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APPENDIX-I

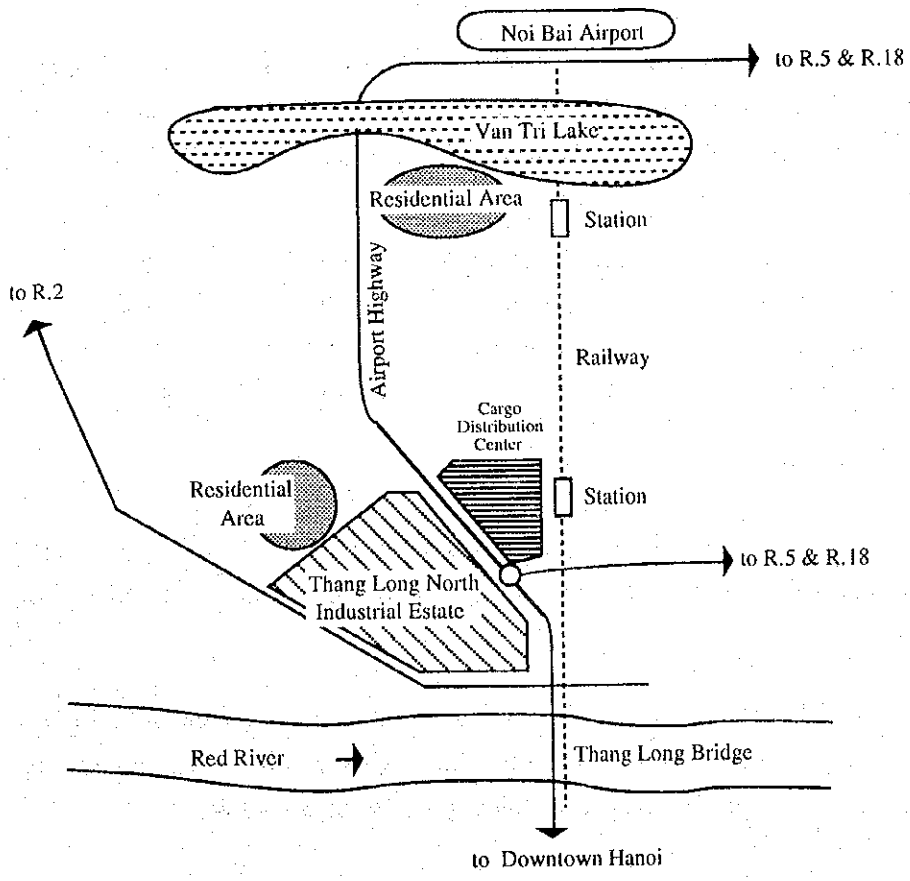
PRE-INVESTMENT STUDY ON DEVELOPMENT OF SELECTED INDUSTRIAL ESTATES

I.1 Thang Long North Industrial Estates

1) Land Use

Distribution of three functions

The three functions involved, i.e. industrial estate, cargo distribution center, and residential area, are planned to be properly distributed to attain the ultimate efficiency of each function. The industrial estate and cargo distribution center are planned to be located in the north edge of Thang Long bridge and the residential area is planned to be near Van Tri lake and in the vicinity of the estate. The distribution of these three functions is illustrated below.



Land use in the industrial estate

To design the land use of Thang Long North IE, a lot size distribution has been analyzed from the results of the demand survey, and proposed as summarized below. The details of lot distribution by industrial category are presented in Table I.01. 10-ha lots will occupy the largest area of 80 ha, followed by 2-ha and 5-ha lots with a total area of 40 ha each. 1-ha lots, 0.5-ha-lots and the smallest lots of less than 0.2-ha are also planned.

	0.2~0.5	0.5~1	1~2	2~5	5~10	10~	Total
Area (ha)	7	10	20	40	40	80	197
Number of Lot	14~35	10~20	10~20	8~20	4~8	4~8	50~111

(average: 80)

Land use in the Thang Long North IE is illustrated in Figure I.1 and the area distribution of each land category is planned as shown in Table I.02. The factory lot area is planned to be 197 ha, which is equivalent to 70% of the total industrial estate area. The cargo distribution center and residential area will have 50 ha each.

The number of employees of the industrial estate is estimated at approximately 40,000 and water demand and electricity demand for the factory and cargo distribution center operation is calculated to be 33,000 m^3 per day and 59 MW, respectively.

	Unit Requirement	Area (ha)	Amount
No. of employees	200 person/ha	197	40,000
Water demand	150 m^3/ha/day	197	33,000 m^3/day
Electric demand	300 kW/ha	197	59 MW

2) Land Grading

The Thing Long North site is flat land currently used as paddy fields. The site should be filled to improve the bearing capacity of the ground and facilitate stormwater drainage.

The filling materials will be obtained from the bed of the Red River or other borrow pits in the vicinity. A 10% of the total volume is assumed for ground subsidence, based on data on geotechnical tests as shown below.

Subsidence: Thickness of Clay x Compressing Coefficient x Height x Specific Gravity

20 (m) x (0.01 ~ 0.04 (cm2/kg)) x 2.0 (m) x 1.9 (t/m3)

=10 ~ 30 (cm)

Judging from the site reconnaissance and geotechnical tests, an average thickness of 2 meters is required of land filling. The fill volume will be approximately 7.2 million m^3 not including the retention ponds and the buffer green area (12.2 ha) in the surroundings of the development site. The excavated soils from the planned retention ponds, will be utilized for filling (excavation volume: 62,000 m^2 x 1.3 m = 81,000 m^3).

The fill volume for the Thang Long North site has been assumed as follows.

Industrial estate (245 ha) :	4,900,000m^3
Cargo distribution center (50 ha):	1,000,000m^3
External facility area (17.31 ha):	346,000m^3
Residential area (50 ha) :	1,000,000m^3
Total fill volume	7,246,000m^3

According to the result of core borings conducted by the Study Team at 2 points in the Thang Long North IE site, the soil at a few meters depth from the ground surface is weak with N value of less than 10. This will require continuous footing or piling for heavy buildings and structures. Soil strength by depth as identified by N value through core borings is summarized below (refer also to Figure I.2 and I.3):

N Value	Depth (m)	
	Boring A	Boring B
more than 10	3.7	0.5
more than 20	16.0	18.0
more than 40	30.0	32.0

The grading design has been prepared on the following conditions:

* The land to be filled has a gradient of more than 0.5%.
* The surface water runoff from the area should be disposed of without causing erosion or sedimentation.
* The existing topsoil is stockpiled to reuse for the establishment of ground cover or planting.

* Wavy profiles should be avoided in roads and walkways and steps in walkways.

* Earth banks that require costly erosion control measures should be avoided as possible, except for areas needed in place of costly retaining walls.

A schematic cross-section of the proposed land grading is illustrated in Figure I.4.

