry use	● Reservation of a water source takes time towards business expansion.
8	―	―	―		● Business opportunities could possibly be missed, against the needs of the companies which demand the relocation to environment-conscious factory.

(Notes1) Biz1 : Utility Business , Biz2: Water Supply Business , Biz3 : Waste water treatment business
（Notes2）○ : To be implemented ― : Not to be implemented

2-9-6 Scoping and TOR in the Research on Environmental Social Consideration

(1) Scoping of this project

The scoping of the project assumes that water project and utility projects wihich are implemented as a series of projects. And we conducted evaluation based on the idea that Waste water treatment business is to be incorporated into utility projects, because the nature of these projects is the same from the perspectives of consideration for environmental society despite the fact that the business model for Waste water treatment business is different from wastewater treatment functions incorporated in utility projects（Table 2-38）.

Besides, the scoping of utility projects was conducted based on the assumption that the projects would attract, construct and operate factories cooperatively together with the IPs whose land development underway.

For this reason, in the case where an IP is going to introduce this project and develop this project as an environment-friendly IP, it is assumed that there may raise the remained issues directly associated with utility projects, which are primarily reflected in water contamination and wastes disposal associated with wastewater treatment. About the other items except the above, it is neccessary to consider that the impact assessment will become the same as the case where the IP is in operation as the general one.

Table 2-38 Scoping of this project

Classification	No.	Items Impacted	Impact Assessment		Reasons for Evaluation
			Before Construction/ Under Construction	When It Is Stage In Operetion	
Anti-pollution measures (Continued from the previous page)	1	Air pollution	D/B-	D/B-	Under Construction: It is temporarily assumed with operation of the equipments for utility equipment and factory construction etc. that air quality deteriorates. In Operation: It is assumed negative impact on the air quality by the emission gas of run vehicles caused by traffic increases and concentration with the increase in employees by factories location. It is temporarily assumed negative impact on the air quality caused by a power supply equipment (gas turbine etc.), when using the backup in emergencies, such as the time of a blackout.
	2	Water Pollution	B-/B-	D/A	Under Construction: The water pollution by the sewerage from a construction site, a heavy industrial machine, vehicles, and construction lodgings, etc. is assumed. In Operation: When a factory including sewerage of a heavy metal etc. is accepted positively if fault arises in the first-step-treatment function by the side of factories, it is assumed that the contaminant exceeding the capacity of the secondary treatment function by the side of the IP flows out. It is assumed by the fault of the waste water treatment function by the side of a factory, the fault of the intensive waste treatment function of an industrial complex, and breach of a

Classification	No.	Items Impacted	Impact Assessment		Reasons for Evaluation
			Before Construction/ Under Construction	When It Is Stage In Operetion	
					contract of a factory that the water quality of sewerage exceeds a setting standard.
	3	Waste	B-/B-	D/A	Under Construction: Generating of construction waste soil and scrap wood is assumed. In Operation: When the storage of waste, one of the utility project's menu, and waste storage and management of the sewerage residual substance etc. which were generated in the the waste water treatment are not performed appropriately, it is assumed that some part of them disperses and flows out outside. When the waste treatment company processes waste kept and managed appropriately in the IP unsuitably, it is assumed that some part of them disperses and flows out outside.
	4	Soil Contamination	B-/B-	D/A	Under Construction: It is assumed that soil could be contaminated due to the spill of the oil for construction. In Operation: It is assumed that soil could be contaminated, due to the spill of the oil used during hours of factory operation or the leak of wastewater caused by the breakage of water distributing pipes.
	5	Noise/ Vibration	B-/B-	D/B-	Under Construction: IPs are primarily surrounded by farmlands, but there are some points which are located close to villages. In the latter case, it is assumed that there could be noise to be generated when construction machinery and equipment and vehicles are operated. In Operation: IPs are primarily surrounded by farmlands, but there are some points which are located close to villages. In the latter case, it is assumed that there could be the impact of the noise from the operations of factories close to villages.
	6	Ground Subsidence	D/D	D/A	Under Construction: It is not assumed that there is no work which could trigger ground subsidence. When it is placed in service: In the case where utility project and wastewater project will be introduced separately, and water project will not be introduced, it is assumed that groundwater could be used for industrial water, which will induce the ground subsidence over a medium term.
	7	Bad Odor	D/D	D/A	Under Construction: It is assumed that there will be no work which triggers bad ordor. In Operation : It is assumed that bad ordor may arise from solvents, waste materials and wastewater, depending on the type of factories attacted to
	8	Bottom Sediment	D/D	D/B-	Whe it under costruction: It is assumed that there could be no work which may impact on the bottom sediment. In Operation: If the wastewater exceeding the limit of the set water quality standard is flowing out continuously, it is assumed that a negative impact could be accumulated on the bottom sediment of waterways or rivers to which such wastewater is flowing out.
	9	Protected Zone	B-/D	D/D	Water Project: There is neither national parks nor protected zones existing within the site of the project in scope and its vicinity. The protected zone is included in the scope of the expanded project of Dau Tieng East Waterway which is subject to the scope of secondary impact. Utility Projects: There is neither national parks nor protected zones existing within the the site of the projects in scope and its vicinity.
	10	Ecosystem	D/D	D/D	Water Project: Given the fact that the land fronting on the existing public road is established as the site of the project in scope, it is assumed that there would be almost no impact on ecosystems due to nonexistence of rare animals and plants there. Utility Projects: Since the site of the projects in scope is within the IP where the land development has been already

Classification	No.	Items Impacted	Impact Assessment		Reasons for Evaluation
			Before Construction/ Under Construction	When It Is Stage In Operetion	
					completed, there is no rare animals and plants existing there.
	11	Conditions of Water	D/D	A/D	Water Project: It is assumed that the securing of the volume of water required for the project could result in reducing and depleting the source of water over a medium term. Utility Projects: Since appropriate quantities of the treated wastewater treated properly will be discharged when the projects are either under construction or placed in service, it is assumed that there would be no change in the water current and riverbeds of rivers.
	12	Geography/ Geology	D/D	D/D	Water Project: Since the land fronting on the existing public road is established as the site of the project in scope, it is assumed that there would be no large-scale excavation which may have an additional impact on geography and geology. Utility Projects: Since the site of the projects in scope is within the IP where the land development has been already completed, it is assumed that no new additional impact would be exerted on geography and geology when the projects are either under construction or placed in service.
Social Environment	13	Relocation of Residents	D/D	D/D	Water Project: Since the farmland fronting on a public road is planned to be used as the land for water intake facilities in this project, it is not assumed that the residents living there will be relocated when the project is either under construction or placed in service. Given the fact that the land fronting on the existing public road is established as the project site for waterways (pipe laying), and only the limited space of several meters is required for laying pipes in the facility when pipies need to pass through residential district, and pipes can be laid under the ground, it is assumed that there would be no new relocation of residents required when the project is either under construction or placed in service. Utility Projects: Since the site of the projects in scope is within the IP where the land development has been already completed, it is assumed that there would be no new relocation of the residents when the projects are either under construction or placed in service.
	14	Poverty Group	D/D	B+/D	Water Project: Since this project is not only intended to supply water to IPs but also supply tap water to the residents, it is expected that public health sanitation of the whole residents including poverty group will be improved after the project is placed in service. Utility Projects: Since the site of the projects in scope is within the IP where the land development has been already completed, it is assumed that there would be no impact on the poverty group when the projects are either under construction or placed in service.
	15	Ethnic Minority/ Indigenous Population	D/D	D/D	Water Project: There is neither ethnic minority nor indigenous population existing in the site of the project in scope and its vicinity. Utility Projects: Since the site of the projects in scope is within the IP where the land development has been already completed, it is assumed that there would be no impact on indigenous population when the projects are either under construction or placed in service.
	16	Regional Economy such as Employment and Livelihood	B+/B+	B+/B+	Water Project: The employment associated with construction work will be generated in the region. The employment for operations and maintenance will be somewhat generated when the project is placed in service. Utility Projects: The employment associated with construction work will be generated in the region. A certain size of employment associated with factory operations will be generated when the projects are placed in service.

Classification	No.	Items Impacted	Impact Assessment		Reasons for Evaluation
			Before Construction/ Under Construction	When It Is Stage In Operetion	
	17	Use of Land and Regional Resources	D/D	D/D	Water Project: Since the land fronting on a public road is planned to be used as the site of this project, it is not assumed that new land or regional resources will be used. Utility Projects: Since the site of the projects in scope is within the IP where the land development has been already completed, it is not assumed that new land or regional resources will be used when the projects are either under construction or placed in service.
	18	Use of Water	B-/D	B-/A	Water Project: It is considered that there will be an impact from turbid water while construction is underway in the waterways on the front and back of the land for water intake facility in this project. Utility Projects: In the case where the discharged water from the factories actively taken in contain heavy metals, it is assumed that contaminated materials exceeding the capacity of secondary treatment functions on IP side, could be outflowed, when there arises a failure on any of primary treatment functions on factory side. In case there occurs any failure in effluent treatment functions on the factory side or any failure in the consolidated wastewater treatement functions, it is assumed that the quality of the effluent will exceed the limit of the set water quality standard due to the breach of contract on the factory side.
	19	Existing social infrastructure and social service	B-/B-	D/B-	Under Construction : It is assumed that temporary traffic congestion will arise while construction is underway along a public road. When it is placed in service: It is assumed that traffic traffic congestion will arise, if relocation and integration of factories will be concentrated temporarily, after the IP is placed placed in service.
	20	Capitals and associated with Society and Regional Communities	D/D	D/D	This project is intended to improve water infrastructure in the project site fronting on a public road as well as provide utility functions including wastewater treatment functions within the IP where the land development has been already completed,. In this regard, it is considered that there will be few impact either on the capitals associated with society or the decision-making bodies of social organizations including local decision-making bodies.
	21	Maldistribution of Damage and Benefit	D/D	D/D	This project is intended to improve water infrastructure in the project site fronting on a public road as well as provide utility functions including wastewater treatment functions within the IP where the land development has been already completed,. In this regard, it is considered that there will be few cases that may bring unfair damage and benefit to the local communities in the surrounding area.
	22	Conflict of Interest within Regional Communities	D/D	D/D	This project is intended to improve water infrastructure in the project site fronting on a public road as well as provide utility functions including wastewater treatment functions within the IP where the land development has been already completed,. In this regard, it is considered that there will be no case that may cause the conflict of interest within the regional communities.
	23	Cultural Heritage	D/D	D/D	There is no cultural heritage existing in the site of water project in scope and its vicinity. Since the site of utility projects in scope is within the IP where the land development has been already completed, the item regarding the existence of cultural heritage is not applicable.
	24	Landscape	D/D	D/D	Since the site of water project in scope is fronting on a public road, it is considered that there will be few impact on the landscape. Since the site of utility projects in scope is within the IP where the land development has been already completed, the impact on the landscape is not applicable.
	25	Gender	D/D	D/C-	It is not assumed that this project will bring a negative impact on genders. But you need to confirm whether any problem is arising or not in the area of employment and so forth in the

Classification	No.	Items Impacted	Impact Assessment		Reasons for Evaluation
			Before Construction/ Under Construction	When It Is Stage In Operetion	
					factories after the operation is started.
	26	Rights of Children	D/D	D/D	It is not assumed that this project will bring a negative impact on the rights of children.
	27	Infectious Disease such as HIV/AIDS	C-/C-	D/C-	Under Construction : It is considered that the inflow of construction workers may possibly lead to the spread of infectious disease. In Operation : It is considered that the inflow and outflow of massive number of workers due to the operations started by factories, it considered that this will cause the spread of infectious disease.
	28	Working Environment (including Work Safety)	C-/C-	D/C-	Under Construction : Due consideration must be given to the working environment of construction workers. In Operation : Due consideration must be given to the working environment and work safety concerning the persons engaged in utility projects and the workers within the IP.
Others	29	Accidents	B-/B-	B-/B-	Under Construction : Due consideration must be given to the accidents that may arise during construction work. In Operation : There is concern over the possible occurrence of the accidents within the IP or traffic accidents during commuting hours, with the operations started by factories.
	30	Impact from Transboundary Issue	D/D	C-/C-	Under Construction : Since the scale and scope of the construction is limited, it is considered that there is few impact from transboundary issue or few impact on climate change. In Operation :It is assumed that there might arise the impact from transboundary issue, in case the effluent exceeding the limit of the set water quality standard continues to flow out due to the failure of water discharge treatment functions on the factory side or the failure of consolidated wastewater treatment functions of the IP, or the breach of contract by factories and so forth.

(Notes1) A+/-: There is critical positive/negative impact
B+/-: It is expected that there will be some positive/negative impact.
C+/-: It is not clear whether there will be positive/negative impact or not.
D: It is expected that there will be no impact.
(Notes2) In Impact Assessment (IA) Colum:
X/Y refereed to < IA of the Utility Project / IA of the Clean Water Supply project>

(2) TOR of the Investigation on the Environmental Social Consideration

The TOR of the Investigation on the environmental social consideration shall be established as given below on the Table 2-39 based on the scoping of this project.

Table 2-39 TOR of the Investigation on the Environmental Social Consideration

No.	Items	Items for Investigation	Investigation Method
－	Alternative Proposals	(1) Validate whether each project is economically feasible or not.	(1) Financial simulation (2) Understanding of the needs
1	Air Pollution	(1) Confirm the environmental standards and mitigation measures and so forth indicated on the EIA concerning the IP in scope (the Second Phase of Thuan Dao IP) (2) Understand the current situation of the companies (factories) planning to move into the IP (what their situation is currently like in the location from which they are planning to move out)	(1) Investigate the existing documents (2) Field investigation at the time when a contract is signed (the companies moving into the IP will conduct field investigation and submit the report.)
2	Water Contamination	(1) Confirm the environmental standards and mitigation measures indicated on the EIA	(1) Investigate the existing documents (2) Field investigation and visit to an

No.	Items	Items for Investigation	Investigation Method
		for the IP in scope (the Second Phase of Thuan Dao IP) (2) The case study for IPs similar to this IP (3) Technological compatibility under this project (4) Understand the current situation of the companies (factories) planning to move into the IP (what their situation is currently like in the location from which they are planning to move out).	individual company and factory. (3) Technical validation (4) Field investigation at the time when a contract is signed (the companies moving into the IP will conduct field investigation and submit the report.)
3	Waste Materials	(1) Check the environmental standards and mitigation measures indicated on the EIA for the IP in scope (the Second Phase of Thuan Dao IP) (2)The treatment method adopted by waste disposal companies (3) Legality of waste disposal companies	(1) Investigate the existing documents (2) Field investigation (field sites for storage and treatment and so forth), visit to an individual company and factory and check the licenses. (3)Check the licenses again at the time when a contract is signed.
4	Soil Contamination	(1) Confirm the environmental standards and mitigation measures indicated on the EIA for the IP in scope (the Second Phase of Thuan Dao IP)	(1) Investigate the existing documents.
5	Noise/ Vibration	(1) Confirm the environmental standards and mitigation measures indicated on the EIA for the IP in scope (the Second Phase of Thuan Dao IP) (2) The Impact exerted from construction work on water intake facilities and utility facilities	(1) Investigate the existing documents. (2) Conduct a prior confirmation with the entities which implement construction and engage in consultations with them concerning countermeasures.
6	Ground Subsidence	(1) The quantities of water and the source of water for water project	(1) Field investigation (visit to the related organizations and survey)
7	Bad Odor	(1) Check the environmental standards and mitigation measures indicated on the EIA for the IP in scope (the Second Phase of Thuan Dao IP)	(1) Investigate the existing documents
8	Bottom Sediment	(1) Check the environmental standards and mitigation measures indicated on the EIA for the IP in scope (the Second Phase of Thuan Dao IP)	(1) Investigate the existing documents
9	Projected Zone	(1) Understand the current situation of the EIA concerning the projects for the source of water and waterways (Dau Tieng East Waterway Project funded by the World Bank) and check the mitigation measures (on the EIA)	(1) Investigate the existing documents
11	Conditions of Water	(1) Check the environmental standards and mitigation measures indicated on the EIA for the IP in scope (the Second Phase of Thuan Dao IP) (2) Understand the current situation of the surrounding area of the IP in scope. (3) Check the site of the project in scope (water intake facilities)	(1) Investigate the existing documents (2) Field investigation (survey) (3) Field investigation (at the time when the points for construction the facilities are identified)
18	Use of Water	(1) Check it at the time of business (before initiating the construction work for water intake facilities.)	(1) Field investigation
19	Existing social infrastructure and social service	(1) Check the environmental standards and mitigation measures indicated on the EIA for the IP in scope (the Second Phase of Thuan Dao IP)	(1) Investigate the existing documents

No.	Items	Items for Investigation	Investigation Method
25	Genders	(1) Check it at the time of attracting the companies moving into and signing a contract with them.	(1) Check it on the venue of an individual consultation.
27	Infectious Disease such as HIV/AIDS	(1) Check it with construction companies before the start of construction.	(1) Check it on the venue of an individual consultation.
28	Working Environment (including Work Safety)	(1) Check the environmental standards and mitigation measures indicated on the EIA for the IP in scope (the Second Phase of Thuan Dao IP) (2) Check it at the time of attracting the companies moving into and signing a contract with them.	(1) Investigate the existing documents (2) Check it on the venue of an individual consultation.
29	Accidents	(1) Check the environmental standards and mitigation measures indicated on the EIA for the IP in scope (the Second Phase of Thuan Dao IP)	(1) Investigate the existing documents
30	Impact from Transboundary Issue	(1) Understand the current situation of the site of the project in scope (waterways and water intake facilities) as well as the surrounding area of the IP in scope.	(1) Field investigation (survey, etc.)
－	Stakeholders' Meeting (SHM)	(1)Understand the intentions of the actors associated with the projects (the business owners of the IP, provincial government and government authorities) (2)Understand the intention of the actors who are influential (People's Committee in the local area, Agricultural Cooperatives, the representatives of the residents and so forth) (3) Stakeholder's meeting	(1) Field investigation (visit to an individual actor.) (2) Field investigation (visit to an individual actor). (3) Convene stakeholder's meeting prior to the start of the projects. (Unlike the case for the existing IP, additional impact from this project will be explained in this meeting.)

(Notes) The portions underlined are the items which will be implemented by JV at the stage of business.

2-9-7 Investigation on the Environmental Social Consideration

(1) Measure of mitigation in EIA of Thuan Dao IP

The measure of mitigation shown to EIA of the Thuan Dao IP is a following table.

In this project, the business unit together with the IP's unit will practice measures based on each correspondence measre shown to the IP's excpt for the additional EIA's items.

Table 2-40 Measure of mitigation in EIA of Thuan Dao IP

Chapter	Section	Solution	Correspondence to the Law on environmental protection. (52/2005/QH11)
4.1	**REDUCE POLLUTION IN SURFACE PREPARATION PHASE IN CONSTRUCTION WORKS**	–	
4.1.1	The compensation, assistance resettlement and damage	Meeting latest stipulations of Province	**Article 36.- Environmental protection for concentrated production, business and service zones** 1. Economic zones, industrial parks, export-processing zones, hi-tech parks, industrial clusters, tourist resorts and entertainment and recreation centers (hereinafter collectively referred to as concentrated production, business and service zones) must comply with the following environmental protection requirements: a/ Compliance with the approved development master plan; b/ Planning and arrangement of functional zones and activities must be associated with environmental protection; c/ Full and proper implementation of contents of approved environmental impact assessment reports d/ Adequate punishment of equipment and tools for collection of ordinary solid wastes and hazardous wastes and compliance with requirements of receipt of wastes already sorted out at source from establishments located in production, business and service zones; (Omission) e/ Regular operation of a concentrated sewage system for collection and treatment of waste water and a system for treatment of gas emissions up to environmental standards;
4.1.2	**Overall development planning**	–	
4.1.2.1	Functional areas, planning mills	Divide plant into 3 groups and lay-out following to pollution degree in the plant	
4.1.2.2.	Arrangement distance	Suitable arrangement distance between groups. (Reference of rules on HCMC high-tech area)	
4.1.2.3.	Plant layout position	Plant layout in functional areas under the Decision of Provincial People's Committee (Decision No 779/QĐ-UBND). Layout counted to air pollution in IP.	
4.1.2.4.	Industrial hygiene Isolated area	Fuel treatment facilities arrangement layout, drainage system, isolated areas formation between IP and residential areas (buffer).	

Chapter	Section	Solution	Correspondence to the Law on environmental protection. (52/2005/QH11)
4.2	**STAGE leveling and INFRASTRUCTURE CONSTRUCTION**	–	**Article 83.- Management and control of dust and gas emissions** 3. Means of transport, machinery, equipment and construction works emitting dust and gases must be equipped with gas filters and reducers, dust shields or other covers to reduce dust up to environmental standards. **Article 40.- Environmental protection in construction activities** c/ Waste water, solid wastes and other kinds of wastes must be collected and treated up to environmental standards. **Article 66.- Waste management responsibilities** 2. Sources, quantities, properties of waste must be identified to ensure application of appropriate treatment methods and procedures to each kind of waste. 4. Waste management shall be performed under the provisions of this Law and other relevant laws. **Article 73.- Treatment of hazardous wastes** 1. Hazardous wastes must be treated to meet environmental standards by methods, technologies and equipment appropriate to chemical, physical and biological characteristics of each type of hazardous waste; in case there is no such treatment technology and equipment in the country, hazardous wastes must be stored according to the provisions of law and the guidance issued by state management agencies in charge of environmental protection until they are treated. **Article 81.- Collection and treatment of waste water** 3. Mud discharged from waste water treatment systems must be managed according to solid waste management regulations. **Article 86.- Prevention of environmental incidents** 1. Owners of production, business and service establishments and means of transport potentially causing environmental incidents must apply the following measures:
4.2.1	Clean-up and treatment of plant biomass	Treat plant biomass when arising in land area of the project.	
4.2.2	Collection and treatment of sludge surface peel	Collect arisen sludge surface peel on land area of the project and treat appropriately.	
4.2.3	Leveling control materials	Use suitable anti-noise materials. When building ground, water and not cause noise in surrounding area with pumping soil and sand on daylight	
4.2.4	Control erosion and sedimentation	To prevent erosion and sedimentation by storm, need to bank and install drainage system.	
4.2.5	Control pollution caused by waste	Collect 50 liters into 1～2 reservoirs, it shall be carried out by treater. Three companies who have license of Ministry of Resources and Environment specialize waste as danger waste, chemistry. Pollution water from builder is treated by mobile W.C.	
4.2.6	Control pollution caused by waste oil	Trying not move nercessary machines to repair in project area. Oil and greasy is collected into dedicated device for treating.	
4.2.7	Reduced accidents and other social issues	Use and supervise strictly equipment of builders. In the project area must be safety during 24 hours. Limit speed in construction area and post indicator board and order suitably. Use major local laborer and manage by card.	
4.2.8	Other mitigation measures	Measures as combination of project area before applying for permission/ treating, burying uninflammable materials / transporting uninflammable materials / registering using chemistry/ planning fight fighting /Periodically managing and maintaining of machines, equipment/large size broadcast device use-prohibited/ safety 24 hours guaranteed in project area/installing indicator, order.	

Chapter	Section	Solution	Correspondence to the Law on environmental protection. (52/2005/QH11)
4.3	STAGE OF EXTRACTION AND OPERATION	–	**Article 83.- Management and control of dust and gas emissions** 1. Organizations and individuals engaged in production, business and services activities emitting dust and gases shall have to control and treat dust and gas emissions up to environmental standards. 2. Use of fuels, materials, equipment and means emitting noxious gases into the environment shall be restricted.
4.3.1	Measures to control air pollution	Altitude of chimney/treatment technology and fuel alteration/ exhaust fumes treatment device/ chemistry-organism decomposition/ safety standard application/ Control, maintenance plan/ materials management, reasonable operation and conformation to procedure system in plant and area.	
4.3.1.1.	Using advanced technology, low pollution	Use safety circle procedures, limit arising of technical harmful substance. Altering harmful substance as materials, fuel to un-harmful substance. Treat and see is dust arising. Eliminate and prevent dispersion of harmful substance by using closed circuit.	
4.3.1.2.	Measures to manage and operate.	Just as treatment technique, use suitable materials, comply with procedure and lowest operation can cut down wastefulness and limit exhaust fumes>	
4.3.1.3.	Using trees to reduce air pollution	Plant greenery in IP and surrounding area may catch dust and smoke, limit air pollution, simultaneously help in filtering air, reduced noise and cooling.	
4.3.1.4.	Use the device measures air pollution treatment	Having method of mechanical dust elimination if use accelerator and dust clean by filtering unit.	

Chapter	Section	Solution	Correspondence to the Law on environmental protection. (52/2005/QH11)
4.3.2.	Measures to control water pollution	–	**Article 36.- Environmental protection for concentrated production, business and service zones** 1. Economic zones, industrial parks, export-processing zones, hi-tech parks, industrial clusters, tourist resorts and entertainment and recreation centers (hereinafter collectively referred to as concentrated production, business and service zones) must comply with the following environmental protection requirements: e/ Regular operation of a concentrated sewage system for collection and treatment of waste water and a system for treatment of gas emissions up to environmental standards; **Article 40.- Environmental protection in construction activities** c/ Waste water, solid wastes and other kinds of wastes must be collected and treated up to environmental standards. **Article 81.- Collection and treatment of waste water** 2. Waste water of production, business and service establishments and zones must be collected and treated up to environmental standards. 3. Mud discharged from waste water treatment systems must be managed according to solid waste management regulations. 4. Waste water and mud containing hazardous elements must be managed according to hazardous waste management regulations.
4.3.2.1.	Reduce pollution from storm water runoff	To prevent overflowing with oil and greasy by storm, before installing rain water pipe to whole IP area, particular rain water reservoir is installed by plant's own.	
4.3.2.2.	Reduce pollution by sewage.	Control with connection with treatment facilities of each plant and concentrated treatment (6,075m^3). . each plant will lost fixed time to treat primary wastewater.	

Chapter	Section	Solution	Correspondence to the Law on environmental protection. (52/2005/QH11)
4.3.3	Measures for solid waste handling	–	**Article 40.- Environmental protection in construction activities** c/ Waste water, solid wastes and other kinds of wastes must be collected and treated up to environmental standards. **Article 66.- Waste management responsibilities** 2. Sources, quantities, properties of waste must be identified to ensure application of appropriate treatment methods and procedures to each kind of waste. 4. Waste management shall be performed under the provisions of this Law and other relevant laws. **Article 73.- Treatment of hazardous wastes** 1. Hazardous wastes must be treated to meet environmental standards by methods, technologies and equipment appropriate to chemical, physical and biological characteristics of each type of hazardous waste; in case there is no such treatment technology and equipment in the country, hazardous wastes must be stored according to the provisions of law and the guidance issued by state management agencies in charge of environmental protection until they are treated. **Article 81.- Collection and treatment of waste water** 3. Mud discharged from waste water treatment systems must be managed according to solid waste management regulations.
4.3.3.1.	Solid waste activities.	Plant will install waste storage equipment and dump them in concentrated ground in IP, then it shall be dumped by a local contract transportation company.	
4.3.3.2.	Industrial solid waste is not hazardous	Industrial waste excluding hazardous is concentrated into indicated equipment, returned or sold to other unit in order to return.	
4.3.3.3.	Hazardous waste	Classify and concentrate into labeled equipment, the plant will maintain it at suitable in order that professional enterprise transport and treat following to stipulation of MONRE.	
4.3.3.4.	Yards of solid waste transshipment	Because there's no hazardous in classified waste, so transshipment store is install with area of 0.86ha at the west of project land bounded by wastewater plant of IP	

Chapter	Section	Solution	Correspondence to the Law on environmental protection. (52/2005/QH11)
4.3.4	**Measures to minimize the impact**	–	**Article 37.- Environmental protection for production, business and service establishments** 1. Production, business and service establishments must comply with the following environmental protection requirements: (Omission) c/ Taking measures to minimize and treat dust and gas emissions up to standards before discharging them into the environment; ensuring that no gas emissions, toxic gas and fume will be leaked or dispersed into the environment; limiting noise, light and heat adversely affecting the surrounding environment and laborers; **Article 86.- Prevention of environmental incidents** 1. Owners of production, business and service establishments and means of transport potentially causing environmental incidents must apply the following measures: a/ To prepare plans for prevention of and response to environmental incidents; b/ To install and furnish equipment, tools and means to respond to environmental incidents; c/ To train and arrange forces ready to respond to environmental incidents; d/ To observe labor safety rules and implement a routine checking regime;
4.3.4.1.	Fire	Measures to fire fighting built and posted up method of refuge by Fire Fighting Department	
4.3.4.2.	Lightning	Measures of lightning are to place protection system at altitude position in IP.	
4.3.4.3.	Preventing leakage of Fuel	To prevent leakage of fuel, IP management strictly checks with Department on urgent dealing when fuel, equipment, store system are leaked.	
4.3.4.4	Control of chemical leakages and safe exposure to chemicals	Chemical is transported into wastewater plant through a professional enterprise. Control chemical current through monitoring system of wastewater area.	
4.3.4.5.	Controlled inundation	Dredge bottom of Rach Chanh river periodically, strengthen bank to prevent discharge of untreated wastewater to river.	
4.3.4.6.	Minimize impacts to the cultural environment - social	Ensure greenery area to per plant and control air pollution. To prevent jam and traffic accident, need to adjust working time among plants, lessen traffic mass, arrange bus, carry out safety education to laborers. Build houses to personnel to ensure demand of housing to far from home laborers.	

(2) **Mitigation measure on the technical side**

1) Quality standard of wastewater project (function) in utility project

This project bases on standard of wastewater quality of Vietnam (QCVN24: 2009/BTMNT), primary treatment from plants achieve water quality "standard B". After primary treatment, wastewater quality is achieved "Standard A" treated by integrated waste water facilities placed in this project. Even in EIA of Thuan Dao IP, wastewater quality is equal to "Standard A", treated water of this project must conform to the water quality "Standard A" with application of environment management mode of Japan.

Furthermore "Standard A" is a value of pollutant in discharged industrial wastewater to water area used for living water. "Standard B" is a value of pollutant in discharged industrial wastewater to water area not used for living water.

Table 2-41 Water quality standard of wastewater project (function)

Item	Unit	C Value		EIA of Thuan Dao IP		Reference	Remaks
		A	B	After Treatment	Before Treatment	Japan's Standards (Uniform Wastewater Standards)	
1 Temperature	℃	40	40	40	45	－	
2 pH	－	6 - 9	5.5 - 9	6～9	5～9	5.8 - 8.6	
3 Smell	－	No bad smell	No bad smell			－	
4 Color	－	20	70			－	※Old standard's(B) is 50
5 BOD5(20℃)	mg/l・	30	50	29.7	200.0	160	
6 COD	mg/l・	50	100	49.5	400.0	160	※Old standard's(B) is 80
7 SS	mg/l・	50	100	49.5	200.0	200	
8 Arsenic	mg/l・	0.05	0.10			0.10	
9 Mercury	mg/l・	0.005	0.010			0.005	
10 Lead	mg/l・	0.1	0.5	0.1	0.1	0.1	
11 Cadmium	mg/l・	0.005	0.010	0.005	0.005	0.100	
12 Chromium(Ⅵ)	mg/l・	0.05	0.10	0.05	0.05	0.50	
13 Chromium(Ⅲ)	mg/l・	0.2	1.0			2.0	
14 Copper	mg/l・	2	2	2	2	3	
15 Zinc	mg/l・	3	3			2	
16 Nickel	mg/l・	0.20	0.50			－	
17 Manganese	mg/l・	0.50	1.00			10.00	
18 Iron	mg/l・	1.00	5.00	1	1	10.00	
19 Cyanide	mg/l・	0.2	1.0	0.198	1	－	
20 Tin	mg/l・	0.07	0.10	0.07	0.07	1	
21 Phenol	mg/l・	0.10	0.50			－	
22 Mineral oil and fat	mg/l・	5	5	4.95	10	5	
23 Animal-vegetable fat and oil	mg/l・	10	20	9.9	30	30	
24 Residual Chlorine	mg/l・	1.0	2.0			－	
25 PCBs	mg/l・	0.003	0.010			0.003	
26 Organic phosphorous	mg/l・	0.3	1.0			－	
27 Organic chlorine	mg/l・	0.1	0.1			－	
28 Sulfide	mg/l・	0.2	0.5			－	
29 Fluoride	mg/l・	5	10			8	
30 Chloride	mg/l・	500	600			－	
31 Ammonia	mg/l・	5	10	4.95	15	40	
32 T-N	mg/l・	15	30	14.85	60	－	
33 T-P	mg/l・	4	6	3.96	8	8	
34 Coliforms	MPN/100ml・	3,000	5,000	3,000	3,000	3,000	
35 Gross α	Bq/l・	0.1	0.1			－	
36 Gross β	Bq/l・	1	1			－	

(Notes 1) Standard A specifies C value of the contaminant in the industrial waste water discharged in the water area used for domestic water.

(Notes 2) Standard B specifies C value of the contaminant in the industrial waste water discharged in the water area used except for domestic water.

(Notes 3) The item of a chloride is applied to neither a salt water region nor brackish water area.

(Notes 4) "Measurement by biological indicator" appropriate for the old standard is deleted.

(Notes 5) The previous version is TCVN5945: 2005.

2) Real-time surveillance of the water quality by in-line monitor

In a utility project, it is necessary to dissolve anxiety that the contaminant more than a standard flows out outside by the fault of a waste treatment function.

For this reason, the real-time monitor of the sewerage which made first step treatment by the factory sides is carried out by the in-line monitor machinery. The secondary sewerage processed centrally is watched similarly and the effluent standard is managed strictly.

When a something unusual arises in the monitor result, the business unit will manage with the authority for stopping the operation by the side of a factory. When needed, stopping factory operation compulsorily is also assumed by supply interception of water supply or electric power.

3) Assumption of the degree of allowance in secondary treatment

Even if the water pollution resulting from first step treatment occurs temporarily, the secondary treatment side keeps the allowance which can process it. The sewerage containing the contaminant beyond a standard is included 10% to the total amount of the primary sewerage from factory sides, the secondary treatment function will be managed so that I may be safe. The secondary treatment function will be managed so that satisfactorily, even if the sewerage containing the contaminant beyond a standard is included 10% to the total amount of the primary sewerage from a factory.

Therefore, it is necessary to take into consideration about the fault of the waste water treatment by the sides of a factories need to be selected so that it can respond in the range of allowance.

(3) Mitigation measure on the management side

1) Education for employees

Utility project under form of business unit (JV) established by Japanese enterprise and Vietnamese enterprise who construction IP. Japanese specialist shall reside permanently in the Joint Venture Company so that they guide and train local state official. Japanese specialist shall work at the project company and train about 50 local employees.

Through the capacity building and training as mentioned above, by introducing Japanese environmental management style in utility project, we absolutely manage quality through utility project that firstly is wastewater treatment and conform the standard established.

2) The Management of the Contracted Companies

We shall contract out the treatment of waste generated by this project to a trustable enterprise that has license of relevant Department. Moreover, in provision of the contract has severe penal term at a commission in order to deter illegal act.

Dong Nai province selected respective enterprise and confirmed it's the appropriate contracted enterprise by interview and inspect process of treatment of it,. IP Development Corp (SONADEZI) is the enterprise has license of hazardous waste treatment including heavy metal and has achievement in such field. On April/2011, the Corp has been building final disposal site.

In the time of project implementation, we need to select trustable enterprise that has been issued license by Province or organization.

3) The Management of the Companies Moving into the Industrial Park

IP must complete the perfectly integrated wastewater treatment facilities (secondary treatment) under Vietnamese Law and, finally, need to discharge treated industrial water to out of IP through that treatment facilities. Besides, each factory that moved into the IP must complete wastewater treatment facilities (Primary treatment) in their own factory depending on a type of manufacturing. IP Management Company stipulates wastewater quality standard of primary wastewater which can receive the "integrated wastewater treatment facilities (secondary treatment)" for each factory and make a "waste water treatment engagement" with each company on the basis that each company observe that standard.

In this project, wastewater quality from wastewater treatment facilities (Primary treatment) of each plant must conform with the "standard B" and with integrated waste water treatment facilities

(secondary treatment) place in this project is “standard A”.

This project, volume of water and waste eliminate from waste water treatment facilities of each plant (Primary treatment), sign “waste water treatment” engagement “, and carry out monitoring frequently. If waste water from a plant exceeded acceptance standard of integrated waste water treatment facilities, IP Management Company has right to refuse treating waste water to such plant and to be protected by law.

This project, temporary breach shall be treated in allowed scope with integrated waste water treatment facilities, but frequent breach for appointed plant, breach plant shall be asked stopping operation by cutting the power off. If so bad situation, supposed as contract cancellation, limited act of breach shall be implemented.

4) Disclosure of Information

For impact on social environment as environmental pollution to sea, neighboring countries, nature, social environment as inhabitants, agriculture, fishery by construction, operating unit service of wastewater treatment, utility, need to identify impact by project is difficult, application of measures for subject is inhabitants is also.

Therefore, by public information through website of business unit (JV) about results of monitored water quality in point of eliminating water into pipeline from IP shall meet requirement of subject. Meanwhile, in upper stream, lower section of IP, MONRE also announces result of periodic water quality inspection.

5) Continuous approach to Long An province

In the situation that operating illegal plants seem free, they have been considering their transfer, firstly is burden of expenses. When promoting the project Long An province ask heavy penalty for act of breach of law through form of administrative punish, preference of transfer shall become effective.

Vice versa, if can not meet with such measures to medium and small enterprises, propose state support by taking fund is fine from application of administrative punish.

6) The situation of reservation and head of water rights

The clean water supply business use the water rights which Long An province acquired form MARD with negotiation is the surface water of the 300,000m^3/day and now the business partner holds (Official letter No.633/BNN-TL). For this reason, the impact of land subsidence by operation of the existing IP using the utility project is avoided.

Moreover, the Phuoc Hoa water-resources project carried out by the loan from ADB, in order to correspond to the Dau Tieng Lake's water level decline for the past several years, will construct a waterway towards the lake from the Phuoc Hoa Lake in the east side of a the lake as an additional water resource, and will supplied to the lake.

2-9-8 Environmental Impact Assessment

(1) Impact Assessment

Table 2-42 shows an assessment of operational environmental impact based upon survey findings.

Table 2-42 Assessment based on scoping projection and survey findings

Classification	#	Impact Item	Impact assessment at time of scoping		Impact assessment based on survey findings		Assessment Reason
			Pre- and mid-construction	Time of handover	Pre- and mid-construction	Time of handover	
Pollution Control Measures	1	Atmospheric pollution	D/B- [B-]	D/B- [B-]	D/B- [B-]	D/B- [B-]	• As shown in the Thuan Dao Industrial Park Phase 2 EIA, by implementing atmospheric pollution mitigation measures (through factory facility placement, etc.) during construction and once service has begun, negative environmental impact can be kept within set limits.
	2	Water pollution	B-/B- [B-]	D/A [A-]	B-/B- [B-]	D/B- [B-]	• Through appropriate management of wastewater disposal by the utility, negative environmental impact can be kept within set limits. Remaining issues are the detection of contract infractions by factories, and detection of problems during primary and secondary treatment.
	3	Waste material	B-/B- [B-]	D/A- [A-]	B-/B- [B-]	D/B- [B-]	• At the present time, through examination of disposal facilities, handling and licenses, the existence of reliable companies capable of waste material management has been confirmed.
	4	Soil contamination	B-/ B- [B-]	D/A [A-]	B-/ B- [B-]	D/B [B-]	• Because of a concern about soil contamination arising from wastewater treatment and waste management, the policy has changed to ensure any impact will be kept within set limits.
	5	Noise and vibration	B-/ B- [B-]	D/B- [B-]	B-/ B- [B-]	D/B- [B-]	• As shown in the Thuan Dao Industrial Park Phase 2 EIA, negative environmental impact can be kept within set limits by mitigation of noise and vibration during construction and once service has begun (through factory

Classification	#	Impact Item	Impact assessment at time of scoping		Impact assessment based on survey findings		Assessment Reason
			Pre- and mid-construction	Time of handover	Pre- and mid-construction	Time of handover	
							facility placement, etc.)
	6	Land subsidence	D/D [D]	D/A [A-]	.(N/A)	D/B- [B-]	• With implementation of utility operations and commencement of water delivery, there is expected to be land subsidence due to the use of groundwater as a water source. • Independent implementation of utility operations and wastewater treatment operations remains a challenge.
	7	Smell pollution	D/D [D]	D/D [D]	.(N/A)	.(N/A)	• As shown in the Thuan Dao Industrial Park Phase 2 EIA, through factory facility placement, etc, (during construction and once service begins), the negative impact of smell pollution can be mitigated and kept within set limits.
	8	Sediment	D/D [D]	D/B- [B-]	.(N/A)	D/B- [B-]	• Sediment build-up due to wastewater treatment and waste material disposal remains a concern, and it is necessary to conduct an assessment of the environmental impact and the extent to which the impact can be minimized.
Natural Environment	9	Protected zones	B-/D [B-]	D/D [D]	D/D [D]	.(N/A)	• Based on the EIA conducted during the Dau Tieng Lake East Channel project, the application of impact mitigation measures will ensure no problems arise once service begins.
	10	Ecosystem	D/D[D]	D/D[D]	.(N/A)	.(N/A)	
	11	Hydrometeor/ precipitation	D/D [D]	A-/D [A-]	.(N/A)	B-/D[B-]	• A concern has arisen about soil contamination caused by wastewater treatment and waste material management operations, and the extent of the impact must be assessed.
	12	Topography, geology	D/D[D]	D/D[D]	.(N/A)	.(N/A)	
	13	Population movement	D/D[D]	D/D[D]	.(N/A)	.(N/A)	
	14	Population in poverty	D/D [D]	B+/D [B+]	.(N/A)	B+/D [B+]	• Confirmation of provision of tap water for the population during the project to build water distribution system
	15	Ethnic minorities & indigenous	D/D[D]	D/D[D]	.(N/A)	.(N/A)	

Classification	#	Impact Item	Impact assessment at time of scoping		Impact assessment based on survey findings		Assessment Reason
			Pre- and mid-construction	Time of handover	Pre- and mid-construction	Time of handover	
Social Environment		groups					
	16	Local economies: employment, livelihood, etc.	B+/B+ [B+]	B+/B+ [B+]	B+/B+ [B+]	B+/B+ [B+]	• Confirmation of generation large-scale employment opportunities through the IP attraction plan
	17	Land & resource utilization	D/D[D]	D/D[D]	.(N/A)	.(N/A)	
	18	Water utilization	B-/D [D]	B-/A- [A-]	B-/D [D]	B-/B- [B-]	• At operational implementation, once the location of the freshwater plant construction spot has been fixed, inspection will be necessary. • An evaluation of the extent of that impact and how to keep it within acceptable limits must be made once the system is in service because of the concern about the impact of wastewater treatment and waste material management on water utilization.
Social Environment	19	Existing social infrastructure and social services	B-/ B- [B-]	D/B- [B-]	B-/ B- [B-]	D/B- [B-]	• As shown in the Thuan Dao Industrial Park Phase 2 EIA, heavy traffic due to higher volume of commuters will be mitigated by actions taken during construction and after service begins (e.g. through regulation of factory operation start times), and keeping the impact of higher traffic volume within set limits.
	20	Social capital and social communities	D/D[D]	D/D[D]	.(N/A)	.(N/A)	
	21	Misdistribution of damage and benefit	D/D[D]	D/D[D]	.(N/A)	.(N/A)	
	22	Intra-regional conflicts of interest	D/D[D]	D/D[D]	.(N/A)	.(N/A)	
	23	Cultural assets	D/D[D]	D/D[D]	.(N/A)	.(N/A)	

Classification	#	Impact Item	Impact assessment at time of scoping		Impact assessment based on survey findings		Assessment Reason
			Pre- and mid-construction	Time of handover	Pre- and mid-construction	Time of handover	
	24	Landscape	D/D[D]	D/D[D]	.(N/A)	.(N/A)	
Social Environment (cont.)	25	Gender	D/D [D]	D/C- [C-]-	.(N/A)	D/C- [C-]	• On hold: Affected by factory employment conditions, therefore must be confirmed during business attraction campaign and contract-signing period
	26	Rights of Children	D/D[D]	D/D[D]	.(N/A)	.(N/A)	
	27	HIV/AIDS and other infectious diseases	C-/C- [C-]	D/ C- [C-]	C-/C- [C-]	D/ C- [C-]	• On hold: Must be confirmed with construction company at time of construction. • On hold: Must be confirmed with incoming companies once factory operations begin.
	28	Labor Environment.(Incl. Occupational Safety)	C-/C- [C-]	D/C- [C-]	C-/C- [C-]	D/C- [C-]	• On hold: Must be confirmed with construction company at time of construction. • On hold: Must be confirmed with incoming companies once factory operations begin.
Others	29	Accidents	B-/ B- [B-]	B-/ B- [B-]	B-/ B- [B-]	B-/ B- [B-]	• As shown in the Thuan Dao Industrial Park Phase 2 EIA, with the application of mitigation measures to control the volume of inbound traffic (e.g. through regulation of factory operation start times) the extent of any negative impact can be kept within fixed limits.
	30	Transborder Impact	D/D [D]	C-/ C- [C-]	.(N/A)	B-/ B- [B-]	• Due to the fact that the effect of these operations will be wide-spread, identifying specific transborder impact is a challenge. Therefore based upon the advice of the guidance committee, through disclosure of monitoring results at downstream sites and water discharge sites, measures will be taken to curb the expansion of negative impact.

(Notes1) A+/-: There is critical positive/negative impact B+/-: It is expected that there will be some positive/negative impact.
C+/-: It is not clear whether there will be positive/negative impact or not. D: It is expected that there will be no impact.
(Notes2) In Impact Assessment (IA) Colum: X/Y refereed to < IA of the Utility Project / IA of the Clean Water Supply project>
(Notes3) [ ] expresses the maximum impact assessment extracted in the item.

(2) **Mitigation measures with a negative impact**

Table 2-43 shows future mitigation management for items marked A, B, or C in the environmental impact assessment. Most of items which are marked "B-"are result of applying mitigation measures with a negative impact which are shown in EIA report of Than Dao IP Phase 2. Therefore, continuous environmental mitigation measures should be ensured for those items.

"A-"is marked on only water contamination in this project. This is because there is some possibility that troubles in wastewater treatment facilities leads outflow of wastewater which exceeds criterion value. To resolve this issue, water quality in both primary and secondary treatment stages should be constantly monitored using in-line monitoring equipment. In the event water remains contaminated after the primary treatment stage, this issue will be resolved through selection of a tenant company capable of conducting secondary treatment to remove any remaining contamination.

Table 2-43 Mitigation measures against negative impact

No.	Impact Item	Policy of measures	Contents of Measures
1	Atmospheric Pollution	• Apply to Atmospheric pollution mitigation measures on EIA of Thuan Dao IP's Phase 2 (factory facility placement, etc.) • In the Utility project, selection of the on site power-generating system's model selection (low emission)	• Select a function and ability to provide materials for leveling project area. / Irrigation water in dry season to avoid dust generated by the wind. • Altitude of chimney/treatment technology and fuel alteration/ exhaust fumes treatment device/ chemitry-organism decomposition/ safety standard application/ Control, maintenance plan/ materials management, reasonable operation and conformation to procedure system in plant and area.
2	Water Contamination	• Apply to Water pollution mitigation measures on EIA of Thuan Dao IP's Phase 2 (factory facility placement, etc.) • Real time monitoring by the inline monitor system • Complete the management to locatin factories • Select the adequate factories	• The volume of solid waste generated daily in the field up to about 30kg per day, this waste will be collected and focused on the bins are located at the site (about 1-2 tanks equipped waste types 50 liters) and contracts with shipping companies to take daily treatment. • The amount of sewage workers in the construction phase of about 3.6 m^3 per day will be treated by septic tanks in the portable toilets. • Reduce the maximum repair vehicles, machinery works in the project area. Maintenance area will be located temporarily and systematic collection of waste grease from the maintenance process, maintaining construction equipment mechanization. • Oil and grease waste generated in the project area was not buried; they will be collected in appropriate containers located in the project. • Operate with the environment management system of Japanese companies. • Grasp the fault of first step treatment or secondary treatment through in-line monitor system when the sewerage

			which exceeded the standard occurs. • Request to stop of operation from the factory side. • Business Unit (JV) corresponds to a design and construction of each factories' waste water treatment if needed and to the consultation of its operation. • Select the factories within the secondary treatment's allowance by its primary treatment level.
3	Waste Material	• Apply to Solid waste handling measures on EIA of Thuan Dao IP's Phase 2 (factory facility placement, etc.) • Continuous management after selection and the contract of a adequate waste treatment entrepreneur	• The volume of solid waste generated daily in the field up to about 30kg per day, this waste will be collected and focused on the bins are located at the site (about 1-2 tanks equipped waste types 50 liters) and contracts with shipping companies to take daily treatment. • The amount of sewage workers in the construction phase of about 3.6 m^3 per day will be treated by septic tanks in the portable toilets. • Reduce the maximum repair vehicles, machinery works in the project area. Maintenance area will be located temporarily and systematic collection of waste grease from the maintenance process, maintaining construction equipment mechanization. • Oil and grease waste generated in the project area was not buried; they will be collected in appropriate containers located in the project. • Solid Waste Containers activities by the factory equipped and placed in appropriate locations in the plant's parking management boards of industrial zones easily collected. • Investor implementation of collection services and garbage transfer station contract with the Company Limited Public Works Ben Luc district transport and handling regulations. • Industrial solid waste is not hazardous: Perform classification of industrial solid waste is not hazardous for collection of solid waste can be recycled or sold for reuse facilities procurement. • Hazardous waste : Sort and collected in containers labeled as prescribed / Containers of hazardous waste from the factory equipped and placed in appropriate locations in the plant and self-contact units are functioning and management agencies permit the collection , transported and handled according to regulations. • Collect each type of waste has been classified in the intermediate plant and solid waste activities and industrial solid waste is not hazardous arising from factories in industrial parks. / No collecting, storing hazardous waste arising from factories in industrial parks./ Transit yards total area: 0.86 ha • Check outsourcing contracter with its license and processing situation at the time of renewal of a contract. • Manage continuously after selection and the contract of an adequate waste treatment unit
4	Soil Contamination	• Apply to Water pollution and Solid waste handling measures on EIA of Thuan Dao IP's Phase 2 (factory facility placement, etc.) • Mitigation of water contamination due to wastewater treatment and waste management.	• To minimize the impact of storm water runoff and water from the process of pumping sand leveling material entrained in the project area is overflowing canal; the following measures will be implemented: Building a system of embankments before leveling. / Establishment and construction of temporary storm water drainage trench at the site prior to discharge storm water canal will flock through the sediment to retain the maximum amount of leveling material entrained water flowing down the channel, canals.
5	Noise, Vibration	• Apply to Noise and Vibration measures on EIA of Thuan Dao IP's Phase 2 (factory facility placement, etc.)	• Under construction, pumping sand from about 7:30 to 11:30 am, 13:00 to 17:00 pm in order not to cause noise impacts to surrounding areas

6	Land subsidence	• Introduce the clean water supply project at the time of operation of the utility project • Acquire amount of water and additional water source with the increase of locating factories (Link with an ADB project)	• Reduction of Land subsidence by use of groundwater by supplying surface water for indusry use through the clean water supply project. • The Phuoc Hoa water-resources project carried out by the loan from ADB, in order to correspond to the Dau Tieng Lake's water level decline for the past several years, will construct a waterway towards the lake from the Phuoc Hoa Lake in the east side of a the lake as an additional water resource, and will supplied to the lake.
8	Sediment	• Apply to Control erosion and sedimentation on EIA of Thuan Dao IP's Phase 2 (factory facility placement, etc.)	• Regular dredging, strengthening the banks of Rach Chanh river (through the project land area)
11	Hydrometeor/ precipitation	• Acquire amount of water and additional water source with the increase of locating factories (Link with an ADB project)	• The Phuoc Hoa water-resources project carried out by the loan from ADB, in order to correspond to the Dau Tieng Lake's water level decline for the past several years, will construct a waterway towards the lake from the Phuoc Hoa Lake in the east side of a the lake as an additional water resource, and will supplied to the lake.
18	Water use	• Correspond to the use situation of the waterway in a downstream region from the intake facility	• Survey will be needed when the construction point of an intake facilities are decided in business practice
19	Existing social infrastructure, services	• Apply to Minimize impacts to the cultural environment - social on EIA of Thuan Dao IP's Phase 2 (e.g. reducing traffic density)	• To limit the jams and traffic accidents during the hours melt shifts, investors will have a plan for the factories and enterprises have overlapping work hours to minimize the time and a tan ca arranged buses to pick up the car to reduce traffic density to avoid traffic accidents. Education workers sense of traffic safety. • Build houses for workers in the resettlement area. • Incorporate with the local management body relating the work of migrant workers managed to stay in the area
25	Gender	• Mitigation of the issue in employment of an attraction company	• At the time of locating factories and contracting with them It will be necessary to check the employment policies affected the item.
27	HIV/AIDS and other infectious diseases	• Prevention from infection expansion at the time of construction and operation	• At the time of construction It will be necessary to check the construction companies' situation. • At the time of operation It will be necessary to check the factories' situation regularly.
28	Labor environment (Incl. workplace safety)	• Improvement of the safe environment at the time of construction and operation	• At the time of construction It will be necessary to check the construction companies' situation. • At the time of operation It will be necessary to check the factories' situation regularly.
29	Accidents	• Apply to Minimize impacts to the cultural environment - social on EIA of Thuan Dao IP's Phase 2 (e.g. reducing traffic density)	• To limit the jams and traffic accidents during the hours melt shifts, investors will have a plan for the factories and enterprises have overlapping work hours to minimize the time and a tan ca arranged buses to pick up the car to reduce traffic density to avoid traffic accidents. Education workers sense of traffic safety.
30	Transborder impact	• Downstream and discharge point water quality monitoring results will be disclosed online.	• Disclose the monitor results of the water quality at the IP's sewerage and the point located downstream region in connection with the utility project through the Internet etc

.(Notes)Underlined points must be confirmed by the joint venture at the business stage.

2-9-9 Summary towards implementation EIA

(1) Implementation of EIA

1) Implementation of additional EIA (Utility Business)

With this business, since neither the institution nor the detail design of equipment is completed at the present stage, it is not a time of carrying out additional EIA. Additional EIA will be made towards practice of business in the stage from which the institution and the detail design of equipment become clear.

The business unit (JV) of the utility project is required to carry out Additional EIA and to pay expense oneself. Additional EIA will be carried out about the technology and the measure assumed on the business plan focusing on "the mitigation on a technical side" and "the mitigation on a management side" shown in this report.

Since the business managed together with Than Dao IP's business unit, it is necessary to combine it with the realization of a measure shown to EIA, and it needs to adjust by the business proprietor and enterprising body (JV) of an industrial complex about the payment of the enforcement method and expense. Both of the business units are required to consider the realization method of mitigation shown to EIA and the payment of expense.

In additional EIA, it is mainly needed that the measures shown in "the mitigation on a technical side" and "the mitigation on a management side" will be practiced. Especially the in-line monitor for grasping whether the waste-treatment function is operated appropriately is important.

It is necessary to check through the water examination whether purified water is satisfying the adequate standard for supply to the IP in the stage of operation.

Although DONRE carries out the water examination periodically about the river where the treatment water will be drained and release the result, it is necessary to grasp the water quality of the river by the water examination in the beginning of utility project's operation stage by the business unit (JV).

2) Implementation of New EIA (Clean water supply business)

With this business, since neither the institution nor the detail design of equipment is completed at the present stage, it has not arrived in the stage of implementing EIA. EIA will be made towards industrialization in the stage from which the detail design of a intake institution or a waterway became clear.

In realization of this business, it is necessary to recognize the Dau Tieng lake as a water source, a Dau Tieng east waterway, a Duc Hoa trunk waterway, and the intake institution and waterway that will be developed with this project to be a series of systems.

In order to implement the original EIA, it is effective to review both EIAs of a Dau Tieng Lake East Canal Project (World Bank) and Phuoc Hoa Water Resources Project (ADB), to analyze the contents of assessment and an environmental impact mitigation measure and to verifies whether they are satisfied with the JICA's guideline. It is also necessary to grasp on the water abundance and the quality which will be supplied to the IP thorough the business, to adopt an adequate environmental impact mitigation measure if needed and to

Moreover, it is required to investigate whether the water acquired from the water source and purified by the institution will be satisfying the adequate standard for supply to the IP in the stage of implementation of the business.

(2) **Monitoring plan**

In the EIA of Thuan Dao IP, noise and dust will be monitored during construction, water quality, air quality, waste, microclimate and soil environment will be monitored after operation in every three month.

Regarding the water quality, although sewage and surface water are the objects of monitoring, the monitoring frequency is too low to manage the adequate treatment function. It is necessary to implement detailed monitoring by high frequency (real time) for the business.

Table 2-44 Modifying the Monitoring program shown to the EIA (Draft)

Item / Objects		Places for monitor	Method	Frequency	Standards
6.2.1. Process of construction implementation					
Noise Dust		2 places in the area where the project is being constructed, 2 places in surrounding populated areas in line with the wind direction	Standard	Every 3 month	TCVN 5937-2005 TCVN 5949-1998
6.2.2 Process of operation					
Water quality Sewage	**Flow rate pH / COD / SS /DO**	**Sewerage points of each factory Sewerage point to the outside of the Industry Park**	**Inline monitoring**	**Real-time**	
Water quality Sewage (drain-water)	Temperture / pH / BOD4/ COD / SS/ TotalP / Total N / .$(NH4)2SO_3$ / mineral oils, plant and animal oils, Coliform	2 places: 1 allocated in the in-put and the other allocated in the out-put of the centered sewage disposal station	Standard	Every 3 month	TCVN 5945-2005 Kq ＝1.1、 Kf ＝0.9 Applied “A” standard

Item / Objects		Places for monitor	Method	Frequency	Standards
Water quality **Surface water**	Temperature / pH / BOD4/ COD / SS/ Total P / Total N / .(NH4)2SO_3 / mineral oils, plant and animal oils, Coli form	2 places: the first is 200m away from discharge sewer (NM01) to lower stream and the second is 200m away from discharge sewer (NM02) to upper stream of Chanh river	Standard	Every 3 month	QCVN 08:2008/BTNMT
Air quality	NO_2 / SO_2 / CO / Noise NH_3 / H_2S / NH_3 /	4 monitoring places inside the industrial zone, but they are outside the area of production facilities; 1 place is next to sewage disposal area and rubbish-transport shaft; 4 places outside the industrial area, lie in Southeast, Northwest, Southwest, and Northeast.	Standard	Every 3 month	TCVN 5937 – 2005, TCVN 5938 – 2005, TCVN 5939 – 2005, TCVN 5940 – 2005, TCVN 5949 – 1998.
Solid-waste sources	● Examine and monitor the transport, storage of solid waste in the industrial waste transport site: quantity, types of waste (living, industrial and hazardous waste). ● Living and industrial solid-waste are collected and carried to the waste transport site by the organization of investors; in case the industrial waste is recyclable and reusable, it will be sold to demanded units, the remains will be treated along with living waste. This is the content in the contract signed with the One-member Limited Liability Company (LLC) on public buildings of Ben Luc district, who is responsible for transporting and treating the waste. ● For hazardous waste, the plants in the industrial zone will directly cooperate with specialized waste disposal companies, which are legally issued under the guidance of Department of natural resources and environment. For example: Limited Liability Company of Sao Mai Xanh, LLC on Production and Trading Service of Moi Truong Xanh, LLC on Trading and Service of Tuong Lai Xanh.etc. ● Hazardous waste is collected, transported, stored and treated in accordance with Circular no. 12/2006/TT-BTNMT on 26/12/2006 of Ministry of Natural resources and Environment and Decision no. 23/2006/QD-BTNMT on 26/12/2006 of Ministry of Natural resources and Environment.			Every 3 month	
Microclimate	Humidity, Temperature, Windy speed	Outside the areas of facilities in the industrial area.	Standard	Every 3 month	
Soil environment	Cd / Cu / Pb / Zn.	1 place in landfill site	-	Every 3 month	QCVN 03:2008/BTNMT National technical standards on allowable limit of heavy metals in the soil

In order to understand the appropriateness of primary effluent treatment (applying the B-standard) on the factory side, and of secondary effluent treatment (applying the A-standard) by the utility primary contractor monitoring will be conducted as laid out below.

Table 2-45 Monitoring program adding to the EIA

1) Constant inline monitoring of effluent water quality discharged from the IP for both flow rate and pH, COD, SS, and DO levels
2) In addition to the above, the business operator in charge of operation management will conduct water quality analysis during processing of the influent water necessary for operations, and give feedback on operations.
3) In answer to demand, operational consultation will be handled carefully based upon the available data, during planning and construction of effluent processing for each tenant, and upon commencement of production.

Moreover, about the waste treatment, since the matters which should be implemented with the business coincides with the monitoring plan shown to the EIA, the contract company will be monitored by the method and frequency of the plan.

(3) Stakeholder Conference

Utility and water supply operations are assumed to existing function in some areas of the IP. In this survey, it has been determined that consultation with local residents would be premature before industrialization of the site begins. Because of this decision, it will be necessary for the business unit (JV) to conduct a conference targeting local residents in order to explain the scope of the project once the operation stage has begun.

The business unit (JV) and the IP's business unit will be require to promote the business with holding the explanation meeting focusing on the additional EIA items to the People's Committee and the Fatherland Front Committee of the area.

About the water supply business, EIA of Dau Tieng Lake East Canal project (World Bank) of a Dau Tieng lake and EIA of Phuoc Hoa Water Resources Project (ADB) should be referred to implement stakeholder conference adequately at the time constructing the intake institution and waterway.

(4) **Expense for EIA's implementation**

The utility business unit (JV) and the water supply business unit (JV) will pay themselves the expense for implementing additional EIA and new EIA, and the expense which is essential for environmental mitigation measures. The companies moving into the IP pay the expense for implementing EIA themselves.

【Reference】

《Actual state of river and surrounding IP》

The circumference of the IP is surrounded by farmland. The inside is developed and leveled completely.

Figure 2-14 Actual state of river which is intended to use in this project in Long An province (Outward)

Figure 2-15 Status in target IP and adjacent area

《Wastewater treatment work in similar existing IP》

In the utility equipment (wastewater equipment) on the existing IP similar to this project, the exterior is covered by the product made from concrete, and the reservoir is processed so that the negative impact on water quality, bad smell, soil, etc. may be avoided.

About waste water treatment, unity with the adjoining natural environment is also considered, it is discharged through a reservoir in a natural river, and watering is also done.

Water reservoir　　Filter/clarifier　　Reservoir before discharging

Figure 2-16 Example on wastewater treatment work in existing IP (LOTECO)

Figure 2-17　Example on working environment in area inside existing IP.(LOTECO)

3. Consideration and proposal of operation plan relating to the relevant PPP infrastructure projects

3-1 Project overview and outline of scope transition

3-1-1 Project overview

As Stated at the first part, this is a feasibility study report for PPP scheme implementation to utility management service and water supply service in IP.

At the closing phase of this F/S, following two services (business) were selected as the target business with high feasibility, and stated the business scheme as Figure 3-1. Following up to this F/S, there will be specific investigation carried out by business operator for execution of this project.

Target project;

Operation of utility management service in Thuan Dao IP II. Installation, possession, operation and management of environment friendly utility facilities and equipment.

Water supply service in Duc Hoa District, Ben Luc district.

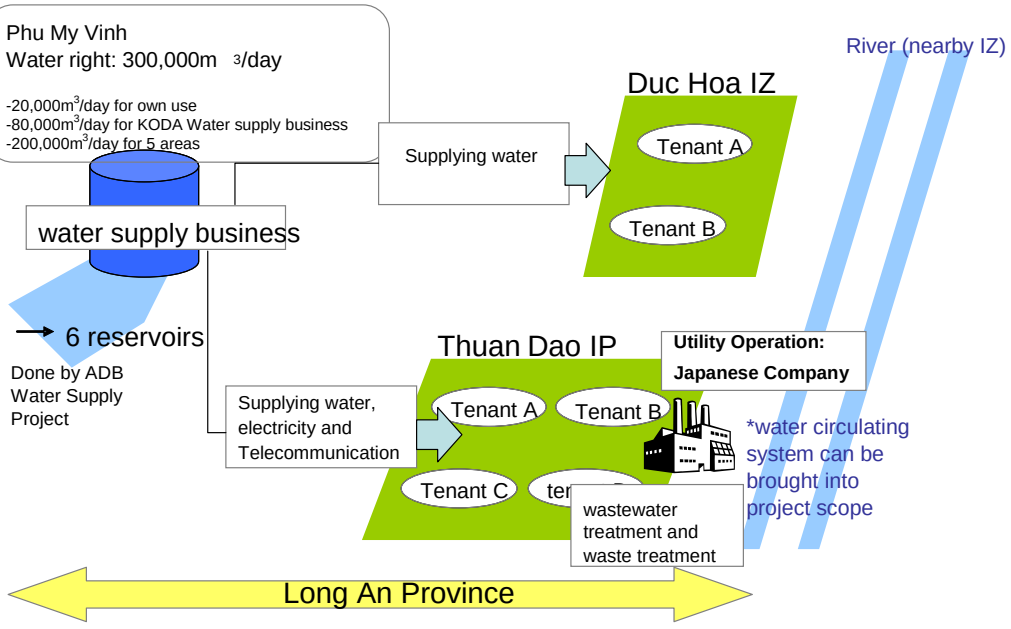


Figure 3-1 Conceptual diagram of target project

3-2 Background of the target selection

Since this F/S is conducted under the purpose of decision making of actual player in the private field, there has been several change and transition with project scope, project site, and player, at the each phase of announcement of PPP bid, bid of specific proposal, and F/S conduction.

The back ground of project scope transition is explained as follows:

(1) **Before the announcement of PPP bid**

Sojitz Corporation and Dong Tam group were under the discussion that Sojitz's was to cooperate for operation and management in the Thuan Dao Industrial Zone 2, the new industrial park owned by Dong Tam group.

Around at the same time, the Phong Phu Company (the State Owned Enterprise) and Long An province were under the negotiation for Phong Phu Company to relocate their dye house from Ho Chi Minh City to Long An province. The Phong Phu Company has been considering relocating their dye house in order to obey the environment protection policy to remove factories from urban area of major city, and has been proposing to all the 53 local authorities (province) in Vietnam, and Long An province is the only authority to accept them, with the condition of "installment of Japanese facilities and equipment, as well as operation and management for waste water treatment".

Long An province, on the other hand, aiming at sustainable development, has been investigating environmental engineering and technology of Japan. With introduction of Nhat Tinh Viet Company, regional government officers visited Japan three times for research.

Furthermore, The Long An province is facing severe land subsidence due to increase of water demand and groundwater usage, and requiring settlement of surface water, using the PPP scheme. Followings are the ideas and comment from Long An province;

- Due to the increase of underwater usage, land subsidence in Long An province is becoming serious. With completion of surface water supply settlement, underwater usage will be exhibited in Long An Province.
- At present, the both water supply for both industrial and domestic use is in Long An province is 100% dependent on underwater. Even industrial park is developed with concept of "Environment-friendly", it will still be the cause of environment destruction, under such condition.
- While Phu My Vinh company has irrigation license and planning to conduct water supply business which is stated on the Master plan of Long An province, it is suggested Japanese team to support them to implement PPP scheme with them.

Regarding the demand from both public and private sector in Long An province, Japanese enterprises established a survey team and brought in the proposal for PPP scheme F/S. Furthermore, in the period of after PPP scheme F/S bid to until specific proposal bid, some more objectives are added to the scope of study, with following requirement.

(2) **Until specific bid proposal**

Commented by Long An province that effect of industrial waste water is serious in Long An province, and it is suggested to take not only new Industrial park (Thuan Dao 2), but also Industrial park which is in currently in operation to be taken into our scope of survey.

The Duc Hoa Industrial Zone, developed by Phu My Vinh company, has accepted a Japanese beverage manufacture. Therefore it is taken into the scope of survey.

On other hand, Dong Nai province, a province located next to Ho Chi Minh City, has proposed to be taken into the scope of survey, that majority of the Industrial Park in Dong Nai Province are in the operation without proper waste water treatment facilities, and causing serious environmental destruction.

As a result, 3 following projects are stated as target projects, and Japanese survey team started survey.

- The utility management services in Thuan Dao 2 Industrial Park and Duc Hoa Industrial Zone of Long An province.
- Water supply service for 2 Industrial Zone and surrounding area.
- Waste water treatment service in Thanh Phu Industrial Zone and Nhon Trach 2 of Dong Nai province (in currently operating Industrial park).

Since industrial waste water treatment was a huge issue in Vietnam, and the number of target site (Industrial park in operation without proper waste water treatment facilities) was estimated to be over 100 in Vietnam, the Waste water treatment service was supposed to be main scope of this survey. The image of the project and related enterprise below are the contents at the period of our proposal, as well as the beginning of this F/S.

Table 3-1 Original target companies

Industrial Zone	Investors	Content	Service provided
Thuận Đạo	Đồng Tâm	On the 17 industries, kind of heavy manufacturing industry such as machinery, chemicals, metals	Water supply, Power, telecommunication, waste water treatment (as circulating system)
Đức Hòa	Phú Mỹ Vinh	On the 17 industries and types of food such as food, beverages, tobacco	Water supply, Power, telecommunication, waste water treatment (as circulating system)
Thạnh Phú	Dong Nai Transportation Joint Stock Company	Industrial Zone are active are facing the problem of wastewater	Wastewater treatment
Nhơn Trạch No.2	Urban & Industry Development Joint Stock Company No. 2		

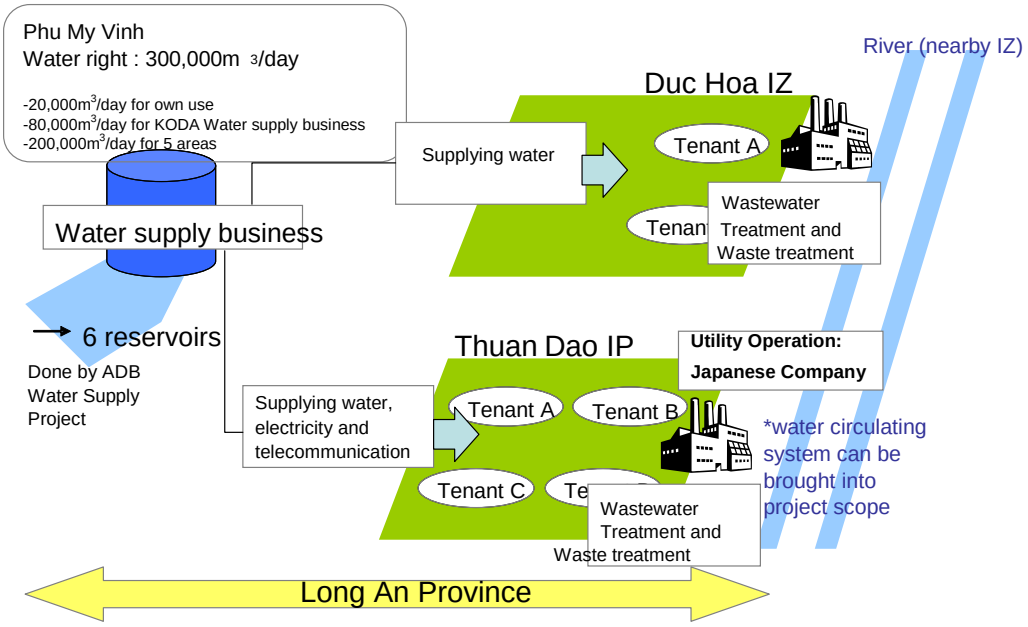


Figure 3-2 Original concept diagram of target project

(3) Scope transition within the investigation period

- From the result of F/S and negotiation, Japanese survey team stated The utility management service in Thuan Dao 2 Industrial Park and Duc Hoa Industrial Zone and water supply service as the target project.
- On the other hand, Duc Hoa of Long An Province and, Thanh Phu and Nhon Trach 2 of Dong Nai province were removed out of the scope because of following reasons.

For the waste water project, instead of Thanh Phu and Nhon Trach 2, survey team has added Hoa Gia Industrial Zone of Long An province, as scope of F/S. However, from the profitability point of view, it was assumed to require longer period of time to conduct F/S, therefore, waste water treatment service was also removed from the scope of F/S this time. Yet, industrial waste water treatment is a crucial issue in Vietnam, that survey team strongly requests to conduct another F/S for this specific issue.

Followings are the explanation of specific reason for project selection (cancellation) in F/S;

- The Duc Hoa Industrial Zone of Long An province has been under the construction of installing the Vietnamese equipment and facility of waste water treatment. However, at the stage of considering cooperation in between Japanese and Local company, many issues such as construction schedule, technical specification, property asset, and many other topics started to occur during the F/S.
- For Thanh Phu Industrial Zone and Nhon Trach 2 Industrial Zone of Dong Nai province, Japanese company assessed that the feasibility of alliance or any joint project with two industrial zones are relatively low.
- The Hoang Gia Industrial Zone of Long An province has not installed waste water treatment equipment or facility yet, but is relatively positive to be taken into account as the pilot case of waste water treatment service. However, from the result of F/S, it is stated that profitability of waste water treatment service is

lower than Japanese company's target point. It is clarified that there are only two methods to meet the profit point for Japanese companies, that whether to provide utility management service as a package service including waste water treatment or to conduct waste water treatment service to as many as 100 industrial park in Vietnam which are not installed waste water treatment facilities yet. For those reasons, survey team stated that this project would require longer period time for F/S.

As conclusion, the utility management service in Thuan Dao 2 Industrial Park and Duc Hoa Industrial Zone and water supply service are stated as the target project.

3-3 Utility management business

3-3-1 Project purpose

To make the utility and the model for management that the IP friendly with the environment needs to have in Long An province and investigate the ability for profit and the suitability of that project.

The utility in this report is the supply of electricity, supply of water, telecommunication devices and wastewater treatment that is the infrastructure that correctly the IP should have.（Figure 3-3）.

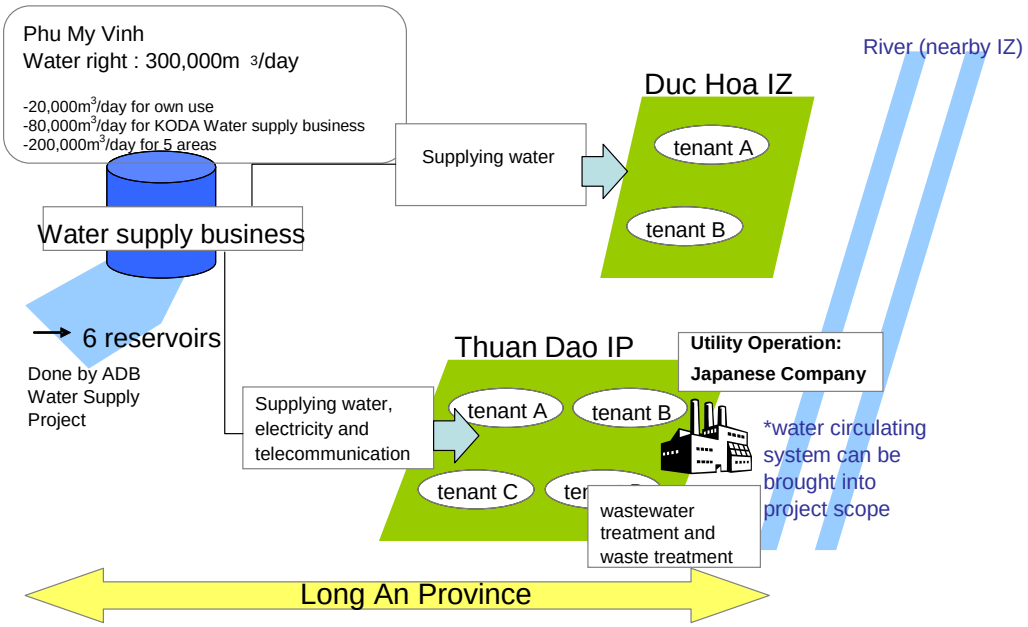


Figure 3-3 conceptual diagram of target project (repeated)

3-3-2 Project site

Thuan Dao IP, Ben Luc district, Long An province

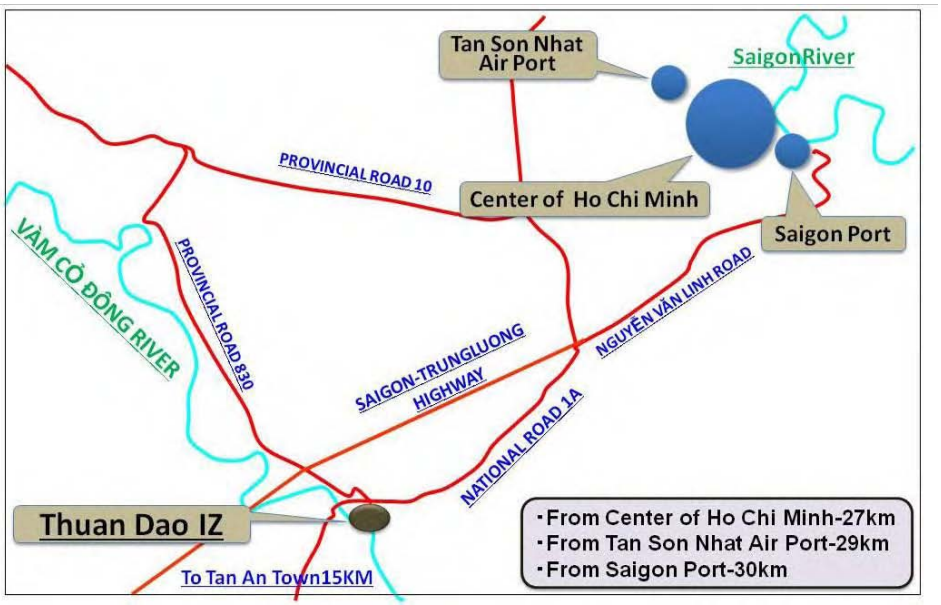


Figure 3-4 Location of Thuan Dao IP

3-3-3 Project Outline

As a conclusion of this survey, utility management service is proposed as one of the solution for reducing effect of industrial waste water in Vietnam.

The environment friendly utility management service is operated and conducted under the partnership of local and Japanese company with method, skill, technology of Japan, providing electricity, telecommunication, water supply and waste water treatment, and other services.

In this project, the objective project site is stated as Thuan Dao Industrial Zone 2, with area of 189ha.

At present, the basic construction for land development is completed. Thuan Dao Industrial Zone 2, has been registered as a normal industrial park, but Dong Tam group, the owner of the industrial park is willing to convert is to the Environment-friendly Industrial park, with partnership of Japanese enterprises, implementing PPP scheme of JICA.About the change of industrial park registration (license), Director of Department of Resources and Environment (DONRE) has commented at the presentation meeting in Long An province, that the switch of the silence is not required, and additional EIA is not required for Thuan Dao 2, but each tenants are required to be confirmed with EIA..

(1) Summary of Thuan Dao Industrial Park

The Thuan Dao Industrial Zone is developed by Dong Tam Group, located at Ben Luc District, in Long An Province (Table 3-2 and Figure 3-4).

Long An province is located in about 23km from center of Ho Chi Minh City, takes about 1 hour for car ride. At present it is performing to construct the high way and the infrastructure of Long An province, within the scope of 5 minutes of this Industrial Zone to have BourBon port (DWT3.000~5.000) therefore it is very convenient about the geographic aspect and has the big advantage about the aspect of the expense for circulation of commodity.

Furthermore, The Dong tam Company is having the plan about the project of the port and development of the new Industrial Zone (Thuan Dao 3) in this area therefore the potentials for economic development of this area is very big, besides that the rate for fulfilling of the period 1 is 90% and the feasibility of the period 2 is high.

Table 3-2 Basis information of proposed IP

Name of industrial Park	**Thuan Dao Industrial park**
Place	Ben Luc Town, Ben Luc District and Long Dinh Commune Can Duoc District, Long An province, Vietnam
Developer	Dong Tam Group.(100%)
Total area	Total area 763ha, phase 1: 113ha, phase 2: 189ha, phase 3 : 461ha
Access	30km from Ho Chi Minh City, 30 m from Tan Son Nhat International Airport, 25km from Saigon Port
Electricity	Supplied by Ben Luc Substation (110/20KV-25+40MVA), 22KV Transmission line
Water supply	8000m^3/day, supplied by the Ben Luc Electric Company
Capacity of wastewater treatment	300m^3/Day
Facilities	ATM、Japanese Vocational school near to the IP
Land release	70～75US$ /m^2/year
Power	Based on the regulation of Long An Electric Company
Water supply	Based on the provision of Long An Water Company
Wastewater treatment	0,2 US$ /m^3/day
Management fee	0.03 US$ /m^2/month
Tenant of the place 1:	7 companies such as Cargill (USA), Ching Luh Shoes (Taipei), Doko (Korea), Koda Saigon (Singapore), Song Long Cakes (Vietnamam).

The business scope is in this survey report is stage 2 of the Thuan Dao IP. Stage 1 of this IZ is already in operation with 90% of occupancy. In addition, the Ching Luh Shoes Company, a Taiwanese capital. occupies 70% of stage 1 area, is owning and using its own wastewater treatment system within

the factory. IP itself owns waste water treatment facility with small capacity.

For reference, Table 3-3 shows the summary of Thuan Dao IP Phase 1 and Figure 3-5 show exterior appearance etc.

Dong Tam Company, which is a local enterprise in Long An province, takes environment damage in this district seriously. They understand the environmental significance of developing Thuan Dao IP Phase 2 as environment-friendly IP and are self-motivated with implementation of this project, so survey team asseses the feasibility of the JV is high.

Table 3-3 Summary of Thuan Dao IP Phase 1 (Reference)

Items		Contents	Special instruction
Name		Thuan Dao Industrial Zone	
Developer		Dong Tam Group	
Address		BenLuc Town,LongDinh Commene,CanDuoc Dis,LongAn	
Total area		Phase 1:113ha, Phase2:189ha, Phase3:461ha	
lease		up to year 2053	
Tenant		Cargill.(USA)・KODA.(Singapore) Ching Luh Shoes(Taiwan)・Cofico(Vietnam)・Song Lon.(Vietnam)・Be tong620 ・Doko.(Vietnam)	
Withstand load		NA	soft ground
Land rent		70～75US$/^{2}	
Management fee		0,03US$/^{2}/Month	
Electricity supply	Private power generation	None	Electricity supply
	Electricity	40MVA＋63MVA	
	Fee	direct contract with EVN	
Industrial water supply	Supplied amount	8,000m^3/Day	Industrial water supply
	Fee	contact with BenLuc Water Supply Foundation	
Wastewater treatment	Throughput	Phase 1 : 300m^3/Day	Wastewater treatment
	Fee	0,2US$	
Rental plant	Fee	3US$^{2}/Month	Rental plant
	Management fee	0.03US$/Month	
	Area	5,600^2	
	Office	6US$/^{2}/Month	
Telephone infrastructure		ADSL	
Minimum tenancy		3 years	Negotiable

Figure 3-5 Exterior appearance of Thuan Dao IP

(2) About Needs and motivation of the project

As mentioned in Chapter 2, the need of project is high because of the strict regulation in Vietnam.

Especially for enterprise of polluting industry sector, there is high motivation of relocating their plants to new environment friendly IP, which allows the enterprise to operate legally right,.

At the same time, for foreign enterprises to expand investment in Vietnam, there are few options for polluting industries be located, whether into the foreign invested IP, or into the new "Environment friendly IP" in this proposal. Also, as in the first part of this report briefly stated, the Vietnam enterprises were indicated that polluting industries has little choice because of the denial of acceptance for polling

industries, as seen with the case of Phong Phu company. Phong Phu Company (dying factory) has faced the fact that all provinces except for the Long An province have refused its relocation. Furthermore, the polluting industries enterprises to set up in the environmentally friendly IZ are able to announce itself as environment friendly enterprise.

Thuan Dao IP Phase 2 which is the site of this project, have already been received inquiry from 20 domestic and foreign enterprises (of which 8 enterprises are polluting industries) and it is continuing to implement PR activities through the seminars, exchange of show that many enterprises pay much attention to the facilities project this utility.

For the enterprises of polluting industries, the cost of moving to "IP-friendly environment" is much greater than the fine of penalty. This means that appropriate enterprises are potential tenants which conducts allows to law and regulation, and such tenants enhance the value of branding the mutual exchange of IP with the leasing land enterprises.

On the other hand, such companies and movement enhances the attractiveness of investment in Long An province, that this business is valuable from the local government's point of view.

(3) **Project Scheme**

Establish an company to construct, own, manage and operate the environmentally friendly utilities through the form of JV, with capital contribution between the local IP management company (Dong Tam Group) IP and Japanese facility manufacturer, with commercial bank and other infrastructure fund capital. It would also take an advantage JICA 2 step loan to facilitate the basic infrastructure.

The environment-friendly utility service is formed of power supply, water supply, waste water treatment, waste storage work, telecommunication and other services and all tenants are charged the "environment-friendly utility service" fee. The tenants are obligated to implement primal processing of waste water treatment, and the JV is to implement the final treatment.

The withdrawal of waste will be delegated to waste treatment specialized company, which is licensed from the government.

Intended the case of discharge of harmful substances have not been fully primary treated to the concentrated wastewater will be fine by cutting electricity and water ... In addition, water after treatment from the IZ will be supervised by Department of Natural Resources and Environment at the downstream and the monitoring results will be publicized on the internet network.

The project scheme of environment-friendly utility business is based on this content (Figure 3-6).

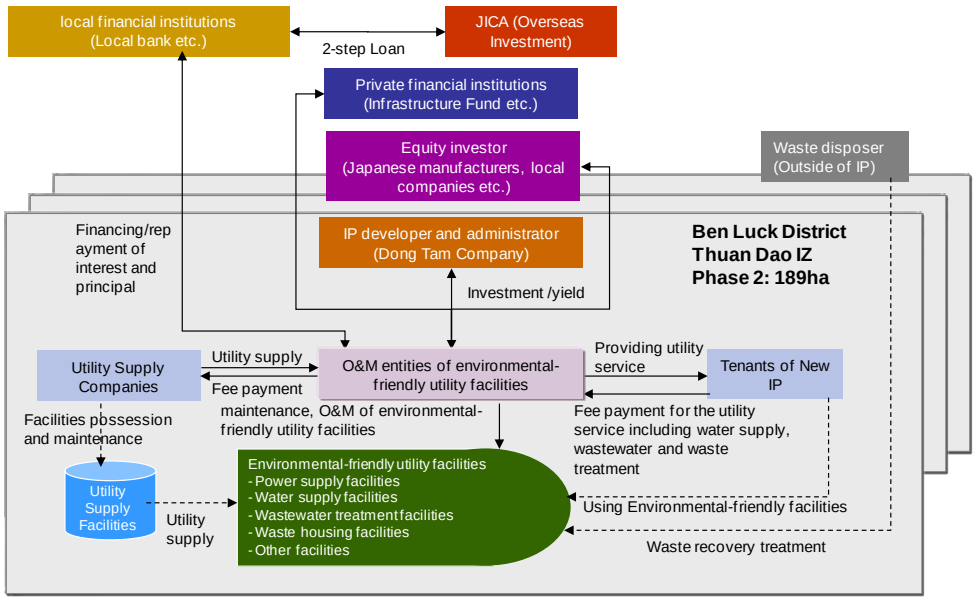


Figure 3-6 Construction Project to work environment-friendly facilities

(4) Reference: Case of "Wastewater treatment business" for IPs currently in operation

(Explanation for conclusion of setting as "out of focus" in this study)

Following projects are not going to execution from the research and negotiation in this study.

<Reference 1 : Duc Hoa 3 Industrial Park, Long An province>

The land development is already done and a Japanese company is setting a manufacturing plant. The IP is facilitated with waste water treatment system by Vietnamese equipment, but Japanese investor claims that Vietnamese waste water treatment standard is too strict that it is unable to meet the required level with Vietnamese facility. The Japanese company stated that is willing to finish up to secondary water treatment and discharge water directly into the river, with Japanese treatment equipments that is now installing inside the factory. Meanwhile, the IP management company policies that Vietnam is under the Vietnam Law it should discharge water to the outside after being treated with concentrated wastewater treatment equipments that IP construct, and not have yet conclusion about this problem.

Table 3-4 Basic information of Duc Hoa 3 IP

Name of industrial park:	**Duc Hoa 3 industrial park- Viet Hoa**
Place :	Duc Lap Ha commune , Duc Hoa district, Long An province, Vietnam
Developer:	Phu My Vinh industrial park infrastructure trading and development Co., Ltd
Total development area:	87ha
Access:	25km from Ho Chi Minh City, 9km from National road 22 (trans-Asian road)

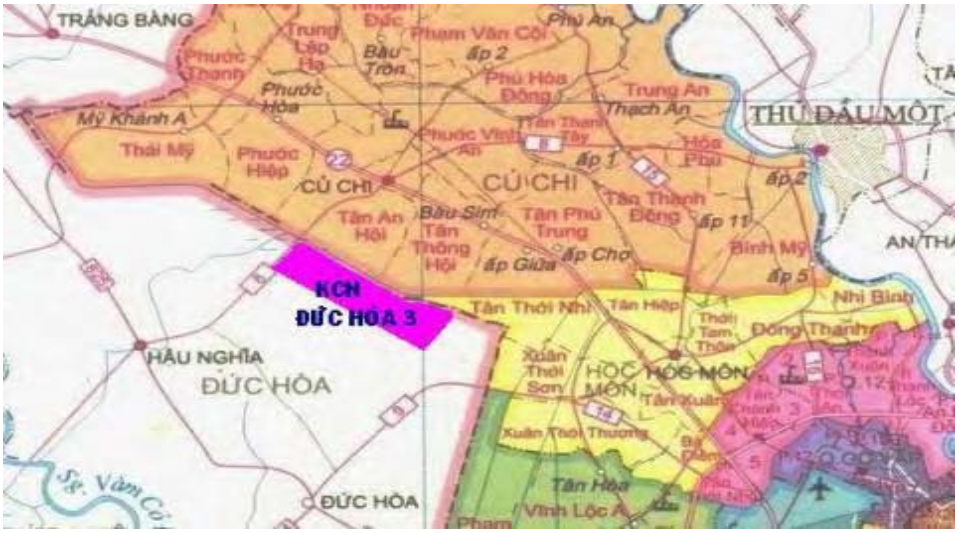


Figure 3-7 Location of Duc Hoa 3 IP

Hereafter are outlines of model IP:

- Internal road is a bituminous road, breadth 24-32m, burden 40 ton/^{2}
- Electricity supply: install transformer station 110KV, consider demand of usage 80MW of solar power plant and urgent generator.
- Clean water supply use of surface water project implemented by joint venture between Japan and Phu My Vinh Company (right of water) in Long An. Phu My Vinh Company owns right of water for irrigation 200,000m^3 form MARD (see detail in clean water project)
- Wastewater treatment intends using intergraded treatment facilities 15,000m^3/day
- Confer with Department of Resources and Environment Long An province on waste treatment. Inspect relevant waste treatment works which need to be equipped.
- Communication needs to be installed IDD service and 1000 ADSL lines. In this survey, we have considered ability of installing such communication facilities.

However, in final phase of this survey, conditions of pool were not agreed between two parties when negotiating joint venture condition between Japan investment company and investment company in this IP. Therefore, intergraded wastewater treatment work to IP is an unperformed project-realization work on base of survey this time.

<Reference 2 : Thanh Phu Industrial Park and Nhon Trach IP in Dang Nai Province>

Table 3-5 Basic information of Thanh Phu IP and Nhon Trach 2 IP

Company considers to input the wastewater treatment installation into the existing industrial park in Dong Nai province
(1) Thanh Phu IP Total area : 177 ha Developer: Dong Nai Transportation Joint Stock Company Add of office: 200 Nguyen Ai Quoc street, Trang Dai ward, Bien Hoa city Contact: Mr. Doan Van Huynh, general dept. manager, tel : 095 8865 245 Add of IP: Thanh Phu Commune, Vinh Cuu District, Dong Nai Province **(2) Nhon Trach 2 IP** Total area : 347 ha Developer: Urban & Industry Development Joint Stock Company No. 2 Add: H22 Vo Thi Sau street, Bien Hoa city Contact : Mr. Ho Duc Thanh, Deputy Director, tel 091 8479 268 Add of IP: Hiep Phuoc, Phuoc Thien & Phu Hoi Commune, Nhon Trach District, Dong Nai Province

After surveying two industrial parks, it was concluded that the management and operation style of the company and the IP do not meet the Japanese enterprise' requirement.

<Reference 3 : Hoang Gia Industrial Park in Long An province>

Figure 3-8 Hoang Gia IP.(Long An province)

【Hoang Gia IP】

- Total area: 150ha, in their 110ha leased (comprise 60 companies); 80% is Vietnam companies 20% is Taiwan and Singapore companies.
- Received license in year 2001. Guarantee right of lease out land from year 2005 ~ 2055.

【Present utility fee form】

- Electricity: Contract direct to EVN
- Water: today, companies are self exploiting groundwater (clean water in Duc Hoa District has not been provided to per plant yet)

【Wastewater treatment】

- Have land for construction, but don't have fund for implementation.
- Project supply whole 8000m^3/day; Phase 1: 3000m^3/day; Phase 2: 5000m^3/day

【Actual state】

- In the future, shall build wastewater treatment work, electricity and clean water supply work, and it's not following form of real estate as from past up to now. Want to be an IP that might control utilities. Besides, control companies are looking forward to establish joint venture company with Japan.
- Main center line of IP has been in cracked state; infrastructure is extremely weak. Here is serious typical IP example in Vietnam today.
- If consider on control in IP aspect, it's always in the lowest level and regularly pay a fine to province, Status so bad that wastewater from plants has been spread over on the road. Besides, neighboring area IP concern to be polluted their environment where have both surrounding agricultural land and private houses.
- There are some companies willing to transfer into the IP. But since the IP do not have proper waste water treatment system, the IP could not obtain license to accept 17 polluting industries, therefore need to equip wastewater treatment facilities promptly.

<On the project in new construction and renovation of wastewater treatment equipment IP>

Establish "Company of construction, own, management, and operation of environment friendly utility supply work" through form of pool of private credit organization (infrastructure construction fund) and environment friendly utility facilities production companies (Japanese companies, home company).

In regard with "Company of construction, own, management, operation of environment friendly utility supply work" is established to per new IP as mentioned above, meanwhile "Company of construction, operation of environment friendly waste water treatment work" is independent and not receive pool of control, operation company of IP.

Many IPs in Vietnam is under the same situation as this IP, that IPs with 17 polluting industries, are operating without proper waste water treatment system and paying fines to government regularly.

Though lot IPs are looking forward to build environment friendly wastewater treatment work urgently, but on reality, IP management and operation company is limited finance for purchase and

construction, and serious polluting wastewater is continuing occurring.

Furthermore, according to information told that although even application of 2StepLoan of JICA (through a domestic bank) for subject is existing IP management and operation company, environment friendly wastewater treatment facilities Japanese companies shall be hard in assessment and winning credit margin of each operating IP management and operation company.

Today, There are 34~35 of 53 provinces have an IP in whole country, and reported that over 100 IPs are not facilitated proper waste water treatment system. Meaning average of three IP in every province will be the target business site of this business model and the market volume is estimated as 15 billion Yen, if each installation cost is stated as 0.15billion Yen.

From above actual state, "Company of construction, operation of environment friendly wastewater treatment work" shall buy environment friendly wastewater treatment facilities by application of 2StepLoan of JICA (through a domestic bank) and carry out installment (use) and O&M such facilities in operating IP. IP management company shall charge for use of facilities and management.

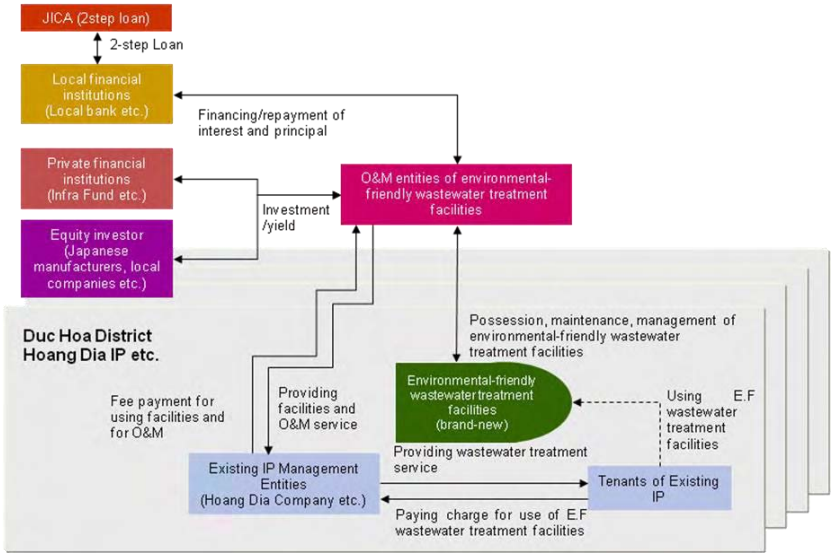


Figure 3-9 Environment friendly wastewater treatment work (application for operating IP)

However, from the result of the survey, it is decided to be removed from the scope, because of its profitability and time requirement for specific F/S.

3-3-4 Implementation framework

(1) Case of construction of brand new IP and installment of environment friendly utility work: Utility Management Company

Establishing Joint venture between Japanese company and Vietnamese company to manage utility, build industrial park, then co-manage, operate environment friendly utilities. This shall collect management fee from tenants.

Set few Japanese engineer and specialists permanently at JV company for capacity building and training local staff.

As the association member, expertise Japanese players such as Industrial park operator, manufacturer and operator of waste water treatment facilities, water suppler and others may join the business as investors or operators.

3-3-5 Demand forecast

Figure 3-10 show the procedure of IP demand forecast.

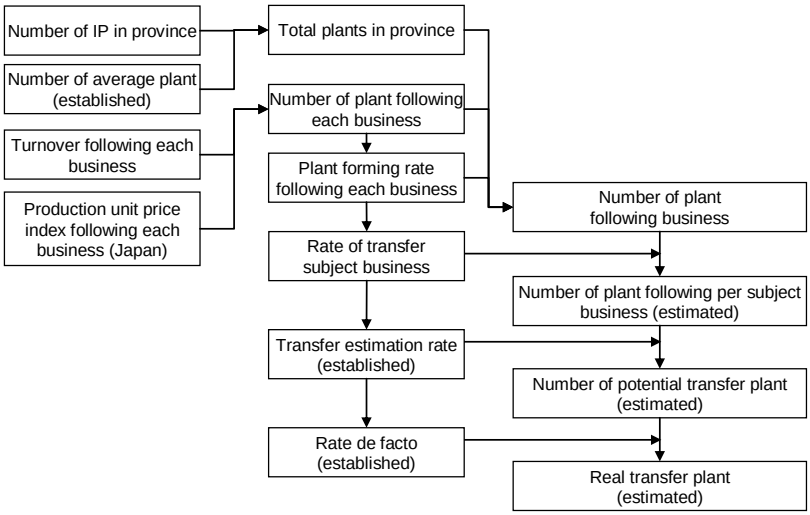


Figure 3-10 Procedure of IP demand forecast

The survey and hearing was carried out for grasping the potential demand of the business.

List of Vietnamese companies, subject of 17 polluting industries intending to transfer into IP extracted from result of survey and hearing opinion. Organization collected information mainly is Associations and 10 companies as follows:

- Vietnam Leather-shoes association
- Vietnam Paper-pulp association
- Vietnam processing-aquatic product export association
- Vietnam cigarettes association
- Vietnam mechanic enterprises association

These enterprises will go first in the demand for movement from the viewpoint of the trademark of enterprise and observation and not to be in the manner to compel for movement. These enterprises consider essentially the suitable operation at the place to move to than giving the expense in movement of the plant and operation after movement.

Thus, the period for commencement of the project will be implemented before movement of the enterprise to have this high sensitiveness (early adopter) and intent that it will step by step perform for movement of the other enterprises suitable with the deployment immediately this project.

In the other hand from this matter therefore when commencing the project not to estimate the manner to be shortcoming the place for receipt due to exceeding the demand to become clear.

When expanding the project will go through these pioneering enterprises (early adopter) to offer about the solution for utility in package with the high belief even to look from outside by the technical ability and the operating ability that is so detailed of the Japanese enterprise and continues to complete the project with the province and the enterprise to have the plan for construction of the new IP.

Besides that, at present to the enterprise which is considering for movement with the premise for covering the new expense then the plant, which are operating violating the law to become the appearance of the free racers. When performing this project then in Long An province will punish closely the illegal operations and through the economic punishment it will continue requiring making the engine for movement.

In the other hand, for this treatment, if not to be satisfied in the medium and small enterprise then to suggest the amount for collect of the punishment to be gone through the economic punishment that will add to the item for public support as a fund.

Besides that, as mentioned in item 3-3-3 the present period there has been about 20 enterprises with the desire to enter into therefore the feasibility of the project is relatively high.

3-3-6 Business scope

Table 3-6 shows the ideal part roles between public and private sector.

It is assumed that land acquisition, design and planning, operation and management of both "Environment friendly utility management service for new industrial park", as well as "waste water treatment service for operating industrial park" are assumed to be conducted by private player.

On the other hand, it is assumed to accept public fund, such as 2step loan through domestic commercial banks for some portion of initial investment.

Table 3-6 Roles between the private and public sectors

Facility name/work name		Land acquisition	Plan/design	Initial investment/ Construction	Operation &Management
Utility management service (for new IP)	Water supply work	Private	Private	State/ private	Private
	Electric power supply	Private	Private	State/ private	Private
	Waste water treatment	Private	Private	State/ private	Private
	Waste storage	Private	Private	State/ private	Private
Wastewater treatment (for existing IP)	Waste water treatment	Private	Private	State/ private	Private

3-3-7 Design conditions

In this "environment friendly" utility management business, the central issue is setting conditions of wastewater treatment, which is the imperative issue and the water supply, which is the critical business establishment

< Wastewater treatment >

According to Vietnamese Law, the IP is completely equipped with Integrated wastewater treatment plants (secondary treatment), and the wastewater must be drained ultimately outside the IP through this plant. Each tenants has to complete its wastewater treatment facilities inside its plant (Primary treatment) according to their industry. IP management company will set the standard of primary wastewater quality for each tenant plant, which Integrated wastewater treatment plant (secondary treatment)" can be accepted, and conduct the wastewater treatment contract with each plant assuming that this standards were protected.

But at half of the existing IPs, the wastewater treatment plants are not completed (secondary treatment). And there are some cases that the capacity of installed treatment equipments is not compliance with the standard value. For example, in Dong Nai province, 9 of 22 IPs do not have

integrated wastewater treatment plants.

In case of the existing IP, the park has to check the value and quality of wastewater drainage from each plant's primary wastewater treatment facilities, and provide the design standard of integrated wastewater treatment plants (secondary treatment), and select the suitable treatment equipments. After that, the IP calculates the wastewater treatment fee and sign new contract of wastewater treatment with tenant plant. In this contract, the IP has the right guaranteed by law; to reject the treatment of wastewater effluent from factory exceeded the acceptance criteria of Integrated wastewater treatment plant. This sample contract refers part of the contract of LOTECO.

3-3-8 Schematic design

<Environment friendly utility management business (Phase 2 Thuan Dao IP)>

Electricity supply:	Supplied by Ben Luc Substation (110/22KV-40+63MVA), 22KV Transmission line
Water supply:	Refer 3-4Water supply business

Content outline from doorway to intake outlet of process of waste water treatment as follows:

i) Large size garbage (crushed garbage) eliminator; scanner by screen
ii) Sedimentation reservoir (sedimentation in beginning phase/sedimentation in final phase)
iii) Organism treatment (anaerobic and aerobic treatment)
iv) Sludge compression, dehydration (or gravitational sludge compression/differential flotation sludge compression)

Here, we use living water and industrial water divergent system (Figure 3-11), simultaneously, it's passed treatment returnable water system and use waste water recycle (as sue for watering tree).

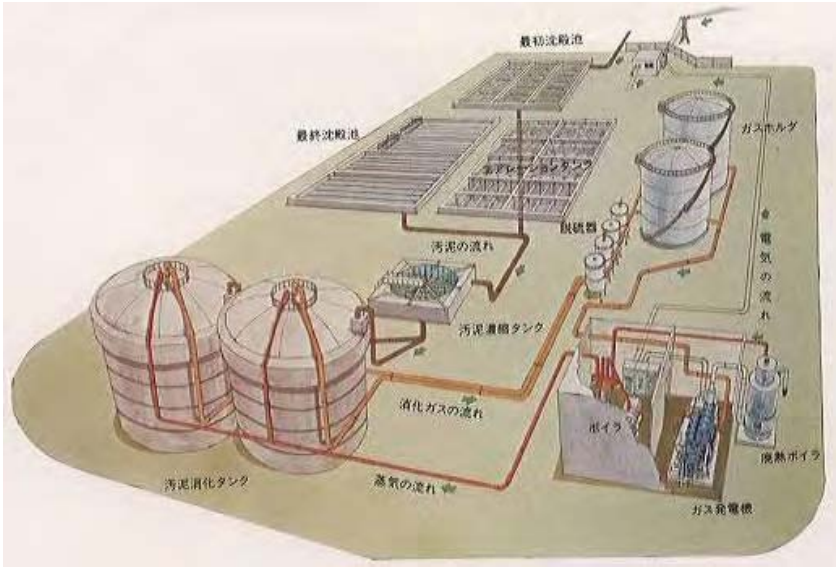


Figure 3-11 Sample overview of wastewater treatment work

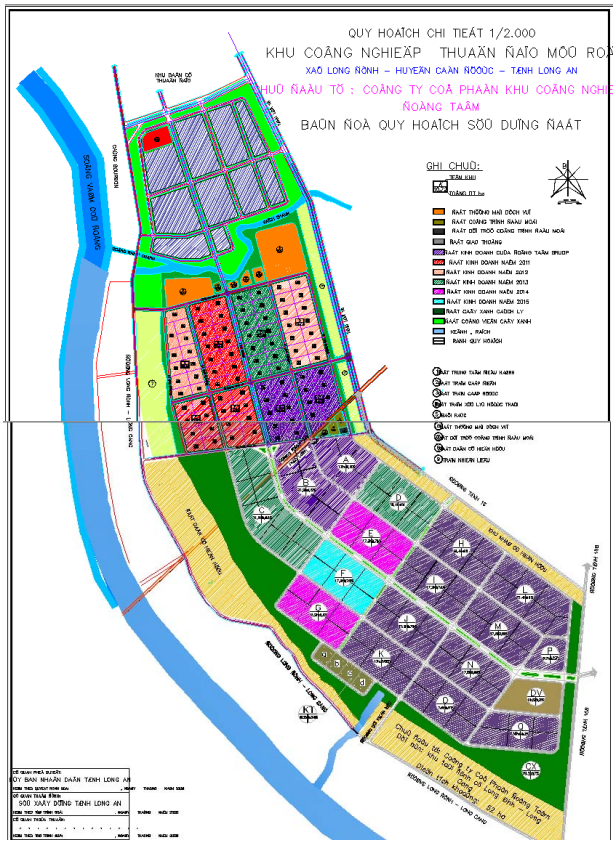


Figure 3-12 Design drawing of Thuan Dao IP

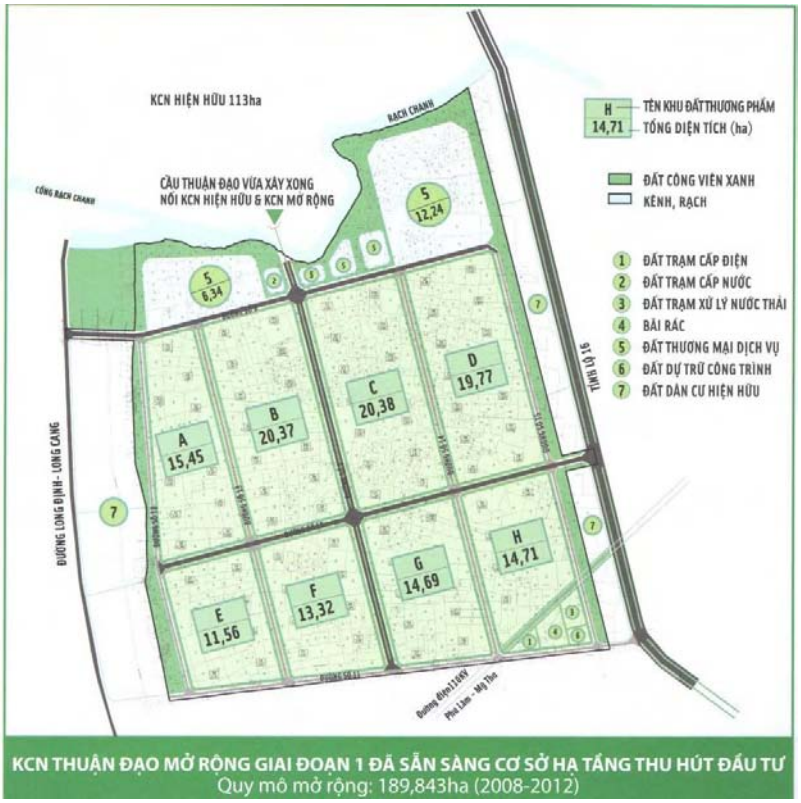


Figure 3-13 Outline design diagram of Thuan Dao2 IP

3-3-9 Estimation of project expenditures

(Case of developing new environment friendly utility management service)

Referring to the F/S done by Dong Tam group as preparatory survey for development planning (Investment project in infrastructure construction Thuan Dao Industrial BenLuc expansion(2009), firstly, totalize items in following table (part has ○ mark) comprise waste water treatment, water supply, electricity supply in expenditure costing in phase 2 of Thuan Dao IP, with 4.10US$/$m^2$ (price in 2011) is the unite price respective area. By our target environment friendly utility work comprise many relevant works as electricity supply, water supply, waste water treatment, waste withdrawal and preserve, communications, so respective facilities need to be added.

Also, according to interviews with investors as the Japanese manufacturers and firms are considering building a new Industrial Zone and construction of environmentally friendly utility, the desire to make known the scale projects under US$ 10 million. Furthermore, when interviewed many IPs and utility vendors, we have set the unit cost in item (7) is US$ 7.02 / m^2 (prices in 2011).

If using the unit built facilities such as on the scale of the project will be US$ 9.69 million (= 193 843 million VND).

Table 3-7 Expenditure in phase 2 of Thuan Dao IP

①	Total Area	1,898,430	sqm	
②	Industrial Zone area	1,302,500	sqm	68.6%

		Price In 2009		Utility
	1-Expenses preparing investment, provisions	647,137	MIlion VND	
	2- Communication	128,108	MIlion VND	
	3- Entrance, fence, green trees	13,823	MIlion VND	
③	4- System discharging rainy, waster water	52,784	MIlion VND	○
④	5-System discharging water	21,701	MIlion VND	○
	6-Leveling sites	128,025	MIlion VND	
	7-Office equipments, other equipments	3,416	MIlion VND	
⑤	8-Electricty, transport means	10,140	MIlion VND	○
	9-Provisions	12,492	MIlion VND	
	Total	1,017,626	MIlion VND	

source Invwstment project in infrastructure construction Thuan Dao Industrial BenLuc expantion(2009)

⑥=(③+④+⑤)÷②÷17,800	Investment Cost unit (Utility)	3.65	$/sqm
	1$＝17,800VND **(Price In 2009)**		
⑦=⑥×(1+8%)^(2011-2009)	Investment Cost unit (Utility)	4.10	$/sqm

[Calculate unit price of project according to information of LOTECO industrial park and manufacturing companiest]

Estimated environment friendly utility project in Thuan dao includes relevant works as electric, water supply, wastewater treatment and communication etc.

Necessary including service investment expenditure(③＋④＋⑤) as above.

Estimation of above unit cost is 6.09$/sqm following information of lot industrial parks and manufacturing companies.

Price increase rate: Calculate price increase rate following to USD [Exchanges rate (ending term price)]		6.00%	
E.F project construction unit price		7.02%	$/sqm (Price in 2011)
Environment friendly work (infrastructure)	43%	4,168	×1000$(Price in year of staring construction)
Environment work (equipment/facilities)	57%	5,525	×1000$ (Price in year of staring construction)
		9,692	×1000$ (Price in year of staring construction)
Total investment		193,843	Million VND
		9.69	Million $

3-3-10 Financing plan

To put forth project expenditure as costing in section 3-3-9 Estimation of project expenditures, we estimated financing method as combination of commercial bank of financial institutions (including infrastructure fund. etc), investment of manufacture and trading companies and 2stepLoan form of JICA through domestic commercial bank, etc. For further detail, please refer section 3-3-14 (Portion of utility supply).

3-3-11 Project Implementation Roadmap

(Utility management company)

According to content of F/S of Thuan Dao 2 IP (Investment project in infrastructure construction Thuan Dao Industrial BenLuc expansion(2009), and comments from Japanese player in industrial park in Vietnam, target year for starting full operation to be 2014, and actual investment to be starting from year 2012. Regarding the stated condition, construction period is set to be year 2012-2013.

Table 3-8 Project Implementation Schedule

Item	2011	2012	2013	2014
Mean of communications	FS/ design/ procurement	■	■	In operation
Electrical equipment		■	■	
Water supply facilities		■	■	
Wastewater treatment equipment		■	■	

(Notes) Except Wastewater treatment business

3-3-12 Business Risks

Result of risk analysis and risk avoidance methodology for utility management business are shown in Table 3-9

Table 3-9 Analysis of risk and reaction for treatment of the water supply business

Type	The risks	Result for survey and solution for treatment
Legal risk	Risk of license issuance	This plan will establish the company for construction, possession, operation of the utility work and supply of the service for fresh water, treatment of wastewater, and other utilities for the companies in the IP. This new company is contributed capital from the companies such as Dong Tam (investor of Industrial Park), the companies for production of device for water treatment of Japan, the commercial companies and the fund for construction of infrastructure of Japan. establishment of the company for management of equivalent IP then before there has been a lot of achievements in Vietnam and following the domestic auditors with the certification that “there is no matter”.