3) Road Network

Traffic entrance to the Thang Long North site will be located at 1 km to the north of the Thang Long Bridge on the freeway to Noi Bai International Airport. The road system in the industrial estate will consist of a circular main road connected to a loop of sub-main and collector roads, as shown in Figure I.5. Street lighting systems are recommended for the main and sub-main roads for traffic safety. It is also proposed to construct a cargo distribution center and cargo railway station as an inland freight depot, located in the area between the freeway and railway.

It is planned that the Thang Long North site will have the following road network:

Industrial Estate

- Main road (w=32.5m)----------Total 3.8 km
- Sub-main road (w=28m) ----------Total 2.5 km
- Collector road (w=21m)----------Total 1.6 km
- Traffic signal----------Total 1 set

Regional Development

- 28m wide road ----------Total 2.0 km
- 21m wide road ----------Total 4.15 km
- Traffic signal----------Total 1 set

The road geometry standard is recommended in "The Master Plan Study on Transport Development in The Northern Part of The Socialist Republic of Vietnam", studied by JICA, June 1994. The 4 kinds of typical cross-sections to be employed for construction or improvement of the national and regional roads related to the estate are shown in Figure I.6.

4) Water Supply Facilities

(1) General

Water supply facilities, as shown in Figure I.7, are to provide water for industrial, domestic, and fire fighting uses in the industrial estate, as well as for the cargo distribution center and the residential area. The system will consist of raw water intake wells, conveyance pipes, purification facilities, reservoir facilities, and distribution pipes with fire hydrants.

The outline of specifications and schematic system flow for water supply facilities in the Thang Long North IE and cargo distribution center are shown in Table I.03 and in Figure I.8, respectively.

(2) Basic conditions

The groundwater in this region contains relatively high levels of total iron (T-Fe) and total manganese (T-Mn), as shown in Table I.04. Water is supplied to factories after the purification process which will reduce T-Fe to 0.3 mg/l, and T-Mn to 0.2 mg/l, in conformity with the drinking water standards in Viet Nam, as shown Table in I.05. In case factories need high grade quality water, they are requested to construct their own special facilities for improving the water supply system.

On the basis of the unit water demand of 150 m^3/ha/day, the maximum capacity of the facilities is planned to be 33,000m^3/day or 4,300 m^3/hr, including a 10% leakage. The residual pressure of supplied water will be maintained higher than 1.5 kg/cm^2 at each use point.

(3) Outline of water supply facilities

Raw water intake facilities

Raw water is pumped up from underground and transferred to the purification facilities which consist of the following main equipment:

- Intake wells : 350 mm dia x 80 m depth x 12 wells(including 2 backup) with 30kW pumps to be installed along the estate roads.
- Conveyance pipes : 300 to 600 mm dia of ductile cast iron with a total of 2,350 m to be embedded along the estate roads.

Purification facilities

The following equipment is required for the 2-step sand filtration system:

- Aeration tanks : 12 m width x 27 m length x 10 m height x 2 units
- No.1 sand filters: 6.2 m width x 4.5 m length x 7.0 m depth x 6 x 2 units
- No.2 sand filters: 6.2 m width x 5.6 m length x 6.0 m depth x 4 x 2 units
- Chlorination equipment : chlorine gas injection type

Sludge to be discharged from the purification facilities is planned to be treated in the sewage treatment facilities after collection from the sewer pipe.

Reservoir facilities

The following reservoir facilities will be constructed to provide water for 10 hours a day:

- Reservoirs : 9,300m^3 x 2 units
- Distribution pumps : 9.0m^3/min x 30mH x 75kW x 10 units including 2 backup units

Distribution pipes

The estate and the cargo distribution center will have a water distribution system consisting of ductile cast iron pipes embedded underground with about 7m earth covering, necessary appurtenances including sluice valves, air vent valves, draw-off valves, water meters, and fire hydrants. Specifications for distribution pipes are:

- For the industrial estate : 100 to 1,000mm dia x 14,500m length
- For the cargo distribution center : 150mm dia x 1,900m length

The laterals and internal pipes for each factory lot are assumed to be constructed by each enterprise.

5) Sewerage

(1) General

The sewage system, as shown in Figure I.9, will be constructed to collect and treat sewage and discharge from the industrial estate, the cargo distribution center and the residential area. Treated sewage will be discharged into the Red River by pump. The sewerage system will consist of sewer pipes, a pump station, and sewer treatment facilities.

The outline of specifications and schematic flow of sewerage system in the Thang Long North IE and cargo distribution center are shown in Table I.03 and Figure I.10, respectively.

(2) Basic conditions

On the basis of the unit water demand of 150 m^3/ha/day, the maximum capacity of sewerage is planned to be 33,000 m^3/day or 4,300 m^3/hr, including infiltration of 10 % .

The levels of BOD and suspended solids are assumed to be both 200 mg/l before treatment and lower than 40 mg/l and 80 mg/l, respectively, after treatment. These post-treatment levels meet the effluent standards class-2 in Viet Nam, as shown in Table I.06. Sludge is planned to be transferred to a final disposal site in the community after drying naturally in the treatment facilities.

In the event that sewage contains toxic substances or extremely high concentrations of organic matters, the factories will be obligated to construct their own pre-treatment equipment to maintain the designed performance of the centralized sewage treatment facilities.

(3) Outline of sewerage

Sewer pipes

The following concrete sewer pipes with necessary appurtenances such as manholes, will be laid embedded with less than 7m earth covering in the industrial estate and the cargo distribution center:

- For the industrial estate : 200 to 1,300mm dia x 11,100m length
- For the cargo distribution center : 200mm dia x 1,700m length

The laterals and internal pipes for each factory lot are assumed to be constructed by each enterprise.

Relay pump station

While sewage will be collected by gravity as a rule, a pump station will be constructed in the estate, in case the earth covering of sewer pipe is over 7m.

- Pump station: 20 m^3/min capacity x 1 unit with a grit chamber and a screen

Sewer treatment facilities

The following equipment will remove pollutants in sewage by biological degradation:

- Grid chambers : 1.8m width x 12m length x 3.0m depth x four(4) units with influent pumps
- Oxidation ditches : 37m width x 78m length x 3.5m depth x four(4) units with aeration rotors
- Settling basins : 33m dia x 3.0m d x four(4) units
- Sludge thickener : 12m dia x 4.5m depth x one(1) unit
- Sludge drying beds : 66m width x 100m length x 1.0m height x one(1) unit
- Disinfection basins : 10m width x 10m length x 3.5m depth x one(1) unit
- Effluent discharge equipment : effluent pumps with overhead pipes

6) Stormwater Drainage

(1) General

The stormwater drainage system, as shown in Figure I.11, will be constructed to discharge rain water and control floods in the industrial estate and the cargo distribution center. The facilities will consist of drain ditches and retention ponds.

The outline of specifications for storm water drainage in the Thang Long North IE is indicated in Table I.03.

(2) Basic conditions

Stormwater will be drained into the existing drainage canal running across the estate. Retention ponds will be provided to prevent harmful environmental influences of the development of the industrial estate on the surrounding water bodies.

The drainage system is designed on the basis of the peak flow discharge calculated in accordance with the following rainfall intensity formula established by MOC.

$$I = 0.36 \times 5426 \times (1 + 0.25 \times \log P \times t^{0.13}) \times 1 / (t + 19)^{0.82}$$

Where, I: rainfall intensity (mm/h)
P: return period (year)
t: time of flood concentration (min)

In calculating the peak discharge, rainfall with return periods of 5 yeras and 10 years are adopted for open ditches and retention ponds respectively. Runoff coefficients of 0.6 and 0.8 are applied for pre-development and post-development periods, respectively.

(3) Outline of stormwater drainage facilities

Drain ditches

The following concrete open drain ditches with necessary appurtenances will be constructed in the industrial estate and the cargo distribution center:

- For the industrial estate: U-shape 0.6 to 1.6m Width x 29,900m Length
- For the cargo distribution center: U-shape 0.8 to 1.2m Width x 3,500 m Length

Pipes and ditches in each factory lot are assumed to be constructed by each developer.

Retention ponds

The following retention ponds with orifice devices and spillways are to be constructed in the industrial estate:

- No.1 retention pond : 112,000m^3
- No.2 retention pond : 28,000m^3
- No.3 retention pond : 33,600m^3

7) Electric Facilities

Power demand

The power demand for the Thang Long North IE is estimated at 72 MW, as summarized below. Detailed demand projection by category is shown in Table I.07.

	Electric demand (MW)
1. Factory	59
2. Cargo Distribution Center	5
3. Residential area	5
4. Others	3
Total	72
Required Installed Capacity	90MVA

(Assuming a power factor of 0.8)

Power supply system

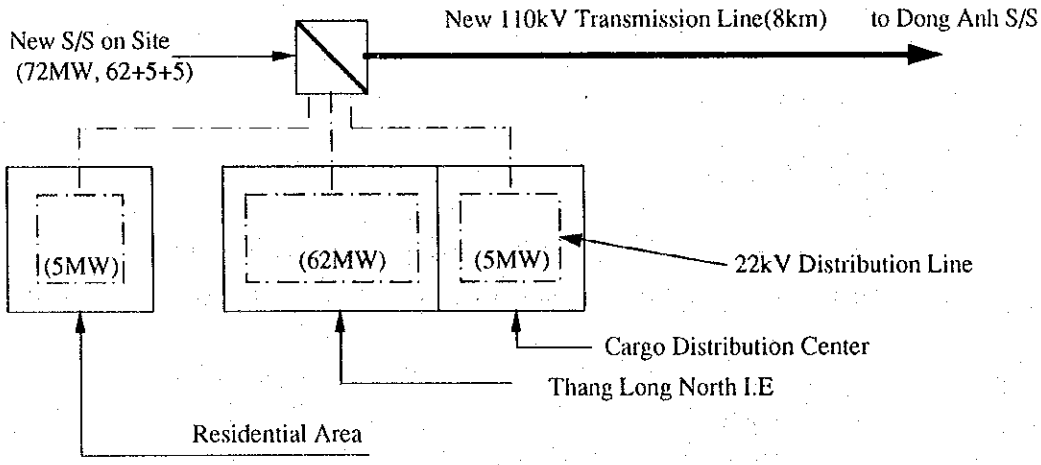
A double-circuit 110kV transmission line (AC185mm^2) from the existing 110kV Dong Anh substation is running across the estate. However, the available capacity of this line will not be sufficient to supply power to the industrial estate. The

Institute of Energy under the Ministry of Energy has planned to upgrade the existing 110kV Dong Anh substation into a 220/110kV intermediate substation with a capacity of 500MVA, in order to set up a 110kV transmission network in Hanoi City. It is, therefore, recommended that a new 110kV transmission line with similar capacity be installed to connect the Dong Anh substation and the estate site.

A new 110/22kV substation will also be required not only for the industrial estate but also for the cargo distribution center and residential area.

At the initial development stage of the estate, a double circuit 110kV transmission line of AC185mm^2 and a substation with a capacity of 32MW will be constructed first. Thereafter, the capacity of the substation will be expanded from 32MW to 72MW at the full development stage.

The schematic plan of the electric supply system for the Thang Long North IE is illustrated below.



22kV switching stations and distribution lines are planned to be constructed to distribute power in the site. Switching stations will be located in the electric load center in order to minimize the length of the distribution line and power loss. The overhead line distribution system along the roads will be adopted because of cost performance, maintenance, and easiness of tapping to consumers.

The proposed distribution system for the Thang Long North IE is shown in Figure I.12.

Proposed implemention for the external facilities

There are two alternative policies for implementation of the new 110kV transmission line and the new substation. They are:

(a) Alternative-A

The external facilities will be constructed by Electricity of Viet Nam (EVN), with a credit extended by the industrial estate developer. EVN will be responsible for operation, maintenance and management of their facilities, as well as collection of power tariff from each user in the industrial estate.

(b) Alternative-B

The external facilities will be constructed by the industrial estate developer at its own cost. The developer will be responsible for the management including operation and maintenance of the estate's facilities. Electric power will be sold to Power Company No. 1, who will in turn be responsible for tariff collection.

The Alternative-A is recommendable, in view of the facts that (i) EVN is responsible for construction and operation of electric facilities of 110kV up and stable power supply, and (ii) the industrial estate developer is not specialized in operation and maintenance of power facilities.

8) Telecommunication Facilities

Telephone Demand

Telephone demand for the Thang Long North IE is estimated at 5,300 subscriber lines as summarized below. Details of the demand by category of industries are shown in Table I.08.

	Subscriber (lines)
1. Factory	788
2. Cargo Distribution Center	50
3. Residential Area	4,500
4. Others	14
Total	5,352 ≈ 5,300

Telecommunications system

The Thang Long North IE will be connected to the existing Dong Anh exchange station which has 637 lines, of which 622 lines are in use. In order to meet the

telephone demand, the capacity of the Dong Anh exchange station should be expanded and improved. A new remote OLTE station is proposed for the industrial estate. The OLTE station will be connected with the Dong Anh exchange station by optical fiber cable. For securing environmental harmony, an underground distribution system is recommended for the industrial estate. The distribution plan of telecommunications facilities is shown in Figure I.13.