Type	The risks	Result for survey and solution for treatment
Economic risk	Risk for change of price	For worry of the period to enhance the price in Vietnam. In the plan for research of this project (as per US$) it implemented in estimation with the rate for inflation of 6%.
	Risk for capital mobilization	【Investment】 10% 【2step loan】 70% 【Borrowing from local bank】20% The mobilized amount: 96,920,000 US$ 【Investment】This utility company beside the Dong Tam company as investor, there is also the participation for capital contribution from the Japanese Infrastructure Construction Fund, the firms and the trade companies 【Loan】2 Step Loan through the prestigious credit organization of Vietnam of JICA It has communicated with Vietnam bank, VDB and ACB have stipulated the active action to the application of these 2 step loan. The intent for loan from the prestigious credit organization of Vietnam (VDB or ACB)
Risk of counterpart	Risk of counterpart	The counterpart intended as above. (Besides the Dong Tam company there is the company of the Japanese Infrastructure Construction Fund, The companies for production of the device for treatment of wastewater of Japan and the Japanese Trade Company) They have communicated for many times from the period to have the ideal about the plan of this project and they confirmed that they wish to participate. Especially, the companies for production of device for treatment of water of Japan not only to cease at the presentation of the desire for participation that they decided in the internality that they will invest into this project.
Risk in the construction period	Risk of work completion / Risk of delay of work	The work for treatment of wastewater possessed by the utility company, but the personality of the companies for supply of the device for treatment of water intend that they will be the shareholders to contribute the capital for the utility company for participation and installation of the equipment will be in the IP that has ensured the land therefore it guesses that the risk for work completion of the work for wastewater treatment is so a little.
	Risk of infrastructure concerned.	The project of the main channel of Duc Hoa by the capital source of ADB, as the water source of such project for supply of fresh water to deploy from the middle of 2011 to the first of 2012. The project for supply of fresh water by the capital source of ODA Korea with the itinerary from 2011 to the end 2013. the condition for loan of ODA of Korea has also been defined.
	Risk for reclamation of land	This plan to construct the utility for the new IP therefore the knot for reclamation of land less to have the difficult ability.
Risk in the period for operation	Risk for forecast of demand	For the matter whether the companies concentrate to move into the IP or not, due to most of the IP of Vietnam do not construct the works for treatment of wastewater, thus the demand of the service for treatment of industrial wastewater is equivalent with 17 services following the very high regulations. We guess that it can attract the demand by determination of the price (fee) reasonably. For construction of the price can refer the price of a lot of IP of Vietnam. Besides that, it can hope to invest the plants of the foreign companies, which are sensitive with the environmental matter through the investment for movement of the location, new construction.
	Risk of expense for operation	To determine the expense for management counting on the actual expense in the IP of Japan in Vietnam those are near to the IP estimated for implementation of this planning. The rate for immigration of these IP is 100% and the implementation for collect of fee for management there is no matter and estimated as the standard for determination of the reasonable price.
	Risk for capital collect	The companies for immigration into the IP could not operate if not to use these utilities. Suppose to pay the expense for management that will implement the solutions such as ceasing the supply of the utility services, or speed up for collect of capital to decrease the risk for reclamation of capital. (By writing clearly in the term O&M then it can decrease the risk for reclamation)

Type	The risks	Result for survey and solution for treatment
	Risk of appeal	The condition for entry into this IP that at the enterprises they should implement to treat the wastewater primarily and the IP will implement for secondary treatment to the wastewater primarily treated. Besides that, for the wastewater from the enterprises then the company for management of utility will control such treatment manner and if the secondary treatment is not enough then to be treated for ceasing supply of electricity, water. By this action then it will protect, avoid the wastewater will be exhausted out the Industrial Park. However, unfortunately the wastewater exhausted from the period to find out the harmful substance until ceasing the operation to cause the effect, damage to the surrounding environment then about the lawful aspect then the enterprise in the IP should be responsible for. Besides that, it will settle this through the Management Unit of Industrial Park. Furthermore, in case the IP of Japan LOTECO, then due to this IP is far from the residential area surrounding therefore not to arising the noise, vibration, odor, wastewater, air…. Thuan Dao IP as well as LOTECO IP surrounding there is not population therefore to estimate the risk from arising the claim is law. Besides that, the member of the legislative office explained that in case unfortunately it should cancel the contract with that enterprise when violating the contract then to follow the present practice of Vietnam, the arising claim there is no matter and the side of IP will not need to have the responsibility of virtue.

Table 3-10 The Off-taker, determination of expense and the base

The plan of the utility management business friendly with the environment	
Off-taker	The company moves into the Industrial Park
Expense for collect	Expense for use of the utility work (including electricity, fresh water, wastewater, wastes) The annual contract calculated in US$, amendment for once each year.
Determination of expense	Expense for sales of electricity, expense for sale of water, fee for treatment of wastewater, expense for treatment of thick sludge after treatment of wastewater.
The base for calculation of expense.	To determine each expense following the information from the adjacent IP (the rate for immigration of 100%). The rate for enhancement of price (calculated as per US$) determined as 6% and calculation in estimation based on the result in the past.

(Notes) The detailed plan of the utility management business friendly with the environment stipulated in financial item (the utility management business friendly with the environment)

3-3-13 Definition of the real situation with the calculation of the environment and society (General of the new investment in the utility management business)

(1) The report of the new investment of Thuan Dao IP

As per item 3-3-3 mentioned, Thuan Dao IP has received the license for construction as the ordinary Industrial Park. The new investment implemented perfectly and it also implemented the report of new investment. Besides that, for change into the IP friendly with the environment does not need to obtain the new license, whereas the report for new investment it is obtaining the idea from Long An province that the companies will obtain when transferring into.

In this report, the report of the new investment that the Thuan Dao IP received including the general contents about the new investment as follows. When implementing the project, the solutions for

implementation need to consider respectively for each project (calling the enterprise, construction, operation) until the deployment of the project that also takes into the own solutions mentioned in the new investment).

In the other hand, the people in Long Dinh district showed the idea through the conversation with the company in the session for explanation to the people that "they appreciate the spirit of the leaders to implement the project for attention to the environment, society actually from the period to prepare for construction until to enter into the operation of the Industrial Park".

At last to show the conclusion that "the enterprises generally is to pay more attention to the environmental matter, however it needs to ensure for local recruitment about the aspect of short term, for long term that it should minimize the effect to the environment during the operation. Through such operation, the enterprises will continue developing. It needs to share the idea with the suitable enterprises and appreciate for deployment of the project".

When implementing the utility management business we need to organize the session for explanation in the detailed period of the project and enhance to reinforce the good relationship with the local people.

Table 3-11 EIA report on Than DaoIP

Item	Content
Report title	REPORT OF EVALUATING ON ENVIRONMENTAL IMPACT – INVESTMENT PROJECT OF THUAN DAO EXTENDED INDUSTRIAL ZONE LOCATION: LONG DINH COMMUNE CAN DUOC DISTRICT LONG AN PROVINCE
Issued date	August 2009
Issuing organization	Investor: Dong Tam industrial zone Joint stock Company
Implementing organization	Center of Environmental Monitoring and Engineering

Table 3-12 Contents of EIA report on Than Dao IP

OPENING
1. SOURCE OF PROJECT
2. PURSUANT TO LAW AND TECHNIQUE OF EVALUATION ON ENVIRONMENTAL IMPACT (DTM)
3. ORGANIZED TO PERFORM THE EVALUATION ON ENVIRONMENTAL IMPACTS

1 DESCRIBED PROJECT BRIEFLY
1.1. PROJECT NAME
1.2. Project manager
1.3. GEOGRAPHICAL POSITION OF PROJECT
1.4. PRIMARY CONTENT OF PROJECT

2 NATURAL, ENVIRONMENTAL AND SOCIO-ECONOMICAL CONDITIONS
2.1. NATURAL AND ENVIRONMENTAL CONDITIONS
2.2. SOCIO-ECONOMIC CONDITION

3 ENVIRONMENTAL IMPACT ASSESSMENT
3.1. CAUSES OF IMPACT
3.2. IMPACT ASSESSMENT

4 MEASURES TO MINIMIZE NEGATIVE IMPACT, PREVENTION AND RESPONSE TO ENVIRONMENTAL INCIDENTS
4.1. REDUCE POLLUTION IN SURFACE PREPARATION PHASE IN CONSTRUCTION WORKS
4.2. STAGE leveling and INFRASTRUCTURE CONSTRUCTION
4.3. STAGE OF EXTRACTION AND OPERATION

5 COMMITMENT TO ENVIRONMENTAL PROTECTION

6 ENVIRNMENTAL TREATMENT WORKS, ENVIRONMENTAL MONITORING AND MANAGEMENT PROGRAM
6.1. LIST OF ENVIRONMENTAL TREATMENT WORKS
6.2. ENVIRONMENTAL MONITORING AND MANAGEMENT PROGRAM
6.3. SUPPORTING MEASURES IN THE PRORAM OF ENVIRONMENTAL QUALITY MONITORING

8 COMMUNITY CONSULTATION
8.1. IN THE OPINIONS OF PEOPLE'S COMMITTEE OF LONG DINH COMMUNE
8.2. IN THE OPINIONS OF FATHERLAND FRONT COMMITTEE OF LONG DINH COMMUNE
8.3. THE INVESTOR'S ABILITY TO MEET THE REQUIREMENTS OF THE COMMUNE

9 DATA AND INFORMATION SOURCES, AND EVALUATION METHODS
9.1. DATA & INFORMATION SOURCE
9.2. THE METHODS USED IN REPORT.

10 CONCLUSION AND PROPOSALS
1. CONCLUSION
2. PROPOSALS

Table 3-13 Method of reduced bad impact as stated in EIA of Thuan Dao IP

Chapter	Section	Solution
4.1	**REDUCE POLLUTION IN SURFACE PREPARATION PHASE IN CONSTRUCTION WORKS**	–
4.1.1	The compensation, assistance resettlement and damage	Meeting latest stipulations of Province
4.1.2	**Overall development planning**	–
4.1.2.1	Functional areas, planning mills	Divide plant into 3 groups and lay-out following to pollution degree in the plant
4.1.2.2.	Arrangement distance	Suitable arrangement distance between groups. (Reference of rules on HCMC high-tech area)
4.1.2.3.	Plant layout position	Plant layout in functional areas under the Decision of Provincial People's Committee (Decision No 779/QĐ-UBND). Layout counted to air pollution in IP.
4.1.2.4.	Industrial hygiene Isolated area	Fuel treatment facilities arrangement layout, drainage system, isolated areas formation between IP and residential areas (buffer).
4.2	**STAGE leveling and INFRASTRUCTURE CONSTRUCTION**	–
4.2.1	Clean-up and treatment of plant biomass	Treat plant biomass when arising in land area of the project.
4.2.2	Collection and treatment of sludge surface peel	Collect arisen sludge surface peel on land area of the project and treat appropriately.
4.2.3	Leveling control materials	Use suitable anti-noise materials. When building ground, water and not cause noise in surrounding area with pumping soil and sand on daylight
4.2.4	Control erosion and sedimentation	To prevent erosion and sedimentation by storm, need to bank and install drainage system.
4.2.5	Control pollution caused by waste	Collect 50 liters into 1～2 reservoirs, it shall be carried out by treatment company. Three companies who have license of Ministry of Resources and Environment specializes waste as danger waste, chemistry. Pollution water from builder is treated by mobile W.C.
4.2.6	Control pollution caused by waste oil	Oil and greasy is collected into dedicated device for treating.
4.2.7	Reduced accidents and other social issues	Use and supervise strictly equipment of builders. In the project area must be safety during 24 hours. Limit speed in construction area and post indicator board and order suitably. Use major local laborer and manage by card.
4.2.8	Other mitigation measures	Measures as combination of project area before applying for permission/ treating, burying uninflammable materials / transporting uninflammable materials / registering using chemistry/ planning fight fighting /Periodically managing and maintaining of machines, equipment/large size broadcast device use-prohibited/ safety 24 hours guaranteed in project area/installing indicator, order.
4.3	STAGE OF EXTRACTION AND OPERATION	–

4.3.1	Measures to control air pollution	Altitude of chimney/treatment technology and fuel alteration/ exhaust fumes treatment device/ chemistry-organism decomposition/ safety standard application/ Control, maintenance plan/ materials management, reasonable operation and conformation to procedure system in plant and area.
4.3.1.1.	Using advanced technology, low pollution	Use safety circle procedures; limit arising of technical harmful substance. Altering harmful substance as materials, fuel to unharmful substance. Treat and see is dust arising? Eliminate and prevent dispersion of harmful substance by using closed circuit.
4.3.1.2.	Measures to manage and operate.	Just as treatment technique, use suitable materials, comply with procedure and lowest operation can cut down wastefulness and limit exhaust fumes>
4.3.1.3.	Using trees to reduce air pollution	Plant greenery in IP and surrounding area may catch dust and smoke, limit air pollution, simultaneously help in filtering air, reduced noise and cooling.
4.3.1.4.	Use the device measures air pollution treatment	Having method of mechanical dust elimination if use accelerator and dust clean by filtering unit.
4.3.2.	Measures to control water pollution	–
4.3.2.1.	Reduce pollution from storm water runoff	To prevent overflowing with oil and greasy by storm, before installing rain water pipe to whole IP area, particular rain water reservoir is installed by plant's own.
4.3.2.2.	Reduce pollution by sewage.	Control with connection with treatment facilities of each plant and concentrated treatment (6,075m^3). . each plant will lose fixed time to treat primary wastewater.
4.3.3	Measures for solid waste handling	–
4.3.3.1.	Solid waste activities.	Plant will install waste storage equipment and dump them in concentrated ground in IP, and then it shall be dumped by a local contract transportation company.
4.3.3.2.	Industrial solid waste is not hazardous	Industrial waste excluding hazardous is concentrated into indicated equipment, returned or sold to other unit in order to return.
4.3.3.3.	Hazardous waste	Classify and concentrate into labeled equipment, the plant will maintain it at suitable in order that professional enterprise transport and treat following to stipulation of MONRE.
4.3.3.4.	Yards of solid waste transshipment	Because there's no hazardous in classified waste, so transshipment store is install with area of 0.86ha at the west of project land bounded by wastewater plant of IP
4.3.4	**Measures to minimize the impact**	–
4.3.4.1.	Fire	Measures to fire fighting built and posted up method of refuge by Fire Fighting Department
4.3.4.2.	Lightning	Measures of lightning are to place protection system at altitude position in IP.
4.3.4.3.	Preventing leakage of Fuel	To prevent leakage of fuel, IP management strictly checks with Department on urgent dealing when fuel, equipment, store system are leaked.
4.3.4.4	Control of chemical leakages and safe exposure to chemicals	Chemical is transported into wastewater plant through a professional enterprise. Control chemical current through monitoring system of wastewater area.
4.3.4.5.	Controlled inundation	Dredge bottom of Rach Chanh river periodically, strengthen bank to prevent discharge of untreated wastewater to river.
4.3.4.6.	Minimize impacts to the cultural environment - social	Ensure greenery area to per plant and control air pollution. To prevent jam and traffic accident, need to adjust working time among plants, lessen traffic mass, arrange bus, carry out safety education to laborers. Build houses to personnel to ensure demand of housing to far from home laborers.

According to EIA of Thuan Dao IP, standard of waste emission and noise treatment, air quality, water quality and waste has been adjusted systematically and shown with numeric value.

Along with wastewater treatment is directly implemented in utility management business which is not direct treatment object, for treating waste, air pollution, noise and wastewater base on standard of per factor as stated in EIA in order to carry out utility management business operation, call up favorable plant, construction and equipment repair.

Standard of per factor in EIA as follows

Table 3-14 Standard of per factor as stated in EIA of Thuan Dao IP

Table 3.1	Pollution due to the exhaust gas by the transportation means, machineries
Table 3.2	Maximum noise level from operation of cargo vehicle and executing machine.
Table 3.3	Pollution coefficient due to burning oil
Table 3.4	Pollution coefficient of electric generator use DO oil
Table 3.5	Coefficient of air pollution by burning gas
Table 3.6	Tonnage and concentration of pollution substances when burning gas.
Table 3.7	Pollution coefficient due to coal
Table 3.8	Coefficient contamination of the manufacturing industry typical
Table 3.9	The composition of pollutants in automobile exhaust
Table 3.10	Pollution coefficient when burning fuels
Table 3.11	Polluted material concentration in rain water
Table 3.12	Standard of using water in estimated
Table 3.13	Weight of average pollution substances
Table 3.14	Nature of activities wastewater compared with standard Waste
Table 3.15	Characteristics of wastewater produced some of the industry
Table 3.16	Component of domestic waste
Table 3.17	Ingredients solid waste in some industries
Table 3.18	Characteristics of solid waste produced in some industries
Table 3.19	Harmful wastes can be generated from manufacture sections

(2) **Quality standard of wastewater project (function) in utility management business**

This project bases on standard of wastewater quality of Vietnam (QCVN24: 2009/BTMNT), primary treatment from plants achieve water quality “standard B”, after primary treatment by integrated wastewater facilities placed in this project shall be “Standard A”. Even in EIA of Thuan Dao IP, Wastewater quality is equal to “standard A”, for this project, must conform to waste standard with application of environment control mode of Japan.

Standard A assumes value of pollutant in industrial water letting out of area of water resources used for living water. Standard B assumes value of pollutant in industrial water letting out of area of water resources not used for living water.

Table 3-15 Water quality standard of wastewater project (function)

Item	Unit	C Value		EIA of Thuan Dao IP		Reference	Remaks
		A	B	After Treatment	Before Treatment	Japan's Standards (Uniform Wastewater Standards)	
1 Temperature	℃	40	40	40	45	—	
2 pH	—	6 - 9	5.5 - 9	6～9	5～9	5.8 - 8.6	
3 Smell	—	No bad smell	No bad smell			—	
4 Color	—	20	70			—	※Old standard's(B) is 50
5 BOD5(20℃)	mg/l	30	50	29.7	200.0	160	
6 COD	mg/l	50	100	49.5	400.0	160	※Old standard's(B) is 80
7 SS	mg/l	50	100	49.5	200.0	200	
8 Arsenic	mg/l	0.05	0.10			0.10	
9 Mercury	mg/l	0.005	0.010			0.005	
10 Lead	mg/l	0.1	0.5	0.1	0.1	0.1	
11 Cadmium	mg/l	0.005	0.010	0.005	0.005	0.100	
12 Chromium(VI)	mg/l	0.05	0.10	0.05	0.05	0.50	
13 Chromium(III)	mg/l	0.2	1.0			2.0	
14 Copper	mg/l	2	2	2	2	3	
15 Zinc	mg/l	3	3			2	
16 Nickel	mg/l	0.20	0.50			—	
17 Manganese	mg/l	0.50	1.00			10.00	
18 Iron	mg/l	1.00	5.00	1	1	10.00	
19 Cyanide	mg/l	0.2	1.0	0.198	1	—	
20 Tin	mg/l	0.07	0.10	0.07	0.07	1	
21 Phenol	mg/l	0.10	0.50			—	
22 Mineral oil and fat	mg/l	5	5	4.95	10	5	
23 Animal-vegetable fat and oil	mg/l	10	20	9.9	30	30	
24 Residual Chlorine	mg/l	1.0	2.0			—	
25 PCBs	mg/l	0.003	0.010			0.003	
26 Organic phosphorous	mg/l	0.3	1.0			—	
27 Organic chlorine	mg/l	0.1	0.1			—	
28 Sulfide	mg/l	0.2	0.5			—	
29 Fluoride	mg/l	5	10			8	
30 Chloride	mg/l	500	600			—	
31 Ammonia	mg/l	5	10	4.95	15	40	
32 T-N	mg/l	15	30	14.85	60	—	
33 T-P	mg/l	4	6	3.96	8	8	
34 Coliforms	MPN/100ml	3,000	5,000	3,000	3,000	3,000	
35 Gross α	Bq/l	0.1	0.1			—	
36 Gross β	Bq/l	1	1			—	

(Notes 1) Standard A specifies C value of the contaminant in the industrial waste water discharged in the water area used for domestic water.

(Notes 2) Standard B specifies C value of the contaminant in the industrial waste water discharged in the water area used except for domestic water.

(Notes 3) The item of a chloride is applied to neither a salt water region nor brackish water area.

(Notes 4) "Measurement by biological indicator" appropriate for the old standard is deleted.

(Notes 5) The previous version is TCVN5945: 2005.

3-3-14 Financial analysis

This part of financial analysis is regarding the utility management business. Financial analysis object is to establish " Company of construction, own, management, operation of environment friendly utility supply work" through form of pool management company of Thuan Dao IP, private credit organization (infrastructure construction fund etc), manufacturing environment friendly utility facilities companies (Japanese and home companies) (Figure 3-14).

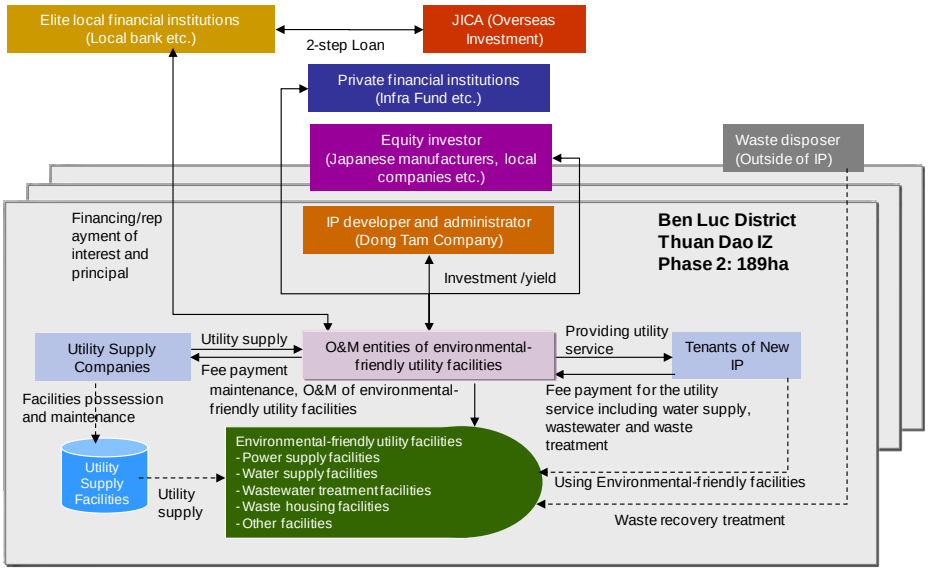


Figure 3-14 Framework of Utility management business

(1) Precondition

1) Project schedule

Project is carried out with following schedule 3-3-11 as follows;

Mean of communications	:Construction (2012~ 2013), commercial operation (year 2014)
Electrical equipment	: Construction (2012~ 2013), commercial operation (year 2014)
Water equipment	: Construction (2012~ 2013), commercial operation (year 2014)
Wastewater treatment equipment	: Construction (2012~ 2013), commercial operation (year 2014)

2) Price increase rate

Rate of inflation used average value of rate of increase price of 1,000,000 VND (nominal value) at the time of 2004, in period of 5 years as from 2005 to 2010, and expected yearly currency rate of US$.

Table 3-16 Price increase rate (in US$)

	Year 2005	Year 2006	Year 2007	Year 2008	Year 2009	Year 2010	Average
Increase rate CPI (%)	8.3%	7.5%	8.3%	23.0%	6.9%	9.2%	10.5%
Estimated price of 1.000.000 VND (Face value) year 2004	1,083,000	1,164,225	1,260,856	1,550,852	1,657,861	1,810,385	
Exchange rate. Ending year price of exchange rate comparison with USD (VND/US$)	15,916	16,054	16,145	16,977	17,941	18,932	
Value counted in USD	68.0	72.5	78.1	91.4	92.4	95.6	
Tỷ lệ tăng giá khi tính sang US$ (%)		6.6%	7.7%	17.0%	1.2%	3.5%	6.0%

3) Total equipment investment

Total equipment investment based on section 3-3-9 Estimation of project expenditures is 9.69 million US$ (=193,843 million VND).

4) Capital mobilization

Establish "Company of construction, own, management, and operation of environment friendly utility supply work" through form of pool of Thuan Dao management company (Dong Tam company), of phase 2 of new Thuan Dao IP – Ben Luc district and private credit organization (infrastructure construction fund etc.) and environment friendly utility facilities production companies (Japanese companies, home company. (seize 85 % of dividend). Besides of pool, " Company of construction, own, management, operation of environment friendly utility supply work" use 2StepLoan of JICA (through home prestige bank counted in US$, 6%, pay original interest within 5 years, pay average interest in 25 years), other credit fund institutions (other home and international credit funds: counted in US$, 6% , pay average interest in 15 years).

In order to construction environment friendly utility work in new IP (electricity supply, water distribution work, wastewater treatment work, waste preserve work and others

According to Vietnam Foreign Investment Law, rate of minimum investment is 30%, of equity from private credit fund (infrastructure construction fund), manufacturing , commercial companies, remainder 70% shall finance from Vietnam prestige credit fund under 2stepLoan form of JICA through Vietnamese prestige credit institution. Period of capital mobilization is adjusted accordingly with period of equipment investment following project route as mentioned above.

Table 3-17 Content of capital mobilization (initial establishment) (×1000US$) (Price in 2011)

Component rate of capital mobilization	Year 2012	Year 2013	Total
Equity (Private fund + manufacturing company + IP management, investment company: 10%)	485	485	969
Loan under 2StepLoan form of JICA (Through home prestige bank): 70%	3392	3392	6785
Other Local bank's loan: 20%	969	969	1938
Total: 100%	4846	4846	9692

Notes) not calculate price increase factor

5) Purpose of capital use

Capital financing to meet equipment investment expenses following project route as mentioned above.

Table 3-18 Purpose of fund application (x 1000US$) (price in 2011)

	Year 2012	Year 2013	Total
Basic Infrastructure	2,084	2,084	4,168
Equipment/facilities	2,762	2,762	5,524
Total	4,846	4,846	9,692

Notes) not calculate price increase factor

6) Quantity of utility demand arising

<Unit price of electricity demand>

Result is 142.5 kWh/m^2*year based on result of 3 years of counting on practical use of monthly electricity in respective with area of IP premise in IP operating utility service supply.

<Unit price of clean water demand>

Result is 3.5 m^3/year*m^2 based on result of 3 years of counting on practical use of monthly water in respective with area of IP premise in IP operating utility service supply.

<Unit price of clean wastewater treatment demand>

Result is 2.8 m^3/year*m^2 based on result of 3 years of counting on practical use of monthly wastewater treatment in respective with area of IP premise.

<Waste: (Unit thick slurry after wastewater treatment counting>

Result is 0.0019 m^3/year*m^2 based on result of 3 years of counting on practical use of monthly wastewater treatment in respective with area of IP premise.

<Quantity of utility demand arising: conclusion>

Requirement of counting per utility demand unit arising through above working, consequently, it's a quantity of utility demand arising on area of 1,302,500m^2 in phase 2 Thuan Dao IP.

Table 3-19 Quantity of utility demand arising (Summary)

Unit of electricity supply	142.5	kWh/m^2-year	185,562,016	(Kw/h)/year(operation year)
Unit of water supply	3.5	m^3/ year-m^2	5,020,778	m^3/year (operation year)
Unit of wastewater arising	2.8	m^3/ year-m^2	4,008,156	m^3/year (operation year)
Unit of sludge arising after treating wastewater	0.0019	m^3/ year-m^2	2,783	m^3/year (operation year)

7) Income and expenses

Seek unit of receipts and expenses in connection with utilities based on selected information from existing IP providing utility services.

Table 3-20 Unit price of income from utilities

Income	Electricity supply	0.054	US$/kWh (Price in 2010)
	Water supply	0.200	US$/$m^3$ (Price in 2010)
	Wastewater treatment	0.28	US$/$m^3$ (Price in 2010)
	Waste treatment, preserve	1,571,008	VND/m^3 (Price in 2011)

Table 3-21 Unit price of expense from utilities

Expense	Electricity supply	0.053	US$/kWh (Price in 2010)
	Water supply	0.100	US$/$m^3$ (Price in 2010)
	Wastewater treatment	0.260	US$/$m^3$ (Price in 2010)
	Waste treatment, preserve	1,300,000	VND/m^3 (Price in 2011)

<Electrical supply>

There are not few of cases of separate contracted with EVN by plants in industrial park. In this case it's not become income of IP. However, according to selected information from existing IP providing utility services, heard that they have been installing transformer equipment by demand for high quality electricity and stable voltage. Unit price from electrical supply is 0,054US$ /kWh) (price year 2010. Unit price expense to electrical supply is 0,053USUS/ kWh (price year 2010)

<Water supply>

According to information from practical result of existing IP is initial building unit price of water is 0.20US$/$m^3$ (price in 2011) = 17.0 Yen/m^3 (price in 2011) and unit price of water supply operation is 0.10US$/$m^3$ and unit price expense to water supply operation is 0.10US$/$m^3$

<Wastewater treatment>

According to collected information from existing utility services IP, built unit price of turnover related wastewater treatment is 0,28US$/$m^3$ (price year 2010) and unit price of receipts is 0,26US$/$m^3$ (price year 2010)

<Waste treatment, preserve>

For waste treatment, preserve, firstly, counting unit price of sludge treatment expense (harmful) and sludge treatment expense (harmless) after treated wastewater, and probability of 10% of harmful wastewater arising and 90% of harmless wastewater arising, then taking weight average value following arising rate is the unit price of waste treatment, preserve demand arising. Practical result of existing IP providing utility services is:

Unit price of sludge treatment expense (harmful) after treated wastewater = 4,000,000 VND/m^3 (price in 2011)

Unit price of sludge treatment expense (harmless) after treated wastewater= 1.000.000VND/m^3 (price in 2011)

And taking weight average value following arising rate to establish as follows:

Unit price of waste treatment, preserve money =1.571.008VND/m^3 (price in 2011)

Unit price of waste treatment, preserve expense =1.300.000VND/m^3 (price in 2011)

<Labor charge>

Labor charge is considered through factors as existing specific example, current writing "Report of contributive investigation on international cooperation promotion in water supply year 2009"(in Japanese). Here intends having 2 managers, 35 engineers implement in operation phase. Established unit price of labor charge is manager = 10.184US$/person/year and engineer is 4.849US$/person/year under materials "Investigation of actual state of operation of Japan companies in Asia and South-east Asia in year 2010 (JETRO)" (Price in year 2010). From there can calculate labor charge in year of commercial operation is 217×1000US$/year

8) Depreciation

According to collected information, utility work (infrastructure): 30 years, utility work (machines, equipment), water work: 10 years, Water distribution work: 30 year. Anyhow, balance is established equal to 0.

(2) **Income and payments assessing result of project (in case of initial establishment) and sensibility analysis of project**

1) Income and payments assessing result of project (in case of initial building)

After assessing receipts and payments, counting accumulative loss and profit shall transfer into profitability from year 10th (2024) after commercial operation.

If calculate IRR (internal recover capital rate) based on formula (Investment – allowance)+EBITDA（interest rate・tax・ net profit), after operating commerce within 30 years IRR = 8,3%, after 20 years IRR = 4,3%, after 30 years IRR = negative.

Calculated EIRR (Equity Internal Rate of Return) (*) as referred value and EIRR (after 10 years of commercial operation) = 5.4%, EIRR (15 years) = 16.5%, EIRR (30 years) = 18.9%.

(*) EIRR calculated on supposed basing on investment, dividend, and receipts in case of supposed that shall sell company in each year assessment (total debts/capital owner – debts)

2) Sensibility analysis

(component of capital mobilization reaches IRR (15 years) ≥ 15%)

Seek condition so that IRR (15 years) ≥ 15% to increase driven with private investors. A enterprise moves IP shall pay right of use is 70US$/^{2} ~ 80US$/^{2} (50 years). Naturally, in this amount included utility construction expense of IP. Therefore, here, realized change of value of IRR (15 years) by making change of rate (amount) of entering into utility construction expenses from turnover from right of use (naturally is not lost fee). As a result, it satisfies IRR (15 years) ≥ 15% by entering 4.59 million US$ (3.52US$/m^2: equal to 4.4~5.0% of 70US$/^{2}~80US$/^{2}) into utility construction expense from turnover from right of use.

Table 3-22 Component of financing satisfied IRR (15 years)= 15%

Enter into turnover from right of use	Investment	2 step loan of JICA	Debt from domestic banks	IRR (15 Years)	EIRR (15 Years)
10%	10%	70%	20%	8.30%	16.5%
4.59MillionUS$.(3.52US$/m^2)	10%	47.0%	0%	15.0%	22.0%

1US$= 84.8 Yen

Table3-23

Environment-friendly Utility Supply Business

1.Industrial Park	Scale of the IP		1,898,430	sqm
	Selled Lot's Area		1,302,500	sqm
2. Sucedule				
	Construction Period		2012	Year(from)
			2013	Year(to)
	Opening Starting		2014	Years
3. Investment				
	Price increase rate (converted by VND/USD anualy average)		6.00%	
	Unit Construction Cost		7.02	$/sqm(2011Year)
	Share of Infrastracture	43%	4,168	×1000$ (Price at starting construction)
	Share of Institution	57%	5,525	×1000$ (Price at starting construction)
	Share of others	0%	0	×1000$ (Price at starting construction)
	Investment Total		9,692	×1000$ (Price at starting construction)
			193,843	Million VND
			9.69	Million $
4. Financial Mnagement	Financial Procurement Total		9,692	×1000$ (Price at starting construction)
	Equity (Private Fund + Private Maker + IP's management Unit)		969	×1000$ (Price at starting construction)
	Gorvanmental Subsidy		0	×1000$ (Price at starting construction)
	JICA's 2step Loan		6,785	×1000$ (Price at starting construction)
	Local Bank's Rate (JICA's 2step Loan)		6.00%	
	Payment Method of JICA's 2step Loan		5	Year's Grace 25
	Borrowing form others		1,938	×1000$ (Price at starting construction)
	Banking Rate		6.00%	Check
	Payment Method		15	years Level Payment
	Short-term interest rate		10.00%	
	Cash equivalent return		1.00%	

5.Salese

			Variation		
Electric Power	Supply price	142.5	(Kwh)/sqm･year	185,562,016	kWh/h/year (Price at starting operation)
Water	Supply price	3.5	m3/year･sqm	4,536,509	m3/year (Price at starting operation)
Wastewater	Generating Unit	2.8	m3/year･sqm	3,618,809	m3/year (Price at starting operation)
Sludge	After treatment Sludge generating Unit	0.0019	m3/year･sqm	2,513	m3/year (Price at starting operation)
Electric Pwer	Salse price	0.0540	$/(Kwh)(2010Year price)	12,650	×1000$ (Price at starting operation)
Water	Salse price	0.2000	$/m3(2010Year price)	1,145	×1000$ (Price at starting operation)
Wastewater	Treatment Fee Price	0.2800	$/m3(2010Year price)	1,279	×1000$ (Price at starting operation)
Sludge	Hazardous Sludge Treatment Fee Price	4,833,870	VND/m3(2011Year price)		
Sludge	WasteTreatment Fee Price	1,208,467	VND/m3(2011Year price)		
Sludge	Wast Management Fee Price	1,571,008	VND/m3(2011Year price)	235	×1000$ (Price at starting operation)
Total Salse	Sensitivity coefficient	100%		15,310	×1000$ (Price at starting operation)

6. Costs

Electric Power	Cost Price	0.0530	$/(kWh (2010Year-Price)	12,416	×1000$ (Price at starting operation)
Water	Cost Price	0.1000	$/m3 (2010Year price)	573	×1000$ (Price at starting operation)
Wastewater	Cost Price	0.2600	$/m3(2010Year price)	1,188	×1000$ (Price at starting operation)
Sludge	Cost Price	4,000,000	VND/m3(2011Year price)		Probability=10%
Sludge	Cost Price	1,000,000	VND/m3(2011Year price)		Probability=90%
Sludge	Cost Price	1,300,000	VND/m3(2011Year price)	195	×1000$ (Price at starting operation)
Total Costs	Sensitivity coefficient	100%		14,371	×1000$ (Price at starting operation)
Manpower (2 managers / 35Engineers)		180	×1000$ (2010Year price) ⇒	227	×1000$ (Price at starting operation)

7. Depliciation	Infrastracture	30	Year(Fixed Amount)	Residual value
	Institution	10	Year(Fixed Amount)	Residual value
	Others	5	Year(Fixed Amount)	Residual value
8.Tax	Enterprise tax on corporation	25%		

Table3-52～54

			(2)	(1)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Environment-friendly Utility Supply Business (Unit：×1000US$)			2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
P/L	Revenue	Electricity + water + wastewater treatment +waste treatment	0	0	15,310	16,229	17,203	18,235	19,329	20,489	21,718	23,021	24,402	25,866	27,418	29,063	30,807	32,656	34,615	36,692
		Other incomes																		
	Total revenue		0	0	15,310	16,229	17,203	18,235	19,329	20,489	21,718	23,021	24,402	25,866	27,418	29,063	30,807	32,656	34,615	36,692
	Cost of sales	Purchases																		
		Other																		
	Total cost of sales		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Operating Expenditure	Operating cost	0	0	14,371	15,234	16,148	17,116	18,143	19,232	20,386	21,609	22,906	24,280	25,737	27,281	28,918	30,653	32,492	34,442
		Business expense	0	0	227	241	255	271	287	304	322	342	362	384	407	431	457	484	513	544
		Expenditure of O&M, water supply equipment rent																		
		Other expenditure																		
		Fixed asset tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total operating expenditure		0	0	14,598	15,474	16,403	17,387	18,430	19,536	20,708	21,951	23,268	24,664	26,144	27,712	29,375	31,137	33,006	34,986
	Net profit (before depreciation)		0	0	712	755	800	848	899	953	1,010	1,070	1,135	1,203	1,275	1,351	1,432	1,518	1,609	1,706
	Depreciation	Infrastructure＋equipment・Machines＋distribution water	0	0	691	691	691	691	691	691	691	691	691	691	139	139	139	139	139	139
	Net operating profit		0	0	20	63	108	156	207	261	318	379	443	511	1,136	1,212	1,293	1,379	1,470	1,567
	Non-operating revenue and exper	Interest received	0	0	0	0	5	11	17	19	20	22	24	28	32	35	40	45	51	58
		Interest expense	0	58	154	105	97	89	488	473	449	425	400	376	352	328	304	280	256	236
	Ordinary profit		0	-58	-133	-41	17	78	-264	-192	-110	-24	67	163	815	919	1,029	1,144	1,265	1,389
	Taxation	Corporate income tax ect.	0	0	0	0	4	20	0	0	0	0	17	41	204	230	257	286	316	347
	Profit in the current term		0	-58	-133	-41	13	59	-264	-192	-110	-24	50	122	612	690	772	858	949	1,042
	Dividend payment		0	0	0	0	11	50	0	0	0	0	43	104	520	586	656	729	806	886
	Profit in the current term after dividend payment		0	-58	-133	-41	2	9	-264	-192	-110	-24	8	18	92	103	116	129	142	156
	Accumulated profit		0	-58	-192	-233	-220	-162	-425	-618	-728	-752	-702	-580	32	721	1,493	2,351	3,299	4,341
Sources and uses statement	Sources	Revenue	0	0	15,310	16,229	17,203	18,235	19,329	20,489	21,718	23,021	24,402	25,866	27,418	29,063	30,807	32,656	34,615	36,692
		Interest received	0	0	0	0	5	11	17	19	20	22	24	28	32	35	40	45	51	58
		Investment (Private fund +Private manfacturing company + IP management investor)	485	485	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		JICA 2 Step Loan（Through local blue-chip bank）	3,392	3,392	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Government subsidies of Infrastructure construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Other Local bank's loan	969	969	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Reversal of cash and deposits	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Short term debt	0	414	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Total Sources	4,846	5,260	15,310	16,229	17,208	18,246	19,346	20,507	21,738	23,043	24,427	25,894	27,450	29,099	30,847	32,700	34,666	36,750
	Uses	Total operating expenditure	0	0	14,598	15,474	16,403	17,387	18,430	19,536	20,708	21,951	23,268	24,664	26,144	27,712	29,375	31,137	33,006	34,986
		Interest expense	0	58	154	105	97	89	488	473	449	425	400	376	352	328	304	280	256	236
		Taxation	0	0	0	0	4	20	0	0	0	0	17	41	204	230	257	286	316	347
		Utility facilities investment (infrastructure)	2,084	2,209	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Utility facilities investment (equipment, machines)	2,762	2,928	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Other utility facilities investmnet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Refund of JICA 2 Step Loan	0	0	0	0	0	0	136	271	271	271	271	271	271	271	271	271	271	271
		Refund of other Local bank's loan	0	65	129	129	129	129	129	129	129	129	129	129	129	129	129	129	65	0
		Refund of short term debt	0	0	414	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Deposit of cash	0	0	15	521	575	621	163	98	180	267	341	413	350	428	510	596	752	909
		Total Uses	4,846	5,260	15,310	16,229	17,208	18,246	19,346	20,507	21,738	23,043	24,427	25,894	27,450	29,099	30,847	32,700	34,666	36,750
B/S	Asset	Cash	0	0	15	536	1,111	1,732	1,894	1,993	2,173	2,440	2,781	3,194	3,543	3,971	4,481	5,077	5,829	6,738
		Fixed asset balance	4,846	9,983	9,292	8,600	7,909	7,217	6,526	5,835	5,143	4,452	3,761	3,069	2,930	2,791	2,652	2,514	2,375	2,236
		Total asset	4,846	9,983	9,307	9,136	9,020	8,949	8,420	7,827	7,316	6,892	6,542	6,263	6,474	6,763	7,134	7,591	8,204	8,974
	Liabilities	Borrowing	4,361	9,072	8,529	8,400	8,271	8,141	7,876	7,476	7,075	6,675	6,274	5,873	5,473	5,072	4,672	4,271	3,935	3,664
		Capital	485	969	969	969	969	969	969	969	969	969	969	969	969	969	969	969	969	969
		Grant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Reserve	0	-58	-192	-233	-220	-162	-425	-618	-728	-752	-702	-580	32	721	1,493	2,351	3,299	4,341
		Total Liabilities	4,846	9,983	9,307	9,136	9,020	8,949	8,420	7,827	7,316	6,892	6,542	6,263	6,474	6,763	7,134	7,591	8,204	8,974
	Depriciation expense (utility faci	Depriciation by straight-line method	0	0	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139
	Depriciation expense (utility faci	Depriciation by straight-line method	0	0	552	552	552	552	552	552	552	552	552	552	0	0	0	0	0	0
	Depriciation expense (other utilit	Depriciation by straight-line method	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fixed asset balace	0	4,846	9,983	9,292	8,600	7,909	7,217	6,526	5,835	5,143	4,452	3,761	3,069	2,930	2,791	2,652	2,514	2,375	2,236
	JICA 2 Step Loan（Through loca	Outstanding balance	3,392	6,785	6,785	6,785	6,785	6,785	6,649	6,377	6,106	5,835	5,563	5,292	5,021	4,749	4,478	4,206	3,935	3,664
		Principal repayments (Total)	0	0	0	0	0	0	136	271	271	271	271	271	271	271	271	271	271	271
		Principal repayment 1	0	0	0	0	0	0	136	136	136	136	136	136	136	136	136	136	136	136
		Principal repayment 2		0	0	0	0	0	0	136	136	136	136	136	136	136	136	136	136	136
		Principal repayment 3			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Interest expense	0	0	0	0	0	0	407	399	383	366	350	334	318	301	285	269	252	236
		0																		
	Other Local bank's loan	Outstanding balance	969	1,874	1,745	1,615	1,486	1,357	1,228	1,098	969	840	711	582	452	323	194	65	0	0
		Principal repayments (Total)	0	65	129	129	129	129	129	129	129	129	129	129	129	129	129	129	65	0
		Principal repayment 1	0	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	0	0
		Principal repayment 2		0	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	0
		Principal repayment 3			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Interest expense	0	58	112	105	97	89	81	74	66	58	50	43	35	27	19	12	4	0
	Short term debt	Outstanding balance	0	414	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Borrowing	0	414	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Repayment	0	0	414	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Interest expense	0	0	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0																		
	Deposit	Outstanding balance	0	0	15	536	1,111	1,732	1,894	1,993	2,173	2,440	2,781	3,194	3,543	3,971	4,481	5,077	5,829	6,738
		Deposit	0	0	15	521	575	621	163	98	180	267	341	413	350	428	510	596	752	909
		Reversal of cash and deposits	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

		(2)	(1)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
①	Investment in facility and equipment	4,846	5,137	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
②	Government subsidies of Infrastructure construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
③	Ordinary profit	0	-58	-133	-41	17	78	-264	-192	-110	-24	67	163	815	919	1,029	1,144	1,265	1,389
④	Depreciation	0	0	691	691	691	691	691	691	691	691	691	691	139	139	139	139	139	139
⑤	Interest expense	0	58	154	105	97	89	488	473	449	425	400	376	352	328	304	280	256	236
⑥	Interest received	0	0	0	0	5	11	17	19	20	22	24	28	32	35	40	45	51	58
⑦=-(①-②)+③+④+⑤-⑥	"-(Investment - Government subsidiees)+EBITDA	-4,846	-5,137	712	755	800	848	899	953	1,010	1,070	1,135	1,203	1,275	1,351	1,432	1,518	1,609	1,706
	IRR（10 years)=	0.9%																	
	IRR（15 years)=	6.5%																	
	IRR（30 years)=	11.3%																	
①	Investment in facility and equipment	485	485	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
②	Government subsidies of Infrastructure construction	0	-58	-133	-41	17	78	-264	-192	-110	-24	67	163	815	919	1,029	1,144	1,265	1,389
①-②		-485	-485	0	0	11	50	0	0	0	0	43	104	520	586	656	729	806	886
	EIRR（10 years)=	-3%																	
	EIRR（15 years)=	12%																	
	EIRR（30 years)=	18%																	
	(-Investment)+Dividend+Selling profit of the company 10th year after operation	-485	-485	0	0	11	50	0	0	0	0	43	104	1,521					
	(-Investment)+Dividend+Selling profit of the company 15th year after operation	-485	-485	0	0	11	50	0	0	0	0	43	104	520	586	656	729	806	6,196
	(-Investment)+Dividend+Selling profit of the company 30th year after operation	-485	-485	0	0	11	50	0	0	0	0	43	104	520	586	656	729	806	886
	EIRR（10 years)=	5.4%																	
	EIRR（15 years)=	16.5%																	
	EIRR（30 years)=	18.9%																	

Table3-52～54

			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Environment-friendly Utility Supply Business (Unit：×1000US$)			2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
P/L	Revenue	Electricity + water + wastewater treatment +waste treatment	38,893	41,227	43,701	46,323	49,102	52,048	55,171	58,481	61,990	65,710	69,652	73,831	78,261	82,957	87,934
		Other incomes															
	Total revenue		38,893	41,227	43,701	46,323	49,102	52,048	55,171	58,481	61,990	65,710	69,652	73,831	78,261	82,957	87,934
	Cost of sales	Purchases															
		Other															
	Total cost of sales		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Operating Expenditure	Operating cost	36,508	38,699	41,021	43,482	46,091	48,856	51,788	54,895	58,189	61,680	65,381	69,303	73,462	77,869	82,542
		Business expense	577	612	648	687	728	772	818	868	920	975	1,033	1,095	1,161	1,231	1,304
		Expenditure of O&M, water supply equipment rent															
		Other expenditure															
		Fixed asset tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total operating expenditure		37,085	39,310	41,669	44,169	46,819	49,628	52,606	55,762	59,108	62,655	66,414	70,399	74,623	79,100	83,846
	Net profit (before depreciation)		1,808	1,917	2,032	2,154	2,283	2,420	2,565	2,719	2,882	3,055	3,238	3,433	3,639	3,857	4,088
	Depreciation	Infrastructure＋equipment・Machines＋distribution water	139	139	139	139	139	139	139	139	139	139	139	139	139	139	0
	Net operating profit		1,669	1,778	1,893	2,015	2,144	2,281	2,426	2,580	2,743	2,916	3,099	3,294	3,500	3,718	4,088
	Non-operating revenue and exper	Interest received	67	77	88	101	114	128	144	161	180	199	221	244	269	296	326
		Interest expense	220	204	187	171	155	138	122	106	90	73	57	41	24	0	0
	Ordinary profit		1,517	1,652	1,794	1,944	2,103	2,271	2,448	2,635	2,833	3,042	3,263	3,497	3,744	4,014	4,414
	Taxation	Corporate income tax ect.	379	413	449	486	526	568	612	659	708	761	816	874	936	1,003	1,104
	Profit in the current term		1,138	1,239	1,346	1,458	1,577	1,703	1,836	1,976	2,125	2,282	2,447	2,623	2,808	3,010	3,311
	Dividend payment		967	1,053	1,144	1,240	1,341	1,448	1,561	1,680	1,806	1,939	2,080	2,229	2,387	2,559	2,814
	Profit in the current term after dividend payment		171	186	202	219	237	255	275	296	319	342	367	393	421	452	497
	Accumulated profit		5,479	6,718	8,063	9,521	11,099	12,802	14,638	16,614	18,739	21,021	23,468	26,091	28,899	31,909	35,220
Sources and uses statement	Sources	Revenue	38,893	41,227	43,701	46,323	49,102	52,048	55,171	58,481	61,990	65,710	69,652	73,831	78,261	82,957	87,934
		Interest received	67	77	88	101	114	128	144	161	180	199	221	244	269	296	326
		Investment (Private fund +Private manfacturing company + IP management investor)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		JICA 2 Step Loan（Through local blue-chip bank）	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Government subsidies of Infrastructure construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Other Local bank's loan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Reversal of cash and deposits	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Short term debt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Total Sources	38,961	41,304	43,789	46,423	49,216	52,176	55,315	58,642	62,170	65,909	69,873	74,075	78,530	83,253	88,260
	Uses	Total operating expenditure	37,085	39,310	41,669	44,169	46,819	49,628	52,606	55,762	59,108	62,655	66,414	70,399	74,623	79,100	83,846
		Interest expense	220	204	187	171	155	138	122	106	90	73	57	41	24	0	0
		Taxation	379	413	449	486	526	568	612	659	708	761	816	874	936	1,003	1,104
		Utility facilities investment (infrastructure)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Utility facilities investment (equipment, machines)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Other utility facilities investmnet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Refund of JICA 2 Step Loan	271	271	271	271	271	271	271	271	271	271	271	271	271	136	0
		Refund of other Local bank's loan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Refund of short term debt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Deposit of cash	1,005	1,106	1,213	1,326	1,445	1,571	1,704	1,844	1,992	2,149	2,315	2,490	2,676	3,013	3,311
		Total Uses	38,961	41,304	43,789	46,423	49,216	52,176	55,315	58,642	62,170	65,909	69,873	74,075	78,530	83,253	88,260
B/S	Asset	Cash	7,744	8,850	10,063	11,389	12,834	14,404	16,108	17,952	19,944	22,093	24,408	26,899	29,574	32,588	35,898
		Fixed asset balance	2,097	1,958	1,819	1,680	1,541	1,402	1,263	1,124	985	846	708	569	430	291	291
		Total asset	9,840	10,808	11,882	13,069	14,375	15,806	17,371	19,076	20,930	22,940	25,116	27,467	30,004	32,879	36,189
	Liabilities	Borrowing	3,392	3,121	2,849	2,578	2,307	2,035	1,764	1,493	1,221	950	678	407	136	-0	-0
		Capital	969	969	969	969	969	969	969	969	969	969	969	969	969	969	969
		Grant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Reserve	5,479	6,718	8,063	9,521	11,099	12,802	14,638	16,614	18,739	21,021	23,468	26,091	28,899	31,909	35,220
		Total Liabilities	9,840	10,808	11,882	13,069	14,375	15,806	17,371	19,076	20,930	22,940	25,116	27,467	30,004	32,879	36,189
	Depriciation expense (utility faci	Depriciation by straight-line method	139	139	139	139	139	139	139	139	139	139	139	139	139	139	0
	Depriciation expense (utility faci	Depriciation by straight-line method	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Depriciation expense (other utilit	Depriciation by straight-line method	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fixed asset balace	0	2,097	1,958	1,819	1,680	1,541	1,402	1,263	1,124	985	846	708	569	430	291	291
	JICA 2 Step Loan（Through loca	Outstanding balance	3,392	3,121	2,849	2,578	2,307	2,035	1,764	1,493	1,221	950	678	407	136	0	0
		Principal repayments (Total)	271	271	271	271	271	271	271	271	271	271	271	271	271	136	0
		Principal repayment 1	136	136	136	136	136	136	136	136	136	136	136	136	136	0	0
		Principal repayment 2	136	136	136	136	136	136	136	136	136	136	136	136	136	136	0
		Principal repayment 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Interest expense	220	204	187	171	155	138	122	106	90	73	57	41	24	0	0
		0															
	Other Local bank's loan	Outstanding balance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Principal repayments (Total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Principal repayment 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Principal repayment 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Principal repayment 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Interest expense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Short term debt	Outstanding balance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Borrowing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Repayment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Interest expense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0															
	Deposit	Outstanding balance	7,744	8,850	10,063	11,389	12,834	14,404	16,108	17,952	19,944	22,093	24,408	26,899	29,574	32,588	35,898
		Deposit	1,005	1,106	1,213	1,326	1,445	1,571	1,704	1,844	1,992	2,149	2,315	2,490	2,676	3,013	3,311
		Reversal of cash and deposits	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	①	Investment in facility and equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	②	Government subsidies of Infrastructure construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	③	Ordinary profit	1,517	1,652	1,794	1,944	2,103	2,271	2,448	2,635	2,833	3,042	3,263	3,497	3,744	4,014	4,414
	④	Depreciation	139	139	139	139	139	139	139	139	139	139	139	139	139	139	0
	⑤	Interest expense	220	204	187	171	155	138	122	106	90	73	57	41	24	0	0
	⑥	Interest received	67	77	88	101	114	128	144	161	180	199	221	244	269	296	326
	⑦=-(①-②)+③+④+⑤-⑥	"-(Investment - Government subsidiees)+EBITDA	1,808	1,917	2,032	2,154	2,283	2,420	2,565	2,719	2,882	3,055	3,238	3,433	3,639	3,857	4,088
		IRR（10 years)=															
		IRR（15 years)=															
		IRR（30 years)=															
	①	Investment in facility and equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	②	Government subsidies of Infrastructure construction	1,517	1,652	1,794	1,944	2,103	2,271	2,448	2,635	2,833	3,042	3,263	3,497	3,744	4,014	4,414
	①-②		967	1,053	1,144	1,240	1,341	1,448	1,561	1,680	1,806	1,939	2,080	2,229	2,387	2,559	2,814
		EIRR（10 years)=															
		EIRR（15 years)=															
		EIRR（30 years)=															
		(-Investment)+Dividend+Selling profit of the company 10th year after operation															
		(-Investment)+Dividend+Selling profit of the company 15th year after operation															
		(-Investment)+Dividend+Selling profit of the company 30th year after operation	967	1,053	1,144	1,240	1,341	1,448	1,561	1,680	1,806	1,939	2,080	2,229	2,387	2,559	39,003
		EIRR（10 years)=															
		EIRR（15 years)=															
		EIRR（30 years)=															

3-4 Water supply business

3-4-1 Project purpose

The project area (such as the Duc Hoa and Ben Luc district) has been currently installed only around 10 water supply facilities with capacity of 1000 m^3 to 15000 m^3 per day. Those water supplies have been conducted mainly in very limited urban and industrial areas. And all of the water source comes from groundwater; the everyday supplies volume just reaches the level of 40.000 m^3.

Long An province is not preferred in terms of irrigation. Groundwater has been only water source for domestic and industrial use in Long An province because surface water in the Province has been not enough for their water demand. Continuous groundwater intake has been caused land subsidence phenomenon, and there is also the landslide in the IP that the Phu My Vinh company is managing (Duc Hoa district), which caused difference slide of more than 20cm in just over a year after construction at the entrance stairs of the office. Phu My Vinh Company proved concern that "if use 3000m^3 groundwater each day, cause slide of more than 20 cm per year. When the number of invested factories increased, the rate of landslides will increase faster. "

Long An province is also worrying about that, if groundwater was used as today, there would be risks arising out of land subsidence in the several areas. The Province declares a water policy that "Building water supply systems and equipments with surface water by utilizing private capital and enforcement", and will ban on the use of groundwater after completion of such systems.

The project is to build water supply system using surface water with the cooperation of Phu My Vinh Company - which has been permitted 300,000 m^3/day water intake right in Long An province. The water will be supplied to IP s in Duc Hoa, Ben Luc districts and also to around residents aiming to develop so-called "environment-friendly IPs" and finally prohibit the use of groundwater.

This is the first project carrying out "privatized water supply system with surface water" in Vietnam. The project enables Long An province to realize natural environmental preservation and improvement of public health.

3-4-2 Project site

- The water intake location: Binh Huu 2 hamlet, Duc Hoa Thuong Commune, Duc Hoa district, Long An province
- The water supply areas: Duc Hoa, Ben Luc districts, (and surrounding as Can Duoc, Can Guoc)Long An province.

3-4-3 Project Outline

The project will supply water about 200,000 m^3/ day (intake: 214,000 m^3 / day) of 300,000m^3 / day which Phu My Vinh company has been permitted. The rest of 80,000m^3 / day has been already committed for the project which has conducted by Korea's ODA (Details refer to (3) in the 3-4-7) since 2009.