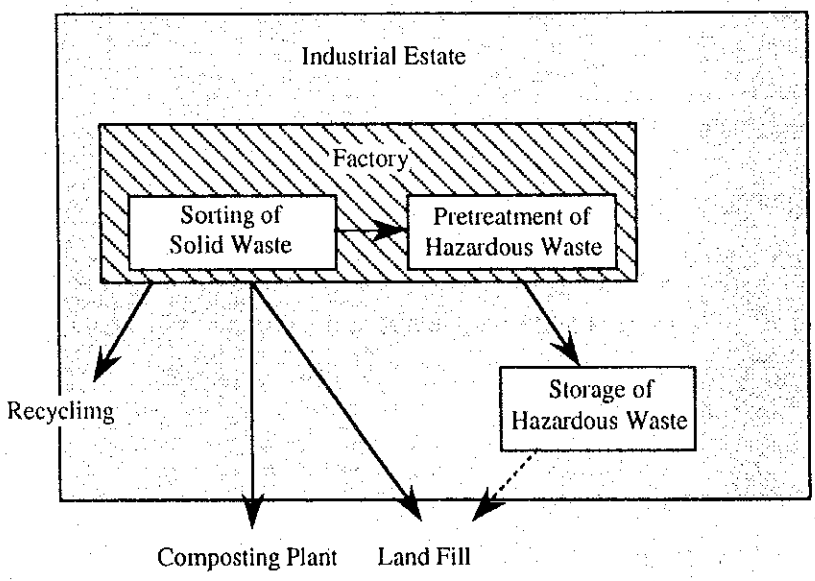
It is proposed by HPT that the design and construction/expansion work for the related telecommunications facilities will be done by HPT at its own cost.

9) Solid Waste Disposal Facilities

(1) Solid waste disposal in industrial estates

In Vietnam, it is common to sort and recycle all possible solid waste, and this practice should continue in the new industrial estates. Recycling is recommended not only for environmental reasons, but because of the lack of suitable landfills in Hanoi. The volume of solid waste should be kept to a minimum.

The general idea of solid waste disposal flow in industrial estate is illustrated below:



Sorting of all solid wastes and pretreatment of hazardous wastes should be done in factories, according to the Law on Environmental Protection. To facilitate this work and to keep the environment clean and the workplace safe, it is important not to mix the different kinds of solid waste, but to sort and store the waste properly. There should be different places for recyclable waste: for waste which can be composted, for waste which has to be transported to landfill, and for hazardous waste.

Inside the industrial estate, each factory will sort their waste and sign a contract with the Urban Environmental Company (URENCO) to collect the unrecyclable solid waste. URENCO will transport solid waste to a landfill (inorganic waste) or to a composting area (organic waste). Currently URENCO only operates in four districts in the city area, but there are proposals to enlarge the operation area to the industrial areas in the suburban districts, enabling factories located outside the city area to have separate contracts with URENCO.

Because there is a lack of hazardous waste treatment systems in Hanoi, provisions should be made for proper and adequate storage inside the industrial estate. If necessary, there can also be incinerators for burnable solid waste. Transportation to possible landfill areas can only be arranged after acceptable facilities to handle and treat hazardous solid waste have been arranged.

(2) Temporary toxic solid waste deposit

Solid waste is defined by two categories; municipal industrial solid wastes (non toxic), and toxic and hazardous wastes.

URENCO will undertake the disposal of non toxic waste in the Thang Long North IE. The disposal of toxic and hazardous solid waste, however, shall be treated by each factory owner and private manufacturing factory due to the lack of treatment systems for hazardous waste in Hanoi.

At present, the lack of facilities for centralized treatment, storage, and disposal of toxic and hazardous wastes forces the industrial estates to consider self-treatment of toxic disposal. A temporary toxic solid waste deposit is recommended for the purpose of environmental protection, as follows :

(1) Period of storage : 20 years

(2) Yield of toxic/hazardous solid waste

	Area (ha) 1/	Yield of Toxic/Hazardous Solid Waste (ton/d) 2/
Total	197	197 x 0.5 x 0.04 = 3.9

Remarks: 1/ Half of factory lot area is assumed to yield toxic waste.
2/ Unit yield rate is assumed to be 40 kg/ha/day based on the information of Ministry of Public Welfare of Japan.

Total volume of toxic/hazardous solid waste is:

39,000 m^3 for 20 years (=3.9x300days x20years / 0.6(specific gravity)).

(3) Necessary area (depth of waste deposit is assumed as 1.2 m): 35,000 m^2

10) Other Facilities

(1) Industrial estate center

An industrial estate center with an operation and maintenance office, industrial laboratory/industrial training center, business center, etc. will be a core of the new industrial estate. Necessary facilities for the industrial estate center are proposed below:

	Floor (m^2)	Site (m^2)
1. Administrative O/M office (inclusive of a one-stop service center)	100	
2. Industrial laboratory/industrial training center	1,000	
3. Fire station	50	4,000
4. Business center (bank, courier serv., telecom. office, etc.)	200	
5. Governmental office (custom, local govt., police, etc.)	50	
6. Amenities (restaurant, clinic, kiosk, nursery, etc)	100	
7. Sports facilities (ball courts, etc.)	-	2,000
8. Others (car parking, etc.)	-	2,000
Total	1,500	8,000

(2) Park

A park with an area of 9 ha (3.2% of total area) is designed to be constructed in the estate in order to upgrade the aesthetic value of the industrial estate and to provide amenities for employees and workers. Facilities to be installed in the park are presented below:

- Athletic facility : multi purpose field, ball court, etc.
- Common space :
  - open field
  - vegetation area
  - promenade, etc.
  - playlot

(3) Cargo distribution center

The proposed cargo distribution center, which will function as an inland freight depot, will be located beside the Thang Long North IE in-between the freeway and railway. This site has advantages for establishment of freight network system to serve the northern area of Hanoi city, and also has easy access to Noi Bai International Airport.

The following points are taken into account in the planning and design of the cargo distribution center:

(a) In studying the cargo distribution center, the transportation network has been examined on national and regional levels, as well as in the framework of overall network development in the Hanoi area.

(b) Due consideration should be given to the rehabilitation of the railway network system to assist the road network.

(c) Volume and type of freight should be carefully projected to gauge the capacity and function of the center and to correlate with other distribution centers in Hanoi city.

(d) The cargo distribution center will have the following basic facilities;

- Transport control center
- Loading and unloading facilities
- Warehouse
- Packing industry
- Container yard
- Petrol station
- Parking, etc.

The conceptual model plan for the cargo distribution center in the Thang Long North IE is illustrated in Figure I.14.

(4) Residential area

A new residential area for workers of the Thang Long North IE is planned to be located in the vicinity of the estate and near Van Tri lake, or about 2 km north of the project site along the highway. A residential complex for foreigners with an international school and recreational facilities is proposed to be constructed by a foreign investor in the Van Tri lakeside area.

The residential area is planned and designed to primarily attract factory workers of the Thang Long North IE. Due to a shortage of housing in and around Hanoi City, the new residential area will provide attractive housing to the workers.

In order to provide reasonable quality of housing and amenities for residents, the following plans are considered for the project:

1) Various types of dwellings are arranged and provided for low to medium class householders, and workers.

2) Recreational facilities such as play grounds and parks are provided to enhance the quality of the neighborhood environment and promote social and recreational opportunities.

3) Sufficient open spaces along the edge of the residential area are provided to act as visual and physical buffers to vehicular traffic.

4) Street and pedestrian walkways are functionally designed in accordance with the standard street classification and offer possibilities for improving the neighborhood appearance and aesthetic value.

The residential area is planned to be 50 hectares. The planned population will be around 10,000 with 2,000 households, based on the assumption of a population density of 200 persons per ha.

I.2 Gia Lam Industrial Estate

1) Land Use

The area distribution by lot size in the Gia Lam IE is summarized below. Approximately 140 lots (factories) are planned to be established in the estate and the average lot size will be 2 ha per factory.

	0.2~0.5	0.5~1	1~2	2~5	5~10	10~	Total
Area (ha)	15	15	30	60	60	100	280
Number of Lot	30~75	15~30	15~30	12~30	6~12	10	88~187 (mean:140)

Land use in the Gia Lam IE is illustrated in Figures I.15 and I.16, and the planned area distribution for each land use is shown in Tables I.09 and I.10. 302 ha or 277 ha are allocated for factory lots. In the case of the second land use plan in Figure I.16, more retention ponds are planned in order to cope with floods in the industrial estate as well as in Gia Lam community. The second land use plan is recommendable in view of floods control efficiency and practicality.

The number of employees of the industrial estate is estimated to be approximately 55,000, and water and electricity demand for the factory and cargo distribution center operation is calculated to be 46,000 m^3 and 134 MW per day, respectively.

	Unit requirement	Area (ha)	Amount
No. of employees	200 person/ha	277	55,000
Water demand	150 m^3/ha/day	277	46,000 m^3/day
Electric demand	–	277	134 MW

2) Land Grading

The land is flat and basically cultivated with paddy. It should be filled up to the level of the existing road (about 1.5 m above ground level) to drain stormwater and to improve the soil bearing capacity. Land filling and grading are designed with a land gradient of more than 0.5%.

Filling is designed to make maximum use of the excavated soil from the retention ponds and the new drainage canal within/nearby the site. Most filling materials could be obtained from the Red River or other borrow pits in the vicinity.

The fill volume for Gia Lam site is estimated as follows:

Industrial estate	
(5.84 mil.m^3 (389ha)-1.13mil.m^3(excavation volume)) :	4,710,000m^3
Cargo distribution center (90 ha):	1,350,000m^3
External facility area (149 ha):	2,240,000m^3
Total fill volume	8,300,000m^3

A schematic cross section of the proposed land grading is illustrated in Figure I.4.

3) Road Network

Major transportation facilities proposed for the Gia Lam IE will include the following:

Industrial Estate Project
- Main road (w=32.5m)---------- Total 4.8 km
- Sub-main road (w=28m)---------- Total 11.0 km
- Collector road (w=21m)---------- Total 2.8km
- Traffic signals ---------- Total 3 sets

Regional Development Project
- Part of 3rd Ring Road ---------- Total 5.4 km
- Interchange---------- Cloverleaf type
- 32.5m wide road ---------- Total 2.98 km
- Traffic signals ---------- Total 7 sets
- Reconstruction of the bridge at Route No.5 across the Cau Bay River ---------- Span 20 m

(The existing bridge is insufficient for the future demand of stormwater drainage.)

The proposed road network system to be developed for Gia Lam IE is illustrated in Figure I.17.

4) Water Supply Facilities

(1) General

Water supply facilities, as shown in Figure I.18, are to provide water for industrial, domestic, and fire fighting uses in the industrial estate, and also the cargo distribution center. The system will consist of raw water intake wells, conveyance pipes, purification facilities, reservoir facilities, and distribution pipes with fire hydrants.

An outline of specifications for water supply facilities in the Gia Lam IE and distribution center is shown in Table I.11.

(2) Basic conditions

The groundwater in this region contains relatively high levels of total iron (T-Fe) and total manganese (T-Mn). Water is supplied to factories after purification facilities have reduced T-Fe to 0.3 mg/l, and T-Mn to 0.2 mg/l, in conformity with the drinking water standards in Viet Nam. In case the factories need high grade quality water, they are requested to construct their own special facilities for improving the supplied water.

On the basis of the unit water demand of 150 m^3/ha/day, the maximum capacity of the facilities is planned to be of 46,000m^3/day or 6,000 m^3/hr including a 10% leakage. The residual pressure of supplied water will be maintained higher than 1.5 kg/cm^2 at each use point.

(3) Outline of water supply facilities

Raw water intake facilities

Raw water will be pumped up from underground and transferred to the purification facilities which will consist of the following main equipment:

- Intake wells: 350mm dia x 80m depth x 16wells(including 3 backup) with 30kw pumps to be installed along the road both inside and outside the estate.
- Conveyance pipes: 300 to 1,000mm dia of ductile cast iron with a total of 4,000m to be embedded along the road both inside and outside the state.

Purification facilities

The following equipment is required for the 2-step sand filtration system:

- Aeration tanks: 12m Width x 27m Length x 10m Height x three(3) units
- No.1 sand filters: 6.2m Width x 4.5m Length x 7.0m Depth x six(6) x three(3) units
- No.2 sand filters: 6.2m Width x 5.6m Length x 6.0m Depth x four(4) x three(3) units
- Chlorination equipment: chlorine gas injection type

Sludge discharged from the purification facilities is planned to be treated in the sewage treatment facilities after collection from the sewer pipe.

Reservoir facilities

The following reservoir facilities will be constructed to provide water for 10 hours a day :

- Reservoirs : 9,300m^3 x 3 units
- Distribution pumps : 12.2m^3/min x 32mH x 90kW x 12 units including 3 backup units

Distribution pipes

The estate and the cargo distribution center will have a waer distribution system consisting of ductile cast iron pipes embedded under ground with about 1.2m earth covering, with necessary appurtenances including sluice valves, air vent valves, draw-off valves, water meters, and fire hydrants. Specifications for distribution pipes are :

- For the industrial estate: 100 to 1,200mm dia x total 21,200m length
- For the cargo distribution center: 300mm dia x 690m length-

The laterals and internal pipes for each factory lot are assumed to be constructed by each enterprise.

5) Sewerage

(1) General

The sewage system, as shown in Figure 1.19, will be constructed to collect and treat sewage and discharge from the industrial estate and the cargo distribution center. Treated sewage will be discharged into the Cau Bay River through an artificial channel to be constructed along the estate. The sewerage system will consist of sewer pipes, a pump station, and sewage treatment facilities. The outline of specifications of the sewerage system in the Gia Lam Industrial Estate is shown in Table I.11.

Apart from the sewerage system for the industrial estate, a sewerage system for the urban area adjacent to the Gia Lam estate is studied in order to serve as a community infrastructure. The outline of specifications of the sewerage system in Gia Lam community is shown in Table I.12.

(2) Basic conditions

Industrial estate sewage

On the basis of the unit water demand of 150 m^3/ha/day, the maxim capacity of sewerage is planned to be 46,000 m^3/day or 6,000 m^3/hr, including infiltration of 10 %

.

The levels of BOD and suspended solids are assumed to be both 200 mg/l before treatment. These levels should be reduced by treatment to lower than 40 mg/l and 80 mg/l, respectively, to meet the effluent standards class-2 in Viet Nam. Sludge is planned to be transferred to a final disposal site in the community after drying naturally in the treatment facilities.