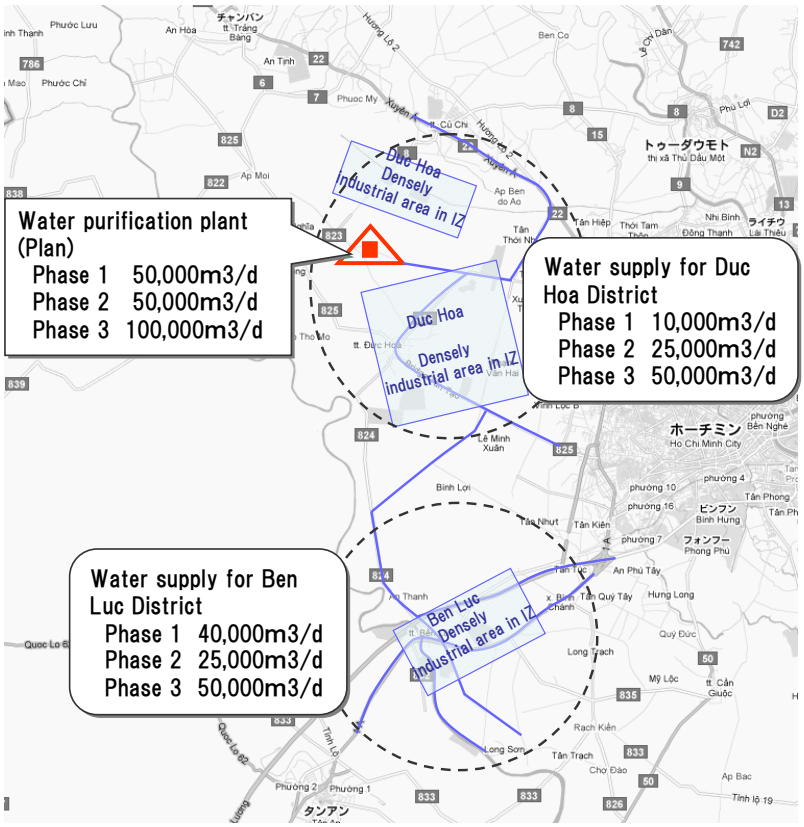
Diagram 2-6 shows an overview of the project. Phase division and capacity of each phase are considered according to estimation of water demand in section 0.

<Project phases>

There will be three phases to implement the project at the Duc Hoa, Ben Luc and around districts. Period of implementation shall be completed in 2020, the target year of Master Plan of Long An province. And this project set goals of each phase as phase 1 in 2015, phase 2 in 2018 and phase 3 in 2020.

<Capacity of each phase>

Given capacity of each system of sedimentation basin and filter is 50,000 m^3. This project designs phase 1 is 50.000m^3 / day × 1 system = 50,000 m^3/day, phase 2 is 50.000m^3 ×1 = 50,000 m^3/ day, and phase 3 is 50.000m^3 x 2 = 100.000m^3/ day with taking into account tolerance of the risk for demand volatilities in each phase. On the other hand, distribution network installation (route, location of pumping stations, diameter of pipelines, and number of pipelines ...) shall be designed satisfying capacity of 200,000m^3/ day, initially.



(Source) Geographic name map：GoogleMaps

Figure 3-15 Project overview

3-4-4 Project body

To carry out water supply service requires such functions as guaranteeing water rights, intaking and filtering water, supplying water and collecting bills. Each function must be identified and undertaken by the most appropriate body in this project scope. Hereafter is the draft list of bodies for each function.

Table 3-28 Required functions and implementation bodies

Function	Option of implementation body	Candidate in this project
Guarantee water rights	Phu My Vinh company guaranteed this right by Ministry of Agriculture and Rural Development through Long An province.	Phu My Vinh company
Intake-filtering water	Following bodies may be considered: ● Existing local water supply company ● Local enterprise ● Japanese enterprise ● Joint venture	According to viewpoint of continuity of business and inheritance of know-how of Japan:Joint venture company composed of local and Japanese enterprises
Water supply Collecting water bills	Following bodies may be considered ● Same as intake-filtering water company ● IP management company for IP use * ● Existing local water supply company for residents use * *This means bulk sales by intake-filtering water company.	According to viewpoint of practical achievement: 【 for IP】IP management company 【 for residents】Existing local water supply company

3-4-5 Demand estimation

Consumers of this water supply service will be companies in and out of IPs and residents. Among them, the prior target consumer of the project is companies in IP because land subsidence by groundwater intake is becoming a serious matter. Thus, here focuses on estimation of water demand for IPs.

(1) Existing water supply works

Before estimating demand, here summarizes existing water supply works for the project location.

There are seven existing water supply works as shown in Table 3-29. All of those water supply works have been using groundwater as intake, and caused land subsidence. And there have been carried out other water supply works for IPs by themselves with using groundwater.

The demand estimation of this project also includes volumes of those existing supplies because this project aims to switch existing supplies with groundwater into with surface water. For implementing the switch from groundwater to surface water, water supply company of the project will sell clean water (bulk sales) to existing IP management companies (ex. Phu My Vinh company) and local water supply companies, and those existing companies will keep supplying to end consumers like companies in IPs or residents.

Table 3-29 Existing water supply works

Name of water supply works	Consumer	Capacity	Company
Phu My Vinh groundwater	IP of Duc Hoa district	15,000m^3/day	Phu My Vinh
Duc Hoa town groundwater	Residents in Duc Hoa district	1,000m^3/day	Local Water supply company
Ben Luc town groundwater	Residents in Ben Luc district	1,000m^3/day	Local Water supply company
Go Den groundwater	Residents in Go Den, Ben Luc area	7,200m^3/day	Local Water supply company
Can Duoc groundwater	Residents in Can Duoc area	1,000m^3/day	Local Water supply company
Can Giuoc groundwater	Residents in Can Giuoc area	2,000m^3/day	Local Water supply company
Tan An groundwater	IP and residents in the west Vam Co Dong river	15,000m^3/day	Local Water supply company

(2) Water demand estimation for industrial parks

Here is the demand estimation for IPs which the project assumes as main target.

1) Conditions of demand estimation

This demand estimation is carried out based on the following viewpoints:

- List operating IPs in intended location of the project.

- Water demand for IP is estimated 40m^3/day per 1ha area. This 40m^3/day unit is extracted from experiences of VIWASE, the Vietnam consulting company.
- However, by activity ratio (rate of companies transfer into IP) with regard to each IP is different, so assume activity ratio of each period until phase 3 under current ratio. Activity ratio is supposed to reach 100% in year 2020, the final phase.
- Based on above conditions, demand of IPs are calculated the following formula "area x activity ratio x 40m^3/day".
- Besides, 40.000m^3/day will be supplied through Korean ODA project in Duc Hoa district, so this amount must be excluded from demand estimation.
- Furthermore, according to information from Phu My Vinh, Saigon Water Supply Corporation (SAWACO) is intending to supply 50.000m^3/day in Duc Hoa district, so it's also excluded from demand estimation of this project.

2) Water demand for industrial park forecast

We carried out demand estimation as stated in Table 3-30 following based on above conditions.

Estimation result shows 48,993m^3/day for phase 1,92,734m^3/day for phase 2, 132,869m^3/day phase 3. Then with this result, we plan implementation as 50.000m^3/day for phase 1,＋50,000m^3/day (totally 100,000m^3/day) for phase 2; 100,000m^3/day (totally 200,000m^3/day) for phase 3.

Besides of IPs, project can supply balance water portion (excess water) to neighboring companies and residents. Especially, phase 3 in year 2020, increase or decrease of plants in IP is not able to be determined because it's still period of 10 years, we expect in trend of increasing water demand of residents by change of their lifestyle. Thus, certainly, phase division and supply volume in each phase are entirely reasonable.

Table 3-30 Demand estimation for IPs

District	Industrial park	Area (ha)	Current activity ratio	Forecast demand.(m^3/day)					
				year 2015 .(Phase 1)		Year 2018 .(Phase 2)		Year 2020 .(Phase 3)	
				activity ratio	Demand	activity ratio	Demand	activity ratio	Demand
Duc Hoa	Duc Hoa 1(phase 1 and 2)	274	41%	75%	8,220	90%	9,864	100%	10,960
	Duc Hoa 3(Anh Hong, Thai Hoa and Viet Hoa)	1376	20%	60%	33,024	80%	44,032	100%	55,040
	Xuyen A	306	41%	75%	9,180	90%	11,016	100%	12,240
	Tan Duc (phase 1 and 2)	535	34%	75%	16,050	90%	19,260	100%	21,400
	Vinh Loc 2	226	unknown	50%	4,520	75%	6,780	100%	9,040
	Total				70,994		90,952		108,680
Thu Thua	Tan Thanh	768	0%	50%	15,360	75%	23,040	100%	30,720
	Total				15,360		23,040		30,720
Ben Luc	Bac An Thanh	692.23	1%	50%	13,845	75%	20,767	100%	27,689
	Tan Buu-Long Hiep	179.5	0%	50%	3,590	75%	5,385	100%	7,180
	Thanh Duc	255	0%	50%	5,100	75%	7,650	100%	10,200
	Thuan Dao Ben Luc	144	97%	100%	5,760	100%	5,760	100%	5,760
	Nhut Chanh	106	58%	85%	3,604	100%	4,240	100%	4,240
	Total				31,899		43,802		55,069
Tan Tru	An Nhut Tan	120	0%	50%	2,400	75%	3,600	100%	4,800
	Total				2,400		3,600		4,800
Can Duoc	Cau Tram	78	9%	50%	1,560	75%	2,340	100%	3,120
	Total				1,560		2,340		3,120
Can Giuoc	Tan Kim	104	31%	75%	3,120	90%	3,744	100%	4,160
	Long Hau	142	76%	100%	5,680	100%	5,680	100%	5,680
	Nam Tan Tap	266	27%	75%	7,980	90%	9,576	100%	10,640
	Total				16,780		19,000		20,480
Total					138,993		182,734		222,869
Water supply through Korea's ODA project 40,000m^3/day (Duc Hoa district)					−40,000		−40,000		−40,000
Purchase water from Ho Chi Minh city 50,000m^3/ day (Duc Hoa district)					−50,000		−50,000		−50,000
Total					48,993		92,734		132,869

.(Source)Industrial park, area, activity ratio: Ministry of Resources and Environment, "National State of Environment 2009", JETRO "Plan of commodity distribution, traffic infrastructure and IP in suburb of Ho Chi Minh city"

(3) 【Reference 1】Water demand for company outside industrial park

Besides of IP, there are companies in target location of the project. This part put forth demand estimation of those companies, because excess water by the project can be distributed to such companies. However, this estimation may include high volatility, because increase or decrease of companies will not be able to expect unlike IPs based on government industrial policy. In this report, it is treated to just a reference.

1) Conditions of demand estimation

- List companies operating in project area based on survey result of Vietnam Water and Environment Company (VIWASE), the Vietnam consulting company.
- Estimated water demand for each company is 30m^3/day per 1ha area. This 30m^3/day unit is extracted from experience of VIWASE, the Vietnam consulting company.
- Based on above conditions, demand of companies are calculated the following formula "area x activity ratio

x 30m^3/day”

2) Water demand for companies outside industrial parks

According to above conditions, we estimate water demand for companies outside IPs as follows:

Table 3-31 Demand estimation of companies outside IPs (year2020)

District	Company name	Area (ha)	Demand estimation.(m^3/day) Area ×30m^3/day
Duc Hoa	Tan Do Co.	300	9,000
	Lien Hung Co.	33	990
	Plastic Co.	48	1,440
	Hai Son Co.	384	11,520
	Hai Son Co.	297	8,910
	Lien Minh Co.	36	1,080
	Hoang Gia Co.	142	4,260
	Duc Thuan Co.	47	1,410
	Hoang Khang Co.	200	6,000
	Hong Ha Co.	150	4,500
	Phu My Co.	49	1,470
	Dai Loc Co.	306	9,180
	Be Great International Holding Limited Co.	41	1,230
	Sao Vang Co.	32	960
	Total		**61,950**
Ben Luc	Thinh Phat Co.	73	2,190
	Dai Dong Co.	22	660
	Hiep Thanh Co.	23	690
	Luong Hoa Co.	38	1,140
	Thanh Phu Co.	266	7,980
	Nhut Chanh Co.	107	3,210
	Viet Uc Co.	21	630
		Total	**16,500**
Thu Thua	CCN Nhi Thanh	118	3,540
	Total		**3,540**
Can Duoc	Long Dinh - Long Cang Co.	113	3,390
	Vinh Phong Co.	68	2,040

District	Company name	Area (ha)	Demand estimation.(m^3/day) Area ×30m^3/day
	Long Dinh Long Cang Co.	127	3,810
	Long Cang extension Co.	557	16,710
	Dong Tam Co.	300	9,000
	Nhat Quang Co.	30	900
	Thanh Tai Co.	70	2,100
	Phuoc Đong Co.	195	5,850
	Deep water port Co	500	15,000
	Total		**58,800**
Can Giuoc	Nam Hoa Co.	280	8,400
	Truong Binh Co.	30	900
	Long Thuong Co.	55	1,650
	Hanh Tram Co.	24	720
	Shipbuilding Co.	100	3,000
	Total		**14,670**
Total			**155,460**

(4) 【Reference 2】Demand estimation of residents

This part describes demand of residents. However as same as companies outside IPs, this estimation has high volatility. So we give this estimation as just a reference.

1) The population of Long An province

Trends in population over the entire province of Long An from year 2000 to 2008 are shown in Table 3-32 and Figure 3-16. It shows that progress of population growth is almost unchanged, and urban population is less than 20%.

This part describe demand of households, it's not in companies. However as same as companies outside IP, we need to pay attention for risks of high demand. This report quotes necessary points to which need to refer.

Table 3-32 Population from year 2000 to 2008 (Categorized on male/female, urban areas and changing process of the birth rate)

	Population	Male	Female	Urban (Persons)	Rural (Persons)	Growth Rate
2000	1,327,935	650,554	677,381	215,613	1,112,322	1.37%
2001	1,347,731	659,375	688,356	222,375	1,125,356	1.49%
2002	1,364,355	667,037	697,349	224,928	1,139,427	1.23%
2003	1,381,305	677,037	704,268	227,475	1,153,830	1.24%
2004	1,400,503	687,336	713,167	230,123	1,170,380	1.39%
2005	1,412,834	694,677	718,157	233,843	1,178,991	0.88%
2006	1,423,735	700,046	723,689	235,499	1,188,236	0.77%
2007	1,434,506	705,347	729,159	249,262	1,185,244	0.76%
2008	1,444,660	710,345	734,315	250,668	1,193,992	0.71%

Source：Statistical Yeare Book 2008 By LA Provincial Statistics Office

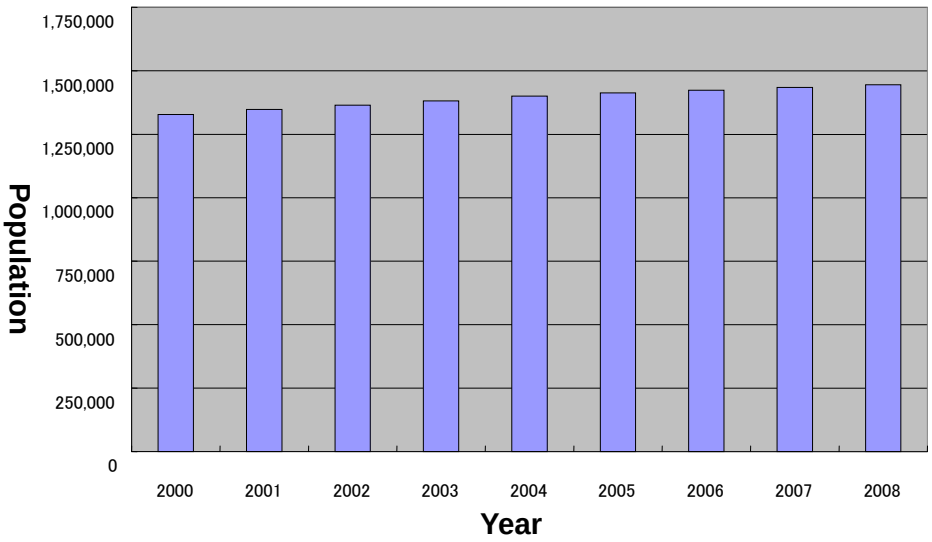


Figure 3-16 Population of Long An province

Current population in year 2008 in the water supply area is shown in Table hereafter. About 90% of the 800 thousand population has been living in rural areas.

Table 3-33 Population in water supply area by the project (year 2008)

District	Total	Male-female		Living areas	
		Male	Female	Urban	Rural
Duc Hoa	207,987	102,124	105,863	36,826	171,161
Ben Luc	132,619	65,118	67,501	18,778	113,841
Thu Thua	92,037	45,191	46,846	16,411	75,626
Can Duoc	177,112	86,964	90,148	14,239	162,874
Can Giuoc	169,827	83,386	86,441	12,069	157,758
Total	779,582	382,783	396,788	98,323	681,260

2) Demand estimation for residential use

Current population living in urban areas is about 100,000 people so that suppose 300 thousand people who live in and around urban area is target of water supply in near future.

We set conditions as water demand for a person per day is 150 liters with a load factor of 1:35. Then the maximum volume per day which can be supplied for families is estimated as below:

Today, water supply companies as stated in clause (1) have been providing 27,200m^3/day to residents. Table hereafter is estimated as doubled in year 2020.

Table 3-34 Demand estimation for residents (year2020)

District	Current urban population	Forecast of population use water .(Urban population ×3)	Demand.(m^3/day) Population use water ×0.15m^3×1.35
Duc Hoa	36,826	110,478	22,372
Ben Luc	18,778	56,334	11,408
Thu Thua	16,411	49,233	9,970
Can Duoc	14,239	42,717	8,650
Can Giuoc	12,069	36,207	7,332
Total	98,323	294,969	**59,732**

3-4-6 Project scope

There are required functions for implementing water supply works as stated in section 3-4-4. Additionally there are some project phases – land clearance, construction and operation / maintenance for each function, and it will be necessary to select proper implementation body for each phase even in the same function.

About project function of intake and filtering, it is easy to clarify functional scope after land clearance completed, so that private companies can enter with low risk relatively. But vice versa, about water distribution, neighboring areas from water filtering facility could be implemented most economically. So in case of private company with 100% of private capital has not incentive to execute water distribution around distant districts. Thus, water distribution is preferable to be undertaken by state company (state enterprises), or private company implement only in profitable scope, meanwhile state company shall implement out of such scope.

From above viewpoint, we divide roles of state-private and scope of working as follows:

Table 3-35 Roles between the private and public sectors

Facility name/work name		Land clearance	Plan and design	Construction	Operation, maintenance
Water for industrial production	Intake water work	State	State	Private	Private
	Filtering water work	State	State	Private	Private
	Water distribution and supply work	State	State	State	State/ private

3-4-7 Design conditions

Necessary conditions and legal preconditions for the implementation of water supply business are summarized as following clauses:

(1) Water source

In Decision No. 1929/QD-TTg issued on 2009 by the Prime Minister "Approving Orientations for Development of Water Supply in Vietnam's Urban Centers and IPs up to 2025, and a Vision Towards 2050", cited that, on regulation, surface water is given priority to use rather than groundwater.

Also in Long An province, the Official letter on groundwater management issued in June 2009 (No.1717/UBND-NN) has directed the use of groundwater is a temporary solution; it will switch to use this system when clean water facilities were completed.

With these conditions, water sources used in this project is not the groundwater but surface water.

(2) Water rights on surface water

Ministry of Agriculture and Rural Development (MARD) plan to carry out projects to build canal in the Duc Hoa (Refer to ADB loan project (3)). Long An province has discussed with MARD to win the right to use canal water which should be built with the aim that the water will be used in agriculture to be used for industry and surrounding residential areas of Long An province to the amount of 300,000 m^3/day. (Official letter No.633/BNN-TL).

(3) Maximum supplying water amount per day

As stated in general section 3-4-3, maximum supply amount is 200,000m^3/day. However, with the assumption that the treatment loss within water treatment plant is equivalent to Japanese of 7%, so it is expected to planned daily maximum intake amount for about 214,000 m^3/day.

(4) **Water intake**

Water is collected along the canal in Duc Hoa district, which was built over Phuoc Hoa Water Project and expected to be implemented by MARD based on loans from the ADB. According to the water use rights (Official letter No.633/BNN-TL), at first, Long An province agreed that MARD has confirmed the main intake point is designated locations along the K15 +340 in Tan My Commune Duc Hoa district. But later that by land clearance matter, such location is changed into Binh Huu 2 hamlet, Duc Hoa Thuong village, Duc Hoa District.

In the water resources projects at Phuoc Hoa district and the construction area of Duc Hoa canal are shown in Figure 3-17. The Duc Hoa's canal system length of about 17km from Cu Chi, located in canal at east Dau Tieng was built in the project funded by World Bank to Duc Hoa district. Issued fund by ADB on 31, Mar 2011. Period of whole project implementation is 3 years as from 2011 ~ 2014, However, according to notice of ADB officer, The Duc Hoa's canal system shall be completed in late 2013. However, due to the purchase of land use, there is still risks remained affecting the progress. So it is necessary to keep collecting information.

Hereafter is project overview.

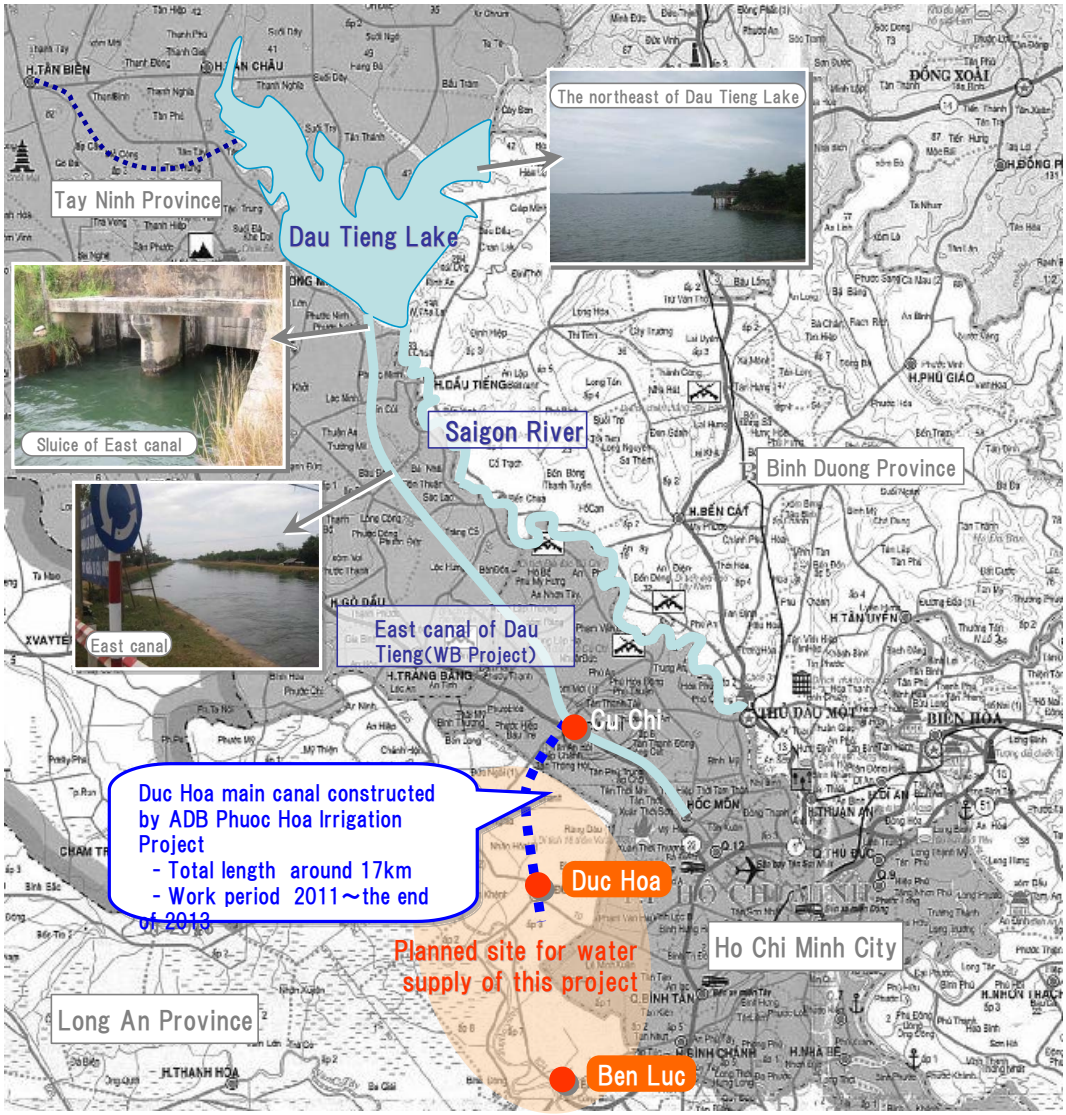
Phuoc Hoa water resources project

.(Official decision of MARD, "Approval for the Project of Investment for Phuoc Hoa Irrigation Construction, the supplement loan for 2nd stage " (No 3415/QD-BNN-XD))

- Total fund : 131.65 million USD
- In there :

ADB	60 million USD
AFD	25 million USD
Vietnam government	42.92 million USD
Beneficiary	3.73 million USD

- Period of implementation : 2011～2014



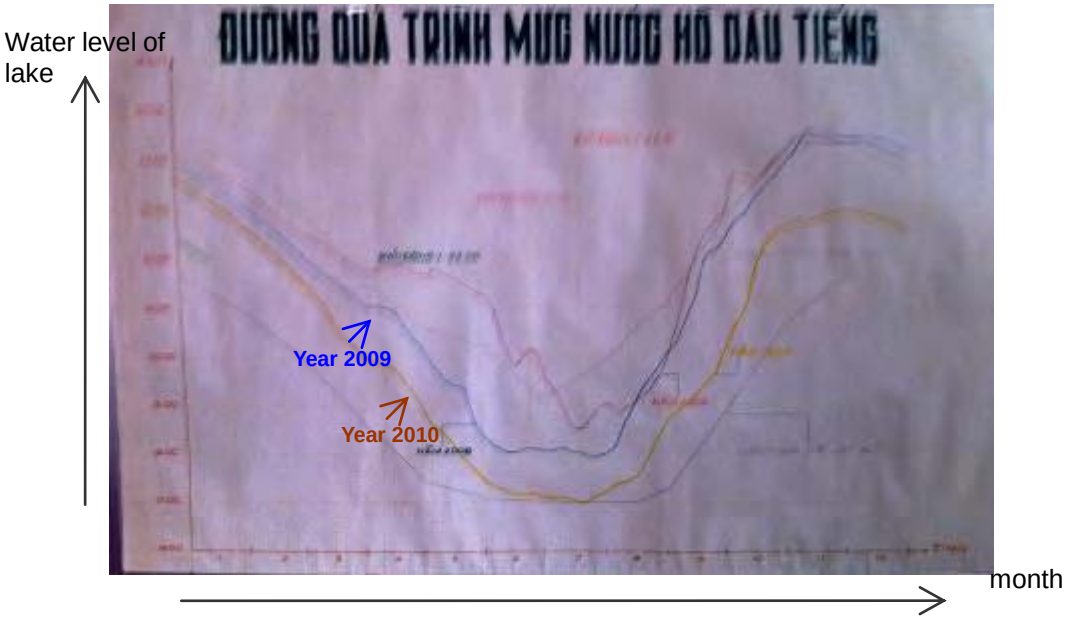
(Source) base map –GTVT publisher, ADB project information

Phuoc Hoa Water resources Project" November 2010, ADB. Image：taken by project team.

Figure 3-17 Phuoc Hoa water source project overview

(5) Guarantee of water intake amount

Implementing intake from the Dau Tieng lake through Duc Hoa canal, but according to survey result, annually water amount in the Dau Tieng lake has been decreased. Management office of the Dau Tieng lake told that in rainy season water amount reach the highest level in November, and the lowest in from June to August in the dry season, this water level has been trending deduction annually. (See figure 2-8)



(Source) Image taken by project team at management office of the Dau Tieng lake

Figure 3-18 Fluctuation of water level of the Dau Tieng lake

In phase 1 of Phuoc Hoa water source project as mentioned in clause (4), canal from the Phuoc Hoa lake laying in the east of the Dau Tieng lake is implemented, so water amount transmits to Duc Hoa are is guaranteed.

However, for balancing periodic increase / decrease of water amount, it is necessary to consider some methods to stable water amount like construction of reservoir in intake point.

(6) **Water quality standard**

Water quality standard is executed under Decision No 1329/2002/BYT/QD of Vietnam Ministry of Public Health.

(7) **Coordination with water supply business by Korean ODA**

1) Overview of Korean project

Plan of construction of water supply work “Hoa Khanh Tay water supply business" (issued license by people’s committee Long An province in Decision No 3379/QD-UBND 2008) with capacity 80,000 m^3/day (phase 1:40,000 m^3/day, phase 2: 40,000 m^3/day) mainly to provide water to Duc Hoa and Ben Luc funded by Korean ODA, and current project status is in phase of detail design. According to Loan Agreement between Vietnam government and Korea Export-import Bank (Korea Economic Development Cooperation Fund - EDCF), content of project is follows.

Overview of Korean ODA Project
(Loan Agreement EDCF No VNM-20)

- Creditor : Korea EDCF
- Borrower : People’s Committee Long An province, Vietnam
- Loan amount : about 30 million USD (in won currency)
  Capital financing for construction of project within 4 years
- Term of payment : 2 times/year, Total 40 times(=20 years)
- Interest rate : 1.0%/year
- Purpose’s loan : Project of supply, filter, watering water, distribution and consulting system

Noted provision :

- If construction of Duc Hoa canal financed by ADB and AFD tardily, period of capital financing of this project shall be adjusted.
- Part of product facilities supply shall carry out under form of competitive bidding among Korea private companies.
- Select advisory under form of proposal from Korea companies (Two-Envelope System).

After completed construction, the water supply system shall hand over to People’s Committee Long An province and local companies who shall operate and control water supply.

2) Coordination with Japanese project

Project by Korean ODA has been changed intake location, method of intake, location of filtering construction many times in planning phase. But up to December, 2010, the project is taking water from the Dau Tieng lake, building filter near Duc Hoa and intaking water by existing canal with some widening repairs executed.

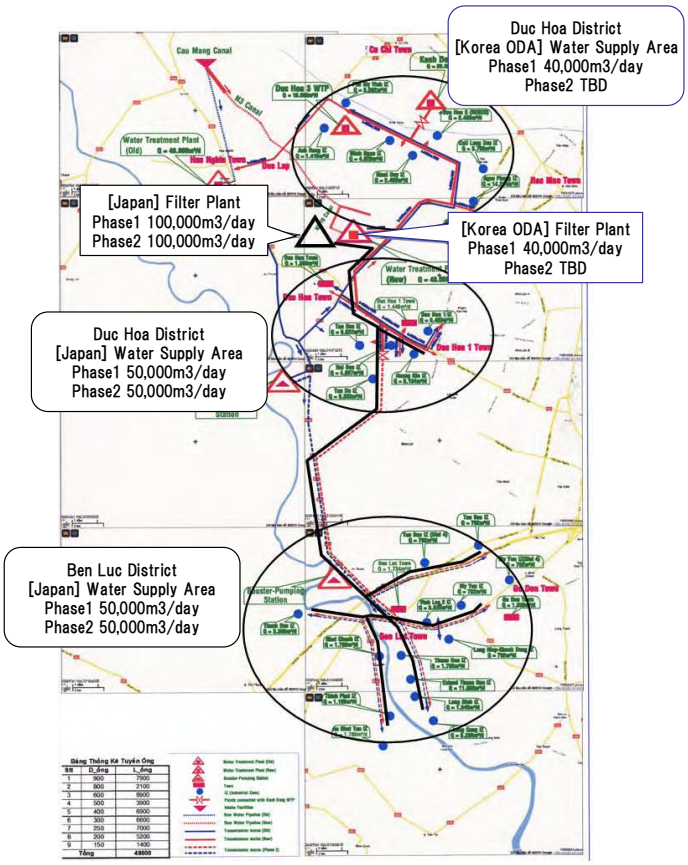
Water supply amount in phase 1 is 40.000m^3/day, mainly distribute for IPs of Duc Hoa district, and a little to the south and neighboring area in Ben Luc districts. Phase 2 is still undecided.

The filtering facility constructed by the Japanese project will be located close to the Korean one, and distribution area – Duc Hoa district will be overlapped. In regard with this matter, current plan of sharing

work as stated in figure 2-6. Especially, water intake facility- construct for each project or just one, distribution area – who distribute to which area in Duc Hoa district have to be coordinated after completion of detail design of Korean project. And also it is expected to keep collecting information. (See figure 2-9)

Table 3-36 Roles between Korean project and Japanese project

Facility		Vietnam	Project ODA of Korea	Project PPP of Japan
Water canal		○ (Financing by ADB,AFD)		
Water source work			○	○
Filter system	Land withdrawal	○		
	Filter station		○	○
Water distribution	Duc Hoa district		○ .(40.000m^3/day)	○ .(10.000m^3/day ～85.000m^3/day)
	Ben Luc District and neighboring districts			○ .(40.000m^3/day ～115.000m^3/day)



(Source) Adjusted image provided by Korea project team

Figure 3-19 Plan of water supply business funded by Korean ODA

3-4-8 Outline design

Summary on the draft design of construction equipments in this project as outlined below:

(1) Intake facility

Intake facility as follows. As stated in design conditions, it is required to stable water source taken from the Dau Tieng lake by raw water reservoir.

Table 3-37 Intake facility overview

Facility		Capacity・Specification
Intake	Pumping station	2,400m^3
	Raw water reservoir	420,000m^3.(2 day)
	Power station	－
Transmission	Transmission pipe	Reinforced concrete pipe　D1400 12.000m

(2) Water treatment facility

As stated in 3-4-3 on project overview, capacity of sedimentation basin and filter of project comprise 4 systems, 1 system = 50.000m^3/day, so maximum capacity water supply in one day shall be 200.000m^3.

<Facility overview>

- Treatment capacity　About 214,000m^3/day
- Sedimentation　4 basin.（4 ponds systems, cube shape, three layers）
- Rapid filtering　16 basin
- Clean water basin　5m deep water, capacity of 40,000m^3

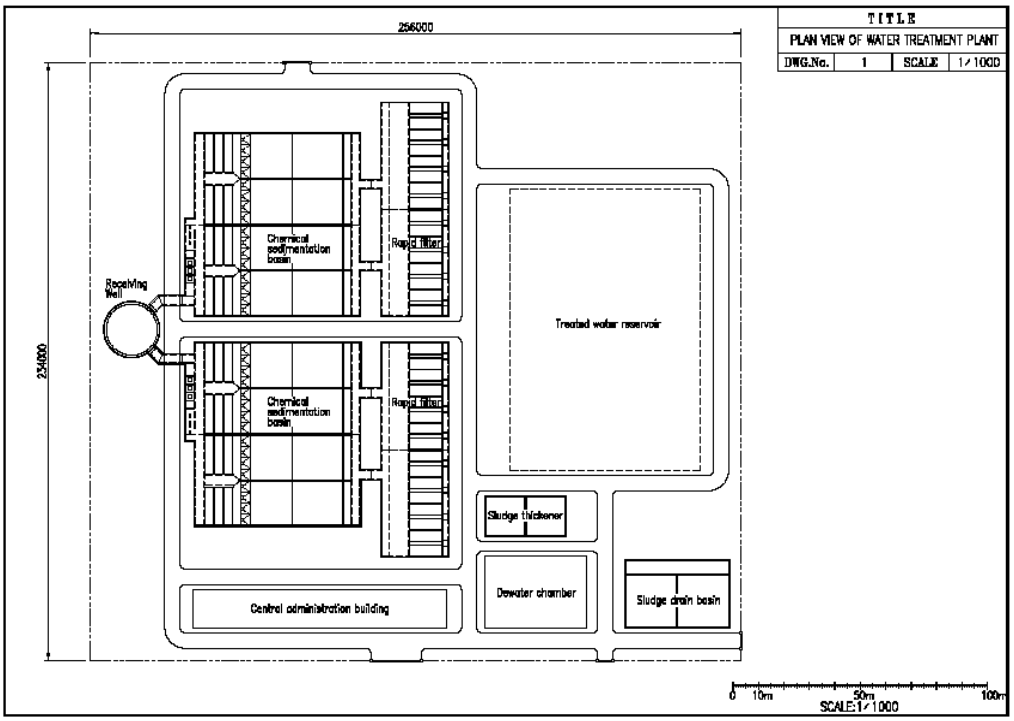


Figure 3-20 Overall plan for clean water equipments

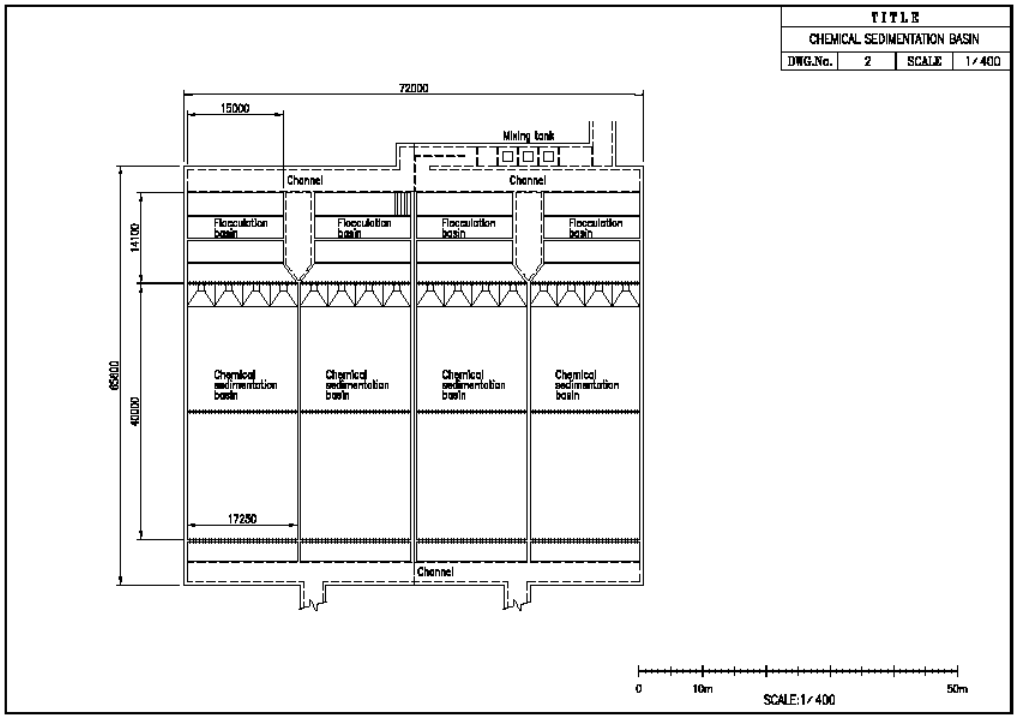


Figure 3-21 Plan on sedimentation basin

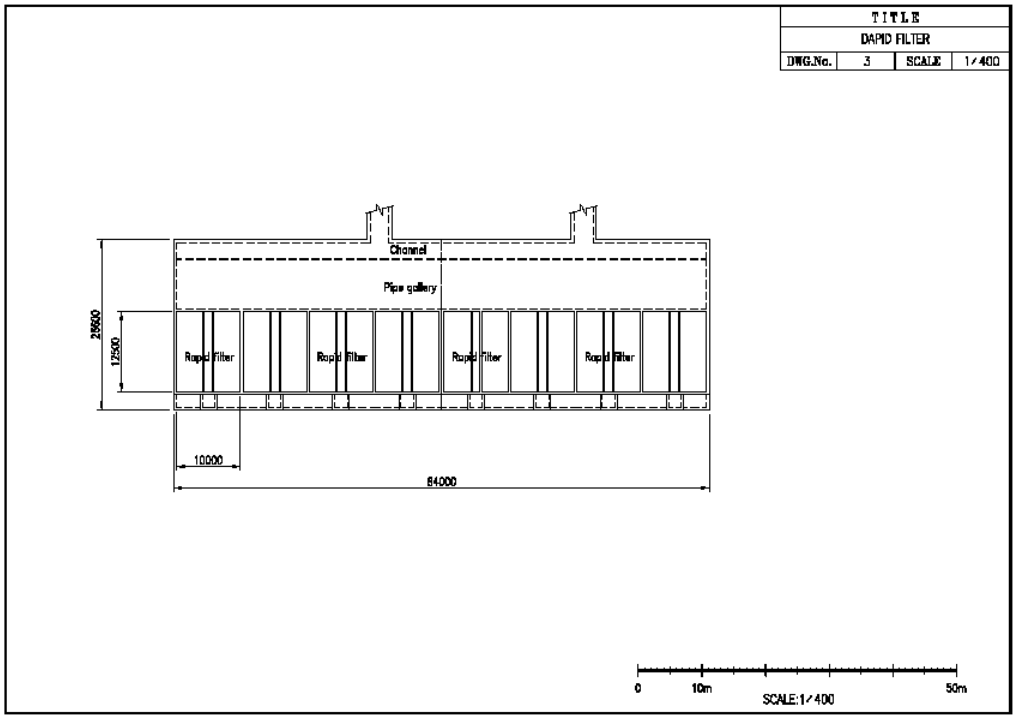


Figure 3-22 Plan on rapid filtering basin

(3) **Water treatment system**

The raw water quality at Dau Tieng lake is preferable and water canals to downstream are flowing along less populated areas so the toxic material affecting on water is not necessarily considered. The water treatment method is a combination of sedimentation and rapid filtering as conventional. (See Figure 3-23)

As survey result of existing filter in Ho Chi Minh city and Long An province shown, such a water treatment method is using generally, thus, it's a suitable method.

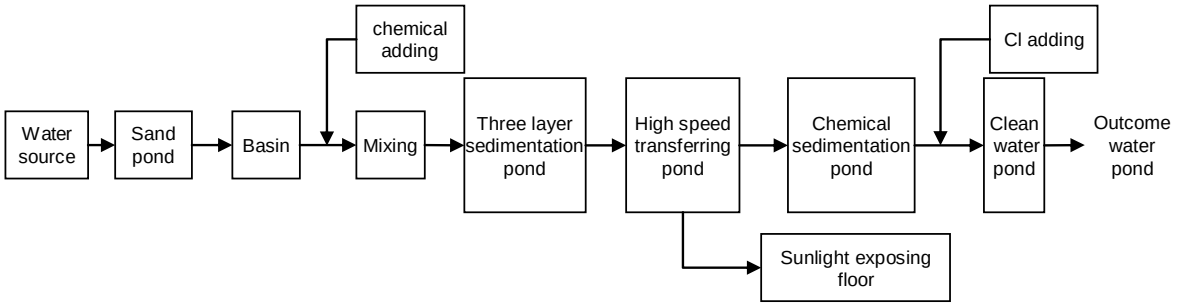


Figure 3-23 Model of water treatment

(4) **Water distribution facilities**

In the area of water supply, due to the flat terrain, the water distribution will be required to use pressure pump. Hereafter is basic content on water distribution facilities.

Table 3-38 Water distribution facilities

Facility		Capacity / Specification
Pumping station	Tan Duc	120,000m^3/day
	Ben Luc	100,000m^3/day
	Tan Trach	60,000 m^3/day
	Long Phung	30,000 m^3/day
Water distribution pipe	Hiep Hoa primary system	D500 15,000 m D300 3,000 m
	Hoa Khanh Tay- Tan Duc	D1400 12,000 m
	Duc Hoa primary system	D600 7,000 m D500 8,000 m D400 10,000 m
	Tan Duc - Ben Luc	D1200 16,000 m
	Primary system at the north of Ben Luc	D400 12,000 m
	Ben Luc – Can Duoc	D800 15,000 m
	Ben Luc primary system	D700 8,000 m
	Can Duoc - Can Giuoc	D800 12,000 m
	Can Duoc primary system	D400 12,000 m
	Can Giuoc primary system	D400 18,000 m

3-4-9 Estimation of project investment

Summary of project investment under redesigns is as 3-4-8.

Based on estimation of Vietnam Water and Environment Joint Stock company (VIWASE), expense here is shown as outline. Unit cost and total expenses estimated by VIWASE is persuasive because of based on comparing with expenses of same type of other project. Original costing list from VIWASE is attached in the end of this documentation.

From the above point with safety aspect, investment for treatment facilities is about 3.1 billion yen, for intake and distribution is about 8.6 billion yen. Besides, it's necessary to calculate expenses of advisory and consultation, land clearance, contingency factor, interests in construction phase, but here is calculated only for direct expenses because of preliminary calculation.

Table 3-39 Direct expenses for water supply business

Year 2011

Description		Expense .(million VND)	Ese .(thousand yen JPY*)
Water intake and intake work	Pumping station	8,400	35,616
	Raw water balance reservoir	25,200	106,848
	Electric station	10.000	42,400
	Transmission pipe	422,136	1,789,849
	Other infrastructure fee to water intake station	19,370	82,128
	Total	485,106	2,056,841
Clean water supply work (filter)	Clean water basin	730,511	3,097,354
	Total	730,511	3,097,354
Water distribution work	Tan Duc pumping station	45,020	190,884
	Ben Luc pumping station	43,070	182,616
	Tan Trach pumping station	25,268	107,136
	Long Phung pumping station	18,146	76,939
	Total	131,506	557,583
	Hiep Hoa primary pipeline	91,042	386,017
	Hoa Khanh Tay- Tan Duc	319,176	1,353,301
	Pipe I Duc Hoa	138,105	585,563
	Tan Duc - Ben Luc water supply pipe	321,235	1,362,031
	Pipe I at the north of Ben Luc	47,900	203,095
	Ben Luc - Can Duoc Distribution pipe	169,111	717,401
	Pipe I Ben Luc	73,444	311,401
	Can Duoc - Can Giuoc Distribution pipe	135,289	573,623
	Pipe I Can Duoc	47,900	203,095
	Pipe I Can Giuoc	71,850	304,643
	Total	1,415,055	5,999,809
Total		2,762,178	11,711,588

1 JPY = 235.9 VND

1US$ = 84.8 JPY

1US$ =

Clean water supply work 20,000VND

Water intake and intake work +Water distribution work 3.1 billion Yen

8.6 billion Yen

3-4-10 Financing plan

To put forth project expenditure as preliminary calculated in section 3-4-9, we have been intending capital procurement by such as 2step loan through prime credit organization in Vietnam with JICA, private financial organization (infrastructure fund etc, manufacturing and commercial enterprises or loan from other credit organizations (as local credit institution, international credit institutions etc). Further detail is in section 2-2-12 (portion of water supply business).

3-4-11 Schedule

Hereafter is overall plan of water supply business implementation.

With target project completed in year 2020, project shall be divided into 3 phases. As reference, there are also mentioned some projects as Duc Hoa canal project with ADB capital, water supply business by Korea's ODA which we have required coordination.

Table 3-40 Schedule of water supply business

Work		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Feasibility survey		■									
Detail design			■■								
Land clearance			■■								
Phase 1	construction			■■	■■						
	Testing operation					■					
	Operation					■					
Phase 2	construction						■■	■■			
	Testing operation								■		
	Operation								■		
Phase 3	construction								■■	■■	
	Testing operation										■
	Operation										■
Water supply business funded by ADB		■	■■	■■	■						
Water supply business funded by Korea's ODA		■■	■■	■■							

3-4-12 Risks Analysis

The contents of assumed risks and analysis for each risk in terms of implementing the water supply business are shown in Table 3-41.

Table 3-41 Risk analysis

Category	Risks	Result of analysis
Legal risk	Risk of license issuance	The water supply business will be implemented as in the form of joint venture with Phu My Vinh Company who received the right for water intake from Long An province and MARD. Thus the issuance of the license for water supply business and establishment of the joint venture company has no problem.
Economic risk	Risk of change of price Risk of capital procurement	Based on the result of financial analysis, the rate of price increase (calculated in US$) determined as 6%. [self-financed] 10% [2stepLoan] 70% [Borrowing from the local bank] 20% Total amount of capital procurement: 138,110,000 US$ Estimation for capital procurement as follows. At present it has defined the participation of the private infrastructure funds and deployment of the form of 2 step loan through the credible bank of Vietnam. [self-financed] The private fund (infrastructure fund, etc.,), the company for production and water supply, the trade company. [Loan] JICA 2 step Loan
Risk due to the counterpart	Risk of counterpart	The counterpart estimates as follows. Besides the Phu My Vinh company there will be expected some Japanese enterprises. [expected counterpart] The Phu My Vinh company (The investor ensures the right of water intake), the private fund, the infrastructure fund, etc, the company for production and water supply, the trade company.
	Risk of work completion / Risk of delay of work	The necessary facility and works are: water filtering, pumping station, water pipelines, water distribution and others. Not only the Japanese companies participate in as the investor, but also as the consultant for construction, management, operation of the project. The part of construction works are surely to be executed by the credible Vietnamese companies, but for collect, execution and management are responsible by the Japanese.
	Risk of related infrastructure project	The water source of the project is ensured through the project of Duc Hoa main canal funded by ADB from the middle of 2011 to the first of 2014. This project has been approved in the Board of Directors of ADB, and the staff of ADB also confirmed about this project (see p. 73). And the another water supply business funded by Korean ODA has been proceeded from 2011 to the end of 2013 and the project status and condition for loan of ODA confirmed.
	Risk for land clearance	Concerning the construction work of main channel and others confirmed by locality. Necessary land clearance for the project (the land for treatment facility and the distribution pipelines): Long An province will permit after signing the contract for land lease for the Korea project (80,000 m^3 / day, whereas land for this treatment facility (200,000 tons/day)) has been ensured. To pay the charge for movement for the landlord intended for implementation later. However, when taking the local survey "this is the dry region that could not produce for agriculture therefore the immigration of the people maybe not be a problem". For assurance of land for installation of the pipe for distribution of water, the necessary space is small, unnecessary for immigration of the people.
Risk on operation	Risk for demand estimation	Establishment of the list of IP in the estimated location of the project to estimate the demand of each IP. To show the unit based on the reference of the projects for supply of water that are operating. To divide into 3 periods, period 3 (in 2020) to pass the rate for operation 100%..(see table 2-4)
	Risk of operation cost	Based on the actual expense of a lot of IPs in the locality to determine the price of the project and show the suitable standard..(3-4-13 Financial analysis)
	Risk for capital recovery	The companies for immigration into the IP could not operate if not to use these utilities. Suppose the expense for management overdue that will implement the solutions such as ceasing the supply of the utility services, or speed up for collect of capital to decrease the risk for capital recovery. Besides that, the risk for change of the price level of water from the households, therefore to avoid the risk be signing the contract take or pay with Long An province.

※Details of environment-friendly utility management business scheme is described in 3-3-14 Financial analysis (Utility management business)

3-4-13 Financial analysis

This part of financial analysis in regard with water supply business as mentioned above. Financial analysis scope is the water supply business which Phu My Vinh company provides to IPs (new and former) with total capacity 300.000m^3/day, in their minus part of water supply by Korea's ODA, remainder about 200.000m^3/day. Meanwhile practically, calculate to supply water to companies outside IP and households, however, high risks of demand, so it's not scope of this financial analysis.

Establish "Company of construction, own, management, operation of environment friendly utility supply work" through form of pool of investor who has water rights in Long An province (Phu My Vinh company), private credit organization (infrastructure fund ect), private companies (water supply facilities company and commercial company act) and implement water supply business.

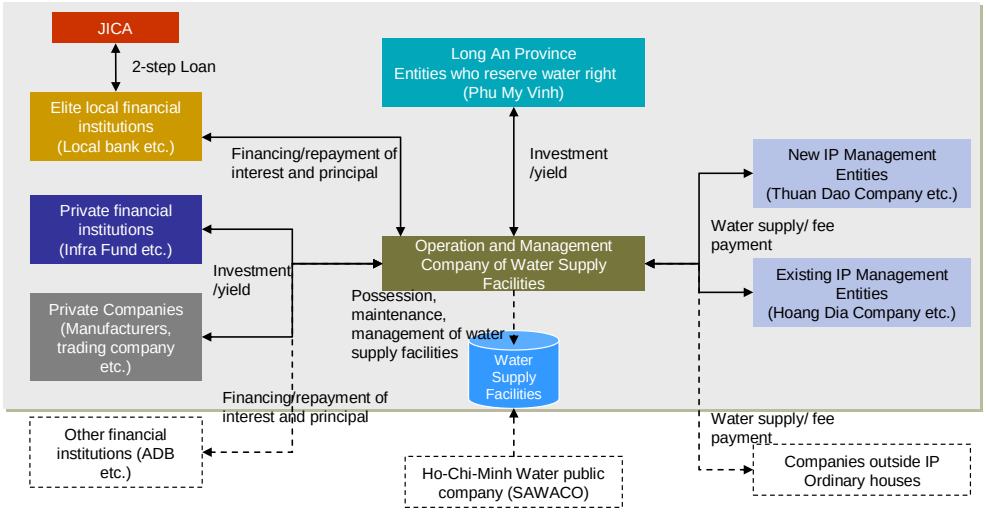


Figure 3-24 Concept diagram of Water supply business

(1) Precondition

1) Project implementation schedule

Project implementation route base on implementation route as stated in section 3-4-11 as follows.

Phase 1：Construction（2013−2014）, commercial operation（2015）

Phase 2：Construction（2016−2017）, commercial operation（2018）

Phase 3：Construction（2018−2019）, commercial operation（2020）

2) Rate of price increase

Selected mark-up rate is 6% and convert it into mark-up rate of the US dollar according to exchanges rate (ending term price of exchange rate of the US dollar).

Table 3-42 Price increase rate in dollar volume(repeated)

	2005	2006	2007	2008	2009	2010	Average
CPI growth rate (%)	8.3%	7.5%	8.3%	23.0%	6.9%	9.2%	10.5%
Estimated price of 1,000,000 VND (nominal price) in 2004	1,083,000	1,164,225	1,260,856	1,550,852	1,657,861	1,810,385	
Exchange rate (the end of year price of the exchange rate compared with USD (VND/US$)	15,916	16,054	16,145	16,977	17,941	18,932	
Value calculated to US$	68.0	72.5	78.1	91.4	92.4	95.6	
Increase price rate in calculating to US$ (%)		6.6%	7.7%	17.0%	1.2%	3.5%	6.0%

3) Total equipment investor expenses

Necessary equipment for ware supply business are “clean water basin work: infrastructure (dam)”, “clean water basin work: equipment, machines (pumping station, raw water balance reservoir, electric station, pipe, and construction expenses of other area intake”, “water distribution work (water distribution system through pumping station, distributive pipe, transmission pipe etc.)

Section 3-4-9 calculated part of preliminary expenses, under rate of water supply of each phase in project implementation route as “water work expense (infrastructure)”, “water work expense (equipment, machines), “Water distribution work” and put forth total investment of project in next page (each phase).

Table 3-43 Method of calculating total investment expenditure phase of project

Price in year 2011 x 1000US$

Expenses		Expense million VND	Expense Yen JPY	Expense x 1000US$		Capacity plan m^3/day	Phase 1	Phase 2	Phase 3	Total
							50000	50000	100000	200000
Intake and lead water work	Pumping station	8,400	32,941							
	Raw water balance reservoir	25,200	98,824							
	Electric station	10,000	39,216							
	Lead pipe	422,136	1,655,435							
	Other infrastructure for intake station	19,370	75,960							
	Total	485,106	1,902,376	22,434		Filter (machines, equipment)	5608.5	5608.5	11217	22434
Filter work	Water basin	730,511	2,864,751							
	Total	730,511	2,864,751	33,782		Filter (infrastructure)	8445.5	8445.5	16891	33782
Water distribution work	Tan Duc pumping station	45,020	176,549							
	Ben Luc pumping station	43,070	168,902							
	Tan Trach pumping station	25,268	99,090							
	Long Phung pumping station	18,146	71,169							
	Total	131,506	515,710	6,081		Water distribution 1	1520.25	1520.25	3040.5	6081
	Pipe 1 (primary)-Hiep Hoa	91,042	357,029							
	Hoa Khanh Tay – Tan Duc	319,176	1,251,671							
	Pipe 1 – Duc Hoa	138,105	541,588							
	Water supply pipe –Tan Duc-Ben Luc	321,235	1,259,746							
	Pipe 1 north Ben Luc	47,900	187,844							
	Ben Luc – Can Duoc	169,111	663,184							
	Pipe 1 – Ben Luc	73,444	288,019							
	Distribution pipe –Can Duoc – Can Gioc	135,289	530,547							
	Pipe 1 Can Duoc	47,900	187,844							
	Pipe 1 Can Gioc	71,850	281,766							
	Total	1,415,055	5,549,236	65,439		Water distribution 2	16359.75	16359.75	32719.5	65439
Total		2,762,178	10,832,073	127,737		Total distribution works	17880	17880	35760	71520

1JPY=255VND

1US$=84,8JPY

Total equipment investment expenditure, phase 1 and phase 2 each phase is 34,527 x 1000US$; phase 3 is 69,054 x 1000US$; so total is 138,108×1000US$（≒11.7billion yen）.

Table 3-44 Total equipment investment.(×1000US$)(price year 2011)

	Phase 1	Phase2	Phase 3	Total
Clean water supply work (infrastructure)	9,131	9,131	18,263	36,525
Clean water supply work (Equipment, machines)	6,064	6,064	12,128	24,255
Water distribution work	19,332	19,332	38,664	77,328
Total	34,527	34,527	69,054	138,108

4) Financing

Estimated financing method is pool under 2stepLoan form of JICA through Vietnam prestige credit fund (following US$, 6%, pay interest and original 5 years, pay average interest in 25 years), Private credit fund (infrastructure construction fund: 85%), and manufacturing, commercial companies and loan from other credit funds (home credit fund, other international credit funds: 6% in US$, pay average interest in 15 years).

Initially establish to this financial analysis is 10% of equity from private credit fund (infrastructure construction fund), manufacturing, commercial companies, 70% shall be financed from Vietnam prestige credit fund under 2stepLoan form of JICA and loan from local banks makes up for 10%. Period of capital mobilization is adjusted accordingly with period of equipment investment following project route as mentioned above.