In the event that the sewage contains toxic substances or extremely high concentrations of organic matters, the factories will be obligated to construct their own pre-treatment facilities to maintain the designed performance of the centralized sewage treatment facilities.

Community sewage

The maximum sewage volume from the community area of about 2,500ha, including industrial waste water from factories located outside the industrial estate and also other public waste water, is estimated to be 55,000m^3/day or 2,980m^3/hr maximum on the basis of the population estimated to be 177,000 in the year 2010. Treated sewage will be discharged directly into the Cau Bay River.

BOD level is assumed to be 270 mg/l and suspended solids level to be 200 mg/l. The effluent treatment standards and sludge disposal methods will be the same as applied to the Gia Lam IE.

(3) Outline of sewerage

Sewer pipes

The following concrete sewer pipes with necessary appurtenances such as manholes will be laid embedded with less than 7m earth covering in the industrial estate, the cargo distribution center, and the community:

(For industrial estate)
in the industrial estate: 200 to 1,500mm dia x 16,000m length
in the cargo distribution center: 200mm dia x 690m length

(For community)
Sewer trunk pipes: 200 to 1,000mm dia x 49,500m length
Sewer collection pipes: 200mm dia x 325,000m (roughly estimated on the assumption of a network ratio of 150m/ha)

The laterals and internal pipes in each factory lot in the industrial estate are assumed to be constructed by each enterprise.

Relay pump stations

While sewage will be collected by gravity as a rule, pump stations will be constructed at necessary places, in case that the earth covering of sewer pipes is over 7m:

(For industrial estate)
- Pump station: 28m^3/min capacity x 1 unit with a grit chamber and a screen

(For community)
- No.1 pump station: 7.6m^3/min capacity x 1 unit with a grit chamber and a screen
- No.2 pump station: 6.3m^3/min capacity x 1 unit with a grit chamber and a screen
- No.3 pump station: 7.3m^3/min capacity x 1 unit with a grit chamber and a screen
- No.4 pump station: 32.6m^3/min capacity x 1 unit with a grit chamber and a screen
- No.5 pump station: 5.6m^3/min capacity x 1 unit with a grit chamber and a screen
- No.6 pump station: 45m^3/min capacity x 1 unit with a grit chamber and a screen

Sewer treatment facilities

The following equipment will remove pollutants in sewage by biological degradation:

(For industrial estate)

- Grid chambers: 1.8mWidth x 12mLength x 3.0mDepth x 6 units with influent pumps
- Oxidation ditches: 37mWidth x 78mLength x 3.5mDepth x 6 units with aeration rotors
- Settling basins: 33mDia x 3.0mDepth x 6 units
- Sludge thickener: 14mDia x 4.5mDepth x 1 unit
- Sludge drying beds: 50mWidth x 220mLength x 1.0mHeight x 1 unit
- Disinfection basins: 10mWidth x 15mLength x 3.5mDepth x 1 unit

(For community)

- Grid chambers: 1.8mWidth x 12mLength x 3.0mDepth x 3 units with influent pumps
- Oxidation ditches: 37mWidth x 78mLength x 3.5mDepth x 7 units with aeration rotors
- Settling basins: 33mDia x 3.0mD x 7 units
- Sludge thickener: 14mDia x 4.5mDepth x 1 unit
- Sludge drying beds: 100mWidth x 110mLength x 1.0mHeight x 1 unit
- Disinfection basins: 10mWidth x 17mLength x 3.5mDepth x 1 unit

6) Stormwater Drainage

(1) General

The stormwater drainage system, as shown in Figure I.20, will be constructed to discharge rain water and control floods in the industrial estate and the cargo distribution center. The facilities will consist of drain ditches, drain channels, and retention ponds. The outline of specifications for the stormwater drainage system in the Gia Lam IE is shown in Table I.11.

In addition to the drainage facilities for the industrial estate, a further schematic drainage study for the community area adjacent to the industrial estate is performed for the catchment basin of about 1,400ha.

(2) Basic conditions

Stormwater will be drained into the Cau Bay River through an artificial drainage channel to be constructed along the estate. Retention ponds will be used to prevent harmful environmental influences of the development of the industrial estate on surrounding water bodies.

The drainage system is designed on the basis of the peak flow discharge calculated in accordance with the following rainfall intensity formula established by MOC.

$$I = 0.36 \times 5426 \times (1 + 0.25 \times \log P \times t^{0.13}) \times 1 / (t + 19)^{0.82}$$

Where, I: rainfall intensity (mm/h)
P: return period (year)
t: time of flood concentration (min)

In calculating the peak discharge, rainfall with return periods of 5 years and 10 years are adopted for open ditches and retention ponds, respectively. Runoff coefficients of 0.6 and 0.8 are also applied for pre-development and after-development periods, respectively.

(3) Outline of storm water drainage for the industrial estate

Drain ditches

The following open concrete drain ditches with necessary appurtenances are to be constructed in the industrial estate and the cargo distribution center:

- For the industrial estate: U-shape 0.8 to 2.8m width x total 36,100m length
- For the cargo distribution center: U-shape 1.8 to 2.9m width x total 1,700m length

Pipes and ditches in each factory lot are assumed to be constructed by each enterprise.

Retention ponds

The following retention ponds with orifice devices and spillways are to be constructed in the industrial estate:

- No.1 retention pond : 28,000m^3
- No.2 retention pond : 42,000m^3
- No.3 retention pond : 300,000m^3
- No.4 retention pond : 100,000m^3

(4) Drainage plan for Gia Lam community area

The drainage plan for Gia Lam community is studied on the basis of the following conditions:

- Catchment basin: total 1,380ha including the industrial estate,
- Return period of rainfall: 10 years,
- Hydraulic gradient of main channel: 0.00033
- Estimated capacity of the Cau Bay River:
  92.8 m^3/sec with 0.00015 gradient and 17m width

The study result is schematically shown in Figure I.21, and the following facilities are proposed to prevent the peak flow discharge from exceeding the existing maximum capacity of the Cau Bay River.

- Retention ponds: total volume 425,000m^3 (retention ponds A & B)
- Main channel along the estate: 3.0 to 17m in width with 1.5 to 2.7m in depth x 5,750m

However, further investigation and study on the discharge capacity of the Cau Bay River should be conducted, if the stormwater from other catchment basin such as the southwest basin of the National Route No. 5 is discharged into the Cau Bay River. Possible countermeasures to be studied for the increase of peak discharge to the Cau Bay River, will include:

- Improvement works of the Cau Bay River to increase its discharge capacity,
- Construction of pump stations for stormwater discharge from the Cau Bay River to the Red River.

7) Electric Facilities

Power demand

Total power demand in the proposed industrial estate and the neighboring Gia Lam community in 2010 is estimated to be 305MW, as summarized below. Details of the demand projection by category of industries are shown in Table I.13.