Table 3-45 Capital mobilization.(×1000US$).(Price year 2011)

	2013	2014	2015	2016	2017	2018	2019	Total
equity (Private fund + manufacturing company + investor of IP management)：10%	1,726	1,726		1,726	1,726	3,453	3,453	13,810
JICA2StepLoan .(Loan from elite local financial institutions)：70%	12,084	12,084		12,084	12,084	24,169	24,169	96,674
Other Local bank's loan：20%	3,453	3,453		3,453	3,453	6,905	6,905	27,622
合計	19,276	19,277		19,279	19,280	36,545	36,546	138,106

5) Purpose of fund use

Provide funds to meet equipment investment expenses following project route as mentioned above.

Table 3-46 Utilization of capital.(×1000US$).(price year 2011)

	2013	2014	2015	2016	2017	2018	2019	Total
Water supply work (infrastructure)	4,565	4,565		4,565	4,565	9,131	9,131	36,522
Water supply work (machines, equipment)	3,032	3,032		3,022	3,022	6,064	6,064	24,256
Water distribution work	9,666	9,666		9,666	9,666	19,332	19,332	77,328
Total	17,264	17,264		19,269	19,270	36,545	36,546	138,106

6) Income and payments

Initial receipts and payments are built according to business result materials of former IPs, with unit price of water (US$/$m^3$) unit price of water supply operation expenses (US$/$m^3$).

Table 3-47 Specific example on water price and water supply operation expenses of current water supply company.(Price in year 2011)

	Binh An Water. (Ho Chi Minh City)	**Thu Duc Water (Ho Chi Minh City)**	**Tan An water .(Long An province, Tan An, Thu Thua, Ben Luc)**
Water money.(US$/$m^3$)	0.2	0.07	0.19
Water supply operation expense.(US$/$m^3$)	0.1	0.05	0.12

Water money unit: 0.20US$/$m^3$ (Price in 2011)=17.0 yen/m^3(price in year 2011)
Cost unit of water supply operation expenses: 0.10US$/$m^3$ (price in 2011)=8.5 yen/m^3(Price in 2011)

7) Labor charge

Labor charge is considered through factors as existing specific example, current writing "Report of contributive investigation on international cooperation promotion in water supply year 2009" (in Japanese). Here intends having 2 managers, 67 engineers implement in operation phase. Established unit price of labor charge is manager = 10.184US$/person/year and engineer is 4.849US$/person/year under materials "Investigation of actual state of operation of Japan companies in Asia and South-east Asia in year 2010 (JETRO)" (Price in year 2010). From there can calculate labor charge in year of commercial operation is 462×1000US$/year.

8) Depreciation

According to collected information, water supply work (infrastructure): 20 year, Water supply work (machines, equipment): 10 year, Water distribution work: 30 year. Anyhow, balance is established equal to 0.

(2) **Receipts and payments assessing result of project (in case of initial establishment) and sensibility analysis of project**

According to interviews, water supply work (infrastructure): 20 year, Water supply work (machines, equipment): 10 year, Water distribution work: 30 year. Anyhow, balance is established equal to 0.

1) Receipts and payments assessing result of project (in case of initial establishment)

After assessing receipts and payments, counting accumulative loss and profit as from commercial operation (year 2015) until year 28th (year 2043) shall transfer into profitability.

Besides, though IRR calculation (internal recover capital rate) based on formula (Investment – allowance)+EBITDA（interest rate・tax・ net profit）, however, positive value was not retained.

Referred value counted EIRR (Equity Internal Rate of Return) (*), but EIRR (10 years after operation) and EIRR (15 years) is negative, EIRR (30 years) = 9.1%.

(*) EIRR calculated on supposed following to investment, dividend, receipts in case of supposed would sell company in assessment of each year (total debts/capital owner -debts)

Cause of Receipts and payments result of above project is assessed as follows:

- Investment on part of water distribution seized over 50% of total investment, this is a large volume of investment.
- Low water price

2) Project sensibility analysis

Case 1: making large difference with water operation expense when providing water money

Require water price level to per IRR (30 years), IRR (10 years) is above 15%.

For example,

IRR (30 years) ≥ 15% water price level ≥ 0,434US$/$m^3$;

IRR (15 years) ≥ 15% water price level ≥ 0,541US$/$m^3$;

IRR (10 years) ≥ 15% water price level ≥ 0,652US$/$m^3$;

Water price rising shall contribute project transferring into profitability.

Table 3-48 Result of sensibility analysis by difference between water price level and water operation expense

Water price Water operation expense (difference：Spread)	Ending accumulative loss-profit year, switch to profit	IRR (After commercial operation for 10 years)	IRR (After commercial operation for 15 years)	IRR (After commercial operation for 30 years)
Water price level：0.434US$/$m^3$ Running Cost：0.10US$/$m^3$ Difference：0.334US$/$m^3$	First year .(2015)	—	7.92%	15.02%
Water price level：0.541US$/$m^3$ Running Cost：0.100US$/$m^3$ Difference：0.441US$/$m^3$	Commercial operation year .(2015)	6.89%	15.01%	19.72%
Water price level：0.652US$/$m^3$ Running Cost：0.100US$/$m^3$ Difference：0.552US$/$m^3$	Year 20th (2035)	15.0%	21.29%	24.43%

Case2 : infusion of public funds

Here, calculate inverse of water price level satisfying IRR (15 years) ≧15%Case of water supply distribution work undertaken by state company of Long An province (50%, 100%).

Result as follows: portion of water distribution work (naturally, increase water money) shall contribute on increasing profit of project

Table 3-49 Result of sensibility analysis by difference of rate of shared duty of water supply work

Rate of duty of state company for water supply, distribution work portion	Water money	Ending accumulative loss-profit year, switch to profit	IRR (After commercial operation for 10 years)	IRR (After commercial operation for 15 years)	IRR (After commercial operation for 30 years)
0%	0.541US$/$m^3$	First year .(2015)	6.89%	15.01%	19.72%
50%	0.408US$/$m^3$	First year .(2015)	—	15.00%	19.65%
100%	0.292US$/$m^3$	First year .(2015)	—	15.00%	19.60%

According to content of above investigation and analysis, we adjust necessary content when implementing the project as follows.

Case3 : Considering profitability of the project in phase 1 only

As considered in financial analysis section, if water project 200.000m^3 from phase 1~ phase 3 with 10% of own fund, 70% of 2StepLoan of JICA and 20% loan from local bank is carried out, water price is 0.2US$/$m^3$ transferring entire interest shall take 20 years, other the hand, ROE won't become a positive number within 10 years and clearly, project-realization is very hard.

For situation, we have been trying analyzing flexibility in water price in herein sensibility analysis section. However, to retain 15% of ROE following above condition, need to set up water price is "0.541US$/$m^3$", that thing is not covering reality when comparing current water price standard of Vietnam.

Therefore, here subject is only phase 1 (50,000m^3) from viewpoint of total investment restriction, after investigation of profitability or un-profitability is only separate phase 1, so implementation method with phase 2, phase 3 which was put forth as superseded project. This is not favorable method with matter of meeting demand for clean water in Long An province through right from the start of project 200,000m^3, so to ensure profitability, it's needed to consider.

After simply calculating based on selected data, we receive temporary result as follows:

Feasibility analysis for subject is only phase 1 (50.000m^3)

- Total investment: 38,975 thousand US$ (in year 2013)
- Equity: 10%
- 2StepLoan of JICA: 70%
- Loan from local bank: 20%

When IRR (15 years after operating) ≧15.0%, water price is 0,412US$/$m^3$.If build to phase 3, IRR(15 years after operating) ≧15.0%, water price is 0,541US$/$m^3$.If considering above result might ensure profitability of the project by decrease of investment value with subject is phase 1.

However, according to estimate, by not counting materiality of re-selection of water supply area in case of precondition is to provide 50.000m^3 only, higher risk of demand by subject selection is only phase 1 (cannot dispose risks by subject which is limited area), therefore, if using this superseded project, need to analyze detailed finance and find out whole of risks.

- Case4 : Founding of a holding company as a 100% subsidiary of Long An Province, which will make use of JICA's 2-Step Loan Program to develop and maintain a water distribution system.
- O&M Company of Water Supply Facilities can remove the asset of a water distribution system from its balance-sheet. O&M Company of Water Supply Facilities can relieve of both investment burden and maintenance/depreciation costs.

- O&M Company of Water Supply Facilities will pay a facility usage fee to the distribution system maintenance and holding company (a 100% subsidiary of Long An Province.)
- The distribution system maintenance and holding company will raise funds for the repayment of principal and interest of JICA's 2-Step Loan program through usage fees charged from O&M Company of Water Supply Facilities.
- O&M Company of Water Supply Facilities will use both investment capital and financing received from local financial institutions to purchase and maintain clean water supply facilities (both infrastructure and equipment/machinery).
- Under the above terms, by back-calculating from the water distribution utility's desired 15-year IRR of greater than 15%, the total water rate has been determined to be 37 cents U.S. per cubic meter (US$0.37/$m^3$).

Table 3-50 Summary: Sensitivity analysis of the difference between Long An province's burden of water distribution facility cost, and water supply utility financing share

Long An province		Water Supply Utility					
Percentage share, water distribution facility Cost	**Actual dollar amount, water distribution facility cost**	**Total funding raised**	**Investment**	**JICA 2-Step Loan**	**Other: local bank loans**	**Water rate, to cover 15-year IRR = 15%**	**EIRR .(15-year)**
0%	0US$	138.1 million US$	10% 13.81 million US$	70% 96.7 million US$.(8.2 Billion Yen)	20% 27.6 million US$	0.54 US$/$m^3$	39.4%
0%	0US$	34.5 million US$ **(Phase 1 Only)**	10% 3.45 million US$ **(Phase 1 Only)**	70% 24.2Million US$.(2.3Billion Yen) **.(Phase 1 Only)**	20% 6.9 million US$ **.(Phase 1 Only)**	0.41 US$/$m^3$	33.4%
50%	28.0% 38.7 million US$.(Subsidy)	99.4Million US$	10% 13.81Million US$	62.0% 85.6Million US$.(7.26 Billion Yen)	US$0	0.41 US$/$m^3$	31.5%
100%	77.3 million US$.(JICA 2-Step Loan)	60.8Million US$	10% 6.08Million US$ **(Water System Off-Balance)**	0% 0Million US$ **(Applied to Water system subsidiary company)**	90% 54.7 million US$ **(Water system off-balance)**	0.37 US$/$m^3$	40.0%
100%	56.0% 77.3 million US$.(Subsidy)	60.8Million US$	10% 13.81 million US$	34.0% 47.0 MillionUS$ (3.99Billion Yen)	US$0	0.29 US$/$m^3$	24.2%

(Note) Future rise in construction cost not included

Table3-51

Water Supply Business

1US$= 84.8Yen 20,000

(2011Year price)

Planning Scale			50,000	m3/day		
Water Pipe's Holding or Not(Off Barance)			0	(0:Holde the Asset 1:Off Balance)		
Construction Period			2013	Year (from)		
			2014	Year (from)		
Operation Starting			2015	Years		
Price increase rate (converted by VND/USD anualy average)			6.00%			
Investment to parts of Infrastracture			10,260	×1000$(Construction Starting Year price)		26.45%
Investment to parts of Institutions & Machinery			6,813	×1000$(Construction Starting Year price)		17.56%
Investment to parts of Water Pipe			21,721	×1000$(Construction Starting Year price)		55.99%
Investment Total			38,795	×1000$(Construction Starting Year price)		100.00%
Financial Procurement Total			38,795	×1000$(Construction Starting Year price)		
Equity (Private Fund + Private Maker + IP's management Unit)			3,879	×1000$(Construction Starting Year price)		10.0%
Gorvanmental Subsidy			0	×1000$(Construction Starting Year price)		0.00%
JICA's 2step Loan			27,156	×1000$(Construction Starting Year price)		70.0%
Local Bank's Rate (JICA's 2step Loan)			6.00%			
Payment Method of JICA's 2step Loan			5	Yearss grace	25	Yearss grace
Borrowing form others			7,759	×1000$(Construction Starting Years price)		20.0%
Banking Rate			6.00%		Check	100%
Payment Method			15	Yearss Level Payment		
Short-term interest rate			10.00%			
Cash equivalent return	1800	0.09	1.00%			
	7000	0.35				
Dividend Tendency			85%			
Water Salese Price	0.200	$/m3(2011Yeai	0.200	$/m3		
Demand of Water	48,993	m3/day	48,993	m3/day		
Sensitivity coefficient (Price)	100%					
Sensitivity coefficient (Demand)	100%		4,515	×1000$(Operation Starting Years price)		
	0.29	5800				
Water Supply Cost Price	0.100	$/m3(2011Yeai	0.100	$/m3(2011Years price)=		
Water Supply	48,993	m3/day	48,993	m3/day		
Sensitivity coefficient (Cost)	100%					
Sensitivity coefficient (Supply)	100%		2,258	×1000$(Operation Starting Years price)		
Manpower (2 managers / 67Engineers)	345	×1000$(2010Y	462	×1001$(Operation Starting Years price)		
Depliciation	Pts of Infrastructure		20	Years (Fixed Amount)	Residual value	0%
	Pts of Institutions		10	Years (Fixed Amount)	Residual value	0%
	Pts of Pipe		30	Years (Fixed Amount)	Residual value	0%
Enterprise tax on corporation			25%			

Table3-52～54

Water supply project (Unit：×1000US$)			(2) 2013	(1) 2014	0 2015	1 2016	2 2017	3 2018	4 2019	5 2020	6 2021	7 2022	8 2023	9 2024	10 2025	11 2026	12 2027	13 2028	14 2029	15 2030	16 2031	17 2032	18 2033	19 2034	20 2035
P/L	Revenue	Water　seles	0	0	4,515	4,786	5,073	10,179	10,790	16,387	17,370	18,412	19,517	20,688	21,929	23,245	24,640	26,118	27,685	29,347	31,107	32,974	34,952	37,049	39,272
		Other incomes																							
	Total revenue		0	0	4,515	4,786	5,073	10,179	10,790	16,387	17,370	18,412	19,517	20,688	21,929	23,245	24,640	26,118	27,685	29,347	31,107	32,974	34,952	37,049	39,272
	Cost of sales	Purchases																							
		Other																							
	Total cost of sales		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Operating Expenditure	Operating cost	0	0	2,258	2,393	2,537	5,089	5,395	8,193	8,685	9,206	9,759	10,344	10,965	11,623	12,320	13,059	13,843	14,673	15,554	16,487	17,476	18,525	19,636
		Business expense	0	0	462	490	519	550	583	618	655	695	736	781	827	877	930	985	1,045	1,107	1,174	1,244	1,319	1,398	1,482
		Expenditure of O&M, water supply equipment rent																							
		Other expenditure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Fixed asset tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total operating expenditure		0	0	2,720	2,883	3,056	5,640	5,978	8,812	9,340	9,901	10,495	11,125	11,792	12,500	13,250	14,045	14,887	15,781	16,727	17,731	18,795	19,923	21,118
	Net profit (before depreciation)		0	0	1,796	1,903	2,018	4,539	4,812	7,575	8,030	8,512	9,022	9,564	10,137	10,746	11,390	12,074	12,798	13,566	14,380	15,243	16,157	17,127	18,154
	Depreciation	Infrastructure＋equipment・Machines＋distribution water	0	0	1,918	1,918	1,918	4,203	4,203	9,338	9,338	9,338	9,338	9,338	8,656	8,656	8,656	7,845	7,845	6,021	6,021	6,021	6,021	6,021	5,508
	Net operating profit		0	0	-123	-15	99	336	608	-1,762	-1,308	-826	-315	226	1,481	2,089	2,734	4,229	4,953	7,545	8,359	9,222	10,136	11,106	12,646
	Non-operating revenue and expenditure	Interest received	0	0	0	0	0	0	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
		Interest expense	0	233	616	518	678	993	3,077	3,932	3,710	5,361	5,215	9,390	9,625	9,885	10,109	10,292	10,425	10,488	10,470	10,369	10,159	9,825	9,365
	Ordinary profit		0	-233	-738	-533	-578	-656	-2,455	-5,680	-5,004	-6,173	-5,516	-9,150	-8,130	-7,781	-7,361	-6,049	-5,457	-2,929	-2,097	-1,133	-9	1,295	3,295
	Taxation	Corporate income tax ect.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	324	824
	Profit in the current term		0	-233	-738	-533	-578	-656	-2,455	-5,680	-5,004	-6,173	-5,516	-9,150	-8,130	-7,781	-7,361	-6,049	-5,457	-2,929	-2,097	-1,133	-9	971	2,472
	Dividend payment		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	825	2,101
	Profit in the current term after dividend payment		0	-233	-738	-533	-578	-656	-2,455	-5,680	-5,004	-6,173	-5,516	-9,150	-8,130	-7,781	-7,361	-6,049	-5,457	-2,929	-2,097	-1,133	-9	146	371
	Accumulated profit		0	-233	-971	-1,504	-2,083	-2,739	-5,194	-10,874	-15,878	-22,051	-27,567	-36,717	-44,847	-52,628	-59,989	-66,038	-71,495	-74,423	-76,520	-77,654	-77,663	-76,692	-74,220
Sources and uses statement	Sources	Revenue	0	0	4,515	4,786	5,073	10,179	10,790	16,387	17,370	18,412	19,517	20,688	21,929	23,245	24,640	26,118	27,685	29,347	31,107	32,974	34,952	37,049	39,272
		Interest received	0	0	0	0	0	0	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
		Investment (Private fund +Private manfacturing company + IP management invest	1,940	1,940	0	2,310	2,310	5,192	5,192	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		JICA 2 Step Loan（Through local blue-chip bank）	13,578	13,578	0	16,172	16,172	36,341	36,341	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Government subsidies of Infrastructure construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Other Local bank's loan	3,879	3,879	0	4,621	4,621	10,383	10,383	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Reversal of cash and deposits	0	0	0	0	0	0	1,417	0	0	1,087	1,076	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	659	0	0
		Short term debt	0	1,655	0	0	872	0	3,735	0	0	1,087	1,076	6,163	7,279	6,930	6,510	6,009	5,159	4,195	3,363	2,092	659	0	0
		Total Sources	19,397	21,053	4,515	27,889	29,047	62,095	67,872	16,401	17,384	20,600	21,684	28,283	30,639	31,606	32,581	33,559	34,275	34,973	35,902	36,497	36,285	37,064	39,287
	Uses	Total operating expenditure	0	0	2,720	2,883	3,056	5,640	5,978	8,812	9,340	9,901	10,495	11,125	11,792	12,500	13,250	14,045	14,887	15,781	16,727	17,731	18,795	19,923	21,118
		Interest expense	0	233	616	518	678	993	3,077	3,932	3,710	5,361	5,215	9,390	9,625	9,885	10,109	10,292	10,425	10,488	10,470	10,369	10,159	9,825	9,365
		Taxation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	324	824
		Utility facilities investment (infrastructure)	5,130	5,438	0	6,110	6,476	13,730	14,554	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Utility facilities investment (equipment, machines)	3,407	3,611	0	4,057	4,301	9,118	9,665	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Other utility facilities investmnet	10,861	11,512	0	12,935	13,711	29,068	30,812	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Refund of JICA 2 Step Loan	0	0	0	0	0	0	543	1,086	1,086	1,733	2,380	3,834	5,287	5,287	5,287	5,287	5,287	5,287	5,287	5,287	5,287	5,287	5,287
		Refund of other Local bank's loan	0	259	517	517	825	1,133	1,826	2,518	2,518	2,518	2,518	2,518	2,518	2,518	2,518	2,518	2,259	2,000	2,000	1,692	1,384	692	0
		Refund of short term debt	0	0	663	868	0	996	0	54	730	0	0	0	0	0	0	0	0	0	0	0	0	1,013	2,693
		Deposit of cash	0	0	0	0	0	1,417	1,417	0	0	1,087	1,076	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	659	0	0
		Total Uses	19,397	21,053	4,515	27,889	29,047	62,095	67,872	16,401	17,384	20,600	21,684	28,283	30,639	31,606	32,581	33,559	34,275	34,973	35,902	36,497	36,285	37,064	39,287
B/S	Asset	Cash	0	0	0	0	0	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417
		Fixed asset balance	19,397	39,958	38,040	59,224	81,795	129,507	180,335	170,997	161,660	152,322	142,985	133,647	124,991	116,334	107,678	99,833	91,988	85,967	79,946	73,925	67,903	61,882	56,374
		Total asset	19,397	39,958	38,040	59,224	81,795	130,925	181,752	172,415	163,077	153,739	144,402	135,064	126,408	117,752	109,095	101,250	93,406	87,384	81,363	75,342	69,321	63,299	57,791
	Liabilities	Borrowing	17,458	36,312	35,132	54,539	75,377	119,972	168,063	164,405	160,072	156,907	153,086	152,898	152,372	151,496	150,201	148,405	146,017	142,925	139,000	134,112	128,100	121,108	113,128
		Capital	1,940	3,879	3,879	6,190	8,500	13,692	18,883	18,883	18,883	18,883	18,883	18,883	18,883	18,883	18,883	18,883	18,883	18,883	18,883	18,883	18,883	18,883	18,883
		Grant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Reserve	0	-233	-971	-1,504	-2,083	-2,739	-5,194	-10,874	-15,878	-22,051	-27,567	-36,717	-44,847	-52,628	-59,989	-66,038	-71,495	-74,423	-76,520	-77,654	-77,663	-76,692	-74,220
		Total Liabilities	19,397	39,958	38,040	59,224	81,795	130,925	181,752	172,415	163,077	153,739	144,402	135,064	126,408	117,752	109,095	101,250	93,406	87,384	81,363	75,342	69,321	63,299	57,791
	Depriciation expense (utility facilities (infr	Depriciation by straight-line method	0	0	513	513	513	1,124	1,124	2,497	2,497	2,497	2,497	2,497	2,497	2,497	2,497	2,497	2,497	2,497	2,497	2,497	2,497	2,497	1,984
	Depriciation expense (utility facilities (Equ	Depriciation by straight-line method	0	0	681	681	681	1,493	1,493	3,316	3,316	3,316	3,316	3,316	2,635	2,635	2,635	1,824	1,824	0	0	0	0	0	0
	Depriciation expense (other utility facilitie	Depriciation by straight-line method	0	0	724	724	724	1,586	1,586	3,524	3,524	3,524	3,524	3,524	3,524	3,524	3,524	3,524	3,524	3,524	3,524	3,524	3,524	3,524	3,524
	Fixed asset balace		19,397	39,958	38,040	59,224	81,795	129,507	180,335	170,997	161,660	152,322	142,985	133,647	124,991	116,334	107,678	99,833	91,988	85,967	79,946	73,925	67,903	61,882	56,374
	JICA 2 Step Loan（Through local blue-ch	Outstanding balance	13,578	27,156	27,156	43,328	59,500	95,841	131,639	130,553	129,467	127,733	125,353	121,520	116,232	110,945	105,658	100,371	95,083	89,796	84,509	79,221	73,934	68,647	63,360
		Principal repayments (Total)	0	0	0	0	0	0	543	1,086	1,086	1,733	2,380	3,834	5,287	5,287	5,287	5,287	5,287	5,287	5,287	5,287	5,287	5,287	5,287
		Principal repayment 1	0	0	0	0	0	0	543	543	543	1,190	1,190	2,644	2,644	2,644	2,644	2,644	2,644	2,644	2,644	2,644	2,644	2,644	2,644
		Principal repayment 2	0	0	0	0	0	0	0	543	543	543	1,190	1,190	2,644	2,644	2,644	2,644	2,644	2,644	2,644	2,644	2,644	2,644	2,644
		Principal repayment 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Refund of JICA 2 Step Loan	0	0	0	0	0	0	1,629	1,597	1,532	3,407	3,303	7,521	7,291	6,974	6,657	6,339	6,022	5,705	5,388	5,071	4,753	4,436	4,119
	Other Local bank's loan	Outstanding balance	3,879	7,500	6,983	11,086	14,881	24,131	32,689	30,171	27,653	25,136	22,618	20,100	17,582	15,065	12,547	10,029	7,770	5,770	3,769	2,077	692	0	0
		Principal repayments (Total)	0	259	517	517	825	1,133	1,826	2,518	2,518	2,518	2,518	2,518	2,518	2,518	2,518	2,518	2,259	2,000	2,000	1,692	1,384	692	0
		Principal repayment 1	0	259	259	259	567	567	1,259	1,259	1,259	1,259	1,259	1,259	1,259	1,259	1,259	1,259	1,000	1,000	1,000	692	692	0	0
		Principal repayment 2	0	0	259	259	259	567	567	1,259	1,259	1,259	1,259	1,259	1,259	1,259	1,259	1,259	1,259	1,000	1,000	1,000	692	692	0
		Principal repayment 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Refund of JICA 2 Step Loan	0	233	450	419	665	893	1,448	1,961	1,810	1,659	1,508	1,357	1,206	1,055	904	753	602	466	346	226	125	42	0
	Short term debt	Outstanding balance	0	1,655	992	125	996	0	3,735	3,681	2,952	4,038	5,115	11,278	18,557	25,486	31,996	38,005	43,164	47,359	50,722	52,814	53,474	52,461	49,768
		Borrowing	0	1,655	0	0	872	0	3,735	0	0	1,087	1,076	6,163	7,279	6,930	6,510	6,009	5,159	4,195	3,363	2,092	659	0	0
		Repayment	0	0	663	868	0	996	0	54	730	0	0	0	0	0	0	0	0	0	0	0	0	1,013	2,693
		Refund of JICA 2 Step Loan	0	0	166	99	12	100	0	374	368	295	404	511	1,128	1,856	2,549	3,200	3,801	4,316	4,736	5,072	5,281	5,347	5,246
	Deposit	Outstanding balance	0	0	0	0	0	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417
		Deposit	0	0	0	0	0	1,417	1,417	0	0	1,087	1,076	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	659	0	0
		Reversal of cash and deposits	0	0	0	0	0	0	1,417	0	0	1,087	1,076	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	1,417	659	0	0

	(2) 2013	(1) 2014	0 2015	1 2016	2 2017	3 2018	4 2019	5 2020	6 2021	7 2022	8 2023	9 2024	10 2025	11 2026	12 2027	13 2028	14 2029	15 2030	16 2031	17 2032	18 2033	19 2034	20 2035
① Investment in facility and equipment	19,397	20,561	0	23,103	24,489	51,916	55,031	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
② Government subsidies of Infrastructure construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
③ Ordinary profit	0	-233	-738	-533	-578	-656	-2,455	-5,680	-5,004	-6,173	-5,516	-9,150	-8,130	-7,781	-7,361	-6,049	-5,457	-2,929	-2,097	-1,133	-9	1,295	3,295
④ Depreciation	0	0	1,918	1,918	1,918	4,203	4,203	9,338	9,338	9,338	9,338	9,338	8,656	8,656	8,656	7,845	7,845	6,021	6,021	6,021	6,021	6,021	5,508
⑤ Interest expense	0	233	616	518	678	993	3,077	3,932	3,710	5,361	5,215	9,390	9,625	9,885	10,109	10,292	10,425	10,488	10,470	10,369	10,159	9,825	9,365
⑥ Interest received	0	0	0	0	0	0	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
⑦ "-(Investment - Government subsidiees)+EBITDA	-19,397	-21,027	565	-22,236	-23,826	-49,362	-56,346	-260	638	-2,183	-1,380	-9,188	-9,084	-8,995	-8,800	-8,482	-8,023	-7,381	-6,531	-5,467	-4,133	-2,495	-547
IRR（10 years)=	#DIV/0!	←「#DIV/0!」の場合は値がでなかったことを示す																					
IRR（15 years)=	#DIV/0!	←「#DIV/0!」の場合は値がでなかったことを示す																					
IRR（30 years)=	-2.30%	←「#DIV/0!」の場合は値がでなかったことを示す																					
① Investment	1,940	1,940	0	2,310	2,310	5,192	5,192	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
② Dividend	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	825	2,101
(-Investment)+Dividend+Selling profit of the company 10th year after operation	-1,940	-1,940	0	-2,310	-2,310	-5,192	-5,192	0	0	0	0	0	-25,964										
(-Investment)+Dividend+Selling profit of the company 15th year after operation	-1,940	-1,940	0	-2,310	-2,310	-5,192	-5,192	0	0	0	0	0	0	0	0	0	0	-55,540					
(-Investment)+Dividend+Selling profit of the company 30th year after operation	-1,940	-1,940	0	-2,310	-2,310	-5,192	-5,192	0	0	0	0	0	0	0	0	0	0	0	0	0	0	825	2,101
EIRR（10 years)=	#DIV/0!	←「#DIV/0!」の場合は値がでなかったことを示す																					
EIRR（15 years)=	#DIV/0!	←「#DIV/0!」の場合は値がでなかったことを示す																					
EIRR（30 years)=	9.1%	←「#DIV/0!」の場合は値がでなかったことを示す																					

Table3-52～54

Water supply project (Unit：×1000US$)			21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
			2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
P/L	Revenue	Water seles	41,629	44,126	46,774	49,580	52,555	55,709	59,051	62,594	66,350	70,331	74,551	79,024	83,765	88,791	94,119	99,766	105,752
		Other incomes																	
	Total revenue		41,629	44,126	46,774	49,580	52,555	55,709	59,051	62,594	66,350	70,331	74,551	79,024	83,765	88,791	94,119	99,766	105,752
	Cost of sales	Purchases																	
		Other																	
	Total cost of sales		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Operating Expenditure	Operating cost	20,814	22,063	23,387	24,790	26,278	27,854	29,526	31,297	33,175	35,165	37,275	39,512	41,883	44,396	47,059	49,883	52,876
		Business expense	1,571	1,665	1,765	1,871	1,983	2,102	2,228	2,362	2,503	2,654	2,813	2,982	3,161	3,350	3,551	3,764	3,990
		Expenditure of O&M, water supply equipment rent																	
		Other expenditure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Fixed asset tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total operating expenditure		22,385	23,728	25,152	26,661	28,261	29,956	31,754	33,659	35,678	37,819	40,088	42,493	45,043	47,746	50,610	53,647	56,866
	Net profit (before depreciation)		19,244	20,398	21,622	22,920	24,295	25,752	27,298	28,935	30,672	32,512	34,463	36,530	38,722	41,045	43,508	46,119	48,886
	Depreciation	Infrastructure＋equipment・Machines＋distribution water	5,508	5,508	4,897	4,897	3,524	3,524	3,524	3,524	3,524	2,800	2,800	2,800	1,938	1,938	0	0	0
	Net operating profit		13,735	14,890	16,725	18,022	20,770	22,228	23,773	25,411	27,147	29,712	31,662	33,730	36,784	39,108	43,508	46,119	48,886
	Non-operating revenue and expenditure	Interest received	14	14	14	14	14	14	14	127	289	474	679	902	1,151	1,424	1,733	2,072	2,433
		Interest expense	8,778	8,066	7,214	6,221	5,057	3,737	2,208	1,581	1,231	979	727	436	262	0	0	0	0
	Ordinary profit		4,971	6,838	9,525	11,815	15,728	18,506	21,580	23,958	26,206	29,206	31,614	34,196	37,673	40,531	45,241	48,191	51,319
	Taxation	Corporate income tax ect.	1,243	1,709	2,381	2,954	3,932	4,626	5,395	5,989	6,551	7,302	7,904	8,549	9,418	10,133	11,310	12,048	12,830
	Profit in the current term		3,728	5,128	7,144	8,861	11,796	13,879	16,185	17,968	19,654	21,905	23,711	25,647	28,255	30,398	33,931	36,143	38,489
	Dividend payment		3,169	4,359	6,072	7,532	10,026	11,797	13,757	15,273	16,706	18,619	20,154	21,800	24,017	25,839	28,841	30,721	32,716
	Profit in the current term after dividend payment		559	769	1,072	1,329	1,769	2,082	2,428	2,695	2,948	3,286	3,557	3,847	4,238	4,560	5,090	5,421	5,773
	Accumulated profit		-70,492	-65,363	-58,219	-49,358	-37,562	-23,683	-7,498	10,470	30,124	52,029	75,740	101,386	129,642	160,040	193,971	230,113	268,603
Sources and uses statement	Sources	Revenue	41,629	44,126	46,774	49,580	52,555	55,709	59,051	62,594	66,350	70,331	74,551	79,024	83,765	88,791	94,119	99,766	105,752
		Interest received	14	14	14	14	14	14	14	127	289	474	679	902	1,151	1,424	1,733	2,072	2,433
		Investment (Private fund +Private manfacturing company + IP management invest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		JICA 2 Step Loan（Through local blue-chip bank）	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Government subsidies of Infrastructure construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Other Local bank's loan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Reversal of cash and deposits	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Short term debt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Total Sources	41,643	44,141	46,788	49,595	52,569	55,723	59,065	62,722	66,639	70,805	75,230	79,926	84,916	90,215	95,851	101,838	108,185
	Uses	Total operating expenditure	22,385	23,728	25,152	26,661	28,261	29,956	31,754	33,659	35,678	37,819	40,088	42,493	45,043	47,746	50,610	53,647	56,866
		Interest expense	8,778	8,066	7,214	6,221	5,057	3,737	2,208	1,581	1,231	979	727	436	262	0	0	0	0
		Taxation	1,243	1,709	2,381	2,954	3,932	4,626	5,395	5,989	6,551	7,302	7,904	8,549	9,418	10,133	11,310	12,048	12,830
		Utility facilities investment (infrastructure)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Utility facilities investment (equipment, machines)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Other utility facilities investmnet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Refund of JICA 2 Step Loan	5,287	5,287	5,287	5,287	5,287	5,287	5,287	5,287	4,744	4,201	4,201	3,554	2,907	1,454	0	0	0
		Refund of other Local bank's loan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Refund of short term debt	3,949	5,349	6,754	8,471	10,033	12,116	3,095	0	0	0	0	0	0	0	0	0	0
		Deposit of cash	0	0	0	0	0	0	11,326	16,205	18,434	20,504	22,310	24,893	27,286	30,883	33,931	36,143	38,489
		Total Uses	41,643	44,141	46,788	49,595	52,569	55,723	59,065	62,722	66,639	70,805	75,230	79,926	84,916	90,215	95,851	101,838	108,185
B/S	Asset	Cash	1,417	1,417	1,417	1,417	1,417	1,417	12,744	28,949	47,383	67,887	90,197	115,090	142,376	173,258	207,189	243,332	281,821
		Fixed asset balance	50,866	45,357	40,460	35,563	32,038	28,514	24,990	21,466	17,941	15,141	12,341	9,541	7,603	5,665	5,665	5,665	5,665
		Total asset	52,283	46,774	41,877	36,980	33,456	29,931	37,733	50,414	65,324	83,028	102,538	124,631	149,978	178,923	212,854	248,997	287,486
	Liabilities	Borrowing	103,891	93,254	81,213	67,455	52,135	34,731	26,349	21,061	16,317	12,116	7,915	4,361	1,454	0	0	0	0
		Capital	18,883	18,883	18,883	18,883	18,883	18,883	18,883	18,883	18,883	18,883	18,883	18,883	18,883	18,883	18,883	18,883	18,883
		Grant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Reserve	-70,492	-65,363	-58,219	-49,358	-37,562	-23,683	-7,498	10,470	30,124	52,029	75,740	101,386	129,642	160,040	193,971	230,113	268,603
		Total Liabilities	52,283	46,774	41,877	36,980	33,456	29,931	37,733	50,414	65,324	83,028	102,538	124,631	149,978	178,923	212,854	248,997	287,486
	Depriciation expense (utility facilities (infr	Depriciation by straight-line method	1,984	1,984	1,373	1,373	0	0	0	0	0	0	0	0	0	0	0	0	0
	Depriciation expense (utility facilities (Equ	Depriciation by straight-line method	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Depriciation expense (other utility facilitie	Depriciation by straight-line method	3,524	3,524	3,524	3,524	3,524	3,524	3,524	3,524	3,524	2,800	2,800	2,800	1,938	1,938	0	0	0
	Fixed asset balace		50,866	45,357	40,460	35,563	32,038	28,514	24,990	21,466	17,941	15,141	12,341	9,541	7,603	5,665	5,665	5,665	5,665
	JICA 2 Step Loan（Through local blue-ch	Outstanding balance	58,072	52,785	47,498	42,210	36,923	31,636	26,349	21,061	16,317	12,116	7,915	4,361	1,454	0	0	0	0
		Principal repayments (Total)	5,287	5,287	5,287	5,287	5,287	5,287	5,287	5,287	4,744	4,201	4,201	3,554	2,907	1,454	0	0	0
		Principal repayment 1	2,644	2,644	2,644	2,644	2,644	2,644	2,644	2,644	2,101	2,101	2,101	1,454	1,454	0	0	0	0
		Principal repayment 2	2,644	2,644	2,644	2,644	2,644	2,644	2,644	2,644	2,644	2,101	2,101	2,101	1,454	1,454	0	0	0
		Principal repayment 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Refund of JICA 2 Step Loan	3,802	3,484	3,167	2,850	2,533	2,215	1,898	1,581	1,231	979	727	436	262	0	0	0	0
	Other Local bank's loan	Outstanding balance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Principal repayments (Total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Principal repayment 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Principal repayment 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Principal repayment 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Refund of JICA 2 Step Loan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Short term debt	Outstanding balance	45,819	40,469	33,716	25,244	15,212	3,095	0	0	0	0	0	0	0	0	0	0	0
		Borrowing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Repayment	3,949	5,349	6,754	8,471	10,033	12,116	3,095	0	0	0	0	0	0	0	0	0	0
		Refund of JICA 2 Step Loan	4,977	4,582	4,047	3,372	2,524	1,521	310	0	0	0	0	0	0	0	0	0	0
	Deposit	Outstanding balance	1,417	1,417	1,417	1,417	1,417	1,417	12,744	28,949	47,383	67,887	90,197	115,090	142,376	173,258	207,189	243,332	281,821
		Deposit	0	0	0	0	0	0	11,326	16,205	18,434	20,504	22,310	24,893	27,286	30,883	33,931	36,143	38,489
		Reversal of cash and deposits	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
① Investment in facility and equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
② Government subsidies of Infrastructure construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
③ Ordinary profit	4,971	6,838	9,525	11,815	15,728	18,506	21,580	23,958	26,206	29,206	31,614	34,196	37,673	40,531	45,241	48,191	51,319
④ Depreciation	5,508	5,508	4,897	4,897	3,524	3,524	3,524	3,524	3,524	2,800	2,800	2,800	1,938	1,938	0	0	0
⑤ Interest expense	8,778	8,066	7,214	6,221	5,057	3,737	2,208	1,581	1,231	979	727	436	262	0	0	0	0
⑥ Interest received	14	14	14	14	14	14	14	127	289	474	679	902	1,151	1,424	1,733	2,072	2,433
⑦ "-(Investment - Government subsidiees)+EBITDA	1,715	4,294	7,222	10,505	14,209	18,308	22,910	26,028	28,788	31,501	34,366	37,462	40,501	43,893	46,973	50,262	53,752
IRR（10 years)=																	
IRR（15 years)=																	
IRR（30 years)=																	
① Investment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
② Dividend	3,169	4,359	6,072	7,532	10,026	11,797	13,757	15,273	16,706	18,619	20,154	21,800	24,017	25,839	28,841	30,721	32,716
(-Investment)+Dividend+Selling profit of the company 10th year after operation																	
(-Investment)+Dividend+Selling profit of the company 15th year after operation																	
(-Investment)+Dividend+Selling profit of the company 30th year after operation	3,169	4,359	6,072	7,532	10,026	11,797	13,757	15,273	16,706	89,531							
EIRR（10 years)=																	
EIRR（15 years)=																	
EIRR（30 years)=																	

3-5 Considering necessary content in order to launch project

The followings are items to be studies based on the results of survey and analysis.

(1) Environment-friendly utility management business

To increase the incentive for private investors to inject capital into the project, the 15-year IRR will be made possible by Dong Tam Group's injection of US$4.59 million US$ (US$3.52/^{2}: corresponding to 4.4-5.0% of US$70-US$80/^{2}) into utility maintenance costs, with the revenue collected as usage rates from businesses in existing industrial areas.

A utility management company will be set up at the Thuan Dao Industrial Park (owned by Dong Tam Group), through investment by corporate entities such as Kobelco Eco-Solutions, Shinsho Corporation, and World Link Japan, and through financing through JICA's general investment and loan scheme However, upon review, the survey found some potential profitability issues related to industrial water supply operations for Thuan Dao Industrial Park. As these issues will take some time to resolve, an alternative proposal will be reviewed, one which involves the use of water from the Vam Co Dong River provided by Phu An Thanh (Joint Stock) Company. Kobelco and Dong Tam will apply for financing through JICA during negotiations for securement of the industrial water supply.

(2) Water supply business

As described previously, construction cost for a water delivery and distribution system is one reason for the costly water usage rate. Because of the higher rates, it seems necessary for Long An Province to implement a public works project that includes some method of absorbing the difference between future and present usage rates, in such a way that takes into account new delivery and distribution costs.

To secure operational feasibility in a way that doesn't involve the increase of water usage rates, a number of steps will be taken.

Project down-sizing (Only Phase 1 operations can be done)

The expenses surrounding the construction of water distribution facilities subsidized by Long An Province

Founding of a holding company as a 100% subsidiary of Long An Province, which will make use of JICA's 2-Step Loan Program to develop and maintain a water distribution system. Thereby O&M Company of Water Supply Facilities can remove the asset of a water distribution system from its balance-sheet. O&M Company of Water Supply Facilities can relieve of both investment burden and maintenance/depreciation costs.

The predicted timeline for the supply of industrial-use water has been delayed by the as-yet unfinished upriver ADB project, and due to the time it will take to complete construction of a delivery and distribution system, either as a public works or yen-loan financed project. For that reason, We will review the adoption of the Phu An Thanh industrial water project that makes use of Vam Co Dong river water. However, since without clean water operations Long An Province's water demand cannot be met, Long An Province must also take part in the commercialization review of these operations.

(3) **Waste water treatment business**

During the process of conducting this survey, negotiations broke down while attempting to come to an agreement on burden allocation for the original target wastewater treatment operations at Duc Hoa IP. However, the industrial wastewater problem in Vietnam is serious, and a proposal will be made to review wastewater management-specific operations using as a model the system in place at Hoang Gia IP.

Appendix

<<Report on project cost estimation from VIWASE (the Vietnam water-supply consulting company>>

No.	Components	Unit	Quantity	Unit price	amount			Total amount (million VND)
					Construction	Technology	Equipment	
A	**Direct expense**							**2,762,178.78**
Ⅰ	**Raw water pumping station Q=210,000m^3/day**				**28,420.00**	**25,200.00**	**9,350.00**	**62,970.00**
1	Raw water canal L=100m,B=20m,H=3m	m^3	6,000	1.50	9,000.00			9,000.00
2	Pumping station L*B*H=25*12*8	m^3	2400	3.50	8,400.00			8,400.00
3	Pumps							
	Q=1500m^3/h, H=15m	set	3	450.00			1,350.00	1,350.00
4	Raw water reservoir L*B*H=2×500×120×3.5	m^3	420,000	0.06		25,200.00		25,200.00
	Power supply system	LS	1	10000.00	2,000.00		8,000.00	10,000.00
5	Auxiliary works	LS	1	9020.00	9,020.00			9,020.00
Ⅱ	**Tân-Mỹ Hòa Khánh Tây raw water pipeline**				**97,416.00**	**324,720.00**		**422,136.00**
1	Reinforce concrete pipe D1400	m	12000	27.06		324,720.00		324,720.00
2	Construction work(%pipe expense)	%	30		97,416.00			97,416.00
Ⅲ	**Phú Mỹ Vinh Ⅱ WTP,Q=200,000m^3/day**				**275,844.56**	**206,532.48**	**248,134.56**	**730,511.60**
	Surface water treatment plant	m^3	200000	3.44	240,954.56	206,532.48	240,954.56	688,441.60
	Investment rate of 2.24milion VND/m^3 in2007-							
	construction price index to 2008 is 1.27;in2009 was 1.1	1.27	1.10					
	and in 2010 is 1.1 in estimation							

No.	Components	Unit	Quantity	Unit price	amount			Total amount (million VND)
					Construction	Technology	Equipment	
	Power supply system	LS	1	42,070.00	34,890.00		7,180.00	42,070.00
V	**Booster pumping station**				**47,326.00**	**58,400.00**	**25,780.00**	**131,506.00**
V.1	**Tan Duc pumping station,Q=120,000m^3/day**				**14,470.00**	**20,700.00**	**9,850.00**	**45,020.00**
1	pumping station L*B*H=21*10*8	m^3	1680	3.50	5,880.00			5,880.00
2	pumps							
	Q=3600m^3/day	set	3	2,000.00			6,000.00	6,000.00
3	Clean water reservoir	m^3	10,000	2.00		20,000.00		20,000.00
4	Auxiliary works	LS	1	1,200.00		700.00	500.00	1,200.00
	Power supply system	LS	1	11,940.00	8,590.00		3,350.00	11,940.00
V.2	**Bến Lức pumping station,Q=100,000m^3/day**				**14,250.00**	**20700.00**	**8120.00**	**43,070.00**
1	pumping station L*B*H=21*10*8	m^3	1680	3.50	5,880.00			5,880.00
2	pumps							
	Q=3000m^3/h, H=40m	set	3	1,500.00			4,500.00	4,500.00
3	Clean water reservoir	m^3	10,000	2.00		20,000.00		20,000.00
4	Auxiliary works	LS	1	1200.00		700.00	500.00	1,200.00
	Power supply system	LS	1	11490.00	8,370.00		3,120.00	11,490.00
V.3	**Tan Trach pumping station,Q=50,000m^3/day**				**10,088.00**	**10,500.00**	**4,680.00**	25,268.00
1	pumping station L*B*H=18*8*7	m^3	1008	3.50	3,528.00			3,528.00
2	pumps							
	Q=1500m^3/h, H=40m	set	3	600.00			1,800.00	1,800.00

No.	Components	Unit	Quantity	Unit price	amount			Total amount (million VND)
					Construction	Technology	Equipment	
3	Clean water reservoir	m^3	5,000	2.00		10,000.00		10,000.00
4	Auxiliary works	LS	1	1000.00		500.00	500.00	1,000.00
	Power supply system	LS	1	8940.00	6,560.00		2,380.00	8,940.00
V.4	**Long Phung pumping station,Q=30,000m^3/day**				**8,518.00**	**6,500.00**	**3,130.00**	18,148.00
1	Pumping station L*B*H=18*8*7	m^3	1008	3.50	3,528.00			3,528.00
2	Pumps							
	Q=900m^3/h, H=40m	set	3	400.00			1,200.00	1,200.00
3	Clean water reservoir	m^3	3,000	2.00		6,000.00		6,000.00
4	Auxiliary works	LS	1	1000.00		500.00	500.00	1,000.00
	Power supply system	LS	1	6242.00	**4,990.00**		1,430.00	6,420.00
VI	**Treated water pipeline**				**337,855.98**	**1,077,199.20**		**1,415,055.18**
VI.1	**Hiep Hoa primary pipeline**				**23,603.58**	**67,438.80**		**91,042.38**
1	Ductile iron pipeD500	m	15000	4.11		61,578.00		61,578.00
	Construction work(%pipe expense)	%	35		21,552.30			21,552.30
2	Ductile iron pipe D300	m	3000	1.95		**5860.80**		5,860.80
	Construction work(%pipe expense)	%	35		2,051.28			2,051.28
VI.2	**Hoa Khanh Tay-Tan Duc transmission pipeline**				**73,656.00**	**245,520.00**		**319,176.00**
	Cast iron D1400	m	12000	20.46		245,520.00		245,520.00
	Construction work(%pipe expense)	%	30		73,656.00			73,656.00
VI.3	**Duc Hoa primary pipeline**				35,805.00	102,300.00		**138,105.00**

No.	Components	Unit	Quantity	Unit price	amount			Total amount (million VND)
					Construction	Technology	Equipment	
1	Ductile iron pipe D600	m	7,000	5.41		37,884.00		37,884.00
	Construction work(%pipe expense)	%	35		**13,259.40**			13,259.40
2	Ductile iron pipe D500	m	8000	4.09		32,736.00		32,736.00
	Construction work(%pipe expense)	%	35		11,457.60			11,457.60
3	Ductile iron pipe D400	m	10000	3.17		31,680.00		31,680.00
	Construction work(%pipe expense)	%	35		11,088.00			11,088.00
VI.4	**Tan Duc-Ben Luc transmission pipeline**				**74,131.20**	**247,104.00**		**321,235.20**
	Cast iron pipe D1200	m	16000	15.44		247,104.00		247,104.00
	Construction work(%pipe expense)	%	30		**74,131.20**			74,131.20
VI.5	**Northen Ben Luc primary pipeline**				**12,418.56**	35,481.60		**47,900.16**
	Ductile iron pipe D400	m	12000	2.96		35,481.60		35,481.60
	Construction work(%pipe expense)	%	35		12,418.56			12,418.56
VI.6	**Ben Luc-Can Giuoc transmission pipeline**				39,025.80	130,086.00		**169,111.80**
	Ductile iron pipe D800	m	15000	8.67		130,086.00		130,086.00
	Construction work(%pipe expense)	%	30		**39,025.80**			39,025.80
VI.7	**Bến Lức-primary pipeline**				**16,948.80**	**56,496.00**		73,444.80
	Cast iron pipe D700	m	8000	7.06		**56,496.00**		56,496.00
	Construction work(%pipe expense)	%	30		16,948.80			16,948.80
VI.8	**Can Duoc - Can Giuoc transmission pipeline**				**31,220.64**	**104,068.80**		**135,289.44**
	Cast iron pipe D800	m	12000	8.67		104,068.80		104,068.80

No.	Components	Unit	Quantity	Unit price	amount			Total amount (million VND)
					Construction	Technology	Equipment	
	Construction work(%pipe expense)	%	30		31,220.64			31,220.64
VI.9	**Can Duoc primary pipeline**				**12,418.56**	**35,481.60**		**47,900.16**
	Cast iron pipe D400	m	12000	2.96		35,481.60		35,481.60
	Construction work(%pipe expense)	%	35		12,418.56			12,418.56
VI.10	**Can Giuoc primary pipeline**				**18,627.84**	**53,222.40**		**71,850.24**
	Cast iron pipe D400	m	18000	2.96		53,222.40		53,222.40
	Construction work(%pipe expense)	%	35		18,627.84			18,627.84
	Total direct expense(A)				**78,682.54**	**1,692,051.68**	**283,264.56**	**276,217,878**
	Construction expense including VAT Gxl							**247,891,422**
	Equipment expense including VAT Gtb							**283,264.56**
B	**Project Management Cost**							**17,708.76**
C	**Investment consultancy cost**							**41,135.32**
1	Preparation of Investment document(A*0.109%*1.1)	%		0.113				3,124.02
2	Geological Survey cost for preparation of Investment report							5,360.00
3	Topographic survey scale 1/500 for preparation of investment report							4,610.00
4	Technical design, detailed design, cost estimation							

No.	Components	Unit	Quantity	Unit price	amount			Total amount (million VND)
					Construction	Technology	Equipment	
4.1	Water intake, raw water ps,booster water ps,WTP	%		1.418				13,503.79
4.2	Treated water pipeline	%		0.964				1,053.40
5	Cost for project effectiveness and feasibility review	%		0.014				12.47
6	Expense for design review	%		0.032				790.99
7	Expense for cost estimate review	%		0.029				715.66
8	Preparation of construction bidding documents, bid	%		0.022				489.02
9	Preparation of equipment procurement bidding documents,	%		0.066				169.19
10	Construction supervision	%		0.427				10,594.88
11	Supervision for equipment installation	%		0.240				711.91
D	**Other expense**							**99,879.29**
1	Work insurance expense	%		0.035				9,714.84
2	Expense for review/approval total investment capital	%		0.155				4,135.74
3	Audit expense	%		0.230				608.71
4	Land clearance and compensation(temporary calculation)							79,950.00
	Raw water pipeline							23,400
	Hoa Khanh Tay-Tan Duc primary pipeline							14,625
	Tan Duc-Ben Luc primary pipeline							15,600
	Ben Luc-Can Duoc primary pipeline							14,625
	Can Duoc-Can Giuoc transmission pipeline							11,700
E	Total(A+B+C+D)							**2,920,902**

No.	Components	Unit	Quantity	Unit price	amount			Total amount (million VND)
					Construction	Technology	Equipment	
F	Contingency5%(A+B+C+D)							146,045.11
G	Interest during construction							476,691.23
H	Drift of prices(10%year-3year)							361,023.51
	Total (E+F+G+H)							**3,904,662**

Dong Tam Industrial zone Joint Stock Company

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REPORT OF EVALUATING ON ENVIRONMENTAL IMPACT –
INVESTMENT PROJECT OF THUAN DAO EXTENDED INDUSTRIAL ZONE

***LOCATION*: LONG DINH COMMUNE – CAN DUOC DISTRICT – LONG AN PROVINCE**

INVESTOR
Dong Tam Industrial zone Joint Stock Company
Director
(Signed & Sealed)
CHAU VAN HUYNH

CONSULTING UNIT
Center of Environmental Monitoring and Engineering
Director
(Signed & Sealed)
DO THI NGOC HOC

Department of Natural Resources and Environment Confirmation
"Report on Evaluating of Environmental Impact - Investment Construction Project of Thuan Dao Extended Industrial Zone" *of* ***Dong Tam Industrial zone Joint Stock Company*** *Approved in Decision No.3027/UBND on date Nov. 18, 2009 of People's committee Long An Province*

Department of Natural Resources and Environment Long An Province
Director
(Signed & Sealed)
NGUYEN VAN THIEP

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OPENING
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1. SOURCE OF PROJECT

Nowadays, Long An province is still in the progress of conversion from agricultural production in to industrial production so it attracts many types of investment in the area that brings about huge benefits of economic, society; also contributes improving people's living standard.

However, there are a lot of industrial factories are formed and developed which are scattered and interleaved in the residential area and focused lengthways arterial traffic therefore it causes many problems that impact on environment and people's living standard. So many zones, groups of industries are set up then it will create advantageously conditions as call for investments in developing industrial zones as control, manage and minimize problems mentioned above.

However, there are huge benefits of economic, society. The industrial development is also showed many environmental problems. Therefore, protecting environment for strong development is interested in entire society, appropriate authorities and investors themselves. To comply with Law on Environmental Protection, Dong Tam industrial zone Joint stock Company carries out to set a report to evaluate on environment impact (ĐTM) for project "Extended Thuan Dao Industrial Zone" in Long Dinh commune, Can Duoc district, Long An province.

Company should be responsible for implementation of the investment project.

2. PURSUANT TO LAW AND TECHNIQUE OF EVALUATION ON ENVIRONMENTAL IMPACT (ĐTM)

Environment impact report for project is established on complying with the following legal documents:

- Law on Environmental Protection No. 52/2005/QH11 dated on November 29th 2005.

- Decree No. 80/2006/NĐ-CP dated on August 09th 2006 by Government of the Socialist Republic of Viet Nam on detail regulations and instructions for implementation many articles of Law on Environmental Protection.

- Decree No. 21/2008/NĐ-CP dated on February 28th 2008 2006 by Government on amendment, adjustment many articles of Decree No. 80/2006/NĐ-CP dated on August 09th 2006 by Government on detail regulations and instructions for implementation many articles of Law on Environmental Protection.

- Circular No 08/2006/TT-BTNMT (Ministry of Natural Resource and Environment) dated on September 08th 2006 by Ministry of Natural Resource and Environment about instructions to evaluate on strategically environment, evaluates on environmental impact and commits to protect environment.

- Circular No. 12/2006/TT-BTNMT dated on December 26th 2006 by Ministry of Natural Resource and Environment about practice condition instructions and documentary proceedings, registration, practiced license, harmful wastage managed code.

- Decision No. 23/2006/QĐ-BTNMT dated on December 26th by Ministry of Natural Resource and Environment for publishing harmful wastage list.

- Circular No. 07/2007/TT-BTNMT dated on July 03rd 2007 by Ministry of Natural Resource and Environment for instructions of classifying and deciding list of factory caused environmental pollution which is settled

- Decree No. 59/2007/NĐ-CP dated on April 09th 2007 by Government on management solid waste.

- Decree No. 88/2007/ NĐ-CP dated on May 28th 2007 by Government on urban and industrial drainages.

- Decree No. 67/2003/ NĐ-CP dated on June 13th 2003 by Government on "Environment protective charges for sewage"

- Decree No. 04/2006/ NĐ-CP dated on January 08th 2007 by Government on "Amending, adjusting many articles of Decree 67/2003/ NĐ-CP dated on June 13th 2003 by Government on Environment protective charges for sewage.

- Official correspondence No. 1161/CP-CN dated on August 16th 2004 by Prime Minister "as regarding to policy extending Duc Hoa I Industrial Zone and Thuan Dao Industrial Zone in Long An province".

- Official correspondence No. 3605/CV-UB dated on September 11th 2003 by Long An provincial people's committee "as regarding to policy extending Thuan Dao Industrial Zone"

- Official correspondence No. 5397/UBND-NN dated on November 02th 2006 by Long An provincial people's committee "as regarding to Ben Luc Industrial zone investment development associated Company to deploy to invest 1 phase in Extended Thuan Dao Industrial Zone".

- Official correspondence No. 02/2008/CV-PC/KCN dated on January 29th 2008 by Dong Tam industrial zone Joint stock Company "as regarding to change Company's name"

- Decision No. 3266/QĐ-UBND dated on December 20th 2007 by Long An provincial people's committee "as regarding to ratify detail planning design for construction with 1/2,000 in map scale of Extended Thuan Dao Industrial Zone, Long Dinh commune, Can Duoc district, Long An province.

- The report for using Viet Nam's standards applied as followings:

+ TCVN (VietNamese standard) 5949: 1998, acoustic- noise level in public and residential areas- Allowable maximum noise level;

+ TCVN 5937:2005, surrounding air quality standard;

+ TCVN 5938:2005, concentration of allowable maximum of many toxics in surrounding air;

+ TCVN 5939:2005, industrial waste gas standard on dust and inorganic;

+ TCVN 5940:2005, industrial waste gas standard on organic;

+ QCVN (Vietnamese regulation) 08:2008/BTNMT : National technical regulation on surface quality.

+ QCVN 09:2008/BTNMT: National technical regulation on underground water quality.

+ TCVN 5945:2005, industrial sewage – Exshaust standard

+ QCVN 03:2008/BTNMT: National technical regulation on allowable limited of heavy metal in soil

3. ORGANIZED TO PERFORM THE EVALUATION ON ENVIRONMENTAL IMPACTS

Dong Tam industrial zone Joint stock Company organizes the evaluation on environmental impact report for project with consultation of Centre of observation and environmental technical service that bases on:

- To collect necessary documents, data, records on economic, technique, natural environmental conditions, society- economic and other documents that relating to project and place to carry out the project.

- To survey the economical, social conditions; to measure environmental situation in project area.

- To estimate, evaluate project impacts on environment and society, economic and then propose the methods of preventing, overcoming for environment monitoring program.

List of members who take part in setting up the evaluation on environmental impact report for project:

* Dong Tam industrial zone Joint stock Company:

- Mr Vo Van Khuyen – Chief Executive Officer (CEO)

* Centre of observation and environmental technical service:

- Do Thi Ngoc Hoc - BA – Deputy Director

- Quach Cao Minh- Engineer – Deputy manager of Technical consultant

- Huynh Cong Thao- worker - Deputy Technical consultant

- Doan Minh Phung - Engineer - Deputy Technical consultant

- Phan Thi Ngoc Anh - Engineer - Deputy Technical consultant

- Tran Hong Nhung - Engineer - Deputy Technical consultant

- Mai Truong Han- Engineer – Deputy Observer and Tester

And all members of Department of Centre of observation and environmental technical service

CHAPTER I
DESCRIBED PROJECT BRIEFLY
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1.1. PROJECT NAME

Extended Thuan Dao Industrial Zone Project

1.2. Project manager

- Project manager: **Dong Tam industrial zone Joint stock Company**

Business address: Thuan Dao Industrial zone, Ben Luc district, Long An province.

- Phone No. : **0918667979**

- Representative: Mr **Vo Van Khuyen** Position: **General Director**

1.3. GEOGRAPHICAL POSITION OF PROJECT

Geographical position of Extended Thuan Dao Industrial zone locates in Long Dinh commune, Can Duoc district, borders on Rach Chanh and connects with Thuan Dao Industrial zone in 1 phase belongs to Ben Luc town.

The area concludes:

- The North near: Rach Chanh

- The West near: roads between villages (red gravel path)

- The South near: couple channel tracks in interior field

- The East near: Currently population lengthways Backroad16

Total area of ground: 189.843 hectare

1.4. PRIMARY CONTENT OF PROJECT

1.4.1. Current use of land

All planning area of Extended Thuan Dao Industrial zone and most of them are field land and several land tenures, canals and a few houses

Among 189.843 hectare of planning land for industrial zone including:

- Land tenures: 12.5788 hectares - 6.63%

- Field land: 148.1973 hectares - 78.07%

- Pond and canal land: 3.789 hectares - 2%

- Traffic area: 0.3318 hectares - 0.17%

- Garden area: 16.257 hectares - 8.56%

- Area for graveyard, tombs: 1.2018 hectares - 0.63%

- Specializing area: 6.4223 hectares -3.38%

- Perennial land: 1.012 hectares - 0.53%

- Flat area is still not used: 0.053 hectares - 0.03%

Total : 189.843 hectares -100%

1.4.2. Current population

There are approximately 1,600 people living in 320 households in industrial planning area, most of them are farmers, traders and some other are local authorities in many agencies in town country and neighborhood communes.

1.4.3. Current architecture

There are 320 houses in industrial planning area with total building floor area: 19,200m^2 including:

* Semi- solidly houses: 320 houses – 19,200 m^2

* Tombs: approximately 400 tombs

1.4.4 Current technical structure

a) Traffic:

There is a road between villages (red gravel path) in the planning area that lines on the West, Rach Chanh is on the North and Backroad 16 is on the East, The south borders couple channel tracks in interior field with 4-6m.

Backroad 16 crosses to Planning area with red gravel path in 6m

Beside it there are many edges of field, canal in order to come to householders in the planning area.

b) Electrical supply

- There is a medium voltage line and a low voltage line along Backroad 16 connected from Ben Luc transformer station with 110/22KV – 40+63 MVA through 22KV line.

- Medium voltage line is along Rach Chanh – Long Dinh road

c) Water supply

There isn't yet any public water supply system. The people principally use rain-water or drilled well water locally

d) Drainage

There isn't yet drainage system. Rain-water and sewage is exhausted primarily following the ground into fields, ponds, canals and Rach Chanh

1.4.5 The nature of industrial zone

The nature of industrial zone is a light industry, processing industry with a little toxin. It priority develops potential industries in region, specially develops manufacturing industries with industrial electrical products and domestics, processing industrial products and high-technical industrial products (they are primarily manufacturing industries with low polluted).

Types of industry are scheduled to place in Extended Thuan Dao Industrial zone as the following:

- Construction materials and interior decoration manufacturing industries: (Types of industry make low environmental pollution)

- Manufacturing industries with products serviced for agriculture, cattle food (dry materials)

- Machinery industry, mechanical engineering, casting mechanic, fisheries and agricultural mechanic

- Industrial resinous products manufacturing industries

- Food processing, beverage, agricultural and forestry.

- Biological technology, health facilities production

- Manufacturing industries with car accessories, motor- accessories; to manufacture and install accessories and devices of motor; to manufacture technical accessories for transport (without plating)

- Manufacturing industries with electron devices, communication and telecommunication devices

- Manufacturing industries with consumer goods for domestic and export: domestic tools, cosmetic, pottery, ceramic, china, glass, garment,…

1.4.6. Industrial orientation

- It is one among two primary, important industry zones in Can Duoc area so that it could attract domestic and foreign investments into building and developing industry; also contribute to create a turning point of economic – society in Long An driven into industrialization and modernization.

- It is a industrial zone with favorable geographical position for relationship in area and technical infrastructure so that it has strong ability to develop industry effectively

- Extended Thuan Dao Industrial zone is a building industrial zone with many factories in order to manufacture the products serviced for agriculture consumer goods for domestic and export, building materials serviced for house building demands and infrastructure buildings in Mekong delta

1.4.7 Planning structure

All planning of industrial zone is divided into the following:

- Industrial enterprise area is divided into 8 groups:

Group A: 15.45 hectares

Group B: 20.37 hectares

Group C: 20.38 hectares

Group D: 19.77 hectares

Group E: 11.56 hectares

Group F: 13.32 hectares

Group G: 14.69 hectares

Group H: 14.71 hectares

- Central area for commercial service is located in the Northern industrial zone on Rach Chanh

- Node structure (electric supply, water supply) is located in the Northern industrial zone

- Sewage treatment area and transshipment disposal area is located in Northeastern industrial zone on Rach Chanh culvert.

Total area of industrial enterprise land: 130.25 hectares

1.4.8 Land use planning

a) Plane of land use planning

Functional zoning

With structure of plan selected, the industrial zone planning is divided into functional zones such as:

**** Industrial enterprise groups include:***

Group A: 12 plots, area 15.45 hectares

Group B: 14 plots, area 20.37 hectares

Group C: 14 plots, area 20.38 hectares

Group D: 14 plots, area 19.77 hectares

Group E: 08 plots, area 11.56 hectares

Group F: 08 plots, area 13.32 hectares

Group G: 10 plots, area 14.69 hectares

Group H: 08 plots, area 14.71 hectares

Total area for industrial enterprise building is 130.25 hectares; divided into 8groups with 88 plots, each plot is from 1.015 hectares to 2.59 hectares

**** Centre of service***

The centre of commercial service is placed at the best favorable position near main road of industrial zone in 1 phase and extending.

Land area: 6.43 hectares -12.24 hectares

Building density: 30-40%

Coefficient of industrial territory utilization: 0.6 – 0.7

Land for building node structure area:

Proposed land for nodal building structure: 2.34 hectares including:

- Power supplying station: 0.40 hectares

- Water supplying plant: 0.40 hectares

- Sewage treatment area: 0.70 hectares

- Transshipment disposal area: 0.84 hectares

The positions of node structure will be removed to conformable places when beginning to build relating technical systems.

**** Sewage treatment area and disposal area:***

They are located near Rach Chanh and commercial service area so that it is useful for transporting waste into centralized sewage disposal plant in daily then they are treated absolutely before sewage water exhausted into Rach Chanh and Vam Co Dong River.

**** Road network in industrial zone:***

Main roads is connected from major road of Thuan Dao Industrial Zone in 1 phase then on North and south and spur road alternately which set up a closed road network and it is very comfortable for relationship inside or outside the industrial zone

Areas of road in industrial zone: 19.633 hectares

**** Insulated green area***

Green is the most important for urban in generally and for industrial zone in particularly. They have much effects on improving microclimate and sanitation in necessary for industrial zone and they are more important for industrial zone in urban.

It is planted green in industrial zone according to 3 types:

* To plant green separately between not together functional areas or properties of manufacture or between industrial area and residential area. To plant shady green in conjunction with separated green.

* Shady green are planted mainly along the streets, internal roads in the industrial zone or internal roads in each factory

* Green for carpet in order to decorate for effect on stage is mainly planted in roads and outer separation in front of enterprise buildings. To plant shady green in conjunction with decorate for effect on stage.

Aside from centralized parts of green, must be planted fixed scale of green (at least 20% of area)

Total area of green and separated green**: 19.04 hectares**

b**) Synthesis of land use planning**

Table 1.1 Statistics of land use planning

No.	Type of land	Area (hecta)	Rate %
1	Land Industrial	130,25	68,61
2	Land Service Centre	18,58	9,79
3	Land traffic	19,633	10,34
4	Land green tree	19,04	10,03
5	Land for major works	2,34	1,23
	Total	**189,843**	**100%**

1.4.9. Planning system infrastructure Technical

a) System Traffic:

Road network of industrial zone

- Road No.1: Pavement 8mx2, sidewalk 5mx2, Sequence separat wide 4m, road limit 30m, length 1.325m.
- Road No.9: Pavement 14m, sidewalk 5m x 2, road limit 24m, length 1.361m.
- Đường số 10: Pavement 14m, sidewalk 4m x 2, road limit 22m, length 1.372m.
- Đường số 11: Pavement 8m, sidewalk 4m x 2, road limit 16m, length 1.360m.
- Đường số 12: Pavement 7m, sidewalk 4m x 2, road limit 13m, length 1.110m.
- Đường số 13: Pavement 8m, sidewalk 4m x 2, road limit 16m, length 1.140m.
- Đường số 14: Pavement 8m, sidewalk 4m x 2, road limit 16m, length 1.230m.
- Đường số 15: Pavement 7m, sidewalk 4m x 2, road limit 13m, length 1.280m.
- General length lines is : 10.178 m.

b) Technical preparation for building land

*** Background leveling scheme**

- All area of industrial zone is designed elevating Cos background with altitude is lower than Long Dinh – Long Cang roads completed approximately 0.1m. The design is met discharged direction for each factory with its ramp background directly forward road and Rach Chanh for draining conveniently

- Designed altitude HXD ≥ 1.5 m

- Filling soil volume: 4,129,085 m^3

- The current of getting soil for leveling: in purpose of using sand from Ben Tre or other by barge on the Vam Co Dong River

***Rain-water draining**

- Directions of drainage:

Two basins are placed for primary draining into Rach Chanh on the Northwestern and Northeastern industrial zone

- Drainage system:

To use box culvert or culvert with cap which are placed along the pavement of roads in order to ensure collecting and draining rain-water from road surface, pavements and buildings

Hydraulic design formula:

Q=□.q.F (L/S) □: coefficient of covering surface 0.6

Q: calculated rainfall rate (l/s hectares)

F: calculating basin area (hectares)

(to select the circle of overflow culvert in 3 years)

Dimension of drain: 14.530m including:

φ 1,200 with 775m in length

φ 1,000 with 1,130m in length

φ 800 with 6,530m in length

φ 600 with 6,095m in length

c) Water supply

*** Water resources**

Company will use the water resource from Ben Luc water plant with its mass capacity or from Hoang Long water supplying company where were built to serve for industrial zone and population in Ben Luc district and vicinity.

- Water demand: 7,594m^3/day and night

- Water supply standard: 40 m^3/hectare/day and night

- Water demand for fire-fighting with flow of 20littles/s in 3 hours

*** Network**

- From water supply station runs into building groups by conduit with φ 250 and from main conduit into areas and buildings by branch pipes with φ 200, with φ 150.

- To place many fire-plugs along the roads with φ 100 in distance 150m/plug. Total fire-plugs are: 69 plugs.

- Water supply pipelines are made by cast iron or galvanized iron or special PVC plastic pipeline

Total lengthen of pipelines: 11,147m

Among that:

φ 250: 1,105m

φ 200:5,686m

φ 150: 4,356m

d) To drainage sewage water and clean environment

*** Sewage drainage**

To plan sewage water drainage system separated to rain-water drainage system

- Sewage flow rate:

Total sewage flow rate is 6,075m^3/day, among that the standards of sewage water drainage is 80% supplied water flow rate

- Sewage water drainage system:

● To layout many pipelines D400 in order to collect sewage from any buildings to run into main pipelines D600, D800 then it runs through sewage treatment plant and then it exhausts out by pipeline D800

● The depth of sewage drain with depth of drain: at first point is 1.2m and at treatment plant is 2-3m.

● The drain is automatically run with total depth is: 11,300m

Among them:

D800 with 1,105m in length

D600 with 5,826m in length

D400 with 4,369m in length

- Sewage treatment: includes 01 sewage treatment plant with capacity 6,080 m^3/day and night.

Sewage is treated with 2 levels:

+ The level I: The sewage is treated in the plant according to standards of Thuan Dao industrial zone regulated before exhausting into sewage drainage network

+ The level II: The sewage is treated centralized in the plant according to Viet Nam standards TCVN 5945 : 2005 which met A column before exhausting into receiving place – Rach Chanh

- Waste gas treatment: according to TCVN

* TCVN 5939: 2005 industrial waste gas standards on dust and inorganic

* TCVN 59: 2005 industrial waste gas standards on dust and organic

- Waste treatment:

To place a centralized garbage collection area with scale of 0.70 hectare near the sewage treatment plant in order to remove to gathered disposal area of district

- To place garbage trucks to collect in daily, not allow backlogging waste which impacted in surrounding environment

c) Power supply

- Power: to plug in Ben Luc station with 100/22KV – 40 + 63 MVA crossing line 22 KV in currently then running along Long Dinh - Long Cang road or Backroad 16 and then directing to planning area. It is also plug in Phu Lam's power

Criterion of power supply: 250 KW/hectare.

- Power demand: 164,57292 million KW h/year

* Total need (including waste and provision): 189.26 million KW h/year

* Total capacity: (including waste and provision): 50,519,76 KW

- Power: to plug in transformer of Ben Luc station 110/22KV – 40+63MVA

- Network:

* From the transformer of industrial zone lines to supply for enterprises, each line is used 3AC 240+120 line covered PVC which is laid concrete pillars with 12m-14m in high. Arranged power line must be secured isolating under the regulation

*** Total length of medium voltage: 13,316m**

Street lighting system: there are 5 step-down stations with 22/0.4 KV supplying power for street lights in the area. Street light is high pressure Sodium type 220V-250W with orange color; is laid on concrete pillars with 8.5m in high in distance of surface road with 8m. At any where there is a medium voltage line so that the street lighting line will be laid along. All street lighting system should be opened and closed automatically by cell or timetable switch. Length of low voltage line is 17,451m. Street lights are laid on one side of road which the road is smaller than 10m. Street lights are laid on two sides of road which the road is larger than 10m.

f) Communication

●Design criteria:

- Area of manufactories: 12 subscriber stations/hectare.

- Area of service centre: 24 subscriber stations/hectare

- Technical building area: 10 subscriber stations/hectare

● Design of object and solution:

- To ensure the demands of communication such as fixed and mobile telephone subscription; internet in the area

- To ensure reliability of communication system

- To construct underground fiber cable link from local post office to central office of industrial zone.

* Cable lines:

- There are many copper cable lines which be passed PVC pipe in depth buried from central office should be laid along two-sided pavement of roads in the industrial zone such as general cable line, branch cable lines, central boxes…. to any areas.

- To install cable lines, central boxes with huge capacity for subscription demands according to estimating then it is easily for subscription developing demands hereafter

- It is placed many manholes in order to pull the cable crossing road

- The centre of cable line is buried with depth in 0.8m as compared with bedding of completed pavement

- Volume of cable lines is depended on communication demands

- On each cable line, placed a cable head box on pavement for easily to connect to factories, enterprises

- Total length of communication cable lines are: 3,663m

- Total subscriber numbers in whole industrial zone: 1,960 subscribers

1.4.10 Implementation schedule

The major time marks to implement the project is divided into the following phases:

* Phase 1:

To complete investment formalities:

- To survey, to distrain the land: from Quarter I-2007 to Quarter II-2008.

- To set up the documents in order to submit planning: Quarter IV-2007

- To set up feasibility study report: Quarter III – 2008

* Phase 2:

- To compensate, evacuate the plan: Quarter III-2008 to Quarter IV-2008

- To fill the plan; to build technical infrastructures: from Quarter III-2009 to Quarter IV-2011

* Phase 3:

- To count invested capital: Quarter I-2012

- To complete the project: Quarter II-2012

CHAPTER II

NATURAL, ENVIRONMENTAL AND SOCIO-ECONOMICAL CONDITIONS

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2.1. NATURAL AND ENVIRONMENTAL CONDITIONS

2.1.1 Topographical features:

- The planning land area in Extended Thuan Dao Industrial zone is flat, low topographic with the most agricultural lands

- Mean attitude of surface field is lower than Long Dinh – Long Cang road approximately 1.3m

2.1.2. Hydrologic and climate conditions

The project is located in Can Duoc district, Long An province so the data of climate condition is referred to Long An province's annual statistical yearbook.

Long An climate is tropical climate and monsoon with rainy season and dry season clearly. Dry season is extended from November of this year to April of next year. Rain season is extended from May to November

2.1.2.1 Air temperature

Base on the data has been made statistically from 2003-2007 at survey station showing that:

- The annual average temperature (2003-2007) at Tan An station: 26.4^{0}C

- The annual average temperature is variable approximately: 26.2-27.5^{0}C

- The temperature difference between the highest and the lowest month is approximately 3.7-5.2^{0}C

- The lowest temperature is often in December and January. The highest temperature is often in April and May.

Table 2.1 Monthly average temperature from 2003-2007

Station	Monthly average temperature (^{0}C)											
	1	2	3	4	5	6	7	8	9	10	11	12
Tan An	24.62	24.96	26.6	28.36	27.84	27.34	26.48	26.56	26.42	26.42	26.32	24.98

Data source: Long An province's annual statistical yearbook in 2007

Air temperature is affected directly emissive, diluted and converting process on pollutant in the air. The temperature is more and more higher then the chemical rate of reaction is the more quickly and time saving the mass in the air is smaller. Simultaneously the temperature a factor makes a change in the evaporating process of organic solvent, stench of mass that is an important factor affected directly on worker's health during working process. Therefore, during time of estimating, forecasting air polluted and proposing solution to prevent pollution that is necessary to be analyzed the factor of temperature.

2.1.2.2. Rainfall

- The rain season begins from May to November with the rainfall approximately 1,301 – 1,440mm, it contains 89.9-94.9% annual rainfall.

- The dry season begins from December to April with the rainfall approximately 85.2 – 145.3mm. it contains 5.1-10.1% annual rainfall. The dry season is reduced clearly with the lowest flow in any river. The water underground level is deeper and seawater level intrudes into mainland following the rivers has an apogee of value.

Table 2.2 Monthly average rainfall from 2003-2007

Station	Monthly average rainfall (mm)											
	1	2	3	4	5	6	7	8	9	10	11	12
Tan An	6.14	11.36	8.74	35.92	235.24	163	215.54	191.12	255.28	208.66	112.74	31.56

Data source: Long An province's annual statistical yearbook in 2007

Rain condition will affect on air quality. It will roll and clean all dust and polluted mass in the air; reduce concentration these mass. Simultaneously water will dilute and take away any mass on the surface land (particularly for cleaning alum); also reduce the pollution in soil environment. Therefore, during time of estimating, forecasting environmental quality and proposing solution to minimize environmental pollution so then it is necessary to analyze and estimate the natural rainfall.

2.1.2.3 Air humidity

Air humidity is depended on rainfall in each season in year. Average air humidity at observer stations in Long An from 79.4 to 88.5%. The highest is 92% in rain season and the lowest is 73% in months of dry season.

Average air humidity in years (2003-2007) at Tan An station: 87.54%

Table 2.3 Monthly average air humidity from 2003-2007

Station	Monthly average air humidity (%)											
	1	2	3	4	5	6	7	8	9	10	11	12
Tan An	86.4	86.6	83.2	81.2	86.8	89.6	90.2	91	91.2	90	87.4	86.8

Data source: Long An province's annual statistical yearbook in 2007

Air humidity as well as temperature is one of natural factor affects on diluting and converting process on pollution and

temperature interactive process of body and human health. Therefore, for these above factors, we must be interested in air humidity in process of evaluating, forecasting environment impacts.

2.1.2.4. Sunlight regime

Long An province's hours of sunlight is observed yearly from 2,261 – 2,589 hours. Sunlight during the day is average from 6.5 – 7.1 hours/day, its maximum is from 9 – 9.4 hours/day. If conventionally for the sunlight month is over 200 hours of sunlight so the sunlight month is from November to April in Long An province. The sunlight month below 200 hours of sunlight is from May to October.

Table 2.4 Monthly average hours of sunlight from 2003-2007

Station	Monthly average hours of sunlight (hours)											
	1	2	3	4	5	6	7	8	9	10	11	12
Tan An	226.1	247.7	256.58	243.62	193.2	180.9	165	174.14	166.28	172.36	203.8	183.58

Data source: Long An province's annual statistical yearbook in 2007

2.1.2.5. Wind

In rain season, the decisive wind direction is southwesterly with appearing frequencies in 70%, from May to November. Wind from sea coming with steam and then it makes rains in the rain season.

In dry season, the decisive wind direction is southeasterly with appearing frequencies in 60-70%, from December to April.

In months of rain season, average wind speed is greater than dry season however the different in each month is not as many as. Monthly average wind speed is 2.8m/s. The strongest wind speed observed is approximately 30 – 40 m/s and then it usually has many thunderstorms. It is most happened in rain season with Western or Southwesterly direction.

2.1.2.6. Atmospheric stability

- Air pollutants are granular (dust) structured and gassy. The decided factor to exhaust dust and gas is atmospheric stability. The pollutants are mixed with the highest exhausting in atmosphere and they are belonged to rigid group A, B, C (unstable group).

- When the atmospheric stability belongs to A, B, C types – if the wind speed is small so the concentration of pollutant is higher, then the wind with great speed.

- If the neutral atmospheric stability is D type or E,F types, then the exhausting ability of pollutant is lowest.

- The degree of exhausting pollutant in dry season is higher than rain season.

Table 2.5 Atmospheric stability

Wind speed (m/s)	Irradiation of daytime			Covering in night	
	strong	weak	medium	Little cloudy	Very cloudy
2-4	A-B	B	C	E	F
4-6	B	B-C	C	D	E

Notices:

A: Very unstable D: Neutralization

B: Medium unstable E: Relative stability

C: Weak instability F: Stability

2.1.2.7. Evaporation

Evaporation is clearly allocated on seasonally, isn't variable on space. Average evaporation is from 65-70% in annual rainfall. Evaporation in dry season is rather great, on the contrary, evaporation in rain season is rather little, it is approximately 4-5mm/day

2.1.2.8. Hydrological regime

There are a lot of canal systems in the area which run crossing planning area as Rach Chanh River. Rach Chanh River is used for exhausting rain water as well as supplying fresh water to agricultural activities in Long Dinh commune. Its stream flow is Q<50m^3/s, connected to Vam Co Dong River and run parallel at the Northern project area.

2.1.3. The status quo of environmental quality in project area

2.1.4.1. Underground water

Centre of observation and environmental technical service took samples, analyzed underground water quality in public well (near Rach Chanh culvert) with 180m in depth. The underground water quality is showed at below table:

Table 2.6 Analyzed results on underground water quality

Criteria / Position	Results						
	Ph	Hardness (mg/l CAC_3)	C^- (mg/l)	NO_3^- (mg/l)	SO_4^{2-} (mg/l)	Fe (mg/l)	As (mg/l)
NN01	6.36	718	1,179	664,3	150	37.64	0.0015
QCVN 09: 2008/BTNMT	5.5-8.5	500	250	15	400	5	0.05

Source: Centre of observation and environmental technical service, October 2008

Notices:

- NN01 – Water sample taken in public well

- QCVN 09:2008/BTNMT: National technical regulation on underground water quality

Remarks:

Analyzed results show that the underground water quality with most of criteria (except As criteria) which isn't met QCVN 09:2008/BTNMT. Because of this underground water nappe is contaminated saltish and many heavy metals so should offer not using this nappe for living demands

2.1.4.2. Surface water

Centre of observation and environmental technical service took samples, analyzed surface water quality in Rach Chanh. Analyzed results of sample are showed at the following table:

Table 2.7 Analyzed results on surface water quality

Criteria Position	**Results**							
	Ph	BOD_5 (mg/l)	COD (mg/l)	TSS (mg/l)	N-NH_3 (mg/l)	N-NO_3 (mg/l)	N-NO_2 (mg/l)	Coliform (MNP/100ml)
NN01	6.62	19	34	57.30	0.174	0.05	0.009	240×10^3
QCVN 08: 2008/BTNMT	6-8.8	6	15	20	0.2	5	0.02	5.000

Source: Centre of observation and environmental technical service, October 2008

Notices:

Position to take samples:

- NN01 – Water sample taken in Vam Co Dong River

- QCVN 08:2008/BTNMT: National technical regulation on surface water quality

Remarks:

Analyzed results show that many criteria such as BOD_5, COD, SS, coliform are over QCVN 08:2008/BTNMT in column A, the remain criteria are regulated as QCVN 08:2008/BTNMT.

Just because the householders who live and breed castles surrounding area to exhaust directly sewage into these canals, trenches which affect to surface water quality.

2.1.4.3 Hydrobiology

During time of carrying out the evaluated on environment impact (ĐTM), Centre of observation and environmental technical service combined with investor to survey the hydrobiology in project area and surrounding. The results are following:

*** Phytoplankton area**

The structure of species composition

After surveying at two points in plant plankton that analyzed 30 plant plankton species belonging to 12 groups, 8 sets and 4 phylum of primary algae. Among them, Bacillariophyta wins a vantage position with 14 species holding 46,7%, next is Cyanophyta with 6 species holding 20%. Two Euglenophyta and Chlorophyta are equally numbers of species, each of phylum has 5 species holding 16,7% (table 2.8).

Table 2.8 The structure of plant plankton species compositions in plant plankton

Ordinal No.	Phylum	Numbers of set	Numbers of group	species	Rate (%) of species
1	Cyanophyta	1	1,0	6	20,0
2	Bacillariophyta	3	6,0	14	46,7
3	Chlorophyta	3	4,0	5	16,7
4	Euglenophyta	1	1,0	5	16,7
	Total	**8**	**12**	**30**	**100**

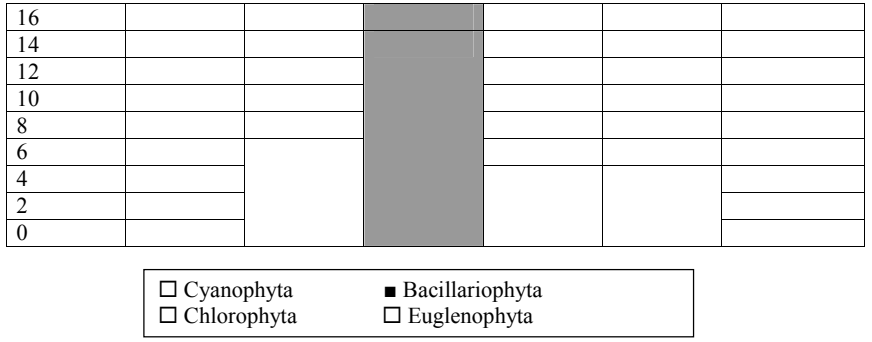

Figure 2.1 The structure of plant plankton species compositions in plant plankton

Bacillariophyta wins a vantage position with appeared of many branches such as:

Coscinodiscus, Cyclotella, Melosira, Fragilaria,… most of them are originated in freshwater, just only Coscinodiscus is originated in sea. They are first food link of the food series in ecosystem.

As well as Bacillariophyta, Chlorophyta with many representatives such as: Pediastrum, Scenedesmus, Spirogyra, Pandorina are branches being value food for fish and shrimp

Cyanophyta has two branches: Oscillatoria and Arthrospira. They are fibrous alga, distribute and develop in watery environment with weak flow and polluted organic.

Euglenophyta has 3 branches: Euglena, Phacus and Strombomonas, as well as Cyanophyta, Euglenophyta is specific species which distributed in hydrology zone be polluted organic, especially domestic sewage and breeding sewage. VCD2 point has more Euglenophyta appeared than VCD1 point.

Numbers of species at two surveyed points are differently. At VCD1 point recorded 18 species, but at VCD2 point recorded 27 species.

Similar index (Sorensen, 1948)

Plant plankton species compositions are recorded at two surveyed points in Vam Co Dong River with similar level is 51,4%. Since it shows that, two surveying points are nearly but its surface water environmental quality is quite differently so its distribution in 2 areas within ½ numbers species be repeated.

Quantity structure and advantage species

Density of alga cell at two points surveyed is low, oscillating from 205 – 345 cells/little. Advantaged alga species are differently in two points, at VCD1 is Cyanophyta (*Oscillatoria acuta*), at VCD2 point is Bacillariophyta (*Thalassiosira sp.*). Advantage developing rate of them is average (from 25,1 to 36,1%) (Table 2.9)

Table 2.9 Quantity of cell and advantaged species on plant plankton species in Vam Co Dong River

Evaluated on environmental impact	**Total quantity**	**Advantaged species**	**Amount LUT (Average/little)**	**Rate % LUT**	**Total species**
VCD1	568	*Oscillatoria acuta*	205	36,1	18,27
VCD2	1375	*Thalassiosira sp.*	345	25,1	

Biological indexes and surface water environmental quality

Various index d and H' of plant plankton at two searched points in Vam Co Dong River is larger. Among that, at VCD2 point (in Ben Luc bridge area) is rich about species compositions as well as the surface water quality is better than VCD2 point (in the port of Cam Nguyen steel factory)

Table 2.10 Table of various index of plant plankton

Evaluated on environmental impact	**D**	**H' (loge)**
VCD1	2,7	1,9
VCD2	3,6	2,2

*** Plant plankton zone**

The structure of species compositions

Through the survey at two positions in Vam Co Dong river in Ben Luc district, Long An province, 19 floating animals have been recognized including: Rotifera (earth-worm), Crustacea (crustacean), Hydrozoa (hydra) and other kinds of larva (Larva). In which, the kinds of crustacean is significantly various (11 species, accounting for 57.9%), the following is the kinds of Larva with 5 species accounting for 26.3%. the left ones are only from 1-2 species accounting for 5.3 – 10.5 respectively. The floating fauna area in Vam Co Dong river has the typical feature of pH low environment that clearly presented through the strongly growth of kinds of Cladocera. Typically are species of Alona rectangular, Macrothrix spinosa, Ilyocrytus halyi whose appearances are signal of highly contaminated alum. Besides, the salt water of Vam Co Dong river is also infected in light level. Through the analysis of specie composition, there are many kinds of Copepoda and Rotifera appearing with rather high density in two places of taking samples.

Table 2.11 Element structure of floating animals

No.	**Branch**	**Number of species**	**Rate (%)**
1	ROTIFERA	2	10.5
2	CRUSTACEA	11	57.9
3	Cladocera	5	26.3
4	Copepoda	5	26.3
5	Ostracoda	1	5.3
6	HYDROZOA	1	5.3
7	LARVA	5	26.3
	Total	19	100

With the nature of passive swimming along with the flow, the crustacean species such as Copepoda, Cladocera, Rotifera and other species of Larva are such important source of food to the larva of shrimp, fish in the river base. Typically are Macrothrix spinosa, Moina dubia, Diaphanosama excisum (Cladocera), Tropocyclops prasinus, Thermocyclops hyalinus, Pseudodiaptomus incisus (Copepoda), Gastropada larva, Copepoda nauplius (Larva).

Homogeneous index (S)

Through the data and calculation by the Primer V5 software, it is recognized that the homogeneous index (S) on the composition of floating animals in the two places of survey in Vam Co Dong river in May, 2008 is rather high (58.9%). The homogeneous index shows off the identical level of surface water environment of such survey places.

The survey places with high the homogeneous index mean the nature of environment is nearly the same and the species appearing in such places are not really different.

Structure of number and prevailed species

The density of floating animals in such two survey places reaches to a very low level changing from 4,000 – 5,000 specie/m^3. The one takes important role in the density of floating animals is the crustacean such as Cladocera, Copepoda and Larva, the biological character of these species is font of living in the alum-infected environment. Due to the alum-infected surface water, despite a lot of floating animals which are capable of broadly distribution and due to the limited growth in the number of species a lot of species are only recognized in the qualitative sample but not in the quantitative sample (Table 2.12).

Table 2.12 Number and prevailed species of floating animals

Survey place	Prevailed sample	Number of species	Amount	Number of prevailed sample	Rate of prevailed sample
VCD1	*Thermocyclops hyalinus*	14	4,000	2,000	50.0
VCD2	*Gastropoda larva*	15	5,000	1,500	30,0

Various indexes and environmental quality

Various indexes d show the variety of specie composition in the different survey places. Through the data analysis, the various indexes in specie composition in the two survey places in Vam Co Dong river in May, 2008 are the same, d=1.6. Showing that the species recognized in the area are nearly repeated all in the two survey places so there is no change in various indexes (Table 2.13).

H' index (Shanon-weiner various index) of floating animals reflects the quality of surface water environment in the research area. Generally, various index of floating animals in the two survey places reaches the average level (various from 1.0 – 1.8). In consideration of marking scheme in surface water assessment, the polluted level of such two places is normal.

Table 2.13 various indexes and quality of surface water environment

Survey place	d	H' (loge)
VCD1	1.6	1.0
VCD2	1.6	1.8

- **Riverbed fauna area (Zoobenthos)**

Structure of specie composition

The poor composition of large-shape boneless riverbed animals in Vam Co Dong river, Ben Luc district in the survey making in May, 2008 only recognizes 09 species including:
Bivalvia, Polychaeta, Oligochaeta and Decapoda (Table 2.14).

Table 2.14 Composition structure of the riverbed animals in Vam Co Dong river, Ben Luc district – Long An province

No.	Group	Number of species	Rate (%)
1	Bivalvia	4	44.4
2	Polychaeta	2	22.2
3	Oligochaeta	1	11.1
4	Decapoda	2	22.2
	Total	9	100

As to the riverbed fauna area in the two survey places in Vam Co Dong river, Ben Luc district, beside the most species originated from the fresh water some other species own the typical characters of salt-infected environment particularly *Alpheopsis vietnami, Corbula caribaea, Meretrix lyrata, Branchiomma cingulata*. The composition of riverbed animals also presents the character of organic-infected pollution with the main present of species getting used to the rich-protein riverbed environment. In which, at the survey place VCD 2 (Ben Luc bridge) number of riverbed animals recognized at the time of taking sample is very low (only 4 species) but all species are the ones indicated in the organic-infected environment.

Homogeneous index S (Sorensen, 1984).

The survey shows out that the two survey places VCD1 and VCD2 in Vam Co Dong river are not far from each other but the recognized composition of riverbed animals is totally diffirent (only 01 general specie). The homogeneous index of specie composition is only 12.2%. Such shows that the environment of riverbed in the two places has the signal of organic infection.

Structure of number and prevailed species

The density of riverbed animals in such two survey places reaches to normal level changing from 350 - 380 species/m^2. The one takes important role in the density of riverbed animals are Bivalvia and Chaeta. In the environment of riverbed with a lot of organic remains decomposed in the two survey places, the species such as *Namalycastis longicirris* (Polycheata), *Branchiura sowerbyi* (Oligochaeta) strongly develop in the density and prevail against other species. Besides, such two prevailed species also show the sail infection of riverbed in Vam Co Dong river, they are the ones being font of in the brackish river and light brackish river (Table 2.15).

Table 2.15. Prevailed species and density of prevailed species

Survey place	Prevailed species	Number of species	Number of prevailed species (specie/m^2)	Density (specie/m^2)	Rate of prevailed species (%)
VCD1	*Namalycastis longicirris*	6	140	350	40.0
VCD2	*Branchiura sowerbyi*	4	250	380	65.8

Indexes of biology and quality of riverbed environment

The various index d and H' in the VCD2 survey place (Ben Luc bridge) is much lower than the one in the VCD1 survey place (port of Cam Nguyen steel factory). Such shows that the variety and quality of riverbed environment as well in the VCD2 survey place are very low. Ben Luc Bridge is most badly affected by the human beings; the riverbed mud is in the form of mixed sand with black brown and ugly smell (Table 2.16)

Table 2.16 Various index Shanon – Wienner

Survey place	D	H' (loge)
VCD1	1.4	1.4
VCD2	0.8	0.8

2.1.4.4. Air, noise and weather

Table 2.17 Result of air quality estimation in the Project

Standard	Results (µg/m^3)				
Position	Dust	Noise (dBA)	SO_2	NO_2	CO
KK01	204	55-57	198	51	3,612
KK02	223	54-58	206	21	4,084
KK03	167	53-58	212	63	2,778
KK04	186	55-60	231	46	4,524
TCVN 5937-2005	300	-	350	200	30,000
TCVN 5949-1998	-	75	-	-	-

Source: Environment Observation and Auditing Service, 10/2008

Notes:

- KK01: Air sample at the south east of the land;

- KK02: Air sample at the south west of the land;

KK03: Air sample at the north west of the land;

- KK01: Air sample at Chanh channel;

(*): TCVN 5937-2005: Air quality – Surrounding air quality standards.
(**) TCVN 5949-1998: Acoustics – Noise in Public Area and Resident Area. The maximum authorized noise level.

Remarks:

The air analysis shows that all standards are under the authorized standards.

2.1.4.5. Land

The result of land quality survey at the Project as follows:

Table 2.18 Result of land quality survey at the Project

Standard / Position		Results (µg/m^3)				
		Zn	Cu	Cd	Pb	As
ĐT01		29.25	19.16	0.026	22.51	6.64
QCVN 03:2008/ BTNMT	Land for agriculture	200	50	2	70	12
	Land for industry	300	100	10	300	12

Source: Environment Observation and Auditing Service, 06/2008

Notes:

QCVN 03:2008/BTNMT: National Technical Standards on the authorized level of heavy metals in the land.

Position of sample:

- ĐT01 – Land Sample in the Project

Remarks:

The result of analysis shows that all the metals in the land satisfy the QCVN 03:2008/BTNMT for agriculture and industry.

2.2. SOCIO-ECONOMIC CONDITION

2.2.1. Area and population

Through the statistics in 2007 Long Dinh Commune has the area of 1,065 ha with population of 8,868 people, 2,169 households.

2.2.2. Actual state of technical infrastructure

- Actual state of transportation

The main land ways in the commune are the provincial road No.16 and Long Dinh – Long Giang road. Long Dinh – Long Giang road is the one passing through the Project to National Highway No.1A (section in Ben Luc town), the actual status of this transportation line is made in red stones with 24 meters in width and is investing to expand and it is estimated to expand for 62m.

The water ways are Vam Co Dong river. The section of Vam Co Dong river flowing through the Project is 200m in width and 20m in depth.

- Actual state of electricity supply

The electricity supply to the area is the national electricity network. Presently, it has covered the entire commune.

The electricity supply to the Project is the one from the National electricity network through the medium voltage line along with Long Dinh – Long Giang road.

- Actual status of water supply

In the area there is not the fresh water supply network yet. The civilians mainly use the water from the wells as the living water. However, the groundwater through the survey shows to be in low quality, the one at the depth >240 m is always alum and salt contaminated.

- Actual state of drainage

There is not the drainage system in the area yet. They are only the interior filed canals.

2.2.3. Economy

- Agriculture

Land area for agriculture: 822.3 ha. The main crop plant is rice and sedge. In which, the rice area accounts for 647ha with the average yield of 4.5 ton/ha; the sedge area accounts for 67ha with the average yield of 10 ton/ha.

The main castle and poultry are buffalo, cow, goat, pig, chicken, duck including: 2,000 pigs, 140 cows, 150 goats, 6,872 chickens, 5,934 ducks.

- Industry

Land area for industry: 108.4 ha. The number of operating industrial facilities is 10.

2.2.4 Health, Education, Culture

Health:

According to statistics in 2007 whole Cam Duoc district has 19 Unit examination treatment, the total number of beds is 146.

Education:

whole district has 12 Nursery school and 36 school of level 1, 2, 3. In Long Dinh commune has 3 point school of Level 1, and 2 point school of Nursery school.

CHAPTER III
ENVIRONMENTAL IMPACT ASSESSMENT

3.1. CAUSES OF IMPACT

3.1.1. The causes of environmental impacts in the phase of space preparation and infrastructure construction

3.1.1.1. Impacts due to the phase of compensation, removal and clearance

In such period, the negative impacts may happen due to the loss of cultivated area, the unreasonable policy of compensation, removal and resettlement…badly affecting to the local people, making their life disorder, cutting off the income source when the land for agriculture is turned into the one for industry… If the adequate settlement cannot be done, the dispute between the local people and investor will surely emerge that slows down the progress of Project.

There are about 400 tombs in the project's area.

3.1.1.2. Causes from the phase of space leveling

It can be summarized for the phase of space leveling as following:

+ Clearing, cleaning the area: the clearance, clean of the area will surely affect the surrounding environment.

+ Space leveling

The material used for space leveling is sand. The sand is transported in the water way of Vam Co Dong River then directly pumped into the Project. The arising problems from the space leveling maybe include:

- Alum-contaminated, waterlogged due to the pump for space leveling.
- Dust diffused from the subgrading
- Exhaust dust and smoke, noise, vibration by the execution means
- The subgrading also prevents the natural drainage in the area making local waterlog
- The overflow of rain may bring along with kinds of dust such as scattered soil, stone, cement, oil…badly affecting to the surface water in the area, the irrigation and drainage serving for the agriculture in the area.
- Living wastewater by the workers
- Solid living waste and construction waste
- Make the vegetational cover change

3.1.1.3. Causes from the phase of infrastructure construction

Technical system construction of the Extended Thuan Dao Industrial Zone includes:

- Construction of internal transportation system to link with the already-present roads in the area.
- Construction of raining water drainage in the entire area of Project.
- Construction of dirty water drainage system from the factories, enterprises in the Industrial Zone, the service management center to the center wastewater treatment system.
- Construction of water supply system for the entire Industrial Zone.
- Construction of electricity supply and communication system
- Construction of a service center of the Industrial Zone.
- Construction of the waste terminal station for the Industrial Zone.

As scheduled, such above construction works will be carried out in line with the space leveling and continue to complete during the time that factories and enterprises are built in the industrial Zone. Such periods are often long lasting and as the result their consequences to the environment will surely happen, including:

+ Dust, exhaust gas, noise and vibration by the equipments, means, machineries in the construction site.

+ Living waste (wastewater and solid waste);

+ Construction waste

+ Spilled oil…

Such above problems will pollute the surface water, ground water, air and land environment in the Project.

3.1.1.4. Other causes

+ Labor accidents: during the period of clearance, leveling as well as technical infrastructure construction, the risks of labor accidents threatening to human-beings' life and assets are significantly high.

+ Bombs still hidden under the ground seriously make life and asset damage

+ Social problems: the highly concentration of workers may create the social problems, complicated relationship between the local people and workers that pave the favorite conditions for the social evils to step up and badly affect the order and security in the area.

3.1.2. Causes to the environment in the phase of operation and exploitation

The Industrial Zone officially comes into the operation since its first factory begun to run. The expended Thuan Tao industrial Zone is scheduled to attract more various kinds of business; therefore, such will incur the pollution sources by the wastewater, exhaust gas, solid waste…with the variety in scale and composition.

3.1.2.1. Causes of exhaust gas: from the technology line, from the burn of fuel, from the transportation and from the exhaust gas treatment, particularly as follows:

+ Exhaust gas from the technological line: is very various that basing on each branch of production but mainly are dust, SO_x, NO_x, CO, NH_3, H_2S, THC, organic gases and hydrocacbon…

+ Exhaust gas from fuel burning by the boilers, desiccators, current generator,…that mainly are dust, SO_x, NO_x …

+ Exhaust gas from the transportation depending on the traffic circulation, technical condition of means and condition of road that mainly are dust, SO_x, NO_x…

+ Exhaust gas from the waste treatment such as wastewater, solid waste polluted the environment with ugly smell, NH_3, CH_4, H_2S,….

3.1.2.2. Causes of wastewater: from the production process; living wastewater from the staffs working in the Industrial Zone, in the residential building of experts; rain overflowing into the campus of the Industrial Zone.

+ Industrial wastewater: from the various production processes including cooling water, cleaning water for workshop equipments. Therefore, the composition, nature and concentration of pollutants are not the same and various.

+ Living wastewater: from the activities of staffs, workers in the Industrial Zone,…The main composition is suspended matter, oil, nutrient, bacterium…

+ Wastewater due to the overflow of rain: the rainwater sweeps away the terminated substances in the surface that pollute the water source mainly are waste matters, oil…

3.1.2.3. Causes of solid waste: The solid waste in the Industrial Zone including the industrial solid waste (hazardous and not hazardous) and living solid waste.

+ Industrial solid waste: from the operation of factory, its composition depends on each kind of production including:

- **Inorganic solid waste**: include mud from system of wastewater containing heavy metals, kinds of cinder from the mechanic factories, acid and alkali waste…
- **Oily solid waste**: from the fuel tanks, oil residue, equipments to collect spilled oil…

- **Organic solid waste**: from the activities of the staffs in the Industrial Zone including the nylon packets, papers, glasses, food remainders…

3.1.2.4. Other causes

- By the water discharge into the receiving sources and the capacity of the receiving sources.
- To the agriculture
- To the technical infrastructure and public service
- To the industry
- To the land-use
- To the socio-economic conditions
- To the environmental problems

3.2. IMPACT ASSESSMENT

3.2.1. In the preparation for leveling and infrastructure construction

3.2.1.1. Clearance, clean

The organic mass will be cleared and cleaned prior to the leveling. In the area where the land is under the water, the mud on the surface will be uncovered prior to the leveling in order to avoid the depression. The uncovered mud will include organic substance (living mass of botanical roots).

Impacts due to the removal of about 400 tombs: The above negative impacts will be adequately cared and solved by the investor.

The impacts are recognized in the average level in case of the absence of reasonable control methods.

The impacts will be minimized by the methods mentioned in Chapter 4.

3.2.1.2. Leveling material control

Total amount of leveling sand is 4,129,085 m^3. The leveling materials must be controlled in the pollution level caused by the heavy metals as well as the other causes to avoid the land pollution and ground water pollution in the area.

3.2.1.3. Pollution due to the exhaust gas by the transportation means, machineries

The activities will release the smoke with pollutants into the environment. The main components are CO, NO_x, SO_2, hydrocacbon, aldehyde.

With the working volume of works categories in the phase of construction, it is forecasted that the number of transportation means in the Project is about 100 times/day.

To suppose that the operating time of vehicle in the work area is 1 hour.

Norm of consuming oil for truck of 10 tons is 3.5 kg/h, each day the truck will consume 350kg DO oil.

Volume of harmful waste air calculates for 01 fuel tons that truck consumed and tonnage of pollution of cargo vehicle in the land of project will be allowed as the table below:

Order	Waste substance	Polluted coefficient (kg/ tons of DO oil)	Tonnage of pollution (kg/day)
1	CO	20.81	7.28
2	Hydocacbon	4.16	1.46
3	NO_x	13.01	4.55
4	SO_2	7.8	2.73
5	Andehyt	0.78	0.27

Source: Curriculum of air pollution and calculating diffusion of polluted substance, Tran Ngoc Chan, Science and Technique Publisher, 2002

3.2.1.6 Noise of vehicles in the work area

Pollution by noise is a relatively light factor however it should be paid attention because vehicles work at area in long time. The noises shall cause affect to mentality of people, affect directly on hearing. However, factors above impact a little on surrounding environment because work area is rather large, few residents are living surrounding it.

The noise in this phase is major of vehicles transport and machines execute. Level of noise is distance from source l meter between cargo vehicles and executing machines shall be presented in the table below. The level of noise will decrease step by step as affected distance and can be forecasted as followings:

$Lp(x) = Lp(x_0) + 20\log10(x_0/x)$

$Lp(x_0)$ = noise level distance source l m (dBA)

x_o = l m

Lp(x) = Noise level at position need to calculate (dBA)

x= position need to calculate (m)

Table 3.2 Maximum noise level from operation of cargo vehicle and executing machine.

Order	Cargo vehicle and executing machines	Noise level distance source l m		Noise level distance source 20m	Noise level distance source 50m
		Approximately	Average		
1	Bulldozer		93	67	59
2	Compactor	72-74	73	47	39
3	Foklift truck	**72-84**	**78**	**52**	**44**
4	Tractor	77-96	86.5	60.5	52.5
5	Bull-clam shovel, grader	80-93	86.5	60.5	52.5
6	Paving machine	87-88.5	87.7	61.7	53.7
7	Truck	82-94	88	62	54
8	Concrete mixer	75-88	81.5	55.5	47.5
9	Movable crane	76-87	81.5	55.5	47.5
10	Electric generator	72-82.5	77.2	51.2	43.2
11	Air compressor	75-87	81.0	55	47
12	Pile drawer	95-106	100.5	74.5	66.5
	TCVN 5949-1998; 50-75dBA (8-18h)				
	Standard of Ministry of public health: manufacture area: 85dBA (time for approaching 08 hours)				

Source: Mackernize,1985

Maximum noise level by cargo vehicles and executing machines at position distances source 20m is lower than allowed limitation of (Vietnam Standard) TCVN 5949-1998. This is impaction cannot be avoided and at lower level.

3.2.1.4 Daily waste substances of construction worker

Daily waste water is estimated as numbers of worker operating on the field work, according to estimated the maximum workers at the work area is 100 persons, using norm of water is 45liters/person/day shall drainage $3.6m^3$ of waste water/ day.

According to WHO, 1993 World Health Organization estimated that tonnage of main pollution parameter in daily waste water is 45-54g/ person/ day BOD_5, COD from 1.6-1.9 BOD_5, therefore total tonnage of daily waste water is 2.25- 2.7kg BOD_5/day and 3.6- 5.13 COD/ day.

Weight of solid wastes are generated about 30kg/day (waste norm is 0.3kg of rubbishes/ person/ day). If waste substances are not processed, they shall impact on environment.

3.2.1.5 Waste lubricating oil

Lubricating oil made from process of maintain, repair cargo and executing vehicles in project area is not avoided. Volume of waste lubricating oil generates from the project area depend on factors: number vehicles, executing machines in work field, volume viscid oil wasted from cargo vehicles and executing machines, viscid changing and machine maintain cycle.

According to survey on waste viscid oil of construction works, the volume viscid oil is wasted from cargo vehicles and executing machines is average of 7liters/ a viscid changing time, about 3-6 months one time. By the numbers of executing work items of the project in construction process are about 100 times cargo vehicles per day, therefore volumes of viscid and oil are drainage about 117-233 liters per month. Wasted lubricating oil is classified as harmful waste substance will be reduced by methods at Chapter 4.

3.2.1.6 Locally flood and increasing turbidity of river water

The local leveling will cause local flooding, temporary project area when construction plans are not reasonable, however the location has canal project Chanh, Vam Co Dong river water can drain, so this effect can easily be minimized.

Rain water flows over project area and pull filler materials can make increase turbidity of river water in the project. Above impacts are local, temporary and easy to control, limit if there are reasonable method in grade process.

3.2.1.7 Social issues

Labor accidents in construction executing process can happen due to ignore, low knowledge, not to obey regulation of labor safety in work field of workers.

Gather a large of workers in the work field can cause to contradiction between local people and workers who come from other areas, arising social issues and cause badly to security and social order of the area.

The number of worker who work in the project area depend on executing volume of work items of the project, estimated that there are about 100 workers at highest concentration moment.

All impacts can be limited by using methods at Chapter 4.

3.2.2 Impacts on envionment in operating and exploring period.

3.2.2.1 Impact of waste air

a. *Waste air generated due to burning fuel.*

Some industries are expected to operate in industrial Zone that uses different fuels for fuel to provide energy for different technologies process. However, the fuel is widely used for industrial activities are mostly of DO, FOR, coal.

However, in the future when the exploitation and put into use liquefied Petroleum gas (LPG) is widely used in domestic with low cost, this is also the type of fuel is recommended for use because its concentrations of toxic gas released from combustion is very low.

We can determine preliminary the amount of waste air pollution from fuel sources above.

* To the fule is DO and FO oil

According to WHO (World Health Organization), pollution coefficient of substances make air polluted due to FO oil (calculated for oil having S content is 3%) and DO is cited in table 3.6.

Table 3.3 Pollution coefficient due to burning oil

Order	Polluted substance	Pollution coefficient (kg/ 1.000 litters of oil)	
		FO oil	DO oil
1	Dust	(0.4 + 1/32S)	0.28
2	SO_2	20 xS	20 x S
3	NO_x	8.5	2.84
4	CO	0.64	0.71
5	VOC	0.127	0.035

Source: World Health Organization, 1993

Beside that, electric generator uses fuel such as DO oil with lower S content from 0.25%, when it burns, it generates polluted substance as burning FO oil but it has lower level, pollution coefficient of electric generator is shown at the table below:

Table 3.4 Pollution coefficient of electric generator use DO oil

Order	Pollution substance	Pollution coefficient (g/HP/hour)
1	Dust	0.15
2	SO_2	0.57
3	NO_2	10.6
4	CO	1.79
5	C_xH_y	0.11

Source: Cummins Electric Generator Company

From fuel consumption and capacity of generators, we will calculate the loads and concentrations of pollutants in emissions.

* To the fuel is gas (liquid petroleum gas)

When we burn gas, content of pollution substances is less than burning oil. The table below shall show the Coefficient of air pollution by burning gas

When burning gas, concentrations of air pollutants are less than by burning oil. The following table indicates the coefficient of air pollution by burning gas:

Table 3.5 Coefficient of air pollution by burning gas

Substances make pollution	Pounds/ 1,000 ft^3 gas	Kg/ 1,000 m^3 gas
Aldehyde (R-CHO)	2	0.032
CO	- 0.4	0.006
Hydrocacbon (HC)	Insignificant	Insignificant
Dioxyt Nitrit (NO_2)	214	3.43
Sulfide diosyt (SO_2)	0.4	0.006
Organ substances	5	0.08
Dust	18	0.289

Source: Emission factors- Ministry of House, Plant and Environment- The Netherland.

To the burning fuel is gas, pollution substances such as SO_2, CO are nearly insignificant, mostly NO_2. For example, calculated volume of consumed gas is 1,000 m^3 (weight rate of gas is 0.7g/cm^3).

If it is totally burned, waste products shall be mainly CO_2, H_2O and a little NO_x, SO_x.

If it is not completely burned, it can produce all kinds of tiny dust particles, the soot and CO2, CxHy, CO, NOx, SOx ...

In this case using a gas mixture of butane and propane gas.

Fuel combustion conditions:

Calculate amount of sufficient air: 15.9 kg air / 1 kg of gas

Calculate amount of excess air: 18.3 kg air / 1 kg of gas

The amount of fuel needed for the burning reaction corresponding rate is 15% excesses oxygen. Waste air emissions at the exit mouth are: 1.0003 x 18.3 = 18 300 m3.

Waste air and concentrations of the burning fuel 1 units is calculated by the conventional combustion reaction. Then we will calculate the mass and volume of flue gas in case conditions with excess air is 15%.

Table 3.6 Tonnage and concentration of pollution substances when burning gas.

Substance make pollution	Tonnage (kg/1,000 m^3 gas)	Concentration (mg/m^3)	TCVN 5939-2005 (B limitation)	
			C	C_{max}
Aldehyde (R-CHO)	0.914	1.74	-	-
CO	0.171	0.33	1,000	1,000
Hydrocacbon HC	Insignificant	Insignificant	-	-
Nitrogen dioxide (NO_2)	97.995	187.17	850	850
Sulfide dioxide SO_2	0.171	0.33	500	500
Organic material	2.286	4.37	-	-
Dust	8.257	15.74	200	200

From the calculated results shown that, concentration of pollution substances in the emissions when we burn gas lower than allowed standard. Therefore, consider that pollution source is not significant.