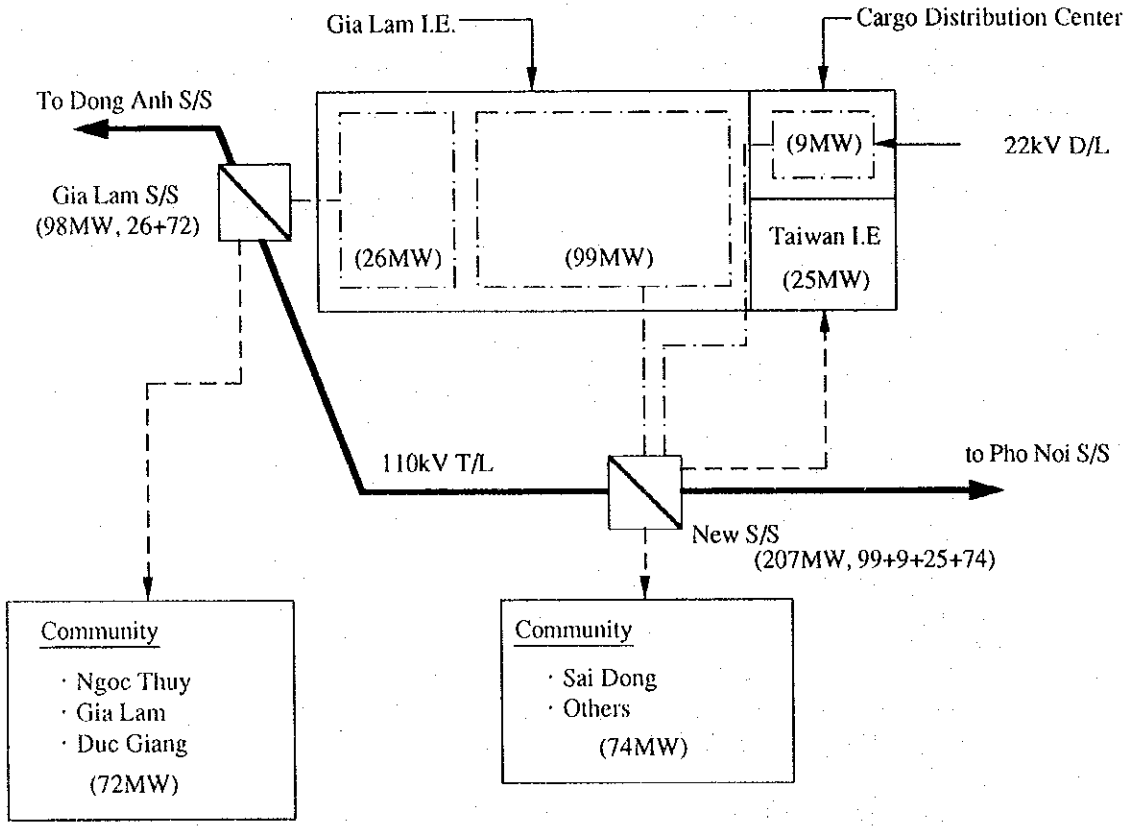
	Electric demand(MW)
I. Industrial Estate	125
(1) Factory	121
(2) Other	4
II. Cargo Distribution Center	9
III. Gia Lam Community	171
(1) Ngoc Thuy district	8
(2) Gia Lam district	23
(3) Duc Giang district	41
(4) Sai Dong district	73
(5) Taiwan I.E	25
(6) Others	1
Total	305
Required Installed Capacity (Assuming power factor as 0.8)	381 MVA

Power supply system

The existing Gia Lam 110kV substation (25MVA) is located at 0.5km from the northern corner of the estate, and is connected with the existing Dong Anh substation by a double circuit 110kV transmission line (AC150mm^2). The transformer capacity of the Gia Lam substation is planned to be upgraded to 80MVA by the year 2010.

Electric power for the Gia Lam industrial estate will be fed first from the existing Gia Lam substation. Additional upgrading at the existing substation with a capacity of 98MW and construction of a new substation with a capacity of 207MW will be required thereafter, in order to meet the demand in 2010. The new substation will be interconnected with the existing Gia Lam substation and the new 220/110kV Pho Noi intermediate substation located at 25km east of Gia Lam, by a double circuit 110kV transmission line (AC400mm^2).

The schematic plan of the electric supply system for the Gia Lam IE estate is illustrated below.



22kV switching stations and distribution line are planned to be constructed to distribute power in the estate. Switching stations will be located in the center of the electric loads to minimize the length of distribution lines and power loss. The overhead line distribution system along the roads will be adopted in view of cost performance, maintenance, and easiness of tapping to consumers.

The proposed distribution system for the Gia Lam industrial estate is shown in Figure I.22.

Alternative plans for the new substation

In case that the new substation is planned only for private use of the proposed industrial estate, the required capacity of the substation becomes 125MW (The construction cost of this substation is estimated to be about US $ 7 million).

8) Telecommunication Facilities

Telephone Demand

Telephone demand for the Gia Lam IE is estimated to be 1,310 subscriber lines as summarized below. Details of demand forecast by category of industry are shown in Table I.14.

	Subscribers (lines)
1.Factory	1207
2.Others	12
3.Cargo distribution Center	90
Total	1309 ≈ 1310

Telecommunications system

The estate will be connected to the existing Gia Lam exchange station. The existing capacity is 2,040 lines of which 2,024 lines are used. In order to satisfy the telephone demand, the capacity of the Gia Lam exchange station should be expanded and improved.

In the initial development stage, connections to the subscribers will be made directly from the existing Gia Lam exchange station. Thereafter, the construction of a new remote OLTE station will be required in the industrial estate. The remote OLTE station will be connected with the Gia Lam exchange station by optical fiber cable.

Underground distribution methods are recommended for the industrial estate with a view of ensuring environmental harmony. The distribution plan of telecommunication facilities is shown in Figure I.23. It is proposed by HPT that the design and construction/expansion work for the related telecommunication facilities will be borne by HPT, in line with the actual telephone demand.

9) Temporary Toxic Solid Waste Deposit

A temporary toxic solid waste deposit is recommended for environmental protection at the Gia Lam industrial estate, as summarized below.

(1) Period of storage : 20 years

(2) Yield of toxic/hazardous solid waste

	Area (ha) 1/	Yield of Toxic/Hazardous Solid Waste (ton/d) 2/
Total	277	277 x 0.5 x 0.04 = 6.0

Remarks: 1/ Half of the factory lot area is assumed to yield toxic waste.
2/ Unit yield rate is as assumed to be 40 kg/ha/day based on the information of Ministry of Public Welfare of Japan.