* For coal fuel:

According World Health organization (WHO), pollution coefficient of air polluted substances due to burning coal (S- Content of percentage of Sulfur in coal, S= 0.5%).

Table 3.7: Pollution coefficient due to coal

Pollution substances	**Pollution coefficient (kg/ tons of coal)**
Dust	5
SO_2	15.5x S
NO_x	1.5
CO	45.0
VOC	9.0

From consumption fuel and capacity of the incinerator, we will calculate the loads and concentrations of pollutants in emissions.

b. The waste gases from the technological line

Preliminary identification can be air pollutants respectively as follows:

+ The smell arise from organic solid waste transshipment sites and waste water treatment areas, plastic industry such as packaging for animal feed

+ The exit gases generate from food processing plants, food, agricultural products, canned fruits, cosmetics.

+ Dust arising from the textile mills, garment, furniture, interior decoration, building materials, ceramics, glass..

+ Noise arising from the precision engineering plant, assembly of industrial machinery, electronic assembly, machine manufacturing, mechanical repair and machinery and mechanical construction.

+ From these lines have been determined above can be downloaded estimated amount of pollutants to know the operation of each power plant based on the pollution factor of the pollutants associated with the type of production corresponding.

+ Here are + pollution coefficient of toxic gases generated during operation of a number of industries producing typical.

Bảng 3.8 Coefficient contamination of the manufacturing industry typical

Industry Type		Uinit (U)	Dust (Kg/U)	SO_2	CO	VOC	H_2S
Food processing, food							
Milling	Rice	Ton	2,97				
	Been	Ton	11,73				
	Corn	Ton	6,25				
	Animal feed	Ton	4,9				
Starch production	KKS	Ton	4,0				
	CKS	Ton	0,01				
Fish processing	Dry gas	Ton	2,5				0,05
	Dry fire	ton	4,0				0,05
Processed meat (no smoke)	KKS	Ton	0,15		0,3	0,18	
	CKS	Ton	0,05			0,075	
Plastic Industry							
PVC	KKS	Ton Product	17,50			8,50	
	CKS	Ton Product	1,70			0,80	
Polypropylene	KKS	Ton Product	1,50			0,35	
	CKS	Ton Product	0,20			0,03	
Wood processing industry							
Plywood	Cut and sand covered	m2	0,05				

Industry Type		Uinit (U)	Dust (Kg/U)	SO_2	CO	VOC	H_2S
	Dried	1000m 2					
Production of construction materials							
Bricks and clay products - dried	KSS	Ton meteria l	35				
	CKS - Cyclone	Ton meteria l	9				
Bricks and clay products - milling	KSS	Ton meteria l	38				
	CKS - Cyclone	Ton meteria l	9,5				
Gypsum	Dried - KSS	Ton	5 - 60				
	Dried - CKS	Ton	0,02				
	Roller mill - KKS	Ton	1,3				
	Roller mill lăn - CKS	Ton	0,06				
	Grinding Mill - KKS	Ton	50				
	Compel mill - CKS	Ton	0,01				
Concrete	KSS	Ton	0,05				
Cement	CKS	Ton meteria l	1,90	1,02			
Packaging production							
Plastic Packaging	KSS	Ton					0,58
Food processing, food							
Milling	Rice	Ton	2,97				
	Been	Ton	11,73				
	Corn	Ton	6,25				

Industry Type		Uinit (U)	Dust (Kg/U)	SO_2	CO	VOC	H_2S
Starch production	**KKS**	**Ton**	**4,0**				
		Ton	**0,01**				
Feed processing	**Ton**	**4,9**					

Source: Assessment of Sources of Air, Water and Land Pollution, WHO 1993
Note: + CKS: controlled+ KSS: uncontrolled

c. **Emissions from transportation activities in the industrial park**

In the process of industrial parks activities, materials and products are transported out into the industrial park by means of transport, means are fueled mainly gasoline and diesel.
Thus, environment will be receiving an additional component emissions of pollutants such as:CO, SOx, Nox, hydrocacbon, Dust ...this is the source of pollution is unavoidable and a source of pollution dispersion, it is difficult to control pollution control.

Table 3.9 The composition of pollutants in automobile exhaust

Toxic components in exhaust gases, %	Working mode of the engine							
	Slow		Increase speed		Stable		Reduction speed	
	Diesel engine gasoline	Diezen	Diesel engine gasoline	Diezen	Diesel engine gasoline	Diezen	Diesel engine gasoline	Diezen
Gas CO	7,0		2,5	0,1	1,8		2,0	
Hydrocacbon	0,5	0,04	0,2	0,02	0,1	0,01	1,0	0,03
Nitơ oxit, ppm	30	60	1050	850	650	250	20	30
Andehyt, ppm	30	10	20	20	10	10	300	30

Source: Air pollution & waste gas treatment, Trần Ngọc Chấn, 2002

d. Exhaust fumes from Fuel combustion process

The industry in the project have the ability to use fuel burning:

- The food-processing plants use fuel burnin to supply heat for boiling, steaming, drying ...
- The manufacturing of products using plastic materials fuel burning use as fuel for stage increase heat molten material.
-

- Mechanical factories use fuel to heat for process of flux.
- Fuel uses for provisional electric generator.

Tonnage of polluted air from burning fuel can be calculated base on pollution coefficient of each fuel and technical character of each machines such as used fuel types, level of consume fuel, …

Table 3.10 Pollution coefficient when burning fuels

Type of fuels	Dust	SO_2	SO_3	NO_2	CO	VOC
	Kg/ton	Kg/ ton	Kg/ ton	Kg/ ton	Kg/ ton	Kg/ ton
LPG	0.060	0.007		2.900	0.710	0.120
DO	0.280	20S	0.28S	2.840	0.710	0.035
FO	P	20S	0.25S	7.000	0.640	0.163
Coal	5	19.5S	-	1.5	45	9

Source: Assessment of Source of Air, Water and Land pollution, WHO 1993
P= 0.4 + 1.32S
S: Sulfur component in oil used in Vietnam, S_{FO} = 3%, S_{DO} = 1%

e. Waste air from other activities in Industrial Zone

Beside sources of waste air above, other activities in industrial Zone also discharge into environment amount of substances cause pollution for air.
At waste water processing area of industrial Zone and gathering waste solid substances area shall make dirty smell and methane and ammonia … due to fermentation, aerobic decomposition, of substances in waste litter and water, mud.
3.2.2.2 Impact from polluted water
When industrial Zone operates, polluted water source:
- Rainy water flows over area of the project field
- Daily waste water of workers who directly take part in producing in industrial Zone.
- Industrial waste water made from manufacture process of factory, firm in concentration industrial Zone, water leaks from yard of transferring solid substances.

a. Rain water flows over

Rain water can be considered as clean waste water, during flowing over ground can pull several dust, dirty materials and cause pollution of area of Rach Chanh river Vam Co Dong river.

c. Impact on land use

The structural change in land used from low productivity agriculture, industrial production ... to bring greater efficiency. In addition to attracting foreign investment, construction projects Thuan Dao industrial Zone also contributed to the state budget a tax from the lease of land in industrial zones.

Pollution levels of rain water depend on the hygiene conditions of the area's capacity to drain rain water drainage systems and environmental quality of air.

With an area of 189.843 ha, level concrete surface is about 80%, rainfall runoff largest estimate:

q x 80% x 1,898,430 m^2 = 32,9121l/s

In which: 80%- level of concretize surface

q= 166.7i l/s ha: rain volume as cubic

i= 0.13mm/ minutes (as highest rain volume in a day approximately 190mm/day).

166.7- module transfer from rain volume calculated as class to cubic.

Table 3.11 Polluted material concentration in rain water

Pollution materials	Concentration (mg/l)
Total nitrit	0.5-1.5
Phosphate	0.004-0.03
COD	10-20
Total hanging solid	10-20

Source: Waste water process technology, Dr. Trinh Xuan Lai,200

Rainfall runoff is collected by separate sewer systems and garbage removal of large scale, the manholes will be periodically dredged to remove trash, sediment.

b. Waste water from factories, firms

* Demand of supplying water and estimated waste water

The company will use water from the water plant of large capacity of Ben Luc water plant, or water plants of Hoang Long Company, for construction of industrial Zones and residential areas, and Ben Luc nearby. Based on the criteria of water supply and water demand in the industrial zone, we can be calculated based on water demand as follows:

- Total area: 189,843 ha.

- Demand of using water: 7,594 m^3/ day. night 940m^3/ha)

Industrial Waste water (equal to 80% supplied water): 6,075 m^3/day.night

- Domestic waste water

+ This is daily waste water of cadres and workers in industrial Zone, from kitchens, dining rooms, toilets, Standard of water for daily activities of workers shall be calculated as regulation 20 TCN-33-85 by Construction Ministry as followings:

Table 3.12 Standard of using water in estimated

Type of factory	Standard of using water	Unequal Coefficient
Heating factory $Q_{heating}$ > 20 Kcal/m^3/hour	45	2.5
Other factories $Q_{heating}$ > 20	25	3.0

20TCN-33-85 by Construction Ministry

+ Water uses for eating demand, prepare for meals of worker at factories, enterprises: according to design standard TCVN 4474-87, water volume use for collective dining-room, calculated for 01 person/ 01 meal is 25 liters. Therefore, waste water volume of factories, enterprises shall be estimated as follows:

$Q_{dining\text{-}room}$ =numbers of worker (depend on factory) x 25 liters/person/day

+ Basic character of domestic waste water contains unconfirmed organic substances, substances are easy to disintegrate (such as cacbonhydrad, protein, fat), nutrition (phosphates, nitric), microbe …

Volume of agents cause pollution in domestic waste water that human brings to environment daily with average weight as follows:

Table 3.13 Weight of average pollution substances

Order	Pollution agents	Weight (g/person. day)
1	pH	6.5-6.8
2	BOD_5	45-54
3	COD	1.6-1.9 xBOD_5
4	Total solid	170-220
5	Hanging solid	70-145
6	Inorganic litter (size <0.2mm)	5-15
7	Grease	10-30
8	Alkali (according to $CaCO_3$)	20-30

STT	Effects of pollution	Volume (g/people/day)
9	Clo	4-8
10	Total Nitơ	6-12
11	Organic Nitơ	0,4x
12	Free Amoni	0,6x
13	Total phospho	0,8-4,0
14	Inorganic Phospho	0,7x
15	Organic Phospho	0,3x
16	Kali, follow K_2O	2,0-6,0
17	Total bacteria	10^9 - 10^{10}
18	Coliform	10^6 - 10^9
19	Fecal Streptococci	10 – 10^5
20	Salmonella typhosa	10 -10^4
21	Unicellular; worm eggs, parasites	to 10^3
22	Virus	10^2 -10^4

WHO, 1993

Activities wastewater containing capable of causing TCVN 5945-2005, limit A, this waste will be treated before being discharged into the environment outside.

Table 3.14 Nature of activities wastewater compared with standard Waste

No.	Pollutants	Average concentrations (mg/l)	TCVN 5945-2005, limit A
1	BOD5	220	30
2	COD	500	50
3	SS	220	50
4	Total Ni tơ	40	15
5	Total Phospho	8	4
6	Coliform No/100	10-10	3.000

Source: Treatment Urban wastewater and industrial - construction design calculations, Lâm Minh Triết – Nguyễn Thanh Hùng – Nguyễn Phước Dân, Publisher Ho Chi Minh City National University, 2004

TCVN 5945-2005: Industrial waste water - Waste standard

+ The concentration of pollutants in waste water will increase the concentration of nutrients, increased turbidity, increased the amount of germs, bacteria in the water ... and contaminate receiving source if no appropriate treatment measures

- **The production:**

This type of waste water generated from the production of factories in industrial zones, composition and characteristics of wastewater depends on the production lines, equipment and technology of each plant. Oriented development the industrial park on the investment of the type of industry can determine the composition and properties as well as loads of pollutants as:

Table 3.15 Characteristics of waste water produced some of the industry

Type of factory		Unit	output	BOD	TSS	Total N	Total P	Other
		(U)	(m3/U)	(kg/U)	(kg/U)	(kg/U)	(kg/U)	(kg/U)
Shrimp	Đóng hộp	Ton product	52	82	43	9,5		Oil: 31
	Đông lạnh	Ton product	115	120	220	10		Oil: 29
Fish		Ton product	24	7,3	9,4	0,65		Oil: 4,7
Crab		Ton product	38	22,5	12	3,7		Oil: 5,6
Crem		Ton product	3	10,9	1,5			
Sữa đặc		Ton product	2	6,7	0,83			
Corn		Ton product	4,5	14,4	6,7			
Bean		Ton product	18	15,3	4,4			
Bread		Ton product		0,11		0,004		
Cakes	Form dry	Ton product		0,7		0,005		

Type of industry	Unit	Capacity	BOD	TSS	Total N	Total P	Other
	(U)	(m^3/U)	(kg/U)	(kg/U)	(kg/U)	(kg/U)	(kg/U)
Wet type	Ton		9		0.05		
Sauce, spice	Ton	2.8	7.5	3.5	0.04	0.03	Grease: 5.7
Plastic industry							
Plastic product	Ton	9.3	2.6				
Materials for decorating interior (Wood processing industry)							
Glued wood	1000m^2	4.1	4	1.1	0.24		Phenol:5
Packing manufacture							
Plastic packing	Ton	125	5.5	10.5			

Source: Assessment of sources of Air, Water and land pollution, WHO 1993

- Group of equipments, machines, mechanic installment.

In this section consists of factory, mechanical assembly workshops, machinery, electrical equipment manufacturers, ... and concentrations of traffic pollution parameters of these relatively small sectors characterized by low water use in the production process, water is mainly used for cooling processes, washing machines, equipment, sanitary waste water from factories and exhaust treatment systems, ... However, the feature of this sector is wastewater parameters typically have greased should be able to increase water pollution. Also, in some factories, workshops by industry, sewage is also capable of the kind of dust contaminated with metal, dust, vapor concentration, detergents, have adverse impacts on ecosystems and environment.

- Other industries such as textiles, in this type of mostly domestic waste water, almost having no produced waste water.

3.2.2.3 Impact of waste solid

Industrial production will generate a significant amount of solid waste. The number and nature of the waste will depend on the type and level of technology.

Overall, the industry in industrial Zones are oriented on maximum utilization of raw materials to increase productivity, lower production costs and the ability to reuse the solid waste for various purposes within each local factory.

Waste solid is expected in the industrial zone will include two types

a. Domestic waste solid

Waste solid activities of officials and employees who work daily in an industrial zone. With the large amount of labor, industrial Zone will take measures to collect and properly treated to avoid polluting the surrounding environment.

Total waste of Extended Thuan Dao industrial Zone (area 368) can be calculated based on average statistics in some big cities in Vietnam.

+ Standard garbage: 0.5 kg / person / day
+ Total: 22.782 people (about 120 persons / ha)
+ Total amount of waste: 11.391 kg / day

Waste components and services can be categorized as follows:

Table 3.16 Component of domestic waste

Order	Component	Include
1	Paper	Book, newspaper, magazines, other papers
2	Glass	Bottle contain medicines and other substances
3	Mental	Can, iron, aluminum box, other metals
4	Plastic	Plastic bottles, nylon package or others
5	Organic	Abundant food, fruits, cover of fruits
6	Toxic agents	Battery, coat, accumulator
7	Beam	Concrete, brick breakage
8	Burnable materials	Clothes breakage, fiber

b.Industrial waste solid

The composition and volume of solid waste produced depends on the business and investment scale of the factories in industrial zones. Volume of solid waste generated can be calculated based on the following norms:

The average emission levels: 40kg/ngay. hectares of industrial land

Industrial land area: 189.843 ha

Volume of solid waste generated is estimated at: 7.594 kg / day

Based on the projected investment industry can determine the composition of the solid as follows:

Table 3.17 Ingredients solid waste in some industries

Textile, Garment	Fibers, rags, bags, ...
- Food processing: - Milk - Juice - MSG, instant noodles	Packaging: paper, plastic, metal, foil, ... Shells, fruit seeds Activated carbon, filter aid material, organic waste residues, ...
Casting technology and metal processing	Ingot scrap, metal slag, ...
Wood processing	Wood chips, sawing ceremony, ensuring

Source: Engineering Industrial Waste Treatment, Nguyễn Văn Phước (Editor)

Table 3.18 Characteristics of solid waste produced in some industries

Type of industry	Unit	Inorganic	Have oil	Organic	Rot	Less hazardous	Can infect
	(U)	(kg/U)	(kg/U)	(kg/U)	(kg/U)	(kg/U)	(kg/U)
Food processing industry							
Meat packing	Ton product				300		
Canned vegetables							
+ Apples	Ton product				280		
+ Beets, carrots	Ton product				210		
+ Oranges tangerine	Ton product				390		
+ Corn	Ton product				660		
+ Pear	Ton product				270		
+ Holand Peas	Ton product				120		
+ Potato	Ton product				330		
+ Tomatoes	Ton product				80		
+ Vegetables	Ton product				220		
Canned products							
+ Fish	Ton product				280		
+ Crab, shrimp	Ton product				570		
Refinery in vegetables	Ton product				4,7		
Beverage industry							

Industry model	Unit	Inorganic	Oil	Organic	Decay	Low harmful	Infective
	Ton of product				300		
Alcohol Distillation	Ton of material				100		
	M^3 beer				20		
Mechanical industry							

Iron recess	Ton of product	142					
Polish	Ton of product	134					
Metallurgy	Ton of product	24.4				348	
Copper	Ton of product	155				3000	
Aluminium	Ton of product	1400				2000	

Source: WHO

* Harmful wastes

The composition of hazardous waste depends on the type of production in industrial zones with the characteristics of hazardous (flammable, explosive, corrosive, reactive, infectious ...). Hazardous waste will be identified in the detail report about the environmental impact assessment or the environmental commitment of each industry to invest in industrial Zones. Hazardous waste is estimated at about 10-20% of total solid waste produced equivalent to 760kg/day-1.520kg/day; dry sludge from waste water treatment system is about 1215 kg 972kg/- per day.

Table 3.19 Harmful wastes can be generated from manufacture sections

Source	Section	Type of waste
Daily waste		Solvent of waste, detergent wastes, fluorescent lamps, waste and other waste containing mercury, ... Electrical equipment, other electronics (containing capacitors, mercury switches, glass from caot tubes and other activated glass, ...) Battery, battery waste
Produce	Food processing	Wastes from manufacture, packaging and using chemical preservative…

Source	Section	Type of waste
	Manufature from plastic	Wastes from production, packaging and using plastic, rubber chemicals, glues, adhesives ... Wastes, substances and materials containing or mixed with polychlorinated biphenyl (PCB), polychlorinated terphenyl (PCT), polychlorinted biphenyls (PBB), polychlorinted naphthalene (PCN)
	Manufacture of cosmetic	Bottles, packaging, containers for chemicals production ...
	Textile, leather shoes	Waste scrap leather and other waste of leather or leather mixtures containing chromium VI compounds or substances that kill the organism.
	Wood manufacture	Bottles of oil paints, varnishes, wood preservatives ...
		Bottles of flammable paint waste: ethylene, dichloride, benzene, toluene, methyl isobutyl ketone - Bottle of solvent: methyl chloride, kerosene, mineral spirits ... - Bottle of waste acid, alkali: acit nitric, hydrofluoric acid, sodium hydrocide ...
		- Solvent distillation of waste and residues: kerosene, butyl alcohol, trichloroethylen, trichloroethan ... - Bottle of waste acid, alkali: nitric acid, phosphoric acid, potassium hydrocide ... - Bottle waste activity: acetyl chloride, organic perocide, chromic acid ...
Other	Process station of waste water	Ion exchange resin saturated or used. Liquid and sludge from regeneration of ion exchange column. Membrane system waste containing heavy metals. Waste oil mixture containing oil and fat from the harmful separation of oil / water.

Source: Decision No. 23/2006/QĐ- Envirionment and Resource Ministry.

3.2.3 Noise, chatter motion and temperature

These sources of pollution can cause bad impacts on health of workers who work directly in area.

a. Noise, chatter motion

It can be generated from sources as follow:

+ From the production of industrial machinery and equipment, from the impact or shock crossing due to the friction of the device.

+ From the operation of transportation facilities, vehicles and machinery construction equipment within the industrial Zone.

b. Temperature

Temperature arises mainly from the phases of heating such as boilers, dryers, from the engines, heating equipment, other vehicles and from manufacturing operations, ... Temperatures will rise in the workshop without ventilation affecting health workers.

3.2.4 Other impacts

a. Impact on technical infrastructure and public service

The formation of Extended Thuan Dao industrial Zone will contribute to change the landscape of the region, transportation systems, electricity and water will be invested in construction. In addition to promoting the development of public services in areas such as banking, postal, telecommunications, food supply, petroleum, gas, transport, public toilets, waste treatment .... meet the development needs of the region, ...

b . Impact on industry

Thuan Dao Industrial Complex contributed to industrial development in the district and province. On that basis, attract technology and financial investments from various sources.

c. Impact on using land

The structural change in land be used from low productivity agriculture, industrial production ... to bring greater efficiency. In addition to attracting foreign investment, construction projects Extended Thuan Dao industrial Zone also contributed to the state budget a tax from the lease of land in industrial zones.

d. Environmental incidents

Environmental incidents in industrial zones is the ability to fire in factories as well as in other construction items of industrial infrastructure such as fuel depots, flammable materials, transformer stations, the problem electrical ...

When a fire occurs will be the loss of people and property, so the fire control measures will be special attention right from the design phase and construction of infrastructure. the fire control measures will comply with the regulations and standards of Vietnam's current situation to the characteristics of each industry.

The incident at the field scale in industrial plants covered by the factory and will be presented in detail in the impact assessment report or other tissue in the environmental commitment of each plant before the construction of industrial Zones.

For centralized waste water treatment plant, and environmental incidents which may occur include:

-Leakages of chemicals used for centralized waste water treatment plant

- Incident handling performance substandard design

-Leakages of chemicals used for centralized waste water treatment plant:

- Centralized waste water treatment plant will be using some chemicals are: HCl and NaOH

- Environmental incidents to the chemical tank is capable leakage, especially sodium acid. If leaks occur, will cause negative impacts on the environment of land, destroyed vehicles and other material, the most dangerous is affecting the lives of workers operating centralized waste water treatment plant.

Incidents processor performance does not meet design criteria:

- Incident handling performance does not meet ISO 5945-2005 standards, the limit A, the KQ = 1, L, KF = 0.9

- Cause: processor performance does not meet the standard by power outages, breakdowns, operation of the system.

e. Impact on economic conditions

The industrial production activities have a strong development major economic significance. The first is to contribute to creating jobs and improving the cultural life of people in the region. Textile industry, garment workers are great sources of attraction, creating jobs for people in the area and residents from moving to other places.

Along with the growth of industrial production and the economy in general also increase the value of land, making the urbanization process more quickly, contributing to raising the educational level, urban civilization marketing people in the region.

Project of Extended Thuan Dao industrial Zone is done will contribute significantly to increasing the volume of industrial products to meet domestic demand and for export. Thereby increase the income of state budget revenues of the factories in the region through the revenues from sales tax, income tax, export and transfer of profits, income tax, ...

However, the positive side also arising negative aspects as land for nature and landscape shrinking environmental pollution is increasing the direct impact to people's quality of life.

In addition, on period constructions, activities with quantity worker about 100 people, easily happen to Social Security by contradiction between workers from different places with local people. Focusing a large labor force In process activity of Industrial zone will easily exacerbate congestion traffic in hour shift finishes and easily influence to order and security in area have boarding-house for worker. These impacts will be diminish by methos in page 4

CHAPTER IV
MEASURES TO MINIMIZE NEGATIVE IMPACT, PREVENTION AND RESPONSE TO ENVIRONMENTAL INCIDENTS

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4.1. REDUCE POLLUTION IN SURFACE PREPARATION PHASE IN CONSTRUCTION WORKS

4.1.1. The compensation, assistance resettlement and damage

In order to create favorable conditions for the execution of leveling, infrastructure building industrial park on schedule, the project owner to conduct compensation and resettlement assistance for households according to current regulations of the State. Priority to resettle people whose land in the land project in place with land in resettlement areas Long Dinh - Cang Long (52ha) if they wish (the company is in the process of implementation of resettlement planning residents). Clearance process will be done new industrial Zone development.

- Also, to create conditions for workers who lost farmland, the priority projects or recruit suitable job for those, helping people stabilize their lives.

4.1.2. Overall development planning

4.1.2.1. Functional areas, planning mills

When layouts plants will note the division into sectors with heavy average, slightly pollution levels, on closer to each other arranged in clusters.

For example, can be arranged into clusters according to industry groups such as:

Table 4.1. Planning the layout of the plant

pollution levels	Lines Group
High	Biotechnology Industrial manufacture of products for agriculture, animal feed (dry ingredients).
Average	Industrial production of plastic products. Industrial production for domestic consumption and export: house wares, cosmetics, furniture, pottery, porcelain, glass ... Industrial production of electronics components, telecommunications equipment and telecommunications. Industrial production of building materials and furniture: production of construction materials, interior decoration materials, the assembled structures, concrete,... Mechanical industry, machinery manufacturing, engineering castings, agricultural and fishery body. Food processing, beverages, agricultural and forest

pollution levels	Lines Group
Low	Industrial production of automobile parts, motorcycle parts, manufacturing equipment and assembly of motorbike components, production and technical equipment for transportation (not plated) Garment industry For industrial and commercial services: banks, post offices, customs offices, amusement parks, sports

- The plant must be arranged together in clusters and ensure the rational organization of production, layout yards, warehouses, using the system infrastructure and environmental protection

- To arrange a specific location, scope of global land surface area of each industry and factories, the production support facilities, the power supply, water supply, sewage treatment, garbage yards, ... accordance with production requirements coalition.

- The industrial enterprises must have a minimum setback 5m; green belt must be isolated from the surrounding works.

- Arrangement of trees and green focus to industrial zone isolation.

4.1.2.2. Arrangement distance

The distance between the clusters arranges plants or between plants is an important factor because it is a key factor to ensure the relative space between buildings. Otherwise reasonable distance will exclude or limit the spread of contamination between the plants or plant clusters facilitate isolation, preventing the spread of fire,

Here's one for presentation some distance provisions for parks and industrial clusters (reference: regulations on construction in the High-Tech Park in Ho Chi Minh City.).

- The distance between the axis of transport and works

Between the routes to work to a distance suitable trees, and the distance between roads and buildings shall be as follows:

+ Large shaft road about 30-50m
Tree distance: 8 m
Distance to work: 15-25m
+ Internal shaft road about 19-24m
Tree distance: 6m
Work distance: 10-15m

- The distance between the glasses works - works as 7-8m.

- The distance between the two land areas separated by two companies: greeneries isolated by 5 m on each side.

- For land along the canal's construction is only 10 meters.

4.1.2.3. Plant layout position

Plant layout position may with great effect to air pollution in the industrial park. When arranging plants, factories will pay attention to the following requirements:

- The functional subdivision, subdivision layout must comply with the decision of the People's Committee (Decision No. 779/QĐ-UBND) on the adjustment of the detailed planning of the project Thuan Dao industrial Zone expansion.

- In planning the project, the plants have air pollution levels are arranged in the high end of the monsoon.

- In planning the construction of each plant: the lower floor layout Categories head wind, high-rise category at the end of the wind; administrative area is the separate production areas, support areas, storage areas and a sequence of trees that separates the sectors together.

- Thoroughly advantage of natural terrain with a reasonable solution to resolve the drainage direction.

Layout position	Lines Group
E	Warehouses, Showroom
A	Textiles; Knitting. Production PP bag from resin; Consumer goods.
F	Pharmaceutical Industry
F	Clothing Processing, garments and sports shoes.
G	Medical device industry Industrial production of electronics components, telecommunications equipment and telecommunications.
B	Manufacture of beverage, food, agriculture and forestry
H	Assembly of automobiles, motorcycles and spare parts production, production and assembly of motorcycle component-devices, producing technical equipment for transportation.

Layout position	Lines Group
C	Building Materials Concrete mixing station.
D	Biotechnology, animal feed

Can not be expected due to the size and number of plants of each type of industry investment in the project, so the arrangement of the plant position groups as presented in Table 4.2 may be changed, but the location of this industry group will prioritize the allocation above.

4.1.2.4. Industrial hygiene Isolated area

Industrial hygiene Isolated areas are a buffer between the industrial zones to residential areas. The size of the isolated industrial areas is determined by distance protection hygiene standards that allow state. Interim standard of environmental science and environmental technology has defined the minimum distance for various types of production include:

- Requirements for sanitary protection distance for fuel burning equipment, thermal power plant boiler.

- Requirements for safety distances for storage systems, fuel tank under flow reserve.

- Decentralization of the factories on the minimum width of sanitary protection distance.

To bridge the gap hygiene will apply technical measures, the use of sewage treatment technologies, limiting the dispersion of pollutants. At that distance protection, sanitation will be scaled back, more efficient land use.

4.2. STAGE leveling and INFRASTRUCTURE CONSTRUCTION

4.2.1. Clean-up and treatment of plant biomass

Before conducting the work of leveling the project area, the investor will conduct surface cleaning: cleaning up and processing plant biomass, specifically:

- The crops of the farming households in the project area will be harvested by households themselves.

- Biomass plant in the project area can be used as fuel or for other purposes.

- Biomass plant collection will be cleared and clean up before leveling. Plant biomass was collected at convenient locations in the project area to move e processing.

- For the plant biomass can not get used for purposes such as timber sales, fuel use: contact and contract with The Public Works Ben Luc District one member limited liability company

shipping offers treatment along with daily solid waste generated in this period.

- The graves that located in project site was exhumed and relocated in accordance with regulations. Using lime, deodorization chemical was in the process of loading the grave. Implementation relocation graves during the dry season in order to avoid pollution from storm water runoff. Do not burn the land in the project (for the graves have no relatives) that must be relocated to the cemetery or crematorium burned in accordance with current regulations.

4.2.2. Collection and treatment of sludge surface peel

- After clearing and cleaning up plant biomass, proceed to peel the surface layer of mud in the project area prior to clearance.

- The amount of sludge separated from the project area will be collected on the land for trees and leveling the area after completing the leveling.

4.2.3. Leveling control materials

This new investment report does not include the contents of environmental impact assessment as well as measures to reduce pollution caused by mining leveling material for leveling the project area. However, to minimize the affects of leveling material, the investor will implement the following measures:

- Select a function and ability to provide materials for leveling project area.

- Employer will perform monitoring during construction leveling under the current regulations of Vietnam Law.

- Irrigation water in dry season to avoid dust generated by the wind.

- Pumping sand from about 7:30 to 11:30 am, 13:00 to 17:00 pm in order not to cause noise impacts to surrounding areas

4.2.4. Control erosion and sedimentation

To minimize the impact of storm water runoff and water from the process of pumping sand leveling material entrained in the project area is overflowing canal; the following measures will be implemented:

- Building a system of embankments before leveling.

- Establishment/ construction of temporary storm water drainage trench at the site prior to discharge storm water canal will flock through the sediment to retain the maximum amount of leveling material entrained water flowing down the channel, canals. The present mud / sand will be built simultaneously in the process of building temporary storm water drainage trench.

4.2.5. Control pollution caused by waste

To minimize the negative impacts caused by wastes generated during construction projects, the following measures will be implemented:

- No organization / minimize the organization of collective kitchens in the project area will therefore limit the maximum amount of sewage and solid waste activities generated in the project area.

- The volume of solid waste generated daily in the field up to about 30kg per day, this waste will be collected and focused on the bins are located at the site (about 1-2 tanks equipped waste types 50 liters) and contracts with shipping companies to take daily treatment.

- Hazardous waste generated during construction mainly paint, solvent containers, chemicals, ... investors will be coordinated with companies specialized functions have been handled and the Administration licensed collectors under the direction of the Department of Natural Resources and Environment as the Sao Mai Xanh Co. Ltd, Moi Truong Xanh manufacturing and commercial services Co. Ltd, the Tuong Lai Xanh commercial service Co. Ltd Collection and handling in accordance with hazardous waste management.

- The amount of sewage workers in the construction phase of about 3.6 m3 per day will be treated by septic tanks in the portable toilets.

4.2.6. Control pollution caused by waste oil

To minimize the negative impacts caused by waste grease generated during construction projects, the following measures will be implemented:

- Reduce the maximum repair vehicles, machinery works in the project area. Maintenance area will be located temporarily and systematic collection of waste grease from the maintenance process, maintaining construction equipment mechanization.

- Oil and grease waste generated in the project area was not buried; they will be collected in appropriate containers located in the project.

- Contacting with other agencies to process before the execution of the project is deployed.

4.2.7. Reduced accidents and other social issues

To minimize accidents and social problems during the construction project, the following measures will be implemented in combination:

- Employees working on site must be equipped with means of labor protection in accordance with: buckle up when construction works on high, armed with helmet, full face mask for the workers on site, equipped with anti-noise earplugs to workers working in high noise areas arise,... Investors will check and supervise the use of strict labor protection facilities of workers during construction.

- The vehicles carried on roadwork with speed 5km/ h to reduce traffic accidents on site.

- The project area will be safe during 24/24 hours on day.

- Installation of signs and signals in the building.

- Use multiple sources of local labor.
- All workers have the card in the region to facilitate project management.

4.2.8. Other mitigation measures

- Combined with functional units of the demising project in the area of land before land clearance.
- The materials in the project area was not burned and buried at the discretion of the project.
- No accumulation of combustible fuel emissions, they are often transported from the site.
- Chemicals used for the project will be registered first.
- Having a plan and the means of fire prevention and occupational safety.
- The equipment and machinery maintenance mechanic will be regularly and on time.
- Do not use the broadcast facilities with large capacity on site.
- The sound barrier, and material will be used temporarily in areas where needed.
- The project area will be safe during 24/24 hours a day.
- Installation of signs and signals in the building.

4.3. STAGE OF EXTRACTION AND OPERATION

4.3.1. Measures to control air pollution

When the industry went into operation the best plan to control pollution from industrial emissions is to control pollution at source. The basic method can be applied:

- The technical solutions to reduce pollution at the plant include:

+ Calculate the height of the chimney emissions accordingly.

+ Change the process technology and fuel.

+ Installation of exhaust treatment systems at plants such as sedimentation, filtration, absorption, adsorption.

+ Decomposes biochemistry.

+ Apply safety measures to prevent incidents (fires, explosions ...) in the manufacturing sector.

Construction plans for periodic inspection, maintenance, replacement or renovation of machinery and production equipment in time to avoid leakage of harmful pollutants into the environment, limiting the risk of fire.

- Seriously perform the operation mode of the exact materials, compliance process technology will make the amount of waste reduced and strict management conditions and source emissions.
- To arrange a reasonable system of trees within the factory as well as across the region.

4.3.1.1. Using advanced technology, low pollution

This measure is considered fundamental, since it allows reduce or eliminate air pollutants are most effective. Main contents of this method are perfect production technology and use periodic cycle.

Technological measures include the use of these technologies produce no or very little waste. It also includes the replacement of raw materials, fuels and many other toxic substances by a non-toxic or less toxic (such as replacing more polluting fuels such as coal with less polluting fuels such as liquefied gas, or oil with higher sulfur content in oil with low sulfur content, ... The power is used increasingly common direction). t also includes the use of production methods do not generate dust or as an alternative method of processing a lot of dust by wet method of processing a minimum of dust ...

Measures using a closed circuit eliminate the effects of air pollutants in the production process by using circulation of all or a portion of the gas again to emit less toxic products, or non-toxic.

Enclosed equipment and machinery is also a strict requirement for environmental protection.

4.3.1.2. Measures to manage and operate.

The operation and management of equipment and machinery as well as process technology is also a measure to control air pollution. Strict implementation of operation mode of the exact amount of raw material, compliance process technology will make the amount of waste reduced and strict management conditions and source emissions.

4.3.1.3. Using trees to reduce air pollution

Trees have much effect in curbing air pollution such as smoking, keeping dust; clean the air filter, noise reduction, reduced air temperature. So, in the industrial park will plant more trees on campus and around the perimeter of the mills and factories, along roads,...

4.3.1.4. Use the device measures air pollution treatment

Air pollutants are generally consists of two types of particles and gas, according to type of emissions that selection methods and process equipment for accordingly.

* The technical measures and dust are commonly applied today include:

+ Dry Cleaner Thu mechanical model based on two basic principles is the principle of gravity and inertia principle, the type of equipment used as dust settling chamber and cyclone.

+ Thu dust by wet method is often attached to the process of cooling and gas absorption, this method efficiency from 85-99% for the recovery of dust-sized 0.1-100µm, use of equipment wash empty air and gas equipment wash buffer material.

+ Filter dust with the principles of operation used foam to keep the environment cleaner when the air flows through this membrane.

* To handle gaseous pollutants may use the methods and associated equipment as follows:

+ Absorption method working principle for air flow in contact with liquid, the gas will be dissolved or converted into the form of less toxic substances, the device buffer tower, spray tower, tower disks used in this method.

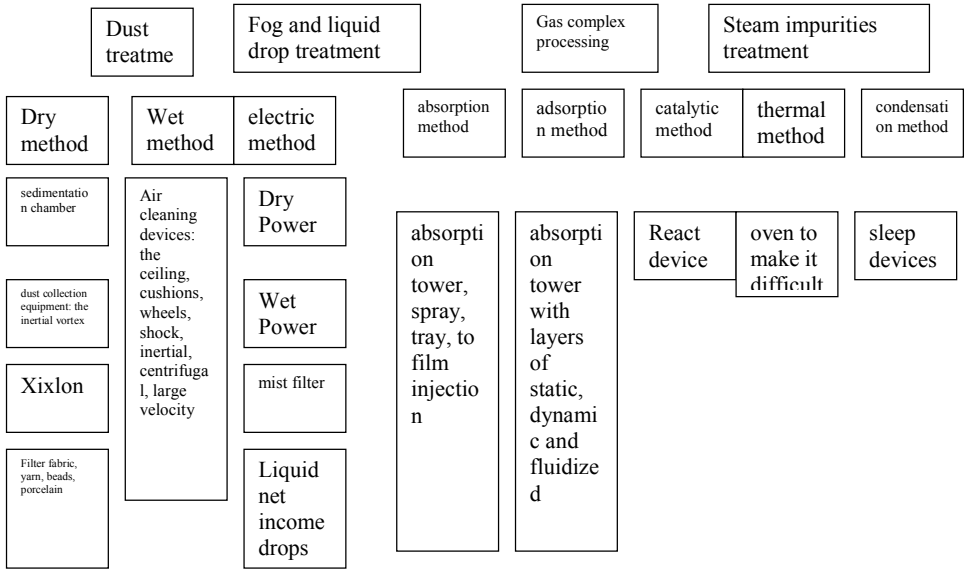
+ Adsorption method based on the activity of the reaction gases with a solid adsorbent desiccant, the efficiency of adsorption depends on surface area of attachment adsorption, adsorption equipment commonly used in odor, waste gas recovery...

The technical solutions control air pollution for some selected industries is given in the following table:

Production line	Pollution control methods	Handle efficiency
catering services	Control dust, cooking odors from the kitchen by means of forced draft	
agricultural processing, food	- Filter by wet dust pad tower. - Handling of odors associated with decomposition of absorbing cushion.	70-80% 85-95%
Storage	- Minimize evaporation and oil tanks closed, filling material embedded in the state, temperature control and heat-resistant. - Airy warehouse.	95-98%

Production line	Pollution control methods	Handle efficiency
Building Materials	- Dealing dust with filter device dust bag - Slightly solvent absorbed by alkali	95-98%
Production of furniture, electrical equipment manufacturing	- Factory ventilation. - Dealing dust with filter device dust bag, cyclone - Waste organic solvent vapor, vapor adsorption of lead by the device.	90-95%
Smoke emissions from fuel combustion sources (boilers, heating furnaces, generators)	- Absorption in emission control - Transmit through the chimney - Change fuel.	80-95%

Figure 4.1.Classification method and escape gas processing equipment



The security measures microclimate

When construction designed making the most advantageous aspects such as rational distribution of skylight for natural ventilation possible while limiting adverse side as the logical layout direction.

On the other hand, need to design maximum natural ventilation in the plant system, installation of drainage capture wind or natural gas to escape the heat. Building ventilation cooling system for workers in areas with high temperature, high power density, there are many toxic gases. System tree in the industrial park, including: park system, the isolation of green plants, the traffic management and separation of the project with the surrounding area. Some trees can be planted for the project, such as Bang, phoenixes, star tree, Verdure tree.

Factories in industrial zones ensure green area of 20% of the total area of each plant. microclimate factors in each factory will be presented in detail in the written commitments to environmental protection or a new investment report for each plant.

❖ **Measures to control noise, vibration.**

To combat noise, vibration in machinery and equipment to implement the following measures:

- Encourage use of less noisy equipment vibration and shock.
- Isolate the areas with the highest noise isolation methods, sound, facilitating machinery and equipment do not overload, always maintained and replaced periodically to ensure the technical conditions for work of machinery and equipment.
- Casting machine foundation to the volume (high concrete), increased depth of foundations, and trench pour dry sand under the floor to avoid vibration.
- Use green buffer zones to separate the sources of noise and reduce the vibration resonance.

The factory in Thuan Dao Industrial Zone will extend gas treatment the Vietnamese standard TCVN 5939-2005, TCVN 5940-2005noise standard TCVN 5949-1998; ensure emissions around the industrial park standard ISO 5937 -2005 and ISO 5938-2005.

4.3.2. Measures to control water pollution

4.3.2.1. Reduce pollution from storm water runoff

The main pollutants in storm water runoff are oil and grease and floating solids were washed away. To handle this pollution source, the plants in the project will build separate oil tank for rain water before entering the storm drain system's overall industrial park.

4.3.2.2. Reduce pollution by sewage.

a. Collection systems and waste water management

❖ **Sewer system.**

❖

Sewer system is divided into two systems: separate system in each lot and the central system were connected to separate systems.

- Separate sewer systems: sewage collection systems (which have been processed at each plant) within the lot will be built and connected to the manhole by investors to provide industrial park as part of the system central sewer system.
- Central sewer system: sewage system separate from the pipeline system will be collected along the central path is connected directly and leads to the concentrated sewage treatment. Sewage will lead to the northeast of the industrial park.
- The centralized sewage treatment is designed with a capacity of 6.075m3 per day.

❖ **Sewage Management**

To ensure sewage treatment system focuses on hard work, forcing the sewage from factories and enterprises in the industrial park are treated to meet standards prescribed by Thuan Dao industrial park expansion.

The preliminary treatment of sewage in each enterprise, including:

- Domestic sewage treatment through a septic tank in mind, depending on the number of workers and the appropriate placement of the toilet that built the septic tank capacity required for appropriate treatment. Water after treatment by septic tanks connected to the drainage system of the industrial park.
- Sewage technology: the design and construction at each plant, factories for processing, in order to neutralize the sewage, removing toxins, heavy metals or reduce pre-concentration of BOD, COD, SS ... allowable so as not to affect the processing of concentrated handling system.

To effectively manage wastewater, at each output of each enterprise, will set up a device measuring the flow of sewage and sewage point sampling.

- Equipment Sewage flow continuously operating 24 / 24 and is the basis to determine the sewage volume in the month, as the basis for calculating the cost of sewage treatment system in focus. The days of sewage flow (if any) is calculated with the flow of sewage a day maximum.
- Sampling of sewage is needed, is performed with a frequency of once per week in each enterprise. Results of sewage sample analysis will determine: which allow discharge sewage into the concentrated sewage system or not. If the concentration of toxic substances, have the potential to adversely affect the treatment system, the required concentration of factories, or industrial equipment to improve the system of their preliminary treatment, and results analysis is also the basis for calculating the cost of sewage treatment.

b. Sewage pretreatment

❖ **Sewage preliminary treatment**

❖

Domestic sewage of each toilet area is treated separately for each zone with three compartment septic tanks.

Septic tanks are doing two projects simultaneously function: sediment deposition and decomposition. Sediment is retained in the pool from 3 to 6 months, under the influence of anaerobic microorganisms; organic matter decomposes, forming part of the gases and other forms of inorganic Republic tan. Sewage sedimentation tank with an appropriate time ensure high-performance processors.

After this treatment system and sewage from each plant, factories in the industrial park to be discharged into sewage treatment systems focus of the industrial park.

Sewage technology

Classification of sewage to be treated: depending on the nature, characteristics and pollution level of each industry and each specific area that can be divided sewage pretreatment into the following categories:

- Sewage provided clean water from sewage system air conditioners from cooling systems, cooling.... can put directly into the environment outside. Of this waste is considered to be clean although it may contain other inorganic, organic, but with a small amount does not cause significant impacts to the receiving environment and resources, therefore, in principle, water this waste can be discharged directly into the storm drain network of the whole region.

- Contaminated waste mechanics: sewage plants most contaminated by soil, sand, garbage, in the process as well as the use of centralized collection and transfer. Contaminated wastes from the mechanical stage of mainly raw materials such as washing, cleaning equipment...

- Waste chemical contamination: sewage of some factories producing construction materials, engineering, cosmetics, will chemically contaminated, making the pH of the sewage to ensure value requirements or contain different chemicals. In the case of plants that use water treatment system emissions absorbed by the wet method, the sewage of this type carry high acidity caused by the formation of different acids such as H2CO3, HNO3, H2SO4 from the gases corresponding emissions such as Cox, NOx, SOx ...

- Oil contaminated waste water: sewage of some plants such as plant engineering, will be contaminated with oil, grease must be removed to the limits before being discharged into the general sewage system to guide the treatment center focus.

- Sewage polluted by organic waste: sewage from food processing plants, water leaks from junk yards transit, often polluted by organic substances will be collected on the treatment center for processing.

Other types of sewage will be pre-treated at plants and factories in industrial parks with the corresponding measures for handling each type of sewage before entering the sewer system generally leads to set up treatment areas middle of the industrial park.

c. Centralized sewage treatment

The entire sewage and sewage treatment technologies, that after preliminary treatment system leads in concentrate.

Total sewage volume Q = 6.075m3 / day

Source receiving is Rach Chanh River that has a flow of Q <50m3 / s

=> The quality of sewage after the sewage treatment system focuses at TCVN 5945-2005, the limit A, the KQ = 1, KF = 0.9

Sewage solutions: sewage after sewage treatment systems are set out Rach Chanh River land holding north of the project. Project owners take measures to preserve and repair the canals of this, regular dredging to ensure water drainage.

Table 4.4 Quality of sewage after treatment

targets	unit	Before sewage treatment standards prescribed by Thuan Dao industrial park expansion	Sewage after the sewage treatment system focuses at TCVN 5945-2005, the limit A, the KQ = 1, KF = 0.9
Temperature	0C	45	40
pH	-	5-9	6-9
BOD5	Mg/l	200	29.7
COD	Mg/l	400	49.5
SS	Mg/l	200	49.5
Total N	Mg/l	60	14.85
Total P	Mg/l	8	3.96
Amoni (Follow N)	Mg/l	15	4.95
Sunfua		1	0.198
Pb	Mg/l	0.1	0.1
Cd	Mg/l	0.005	0.005
Fe	Mg/l	1	1
Cu	Mg/l	2	2
Cr (VI)	Mg/l	0..5	0.05
Xianua	Mg/l	0.07	0.07
mineral oil	Mg/l	10	4.95
Animals grease	Mg/l	30	9,9
Coliform	MPN/ 100ml	-	3000

Description of technology

Wastewater is processed from plants and factories in general sewerage system wastewater treatment systems focus. First, the wastewater is separated but garbage and raw sewage into the tank led to the removal of oil sands combine to remove the sand solids and grease from waste water then flows into the sewage pit stop receiving the pump, following Waste water that is pumped up garbage motorized screens (remove junk planet) before the conditioning tank. At a gas tank to regulate the gas supply in order to avoid the blows from the fermentation process causes the smell. From here, wastewater will be pumped to tanks balance to stabilize the pH of wastewater. At equilibrium the chemical bath (NaOH or H2SO4) is to put magnets on the tank of wastewater pH on average by automatic pH controller. Waste water is led into a settling tank to remove suspended matter in water. Then, waste water is led through aerobic biological tank.

In aerobic biological tank, under the effect of aerobic microorganisms, organic matter will decompose into simple inorganic substances. Here, air is supplied from outside air blowers. Continue to waste water is led through the second tank, takes place the process of phase separation, solid phase is activated sludge will settle to the bottom tank is diluted by water in the gutter will overflow through aerobic biological filter. . At the pollutants are removed by microorganisms can stick on floating rates through flocculation tank made of cotton and sedimentation to remove pollutants biodegradation difficult. Wastewater is then passed through the tank and then pumped through the reservoir continued before discharging wastewater into rivers Rach Chanh sterilized, fitted with water meter before being discharged. Sewage after the sewage treatment system focuses at TCVN 5945-2005, the limit A, the KQ = 1, KF = 0.9

Tank bottom sludge, Part 2, a tank is pumped to the aerobic biological sludge in the tank maintenance, spraying mud in balance tank 2, sludge from a settling tank after flocculation and sedimentation tanks are pumped through the creation of cotton compression tank sludge to increase the amount of sludge in the tank. Here, sludge continues to be pumped through the sludge dewatering, sludge drying after extracting an estimated 972kg per day - 1.215kg per day is a hazardous waste unit owner rental collection and transport functions handled in accordance current regulations, the water collected when the compressor and pressure tank will be brought back to balance is processed next.

+ **Prevent reception - underground pumping**

Volume tank	: 500 m3
Size of building	: D x R x C = 10 x 10 x 5 (m)
Materials	:Reinforced Concrete
Quantity	: 01

+ **Clarifier sand tank**

Volume tank	: 18m3
Size of building	: D x R x C = 9 x 1 x 2 (m)
- Materials	: Reinforced Concrete
- Quantity	: 02

+ **Equable tank**

- Volume tank	: 500m3
- Size of building	: D x R x C = 10 x 10 x 5 (m)
- Materials	: Reinforced Concrete
- Quantity	: 04

+ **Neutralization tank**

- Volume tank	: 40m3
- Size of building	: D x R x C = 8 x 2 x 2,5 (m)
- Quantity	: 04

+ **Sedimentation tank 1**

- Volume tank	: DK x C = 11 x 4,5 (m)
- Materials	: Reinforced Concrete
- Quantity	: 04

+ **Aerobic biological filter tank**

- Volume tank	: 700m3

- Size of building : D x R x C = 20 x 7 x 5 (m)
- Materials : Reinforced Concrete
- Quantity : 04

+ **Aerobic biological tank**
- Volume tank : 1.000m3
- Size of building : D x R x C = 20 x 10 x 5 (m)
- Materials : Reinforced Concrete
- Quantity : 04

+ **Sedimentation tank 2**
- Size of building : DK x C = 15x 4,5 (m)
- Materials : Reinforced Concrete
- Quantity : 04

+ **Structural adhesive flocculation tank**
- Volume tank : 40m3
- Size of building : D x R x C = 8 x 2 x 2,5 (m)
- Quantity : 04

+ **Sedimentation tank**
- Size of building : DK x C = 11 x 4,5 (m)
- Materials : Reinforced Concrete
- Quantity : 04

+ **Reservoir**
- Volume tank : 6.250m3
- Size of building : D x R x C = 50 x 50 x 2,5 (m)
- Materials : Reinforced Concrete
- Quantity : 01

+ **Compression sludge tank**
- Volume tank : 180m3
- Size of building : D x R x C = 6 x 6 x 5 (m)
- Materials : Reinforced Concrete
- Quantity : 02

+ **Operator**
- Size of building : D x R x C = 10 x 6 x 3,5 (m)
- Quantity : 01

Estimated construction cost of wastewater treatment systems: 45 billion VND.

Wastewater treatment system will be constructed in modular format (expected 6 modules; 5 modules 1000m2 per day, and a modular 1100m3 / day), depending on progress in attracting investment.

4.3.3. Measures for solid waste handling

Solid waste is at the industrial park including:

- Solid waste from daily activities, from the administration, services, and from the activities of workers in factories.

- Solid waste industry is very diverse depending on the technology and products, including solid waste non-hazardous industrial and hazardous.

- Dried sludge from wastewater treatment system is estimated at 972kg per day - 1.215kg per day. When in operation the company will take samples to determine the nature of the sludge is hazardous waste if it will be stored and handled as industrial waste.

4.3.3.1. Solid waste activities.

- For investment in factories in industrial parks.

+ In each factory is equipped with two types of solid waste bins with lids durable material: a garbage bin the hard disk or processor can take advantage of the dry garbage again: shell cans, empty beer glass bottles, plastic bottles ... a trash can form a soft, easily decomposed, such as waste paper, leftover food ...

+ Solid Waste Containers activities by the factory equipped and placed in appropriate locations in the plant's parking management boards of industrial zones easily collected.

- Investor implementation of collection services and garbage transfer station contract with the Company Limited Public Works Ben Luc district transport and handling regulations.

4.3.3.2. Industrial solid waste is not hazardous

- For investment in factories in industrial parks

+ Perform classification of industrial solid waste is not hazardous for collection of solid waste can be recycled or sold for reuse facilities procurement.

+ Collection of the specified container.

+ containers of industrial solid waste is not hazardous by the factory equipped and placed in the appropriate location in the car factories to industrial parks management board gathered easily.

- Investor implementation of collection services for garbage transfer station. Industrial waste can be recycled or reused will be sold to other units if required, will not use the handle with garbage

4.3.3.3. Hazardous waste

For plants in industrial investment

+ Sort and collected in containers labeled as prescribed.

+ containers of hazardous waste from the factory equipped and placed in appropriate locations in the plant and self-contact units are functioning and management agencies permit the collection , transported and handled according to regulations.

+ Hazardous waste will be collected, transported, stored and processed in accordance with Circular No. 12/2006 / TT-BTNMT dated 26/12/2006 of the Ministry of Natural Resources and Environment, and Decision No. 23 / 2006/QD-BTNMT dated 26/12/2006 of the Ministry of Natural Resources and Environment.

+ Add closely with the Department of Natural Resources and Environment of Long An in the implementation of declarations as well as collecting, sorting, transporting and handling hazardous waste.

4.3.3.4. Yards of solid waste transshipment

- The purpose of transshipment yards of solid waste:

+ Collect each type of waste has been classified in the intermediate plant and solid waste activities and industrial solid waste is not hazardous arising from factories in industrial parks.

+ No collecting, storing hazardous waste arising from factories in industrial parks.

- Location and construction area:

+ To the west of the project next to the wastewater treatment plant.

+ Transit yards total area: 0.86 ha

- Intermediate storage of solid waste:

+ There are regional classification of solid waste can be recycled and use.

+ Having a system of leachate collection stations connected to centralized wastewater treatment.

+ There waterproofing systems.

+ Garbage from transfer station will be moved during the day.

Solid waste transfer station at the joint-stock company Dong Tam Industrial units will rent collectors as Limited Company The Ben Luc district municipality or rental investors dump Da Phuoc, Ho Chi Minh City collection process when the district needs medical focus is landfill. When the district or provincial investments focus, the landfill will contact the company and the contract of carriage collection and treatment.

4.3.4. Measures to minimize the impact

4.3.4.1. Fire

The fire prevention measures will be the authority on fire prevention, fire fighting and detailed design guidelines for each plant. The fire is being applied in the technical, educational propaganda.

Investors will combine with other agencies in fire prevention, fire fighting, training, training room forces fire sales professionals at the unit to minimize the damage caused by fire.

Fire fighting system is a combination of distances greater than 10 meters workshop are eligible to move people and vehicles when there is fire, keep a wide area needed to separate the fire from spreading. The fire hydrant are located throughout its plant, combined fire fighting equipment such as CO2 bottle, foam bottle ... in each production unit and placed in locations convenient operation. Fire sprinkler system automatically in the temperature range 70 ° C are arranged on the roof produce combined pump system controlled by pressure in the pipeline or from the overhead water storage tank.

- At the location of production, workers should perform stringent fire safety regulations during work time.

- Other machinery and equipment working temperature, high pressure resumes must be checked periodically in the registry functions of state agencies. These devices have temperature gauges, pressure, and liquid level in their device to monitor the technical parameters and surface insulation equipment with flammable components.

- For electrical wiring must be calculated with reasonable cross-section with amperage, equipped with overload protection, high temperature areas are going underground wires or strictly protected.

- For other types of solvents and flammable fuel should be stored in separate repositories isolation, away from potential sources of ignition and spark, the solvent tank to the design and installation safety valve, the temperature monitoring equipment, fire equipment, automatic fire fighting, ventilation organization of these areas to prevent accumulation of concentrations to dangerous levels.

- In production areas, inventories of raw materials and finished products to install fire alarm systems, information systems, alarm. The fire prevention and fire fighting should be checked regularly and in a state ready.

- In areas can cause fires, workers must not smoke, do not bring lighters, matches, tools ignition by friction, sparks...

4.3.4.2. Lightning

- Installation of lightning protection systems for the high position of each industrial park and factories, factories...

- To install the system for lightning, static electricity buildup and collection system improvements in new technologies to achieve high safety for the operation of mills and factories.

- Electrical Grounding shock ≤ 10 when the resistively of the soil <50.000Ω/cm2. Ground shock resistance ≥ 10 when soil resistively > 50.000Ω/cm2.

- The technical development of high lightning, creating new technologies with the ability to ensure safety across the wide area has been commercialized and sold on the market. It was good conditions for companies, factories and enterprises applications.

4.3.4.3. Preventing leakage of Fuel

To fight and rescue resource leaks, liquid or gaseous fuel, the management boards of industrial zones in cooperation with the authorities often rigorous testing of technical systems in the storage means transportation plans and rescue incidents, as follows:

❖ **Storage tank system**

Repository systems Fuel and Energy of each plant or enterprise must meet the standards of Vietnam and international technical and safety (including the cooling system, exhalation valve, lightning protection system, the system fire fighting equipment stored raw materials, fuel must be compatible)

Transport and the import of fuel

- The transportation of petroleum, liquid materials (such as tank cars ...) must have legal status as well as meeting safety standards and techniques to cope with work on road transport information.

- Implement strict technical regulations, safety in the import, export and fuel.

❖ **Troubleshooting plan leaked**

Industrial Zone Management Board plans for troubleshooting storage areas of raw materials, fuel can leak, close coordination with other agencies and local governments to handle incidents in the event of a leak.

❖ **4.3.4.4 Control of chemical leakages and safe exposure to chemicals**

- The chemicals are transported to the wastewater treatment plant by means of specialized suppliers to come by.

- Chemicals are stored in a warehouse right; investors will plan for the minimum storage of chemicals.

- Compliance with stringent process and store chemicals used in the manufacturer's instructions.

- All workers operating sewage treatment stations are instructions and safety measures when exposed to chemicals

- When working with chemicals, workers should carry personal safety equipment such as masks, goggles, gloves.

- Tools such as emergency eye wash equipment were placed in such positions are exposed to chemicals.

❖ **Incident control processor performance Inaccessible**

To prevent and minimize the impact of the incident leading to effective treatment is not achieved; investors carry out the following measures:

- To comply with design requirements

- Operating staff must be trained in program operation and maintenance of sewage treatment systems.

+ Implement well the treatment system monitoring

+ Set up appropriate monitoring programs for sewage treatment station

+ Make good monitoring programs

+ Having a plan in time when handling the incident to the sewage treatment station.

- Where the focus system is not working due to power outages or damage shall be contained in sewage conditioning tank, reservoirs and even repairs damaged units, then the sewage circulation pump in the reservoir if sewage treatment at the output of the reservoirs do not meet prescribed standards. In case, electric power was cut, that the factories in the industrial Zone does not work so the amount of sewage discharged at this time is negligible.

4.3.4.5. Controlled inundation

- Regular dredging, strengthening the banks of Rach Chanh river (through the project land area)

- No discharge of untreated sewage standards in this canal.

4.3.4.6. Minimize impacts to the cultural environment - social

- Make sure the green area and controlling environmental pollution in each plant, as well as global enterprises such as industrial parks in the report to ensure clean air environment for people living in the area.

- To limit the jams and traffic accidents during the hours melt shifts, investors will have a plan for the factories and enterprises have overlapping work hours to minimize the time and a tan ca arranged buses to pick up the car to reduce traffic density to avoid traffic accidents. Education workers sense of traffic safety. Build houses for workers in the resettlement area.

- Incorporate with the local management body relating the work of migrant workers managed to stay in the area

CHAPTER V

COMMITMENT TO ENVIRONMENTAL PROTECTION

In the time to operate, it's unavoidable for the industrial zone to generate environmental impact factors. Understanding the importance of environmental protection, relation between industrial development and clean environment preservation; in order to ensure the development goals without polluting the environment, the Company commits to:

- Afford the environmental protection of the Industrial area in line with article 36, chapter V of the Environmental protection act no. 52/2005/QH11 on November 29th, 2005.

- Carry out the pollution control measures in the stages of leveling, infrastructure construction, as well as in the operation period of the industrial zone as proposed in chapter IV of the report.

- Require the investors in the industrial area to give the evaluation report on environmental impacts or the commitment to environmental protection for each project.

- Invest to build the centered sewage disposal station of the industrial zone in parallel with the infrastructure construction of industrial area; and finish the sewage disposal system before plants in the industrial area put into operation. Demand the secondary investors to link their own system to the common system of the industrial area.

- Install the electricity and water meters in the centered sewage disposal system to observe and run the system. Install the automatic monitoring station on waste and exhaust emissions when the industrial area attracts investment and puts into action with over 80% it's plants.

- Manage the hazardous waste in accordance with the Circular no. 12/2006/TT-BTNMT on December 26th, 2006 of Ministry of Natural resources and Environment and the Decision no. 23/2006/QĐ-BTNMT on December 26th, 2006 of Ministry of Natural resources and Environment.

- Implement the environmental monitoring program in the process of construction and operation and send the environmental monitoring report to the Department of Natural resources and Environment to observe.

- In the process of operation, the project commits to do the pollution control measures effectively and they must satisfy Vietnam environmental standards as follows:

+ For the quality of air environment: ensure to satisfy the environmental standards TCVN 5937-2005; TCVN 5938-2005; TCVN 5939-2005; TCVN 5940-2005; the noise standard TCVN 5949-1998.

+ For the quality of air environment: Wastewater from the centered sewage disposal station satisfies the standard TCVN 5945-2005, limit A, Kq=1.1, Kf=0.9 before flowing into the receiving source.

- Cooperate closely with State management agencies in the area and comply with their requirements in the process of project's construction and operation; and automatically obey the current rules of Vietnamese Law.

CHAPTER VI

ENVIRNMENTAL TREATMENT WORKS, ENVIRONMENTAL MONITORING AND MANAGEMENT PROGRAM

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6.1. LIST OF ENVIRONMENTAL TREATMENT WORKS

Table 6.1 List of environmental treatment works

OR.	Environmental treatment works	Work progress
	Construction phase	
1	Allocate for sprinklers at the works	Used from the process of project implementation till finishing the process of construction implementation.
2	Equip for containers of living solid waste	Used from the process of project implementation till finishing the process of construction implementation.
3	Equip for mobile toilets	Used from the process of project implementation till finishing the process of construction implementation.
4	Allocate for the temporary maintenance areas for means of transport and construction.	Used from the process of project implementation till finishing the process of construction implementation.
5	Allocate for centered areas of living solid waste.	Used from the process of project implementation till finishing the process of construction implementation.
	Operation phase	
7	Rain-water collection system	In the process of infrastructure construction
8	System of septic tanks for the management center area.	In the process of infrastructure construction
9	Build up the sewage collection system	In the process of infrastructure construction
10	Centered sewage disposal station	Finish before the plants of industrial area put into operation
11	Solid waste transfer station	In the process of infrastructure construction
12	System of green trees	In the process of infrastructure construction

OR.	Environmental treatment works	Work progress
13	System of fire protection and prevention	In the process of infrastructure construction
14	Lightning arrester	In the process of infrastructure construction

6.2. ENVIRONMENTAL MONITORING AND MANAGEMENT PROGRAM

6.2.1. Pollution source management

The environmental management works in the industrial area plays important roles in preventing damages and consequences caused by environmental pollution; therefore, it is necessary to focus on these following issues:

- Based on the overall project, the investors of industrial area build up the systems of transport, electricity, water; system of industrial sewage collection; both system of living water collection and another of rain-water collection; Management board of industrial area and other related units take part in evaluating the technology designs of the plants to monitor the systems of sewage collection and treatment as regulated in order to protect the area's environment.

- When a production plant invests in the industrial area, it has to give out the commitment to environmental protection or the environmental impact assessment report, which insists the solutions to pollution control satisfying environmental requirements of the management board of industrial zone and State authorized agencies.

- Cooperating with authorities, plants and factories in the industrial area draw up the plans for prevention of accidents, fire and explosion, fuel release.

- Regular examinations of the environmental protection works of plants, factories.

- The investors of industrial area need to allocate a cadre staff skilled in environment so as to observe the common treatment system; complete related work; know how to evaluate and analyze to find out unusual changes, and take control measures or improvements.

- Meet the standard on industry isolated areas, pay attention to the distance and height among plants in industrial clusters and dividing lines of green trees, the proportion of the total areas of green trees in comparison to the ones of grounds.

6.2.2. Environmental monitoring program

For purposes of measuring environmental status and predicting quality of the environment of industrial zone of Thuan Dao in expansion; the management board cooperates with the authorities and plants, factories in the industrial area to make environmental monitoring programs, collect the samples for monitoring environmental quality in some production facilities and

important areas in the industrial zone with an annually periodical time, in details:

6.2.1. In the process of construction implementation

The environmental monitoring program will be carried short after the project begins to implement. In the process of construction, the aims of program at:

+ Monitor the environmental sanitation and infectious diseases at the construction site.

+ Ensure that the building of infrastructure system will satisfy technical requirements of the design.

Monitoring program

+ Chosen specifications: noise, dust

+ Places for monitor: 2 places in the area where the project is being constructed, 2 places in surrounding populated areas in line with the wind direction.

+ Frequency of collecting samples and analyzing: every 3 months.

+ Devices for collecting samples: standard devices

+ Compare standards: TCVN 5937-2005, TCVN 5949-1998.

6.2.2. In the process of operation

a. Monitoring water quality

**** Sewage (drain-water)***

- Chosen specifications: temperature, pH, BOD_5, COD, SS, total P, total N, ammonium (counting unit: N), sulfurous, mineral oils, plant and animal oils, Coliform.

- Places for monitor: 2 places: 1 allocated in the in-put and the other allocated in the out-put of the centered sewage disposal station.

+ Frequency of monitor: every 3 months.

+ Devices for collecting samples and analyzing methods: standard methods

+ Compare standards: Standards issued by the industrial area on in-put sewage; and TCVN 5945-2005, limit A, with Kq=1.1, Kf=0.9 for treated sewage.

**** Surface water***

- Chosen specifications: pH, COD, BOD_5, SS, oil, heavy metals: Fe, Pb, Cd, Cu, Cr, Coliform.

- Places for monitor: 2 places: the first is 200m away from discharge sewer (NM01) to lower stream and the second is 200m away from discharge sewer (NM02) to upper stream of Chanh river.

- Frequency of monitor: every 3 months.

- Devices for collecting samples and analyzing methods: standard methods

- QCVN 08:2008/BTNMT: National technical standards on the quality of surface water.

b. Monitoring air quality

- Chosen specifications: NO_2, SO_2, CO, noise; and standards: H_2S, NH_3 on monitoring places; sewage disposal area.

- Places for monitor: 4 monitoring places inside the industrial zone, but they are outside the area of production facilities; 1 place is next to sewage disposal area and rubbish-transport shaft; 4 places outside the industrial area, lie in Southeast, Northwest, Southwest, and Northeast.

- Frequency of monitor: every 3 months.

+ Devices for collecting samples and analyzing methods: standard methods

+ Compare standards: TCVN 5937 – 2005, TCVN 5938 – 2005, TCVN 5939 – 2005, TCVN 5940 – 2005, TCVN 5949 – 1998.

c. Monitoring solid-waste sources

- Examine and monitor the transport, storage of solid waste in the industrial waste transport site: quantity, types of waste (living, industrial and hazardous waste).

- Living and industrial solid-waste are collected and carried to the waste transport site by the organization of investors; in case the industrial waste is recyclable and reusable, it will be sold to demanded units, the remains will be treated along with living waste. This is the content in the contract signed with the One-member Limited Liability Company (LLC) on public buildings of Ben Luc district, who is responsible for transporting and treating the waste.

- For hazardous waste, the plants in the industrial zone will directly cooperate with specialized waste disposal companies, which are legally issued under the guidance of Department of natural resources and environment. For example: Limited Liability Company of Sao Mai Xanh, LLC on Production and Trading Service of Moi Truong Xanh, LLC on Trading and Service of Tuong Lai Xanh.etc.

Hazardous waste is collected, transported, stored and treated in accordance with Circular no. 12/2006/TT-BTNMT on 26/12/2006 of Ministry of Natural resources and Environment and Decision no. 23/2006/QD-BTNMT on 26/12/2006 of Ministry of Natural resources and Environment.

- Frequency of monitor: every 3 months.

d. Monitoring standards on microclimate in the plants of the industrial area

- Objectives of monitoring: humidity, temperature, windy speed outside the areas of facilities in the industrial area.

- Frequency of monitor: every 3 months.

e. Monitoring the soil environment

- Chosen specifications: As, Cd, Cu, Pb, Zn.
- Places for monitor: 1 place in landfill site.
- Frequency of monitor: every 3 months.

- Compare standards: QCVN 03:2008/BTNMT – National technical standards on allowable limit of heavy metals in the soil.

6.3. SUPPORTING MEASURES IN THE PRORAM OF ENVIRONMENTAL QUALITY MONITORING

Beside above mentioned methods of proactive monitor, prevention of pollution-easy-sources, the investor of projects in the Industrial area of Thuan Dao in expansion will regularly organize the training and studying of regulations on environmental protection works for all cadres, workers in the Industrial area.

In the process of management and operation, in case finding out new pollution sources, the investor will timely make effective methods to treat these sources or timely report the situation to authorities and environmental specialized agencies to receive the best solution.

Besides, in order to ensure the good health for all cadres and workers in the industrial area, the investor will cooperate with the plant managements to utilize requires for these plants and factories to launch the periodic health examination campaigns.

No.	Content	Categories	Funds for construction (1.000 đ)	Operating funds (1.000 đ/month)
Construction phase				
1	Dust treatment	Sprinkler system		2
2	Waste water treatment	Mobile toilets		1.000 - 2.000
3	Solid waste disposal activities	Solid Waste containers	500 - 1.000	Contract with the functional unit: 2000
4	Waste oil treatment	Waste oil containers	500	Contract with the functional unit: 500 - 1.000
Operation phase				
1	Rainwater collection	Rainwater collection system	10	
2	Waste water treatment for services works	Septic tank		
3	Wastewater collection	Wastewater collection system on the station Wastewater Treatment		
4	Wastewater treatment	Waste water treatment stations focus (with watches power, water installed for the treatment system)		
5	Solid Waste treatment	Solid waste transfer station		
6	Fire Prevention	Fire Prevention system		

No.	Content	Categories	Funds for construction (1.000 đ)	Operating funds (1.000 đ/month)
7	Lightning Prevention for the entire area	Lightning Prevention system	200.000 ÷ 400.000	1.000
8	Improve microclimate conditions	Isolation trees	200.000 ÷ 400.001	15.000

7.2. FUNDING ESTIMATES ENVIRONMENTAL MONITORING

Table 7.2 Funding estimates environmental monitoring

No.	Content	Funds for construction (1.000 đ)
A	In the process of building	

1	Wastewater Monitoring	4.000
2	Surface water monitoring	6.000
3	Air monitoring	8.000
B	In the process of operations	
1	Wastewater Monitoring	15.000
2	Surface water monitoring	15.000
3	Air monitoring	15.000
4	Environmental monitoring of land	10.000
5	Solid waste Monitoring	10.000
6	Microclimate conditions Monitoring	10.000

CHAPTER VIII
COMMUNITY CONSULTATION
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8.1. IN THE OPINIONS OF PEOPLE'S COMMITTEE OF LONG DINH COMMUNE

In the process of capital construction:

- Before the land clearing work, the construction unit should draw up contracts with the engineering unit to demine the overall project in order to keep the process of construction in safe.

- Because the construction works is next to the village road 16 and the road of Hamlet 4 with the high population density, it is necessary to carefully count and design the water outlet system, the building foundation bed (written in the report) will be higher than the ground level of populated area, though lower than the road Long Dinh – Long Can.

- In case the land clearing work done by motorized transport, the investor needs to require the construction units to commit about transport velocity without dropping for the purposes of absolute safety of people's properties and lives.

In the process of working:

- Because the population density of surrounding areas is high, the investor should not locate highly polluted industries such as the aluminum, accumulator production, etc.

- Because of a large project, the building of sewage disposal plant needs to apply the most modern equipments and technologies.

- For the industries easy making odors, it is necessary to treat thoroughly so as not to spread over surrounding areas.

In conclusion: Through the brief description of environmental impact assessment report of the investment project of industrial zone Thuan Dao in expansion, we affirm that this repot is feasible and require the investor to follow the disposal processing and the commitments to environmental protection during the time to carry out the project.

8.2. IN THE OPINIONS OF FATHERLAND FRONT COMMITTEE OF LONG DINH COMMUNE

In the process of capital construction:

- It's necessary to solve satisfactorily the compensation, removal and resettlement for residents to stabilize their psychologies. This, thus, is the base to speed up the project progress.

- The process of collection and treatment of the plant biomass, graves needs to be done rapidly, tidily and timely to avoid nasty smells.

- What materials are used in the ground leveling? How do they affect the environment? It's necessary to evaluate them carefully. Because of the process of transportation, these materials will diffuse into the air and cause considerable amounts of dusts, sands.

……

These amounts of dusts can be caused by vehicles or haulers. The company had solutions to traffic restriction and used standard trucks. However; it is necessary to know that heavy transport vehicles cause not only smokes, dusts which affect the environment, but also the roads seriously damaged (the projects in the Industrial zone Long Dinh are obvious examples). Therefore; in order to solve these above problems, beside the capital construction of the industrial zone, the roads to the industrial area should also be improved. Combining with flooding restrictions caused by land

clearing work, the company should install the water outlet systems. As the results, when the company puts into operation, the industrial zone will avoid flooding state, which affects the environment and makes conditions for pathogens to develop (lessons drawn from constructions of the Industrial zone Hamlet 4, Long Dinh).

- Construction works attracts large amounts of workers. This will lead to wastages: nylons, garbage…which affects the landscapes of environment. In the other hand, the construction works closes to the rivers: Rach Chanh and Vam Co Dong, the winds will sweep these wastages to the river beds; this pollutes the rivers and damages the landscapes. The company should give the best solutions for the wastes thrown by workers.

- A considerable issue now laid by the companies in the commune is the accidents at work, which often happen by subjective or objective factors. Therefore; when the works is begun, the company should give effective methods for workers to recognize the importance of labor safety; and protection and prevention of fire and explosion.

- The company is highly appreciated its paying attentions to solve the noise state affecting the people around.

In the process of operation:

- Ensure the labor safety, the protection and prevention of fire and explosion when the company uses DO oils and gas fuels. Cooperate usually with functional departments of the province to train the prevention of fire and explosion at the bases.

- The company must be equipped with the drain-water collection and disposal system. Through the methods to minimize environmental pollution, the company should have both the waste collection and disposal system, and the collection and disposal system of storm-water. If using a shared system, drain-water and storm-water flow together in a pipe with a long time, this will cause environment polluted.

- Exhaust emission is the deep concern, is one of the green house effects. What the company has done in the summary table will increase the amounts of exhaust emissions, dusts and solvents. The company will minimize the emissions and dusts into the environment, intensify the process of sewage disposal before emitting them into the air. Because the Food and Plastic processing company often pollutes the air with nasty smell and poisonous gas, it is necessary to have the treatment system to minimize these

amounts of exhaust emissions. Because of such a long period, the atmosphere and ozone layer will be relatively affected. Besides, planting many trees around the plant is an effective and long-term solution.

- Through technology map, the emissions are mud-pressed, and buried later. If they aren't carefully buried, the atmosphere will be affected for a long time. Therefore, the company needs to clearly state the places to burry; otherwise, the environment will be polluted.

In conclusion:

Fatherland Front Committee of Long Dinh commune highly approves the spirit of the company's management board which pays attention to environmental protection during the time from capital construction to operation. Being a group of people, the Fatherland Front Committee recognizes that the environment is now a commonly concerned problem of the residents; it has been seriously affected by the emissions from the companies. Therefore, when the company puts into operation, although in the short term it provides employments for local labors and the outside, in the long term the company must minimize its effect to the environment. As the results, the company will develop more and more rapidly.

Some opinions share with the company.

Warmly welcome!

8.3. THE INVESTOR'S ABILITY TO MEET THE REQUIREMENTS OF THE COMMUNE

The Join-Stock Company of Dong Tam industrial zone commits to satisfy the requirements of the commune in accordance with the rules of current law of Vietnam and other involved documents.

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CHAPTER IX
DATA AND INFORMATION SOURCES, AND EVALUATION METHODS

9.1. DATA & INFORMATION SOURCE

- The Official Document no. 4371/UBND-KT on September 7th, 2007 of People's Committee of Long An province, on negotiating about the investment places.
- The Official Document no. 1161/CP-CN on August 16th, 2004 of Prime Minister, on "Policies on expanding the Duc Hoa Industrial Zone I and Thuan Dao Industrial Zone of Long An province".
- The Official Document no. 3605/CV-UB on September 11th, 2003 of People's Committee of Long An province, on "Expanding Thuan Dao Industrial Zone".
- The Official Document no. 5397/UBND-NN on November 2nd, 2006 of People's Committee of Long An province, on "Joint Venture Company of Investment and Development of Ben Luc Industrial Zone noticed about its first investment in the Industrial zone Thuan Dao in expansion".
- The Official Document no. 02/2008/CV-PC/KCN on January 29th, 2008 of Joint-Stock Company of Dong Tam Industrial Zone, on "Renaming the Company".
- The Decision no. 3266/QD-UBND on December 20th, 2007 of People's Committee of Long An province, on "Adopting the detailed plans for construction with the map ratio of 1/2000 of the Industrial Zone Thuan Dao in expansion, Long Dinh commune, Can Duoc district, Long An province".
- The Decision no. 779/QD-UBND on March 30th, 2009 of People's Committee of Long An province, on "Adjusting the detailed plans for construction with the map ratio of 1/2000 of the Industrial Zone Thuan Dao in expansion, Long Dinh commune, Can Duoc district, Long An province".
- Presentation on the detailed plans for the Industrial Zone Thuan Dao in expansion, Long Dinh commune, Can Duoc district, Long An province.

And the uses of technical documents include:

+ The Circular no. 08/2006/TT-BTNMT on September 8th, 2006 of Ministry of Natural resources and Environment, on guidance of evaluating the strategic environment, environmental effects, and commitment on environmental protection.

+ Documents and information on natural conditions, socio-economics, environment situation of planned areas given by the communal management office, is very reliable.

+ Another reliable data on measurement, survey on the environment of water, atmosphere, and solid emissions…collected by the consulting unit, is used for the report.

+ Reports… of the projects using the same technologies and other similar projects made by specialized agencies and adopted by authorized agencies in recent years are also highly reliable.

+ Documents on the waste disposal technology (sewage, gas, solid emissions) in the domestic and foreign area and Documents on environment managing of the Central and local committees, are highly reliable.

+ The 2007 Statistical Yearbook issued by Long An Statistical Office

9.2. THE METHODS USED IN REPORT.

- Statistics: Use the method of statistics to analyze data.

- Interview: Have interviews with leaders and residents of the local areas. In more details, the subjects of interviews are the People's Committee and Fatherland Front Committee of Long Dinh commune, Can Duoc district.

- Identification: Describe the environment situation; define the project's factors which can affect the environment.

- Comparison: Based on the results of survey and measurement at the scene; analysis at the laboratory; and theoretical results as counted; then compare them to Vietnam's standards in order to define the environment quality in the planned areas.

- Brief evaluation: To estimate the amounts of pollution and pollution factor basing on the pollution factor regulated by The World Health Organization.

- Reference: Make references of similar reports.

- Specialist: Require specialists for advices in specialized areas.

These above mentioned methods are commonly used and they are also evaluated by the domestic and international scientists; therefore, they are highly reliable method

CONCLUSION AND PROPOSALS

1. CONCLUSION

Benefits from the project

- The position of the Industrial Zone Thuan Dai in expansion is estimated as many advantages for industrial development:

+ Inter-provincial transport network and among regions is convenient.

+ The plan details are made on the base of development orientation of Sothern Key Economic Region, at the same time they also obey the rules of National law.

- The project satisfies the demands on economics, technique and society on the developmental orientation of the locality and Sothern Key Economic Region.

- It attracts many skilled labors so that they can approach the modern techniques, machines, devices and technologies. This can partly contribute to develop the domestic industries

- It makes good conditions on developing infrastructures, traffic, electricity, water, post and communication, trading services. So, the residents have also good chances to improve economic and cultural life.

- It creates more budgets from the operation of investment projects.

Environmental effects made when the project puts into operation.

- It is possible that the air environment, soil, surface and ground water can be polluted; and in the process of land clearing and infrastructure construction, if the company does not give effective methods, the natural biological system of the area can also be changed.

- The risks and accidents are caused in both processes of capital construction and the operation of the Industrial Area.

2. PROPOSALS

We respectfully request that the agencies and mentioned authorized levels consider and give good conditions to step up the project.

PART APPENDIX

TRANG 99

PEOPLE'S COMMITIES
LONG AN PROVINCE

=====
No. 36/05 CV-UB

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom – Happiness
==========

Tan An on Date Nov. 02, 2006

About: Expand Thuan Dao Industrial zone

Submit:
- Management Board Industrial Zones of Province
- Natural Resources & Environment Department,
- Construction Department, Industrial Department
- Planning & Investment Department
- People's Commities Can Duoc District
- Joint Venture Investment Development Company of Ben Luc industrial zone

- Based on the contents of the minutes meeting No. 2445/BB-UB on Date June 19, 2003 and consider proposals of the Management Board Industrial zones in Document No. 376/CV-BQL on Date July 17, 2003 about **Expand Thuan Dao Industrial zone of** Joint Venture Investment Development Company of Ben Luc industrial zone. About this problem People's Commities of province has idea follow:

- Undertakings: People's Commities of province disagree about location and area to expand Thuan Dao **Industrial zone with area about 879 hecta and build** residential areas (resettlement arrangement for the clearance of households) with area about 111 hecta in Long Dinh & Long Can commune, Can Duoc District.

- Investor (Joint Venture Investment Development Company of Ben Luc industrial zone) contact with Management Board Industrial zones and functional departments other relevant for instructions procedures follow regulations.

- To date Sep. 30, 2004, investor must complete procedures follow regulations and project implementation, if not finished this jobs
People's Commities will revoked follow regulations.

On behalf People's Commities of province
Chairman
(Signed & Sealead)
DUONG VAN TIEP

THE GOVERNMENT **SOCIALIST REPUBLIC OF VIET NAM**
No.1161/CP-CN **Independence – Freedom – Happiness**

Ha Noi, August 16th , 2004

With regard to the guideline of extending Duc Hoa I Industrial Zone and Thuan Dao Industrial Zone

Respectfully addressed to: - Ministry of Planning and Investment
- Ministry of Construction
- People's Committee of Long An province

In consideration of the proposal by People's Committee of Long An province (Official document No. 1880/CV-UB dated on May 10th 2004), the idias of many Ministries such as: Ministry of Planning and Investment (Official document No. 4682/BKH-KCN&KCX dated on July 28th 2004), Ministry of Construction (Official document No. 838/BXD-KTQH dated on June 08th 2004) for the guideline of extending Duc Hoa I Industrial Zone and Thuan Dao Industrial Zone in Long An province, Prime Minister gave out the ideas as follows:

1. To approve for the guideline of extending Duc Hoa I Industrial Zone and Thuan Dao Industrial Zone in Long An province.

Chairman of People's Committee of Long An province should conduct any investor to set up detail planning and feasible project in order to extend these industrial zones mentioned above. Among that, the investor should define the area scales in accordance with its financial ability and ability attracting the investment capital in order to ensure overall connecting all technical infrastructural system of two phases then submitted for approval according to currently regulation.

2. People's Committee of Long An province conducted to set up a general planning in Tan An, Ben Luc, Can Giuoc, Duc Hoa in order to ensure overall developing society infrastructure system, technical infrastructure and protecting the ecological environment in area./.

ON BEHALF OF PRIME MINISTER
VICE- PRIME MINISTER

Distributed to:

- As above
- Prime Minister Vice Prime Minister Nguyen Tan Dung
- Ministries: Financial, Communications and transport

Industry, Natural Resource and Environment, Defence

- Management board of Long An industrial zones

Governmental offices: BTCN, Director Nguyen Cong Su

- Departments: QHQT, NN, IV, TTBC
- Prime Minister's spokeman

Saved: CN (5), VT

Nguyen Tan Dung

PEOPLE'S COMMITTEE OF LONG AN **SOCIALIST REPUBLIC OF VIET NAM**
No.5397/UBND-NN **Independence – Freedom – Happiness**

Tan An, November 02rd, 2006

Ben Luc Industrial Zone invested developing associated Company developed its investment in phase 1 in Extended Thuan Dao Industrial Zone

Respectfully addressed to: - Management board of provincial industrial zones
- Department of Natural Resource and Environment
- Department of communication and transport
- Department of Construction; Department of Industry
- People's Committee of Can Duoc district
- Ben Luc Industrial Zone invested developing associated Company.

In consideration of the Official Document No.920/BQL-KCN-XD dated on October 23th 2006 by Management Board of Industrial Zones as regarding to a proposal for Ben Luc Industrial Zone invested developing associated Company to develop its investment in phase 1 in Extended Thuan Dao Industrial Zone, the Provincial People's Committee would like to give out the ideas as follows:

1/- Approve for Ben Luc Industrial Zone invested developing associated Company to develop its investment in phase 1 in Extended Thuan Dao Industrial Zone as the proposal by Management Board of Industrial Zones as above mentioned official document. *(Attracted official document and copy of cadastral map)*

In particular of exit way in industrial zone on the side of Long Dinh- Long Cang road should be commissioned to Management Board of Industrial Zones to preside over with related appropriate authorities (Department of communication and transport, Department of Natural Resource and Environment, People's Committee of Can Duoc district, Nam Sao international joint stock Company) to carry out actual surveying, to unite the best position and then Department of Natural Resource and Environment could solve the procedures about specific land.
2/- People's Committee of Can Duoc district carried out to publish about investment guidelines mentioned above; to hold status quo of land, houses,… in order to base on seizing, paying damages, evacuating plan according to the regulation. As well as, there is a plan to arrange resettlement for population, without any claim happened.
In accordance with guideline above, Management Board of Industrial Zones and related appropriate authorities should be developed to perform specifically.

ON BEHALF OF PROVINCIAL PEOPLE'S COMMITTEE
CHAIRMAN OF PROVINCE
Vice- CHAIRMAN

Distributed to:

- CT, PCT, Provincial People's Committee
- As above
- NC-TH Department
- Saved: VT, Nh

Ben Luc Industrial Zone

Do Hoang Viet

SOCIALIST REPUBLIC OF VIET NAM
Independence – Freedom – Happiness

No.02/2008/CV-PC/KCN

Long An, January 29th , 2008

With regard to change the name of company

Respectfully addressed to: ALL DEPARTMENTS, SERVICES, GOVERNMENT MANAGEMENT AGENCIES
PARTNERS AND CUSTOMERS

Ben Luc Industrial Zone invested developing associated Company reported some information to all departments, services, government agencies, partners and customers as the following:
- Head office: Thuan Dao Industrial Zone, Ben Luc District, Long An Provice
- Investment license No. : 2316/GP issued on April 04th 2003 by Ministry of Investment and Planning.
- The certificate of amending the Investment license No. : 2316/GCNĐC1/50/2 issued on April 13th 2007 by Management Board of Long An's Industrial Zones

Tax code: 1100582970

Will formally change its name into:

DONG TAM INDUSTRIAL ZONE JOINT STOCK COMPANY
- Head office: Thuan Dao Industrial Zone, Ben Luc District, Long An Provice
- Investment license No. :502032000050 issued on January 11th 2008 by Management Board of Long An's Industrial Zones

Tax code: 1100582970

Yours respectfully

DONG TAM INDUSTRIAL ZONE JOINT STOCK COMPANY
GENERAL DIRECTOR

Distributed to:
- As above
- Saved VT nvt-3b

VO VAN KHUYEN

Tr 103 – 108

PEOPLE'S COMMITTEE OF LONG AN PROVINCE Number: 3266/QĐ-UBND	**SOCIALIST REPUBLIC OF VIETNAM** **Independence – Freedom – Happiness** Tan An, December 20th, 2007

DECISION
On adjusting detailed planning for construction with 1/2,000 in map scale of the Extended Thuan Dao Industrial zone, in Long Dinh commune, Can Duoc district, Long An province

PEOPLE'S COMMITTEE OF LONG AN PROVINCE

Based on the Law on organizing People's Council and People's Committee dated on November 26th, 2003;

Based on Constructional law dated on November 26th, 2003;

Based on the Decree No. 08/2005/NĐ-CP dated on January 24th, 2005 by the government on construction planning;

Based on the Circular No. 15/TT-BXD dated on August 19th, 2005 by the Ministry of Construction on guidance of making, assessing, adopting and managing the construction planning;

With regard to the Document No. 50/2007/CV-BGĐ/BL dated on November 26th, 2007 by Ben Luc Industrial Zone Developed Investment Associated Company; and the document copy on adjusting detailed planning for construction with 1/2,000 in map scale of the Extended Thuan Dao Industrial zone, Long Dinh commune, Can Duoc district, Long An province, No. 52/TĐ-SXD dated on December 17th 2007 by Long An's Department of Construction.

DECIDE:

Article 1: Adopt and adjust some contents in detailed planning scheme for construction with 1/2,000 in map scale of the Extended Thuan Dao Industrial zone, Long Dinh commune, Can Duoc district, Long An province, with the following provisions:

**** Planning position:*** Long Dinh commune, Can Duoc district, Long An province
**** Scale, area:*** 189.843 hectares
**** Investor:*** Ben Luc Industrial Zone Developed Investement Associated Company
**** Consultant unit:*** Centre of Rural urban planning architecture – Long An's Department of construction

I. Position, boundary, area:

Extended Thuan Dao Industrial Zone is located in Long Dinh commune, Can Duoc district which bordering to Thuan Dao industrial zone in phase 1 – Ben Luc town and crossing to Rach Chanh on North.

Boundary of area is limitted as:
- The North near: Rach Chanh
- The South near: couple channel tracks in interior field
- The East near: Currently population lengthways Backroad16
- The West near: roads between villages (red gravel path)

II. The nature of Industrial Zone

The nature of industrial zone is a light industry, processing industry with a little toxin. Pollutted level is from III to IV level. Types of industry are scheduled to place in Extended Thuan Dao Industrial zone as the following:

- Industry of production of construction materials and interior decoration: (Types of industry make low environmental pollution)
- Industry of production of serviced for agriculture, processing food for domestic animals
- Industry of production of machinery, mechanical engineering, fisheries and agricultural mechanic Industry of production of resinous products
- Projects of processing food, beverage, agricultural and forestry.
- Biological technology, production of health facilities
- Industry of production of car accessories, motor- accessories; to manufacture and install accessories and devices of motor; to manufacture technical accessories for transport (without plating)
- Industry of production of electron devices, communication and telecommunication devices
- Industry of production of consumer goods for domestic and export: domestic tools, cosmetic, pottery, ceramic, china, glass, garment,…

III. Layout of architectural planning:

1. Structure of space organized

- Total area of industrial factory constructional land is 123.925 hectares, divided into 8 groups with 86 plots. Each plot has area from 1.12 hectares ÷2.605 hectares.
- Building density is 50% (It may be larger, depending on types of manufacturing and ceiling), coefficient of industrial territory utilization is 0.7.

Group A: 12 plots, area 14.75 hectares
Group B: 12 plots, area 15.72 hectares
Group C: 14 plots, area 20.09 hectares
Group D: 14 plots, area 19.42 hectares
Group E: 08 plots, area 12.73 hectares
Group F: 08 plots, area 12.77 hectares
Group G: 10 plots, area 14.20 hectares
Group H: 08 plots, area 14.245 hectares

**** Centre of commercial service area***

- Placed 02 commercial service centers in Northern Industrial Zone
- Land area: 11.62 hectares -12.24 hectares, Building density is 30÷40%
- Coefficient of industrial territory utilization: 0.6 ÷ 0.7 hectares

**** Land for nodal technical buildings:***

- Land area: 2.50 hectares, among them are many buildings such as:
- Power supplying station: 0.40 hectares
- Water supplying plant: 0.40 hectares
- Sewage treatment area: 0.84 hectares
- Transshipment disposal area: 0.86 hectares

The positions of land for nodal technical buildings will be removed to conformable places when beginning to build relating technical systems.

**** Green land***

Total area of green land is 21.6104 hectares

- Green concludes 3 types

+ Green is separated between the area not function together, properties of manufacture or between industrial area and residential area.
+ Shady green are planted mainly along the pavements of street
+ Aside from centralized parts of green, it must have at least 20% area of green in each building

**** Transport network in industrial zone:***

Areas for traffic in internal industrial zone is 30.1876 hectares

2. Land use planning:

- Industrial area:	123.925 hectares	(65.28%)
- Area for commercial service centers:	11.62 hectares	(6.12%)
- Green area:	21.6104 hectares	(11.38%)
- Traffic area:	30.1876 hectares	(15.90%)
- Area for nodal technical buildings:	2.50 hectares	(1.32%)
Total:	**189.843 hectares**	**(100%)**

IV. Planning for technical infrastructure network

1. Technical preparation for building land:

a. Subgrading:

- Designed altitude Hxd ≥ 1.5 M (lower than Long Dinh – Long Cang road about 0.1m)
- Volume of materials for subgrading: 4,129,085 m^3
- Source of materials for subgrading: moved from other places

b. Rain-water draining

- Water drainage direction: In the direction of Rach Chanh in the North of Industrial zone
- Water draining system: To use box culvert or culvert with cap which are placed along the pavement of roads in order to collect rain-water from the road surface, pavements or building.

2. Traffic:

- Road No. 1 (cross section 1-1): building line is 30m in width, road surface is 8m×2 in width, separating strip is 4m in width, two-sided of pavement is 8m×2 in width.
- Road No. 9 (cross section 4-4): building line is 25m in width, road surface is 15 in width, two-sided of pavement is 5m×2 in width.
- Road No. 10, 11, 12, 13, 14 (cross section 2-2; 3-3): building line is 24m in width, road surface is 14 in width, two-sided of pavement is 5m×2 in width.
- Road No. 15, 16 (cross section 5-5): building line is 20m in width, road surface is 10 in width, two-sided of pavement is 5m×2 in width.

3. Water supply:

a. Water resource: To use provincial public water supply system which directly into planning area.

b. Water supply standard: 40m^3/hectares/day

c. Water demand: 7,594 m^3/day

Water demand for fire-fighting with flow of 20littles/s in 3 hours

d. Network:

- From water control station in industrial zone connected to primary conduits with φ 250 along the main roads and then directly into areas and buildings by branched conduits with φ 200, φ 150
- placed many fire-plugs along the roads with φ 100 in distance 150m/plug.
- Water supply pipelines are made by cast iron or galvanized iron or special PVC plastic pipeline.

4. Power supply:

a. Power: to plug in Ben Luc station with 100/22KV – 25 + 40 MVA crossing line 22 KV in currently then running along Long Dinh - Long Cang road

b. Criterion of power supply: 250 KW/hectare.

c. Power demand: 164,57292 million KW h/year

* Total need (including waste and provision): 168.07 million KW h/year
* Total capacity: (including waste and provision): 44,021,86 KW

d. Network:

- 22 KV line connected from Long Dinh - Long Cang road directly to power consumption buildings
- To place many step-down station with 22/0.4KV at fit position for supplying power to commercial service works, nodal technical places and street lightings

- Street lighting system: Street light is high pressure Sodium type 220V-250W with orange color; is laid on concrete pillars with 8.5m in high in distance of surface road with 8m. At any where there is a medium voltage line so that the street lighting line will be laid along. All street lighting system should be opened and closed automatically by cell or timetable switch.

* To prepare an area with 0.4 hectares in industrial zone in order to place privately a station 110/22KV for industrial zone in necessary.

5. Sewage water draining and environmental sanitation:

a. Sewage water draining:

- The sewage water draining system is separated from rain water draining system.
- Standard of water draining flow is calculated by 80% of water supply
- Total water draining flow is 6.075 m3/day
- The sewage water draining system

● To place many pipelines D400 in order to collect sewage from any buildings to run into main pipelines D600, D800 then it runs through sewage treatment plant and then it exhausts out by pipeline D800

- Sewage treatment: to build 01 sewage treatment plant with capacity 6,080 m^3/day. Sewage is treated with 2 levels:

+ The level I: The sewage is treated in the plant according to standards of Thuan Dao industrial zone regulated before exhausting into sewage drainage network
+ The level II: The sewage is treated centralized in the plant according to Viet Nam standards TCVN 5945 : 2005 which met A column before exhausting into receiving place – Rach Chanh

b. Waste treatment:

- To place a centralized garbage collection area with scale of 0.86 hectares near the sewage treatment plant in order to remove to gathered disposal area of province
- To place garbage trucks to collect in daily, not allow backlogging waste which impacted in surrounding environment.

6.) Communication

a. Design criteria:

- Area of manufactories: 12 subscriber stations/hectare.
- Area of service centre: 24 subscriber stations/hectare
- Technical building area: 10 subscriber stations/hectare

b. Design of object:

- To ensure the demands of communication such as fixed and mobile telephone subscription; internet in the area
- To ensure reliability of communication system
- To construct underground fiber cable link from local post office to central office of industrial zone.

c. ***Design of solution***

There are many cable lines which buried in depth from central office to be laid along two-sided pavement of roads in the industrial zone such as general cable line, branch cable lines, central boxes…. to any areas.

- When developing performing the project, investor should report detailed investment performing process and combined strictly with many sectors such as: Construction Sector, Transport Traffic Sector, Natural Resource and Environment Sector, Industry Sector, Electricity Sector, Post Sector, Water supply Sector, Urban Constructional Sector, Management of Board of Industrial Zones, People's committee of Can Duoc district and other relating appropriate authorities in order to ensure completing the process of technical instructional building that meets requirement and be comprehensive for invested project.

Article3. The Chief of the Provincial People's Committee Secretariat, Directors of Departments such as: Department of Construction, Department of Investment and Planning, Department of Natural Resource and Environment, Finance Service, Department of Technologic and Science, Department of Post and Telecom, Department of Industry, Department of Travel and Trade, Department of Transport and Traffic, Department of Agriculture and Rural Development, State Treasure of province, Provincial Management of Board of Industrial Zones, Chairman of People's committee of Can Duoc district, Director of Ben Luc industrial zone developed investement associated company, Director of urban planning architectural in rural and other relating appropriate authorities which are responsible for implementation of this Decision.

ON BEHALF OF PROVINCIAL PEOPLE'S COMMITTEE
Pp CHAIRMAN
VICE CHAIRMAN

Distributed to:
- TTVTU;
- Head of People's council, People's council (provincial);
- Provincial Chairman, vice chairman;
- As article 3;

NC, UB;
Saved: VISXD .

Nguyen Thanh Nguyen

PEOPLE'S COMMITTEE OF LONG AN
DEPARTMENT OF CONSTRUCTION

SOCIALIST REPUBLIC OF VIET NAM
Independence – Freedom – Happiness

No. : 355/SXD-KT

Tan An, March 11th , 2003

With regard to submit approval on adjusting
detailed planning for
Extended Thuan Dao Industrial Zone.

Respectfully addressed to: Long An Provincial People's Committee.

Department of Construction received a report on January 05th 2009 by Dong Tam Industrial Zone Joint stock Company for request on adjusting detailed planning for construction with 1/2,000 in map scale of the Extended Thuan Dao Industrial zone, in Long Dinh commune, Can Duoc district, Long An province (Provincial People's Committee approved at Decision No. 3266/QĐ-UBND dated on December 20th 2007).

Department of Construction had a document in writing No. 156 SXD-KT dated on February 10th 2009 to submit on Provincial People's Committee to approve on adjusting detailed planning for the Extended Thuan Dao Industrial zone, in Long Dinh commune, Can Duoc district.

Provincial People's Committee had a document in writing No.374/UBND-CN dated on February 17th 2009 agreed with Dong Tam Industrial Zone Joint stock Company on adjusting detailed planning for the Extended Thuan Dao Industrial zone. Nowadays Dong Tam Industrial Zone Joint stock Company submitted according to the regulation so Department of Construction respectfully submit to Provincial People's Committee to approve on adjusting detailed planning for construction with 1/2,000 in map scale of the Extended Thuan Dao Industrial zone, in Long Dinh commune, Can Duoc district, Long An province with the following contents:

- To change the directions of lines No. 10, 12 and 13; reduce the width of building line many lines and delete many sub-lines near Rach Chanh

+ To adjust the line No. 9 with building line 25m in width (road surface is 15m in width, two-sided of pavement is 2×5m in width) into road with building line 24m in width (road surface is 14m in width, two-sided of pavement is 2×5m in width)
+ To adjust the line No. 10 with building line 24m in width (road surface is 14m in width, two-sided of pavement is 2×5m in width) into road with building line 22m in width (road surface is 14m in width, two-sided of pavement is 2×4m in width)
+ To adjust the line No. 11, 13, 14 with building line 24m in width (road surface is 14m in width, two-sided of pavement is 2×5m in width) into road with building line 16m in width (road surface is 8m in width, two-sided of pavement is 2×4m in width)
+ To adjust the line No. 12 with building line 24m in width (road surface is 14m in width, two-sided of pavement is 2×5m in width) into road with building line 13m in width (road surface is 7m in width, one-sided of pavement is 2m in width, the other is 4m in width)
+ To adjust the line No. 15 with building line 20m in width (road surface is 10m in width, two-sided of pavement is 2×5m in width) into road with building line 13m in width (road surface is 7m in width, one-sided of pavement is 2m in width, the other is 4m in width)

- To increase service land area from 11.62 hectares to 18.58 hectares.
- To remove the positions of sewage treatment plant and disposal area near the line No. 9

Adjustment of land use planning as follows:

- **Land use planning approved follow the Decision No. 3266/QD-UBND Date 20/12/2007 of People's Commities Long An Province.**

Industrial land Land Commercial Service Center Land Tree planting Land transport Land engineering works focal	: : : :		
Total	**:**		

*** Land use planning for adjustment**

Land Treasure, plants Land administration services Land transport Land Tree planting Technical land areas	: : : :		

Respectfully submitted to People's Commities for consideration and decision

P.P Director

(Signed & Sealed)

PHAM NGOC DUNG

PEOPLE'S COMMITTEE **OF LONG AN PROVINCE** …… No. : 779/QĐ-UBND	**SOCIALIST REPUBLIC OF VIETNAM** **Independence – Freedom – Happiness** …….. *Tan An, on March 30th, 2009*

DECISION
On adjusting the planning details with map ratio of 1/2,000 of the Extended Thuan Dao Industrial Zone Long Dinh commune, Can Duoc district, Long An province.

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PEOPLE'S COMMITTEE OF LONG AN PROVINCE

Based on the Law of organizing People's Council and People's Committee dated on November 26th, 2003;

Based on the Law of construction dated on November 26th, 2003;

Based on the Decree No. 08/2005/NĐ-CP dated on January 24th, 2005 of the government on construction planning;

Based on the Circular No. 19/2008/TT-BXD dated on November 20th, 2008 of the Ministry of Construction on guidance of making, assessing, adopting and managing the construction planning of the industrial and economic areas;

With regard to the Document on January 5th, 2009 of the Dong Tam the Industrial zone Joint-Stock Company; and the Document No. 355/SXD-KT dated on March 11th, 2009 of Long An's Department of Construction, on adjusting detailed planning for construction with 1/2,000 in map scale of the Extended Thuan Dao Industrial zone, Long Dinh commune, Can Duoc district, Long An province.

DECIDE:

Article 1: Adopt and adjust some contents in detailed planning scheme for construction with 1/2,000 in map scale of the Extended Thuan Dao Industrial zone,, Long Dinh commune, Can Duoc district, Long An province, with the following provisions:

- Change the direction of roads no. 10, 12 and 13; reduce the width of building line of some roads and abort the branch roads near the Chanh channel.

+ Adjust the road no. 9 with building line of 25m (width of the road surface is 15m, dimension of the sidewalk is 2x5m) into the road with building line of 24m (width of the road surface is 14m; dimension of the sidewalk is 2x5m).

+ Adjust the road no. 10 with building line of 24m (width of the road surface is 14m, dimension of the sidewalk is 2x5m) into the road with building line of 22m (width of the road surface is 14m; dimension of the sidewalk is 2x4m).

+ Adjust the road no. 11, 13, 14 with building line of 24m (width of the road surface is 14m, dimension of the sidewalk is 2x5m) into the road with building line of 16m (width of the road surface is 8m; dimension of the sidewalk is 2x4m).

+ Adjust the road no. 12 with building line of 24m (width of the road surface is 14m, dimension of the sidewalk is 2x5m) into the road with building line of 13m (width of the road surface is 7m; dimension of the sidewalk is 2x4m).

+ Adjust the road no. 15 with building line of 20m (width of the road surface is 10m, dimension of the sidewalk is 2x5m) into the road with building line of 13m (width of the road surface is 7m; dimension of the sidewalk is 2x4m).

- Increase the area of lands for service from 11.62ha to 18.58ha.
- Move the sewage disposal station and the landfill next to the road no. 9.

After having adjusted, the Extended Thuan Dao Industrial zone,, Long Dinh commune, Can Duoc district, Long An province has the structure of land-use as follows:

+ Lands for plants, depots	:	130.25ha	(68.61%).
+ Lands for administration, services	:	18.58ha	(9.79%).
+ Lands for traffic	:	19.633ha	(10.34%).
+ Lands for green trees	:	19.04ha	(10.03%).
+ Lands for technical areas	:	2.34ha	(1.23%).
In total	**:**	**189.843ha**	**(100%).**

Article 2. Dong Tam Industrial zone Joint-Stock Company and other related units obey these following regulations:

- Dimension and official planning boundary will be defined according to the Land allocation decision of provincial people's committee after receiving the handover document of boundary stone of Department of natural resources and environment.
- When making up the detailed planning scheme with map ratio of 1/500, base design, and construction drawing; the investor has to cooperate with consulting units to adjust the infrastructure system adequately.
- Organize to make the scheme public so as to let surrounding people know.
- Organize to manage and carry out the land allocation (based on authority).
- Build the works as planned.

Article 3. Chairman of the Province's office of Provincial People's Committee, Directors of the Departments of Construction, Planning and Investment, Natural resources and Environment, Transportation, Finance, Science and Technology, Commerce and Industry, Agriculture and Rural Development, leaders of Managing Board of industrial zones, Provincial State Treasury, Chairman of provincial People's Committee of Can Duoc, Director of the Dong Tam Industrial zone Joint-Stock Company, Director of the architecture center of urban & rural planning, and related units are responsible for implementation of this decision.

- This decision is an inseparable part of Decision No. 3266/QĐ-UB dated on December 20th, 2007 issued by People's Committee of Long An province.
- Abolish the contents of Decision No. 3266/QĐ-UB dated on December 20th, 2007 issued by People's Committee of Long An province which are contrary to this Decision.

Distributed to: - People's Council - Chairman, Vice-chairman of Provincial People's Committee - As article 3 - Office of general research - Archived: office	**ON BEHALF OF PROVINCIAL PEOPLE'S COMMITTEE** **CHAIRMAN** **Duong Quoc Xuan**

PEOPLE'S COMMITTEE **OF LONG DINH COMMUNE** …… No. : 99/CV-2008	**SOCIALIST REPUBLIC OF VIETNAM** **Independence – Freedom – Happiness** …….. *Can Duoc, on November 10th, 2008*

"On community consultation for investment project of
the Extended Thuan Dao Industrial zone"

To: **Dong Tam industrial zone Joint-Stock Company**

- Based on The environmental protection act on November 29th, 2005;

- Based on the Decree no. 80/2006/ND-CP on August 9th, 2006 of the Government, on detailed regulations and guidance of implementing some provisions of The environmental protection act;

- Based on the Circular no. 08/2006/TT-BTNMT on September 8th, 2006 of the Ministry of natural resources and environment, on guidance of evaluating the effects on environment and strategic environment, and commitment to environmental protection.

- According to the Document no. 33/2008 on October 28th, 2008 of Dong Tam industrial zone Joint-Stock Company, on consultation of evaluation reports on environmental effects of the investment project of the Extended Thuan Dao Industrial zone at Long Dinh commune, Can Duoc district, Long An province with these following opinions:

FOR THE ENVIRONMENT:

- In the process of capital construction:

- Before the ground leveling work, construction units should make contracts with engineering units those who demine for the overall project so as to keep the process of operation in safe.

- Because the construction works is next to the village road 16 and the road of Hamlet 4 with the high population density, it is necessary to carefully count and design the water outlet system, the building foundation bed (written in the report) will be higher than the ground level of populated area, though lower than the road Long Dinh – Long Can.

- In case the land clearing work done by motorized transport, the investor needs to require the construction units to commit about transport velocity without dropping for the purposes of absolute safety of people's properties and lives.

- In the process of operation:

- Because the population density of surrounding areas is high, the investor should not locate highly polluted industries such as the aluminum, accumulator production, etc.

- Because of a large project, the building of sewage disposal plant needs to apply the most modern equipments and technologies.

- For the industries easy making odors, it is necessary to treat thoroughly so as not to spread over surrounding areas.

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OTHER OPINIONS:

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IN CONCLUSION:

Through the brief description of environmental impact assessment report of the investment project of Extended Thuan Dao Industrial zone, we affirm that this repot is feasible and require the investor to follow the disposal processing and the commitments to environmental protection during the time to carry out the project./.

PP CHAIRMAN
VICE CHAIRMAN

Le Ngoc Danh

FARTHERLAND FRONT COMMITTEE OF LONG DINH COMMUNE …… No. : 19/CV.MTTQ	**SOCIALIST REPUBLIC OF VIETNAM** **Independence – Freedom – Happiness** …….. *Long Dinh, on November 4th, 2008*

"On community consultation for investment project of the Extended Thuan Dao Industrial zone"

To: **Dong Tam industrial zone Joint-Stock Company**

- Based on The environmental protection act on November 29th, 2005;

- Based on the Decree no. 80/2006/ND-CP on August 9th, 2006 of the Government, on detailed regulations and guidance of implementing some provisions of The environmental protection act;

- Based on the Circular no. 08/2006/TT-BTNMT on September 8th, 2006 of the Ministry of natural resources and environment, on guidance of evaluating the effects on environment and strategic environment, and commitment to environmental protection.

- According to the Document no. 33/2008 on October 28th, 2008 of Dong Tam the Industrial zone Joint-Stock Company, on consultation of evaluation reports on environmental effects of the investment project of the Extended Thuan Dao Industrial zone at Long Dinh commune, Can Duoc district, Long An province, the fatherland front committee of Long Dinh commune gives some opinions as follows:

FOR THE ENVIRONMENT:

*** In the process of capital construction:**

- It's necessary to solve satisfactorily the compensation, removal and resettlement for residents to stabilize their psychologies. This, thus, is the base to speed up the project progress.

- The process of collection and treatment of the plant biomass, graves needs to be done rapidly, tidily and timely to avoid nasty smells.

- What materials are used in the ground leveling? How do they affect the environment? It's necessary to evaluate them carefully. Because of the process of transportation, these materials will diffuse into the air and cause considerable amounts of dusts, sands. These amounts of dusts can be caused by vehicles or haulers. The company had solutions to traffic restriction and used standard trucks. However; it is necessary to know that heavy transport vehicles cause not only smokes,

dusts which affect the environment, but also the roads seriously damaged (the projects in the Industrial zone Long Dinh are obvious examples). Therefore; in order to solve these above problems, beside the capital construction of the industrial zone, the roads to the industrial area should also be improved.

Combining with flooding restrictions caused by land clearing work, the company should install the water outlet systems. As the results, when the company puts into operation, the industrial zone will avoid flooding state, which affects the environment and makes conditions for pathogens to develop (lessons drawn from constructions of the Industrial zone Hamlet 4, Long Dinh).

- Construction works attracts large amounts of workers. This will lead to wastages: nylons, garbage…which affects the landscapes of environment. In the other hand, the construction works closes to the river Vam Co, the winds will sweep these wastages to the river beds; this pollutes the rivers and damages the landscapes. The company should give the best solutions for the wastes thrown by workers.

- A considerable issue now laid by the companies in the commune is the accidents at work, which often happen by subjective or objective factors. Therefore; when the works is begun, the company should give effective methods for workers to recognize the importance of labor safety; and protection and prevention of fire and explosion.

- The company is highly appreciated its paying attentions to solve the noise state affecting the people around.

In the process of operation:

- Ensure the labor safety, the protection and prevention of fire and explosion when the company uses DO oils and gas fuels. Cooperate usually with functional departments of the province to train the prevention of fire and explosion at the bases.

- The company must be equipped with the drain-water collection and disposal system. Through the methods to minimize environmental pollution, the company should have both the waste collection and disposal system, and the collection and disposal system of storm-water. If using a shared system, drain-water and storm-water flow together in a pipe with a long time, this will cause environment polluted.

- Exhaust emission is the deep concern, is one of the green house effects. What the company has done in the summary table will increase the amounts of exhaust emissions, dusts and solvents. The company will minimize the emissions and dusts into the environment, intensify the process of sewage disposal before emitting them into the air. Because the Food and Plastic processing company often pollutes the air with nasty smell and

poisonous gas, it is necessary to have the treatment system to minimize these amounts of exhaust emissions. Because of such a long period, the atmosphere and ozone layer will be relatively affected. Besides, planting many trees around the plant is an effective and long-term solution.

- Through technology map, the emissions are mud-pressed, and buried later. If they aren't carefully buried, the atmosphere will be affected for a long time. Therefore, the company needs to clearly state the places to burry; otherwise, the environment will be polluted.

- During the time to construct and operate the machine system as well as to preserve the waste disposal systems, it is necessary to have the observation of environmental authorities.

*** In conclusion:**

Fatherland Front Committee of Long Dinh commune highly approves the spirit of the company's management board which pays attention to environmental protection during the time from capital construction to operation. Being a group of people, the Fatherland Front Committee recognizes that the environment is now a commonly concerned problem of the residents; it has been seriously affected by the emissions from the companies. Therefore, when the company puts into operation, although in the short term it provides employments for local labors and the outside, in the long term the company must minimize its effect to the environment. As the results, the company will develop more and more rapidly.

Some opinions share with the company.

Warmly welcome!

ON BEHALF OF FATHERLAND FRONT COMMITTEE
CHAIRMAN

Nguyen Van Minh


JICA