Total volume of toxic/hazardous solid waste is as follows :

60,000 m^3 for 20 years (=6.0x300days x20years / 0.6(specific gravity))

(3) Necessary area (depth of waste deposit is assumed as 1.2 m): 50,000 m^2

10) Other Facilities

(1) Park

A park with an area of 38.9 ha (8.9 % of total area) is designed in order to upgrade the aesthetic value of the industrial estate and to provide amenities. The park shall also act as a buffer zone between Gia Lam residential community and the Gia Lam industrial estate. Facilities to be installed in the park are presented below:

- Athletic facility : multi-purpose field, ball court, etc.
- Common space :
  - open field
  - vegetation area
  - promenade etc.
  - playlot
  - waterfront rest area (inclusive of a retention pond)

(2) Cargo Distribution Center

It is recommended that a cargo distribution center be established in Gia Lam. The proposed cargo distribution center will function as an inland freight depot, and it will be located in the vicinity of the proposed interchange at the crossing point of the Route No.5 and the Third Ring Road. This site has easy access to Hai Phong and the planned Cai Lan port. Most cargoes through these ports would be destined for Hanoi City. Maximization of the traffic system has to be considered, and, this distribution center will be most recommendable judgig from its location near the inter city interchange.

The conceptual model plan for the cargo distribution center in Gia Lam is illustrated in Figure I.24.

I.3 Preliminary Environmental Impact Assessment

1) Environmental Legislation, Standards and Management

(1) Legislation and Standards

The Law on Environmental Protection was ratified by the National Assembly in December 1993, and the Government Decree on Guidance for Implementation of the Law on Environmental Protection was promulgated in October 1994. Guidance and regulations concerning Environmental Impact Assessment are included in the Government Decree. Besides, there are articles on Hygienic Regulations concerning industry.

Environmental legislation and standardization are quite new in Vietnam, and little experience has been accumulated in the use and application of the Law. There is also an insufficient number of experienced staff in environmental management to manage and enforce the legislation and regulations.

The "Provisional Environmental Criteria" issued by the Ministry of Science, Technology and Environment (MOSTE) in 1993, are still in use, because the preparation of new standards is not yet completed. In the Government Decree, there is a list of environmental standards. The standards related to the industry and industrial estates are: environmental standards for land protection; water protection; air protection; regulating noise pollution; radioactivity and ionization; environmental protection in residential areas; environmental protection in production areas; planning industrial, urban and civil constructions; transportation, storage and utilization of toxic and radioactive materials; using micro-organisms, and import and export of materials.

According to the Environmental Protection Law and the Government Decree, all enterprises must have appropriate waste treatment systems to fulfill the environmental standards and to prevent environmental degradation, pollution, and incidents. All industrial enterprises have to organize the treatment of solid, liquid, and gas wastes so that effluents fulfill environmental standards before being discharged. The treatment technologies have to be approved by a responsible entity of the state management. Wastes have to be collected, transported, and treated daily from urban and industrial areas according to the regulations given by the waste management. Wastes containing micro-organisms and pathogenic microbes should be carefully treated before transportation to the landfill. Wastes containing toxic chemicals have to be treated separately before transportation.

Activities generating smoke, dust, noxious gas, and bad odors, which can harm the atmosphere, as well as activities discharging grease or oil, toxic chemicals, radioactive substances exceeding permissible limits, wastes, dead animals or plants, harmful and infectious bacteria, and viruses into water sources, and importing technologies and equipment not fulfilling environmental standards are strictly prohibited.

The import and export of technologies, machinery, equipment, biological and chemical products, toxic substances, radioactive materials etc., which relate to the environment must be approved by appropriate authorities. The import of equipment and technology required by the projects must be approved by the state management of environmental issues, on the basis of EIA reports.

MOSTE will give the import licenses to the projects approved by State management agencies.

(2) Environmental Management

At the state level, management of environmental issues is undertaken by MOSTE. The main duty of MOSTE is to assist the Government in the strategies and policy planning related to science, technology and the environment. Other duties include appraisal of EIA reports; supervising, inspecting and checking the observance of environmental protection legislation; and organizing, establishing and managing monitoring systems.

According to the Government Decree, other Ministries and Government offices coordinate with MOSTE to conduct the following activities: (i) to investigate, observe, study and assess the current environmental situation within their own branches, (ii) to draft and present proposals to the Government for decision and to organize the implementation of plans on preventing, resisting and overcoming environmental deterioration, pollution and incidents within their own branches, (iii) to study and apply scientific and technological advances in the field of environmental protection, and (iv) to educate, propagandize and spread the knowledge, laws on environmental protection within their branches.

The local environmental authorities are the provincial Departments (or Services) of Science, Technology and Environment, which are responsible before the People's Committees of the provinces and cities for the implementation of state management environmental protection in their localities.

In cities under the People's Committees, there are the Transportation and Urban Public Works Services (TUPWS) which are responsible for water supply, sewerage, and solid waste. In Hanoi, there are three companies under TUPWS. Hanoi Water Business Company (HWBC) takes care of the water supply, Hanoi Sewerage and Drainage Company takes care of drainage and cleaning of sewers and channels, and Urban Environment Company (URENCO) takes care of collection and transportation of solid waste and landfill.

(3) Environmental Impact Assessment (EIA) Process

Environmental Impact Assessment has to be done in the aspects of: (i) overall strategies for regional development, strategies and plans for development of provinces and cities, and strategies for urban development, (ii) economic, scientific, health care, cultural, social, security and defense, (iii) projects to be carried out with the funds invested, assisted, granted or contributed by foreign organizations or individuals or international organizations. The operating projects and factories have to make EIA report, too.

According to the Government Decree, EIA has to be conducted for all large projects and factories in accordance with the Vietnamese environmental standards. Approval of EIA reports is given at the state level by MOSTE, and at the local level by the local Department for Science, Technology and Environment, as shown in Table I.15. In the Government Decree, the contents and demands of the EIA reports are defined. Instructions on EIA reports are given separately to the direct foreign investment projects. Inside the industrial estate, every factory should give explanation on the action and technology to be applied for environmental protection.

2) Preliminary EIA on the Thang Long North Industrial Estate

(1) Present Socio-economic Status

(a) Location and land use

The proposed industrial estate area is located in a triangle formed by the north bank of the Red River, the highway to Noi Bai Airport, and villages extending in the north. Villages are located around the proposed area, but actually there are no houses inside the proposed area. The proposed area is divided into five communes; most of the land belongs to Vong La, Kim Chung and Hai Boi communes, and little parts are in Dai Mach and Kim No communes. The present land use is shown in Table I.16.

Most of the area is agricultural land, where double cropping of paddy is practiced, and the productivity is 2.5 - 2.9 tons/ha/year. If only one rice crop is cultivated, the productivity is 1.5 tons/ha/year on an average. In Dai Mach, one rice and one other cash crop are cultivated yearly. Agricultural productivity is 50-70% compared with the productivity in China, South Korea or Indonesia. Agricultural land per farmer household is quite small, only 0.18 - 0.24 ha in all communes, which is slightly smaller than the average of 0.28 ha in the Red River Delta.

(b) Population and education level

The total population in these five communes is about 36,800 and the number of households is about 8,400. Almost all households are informed to be farmer households (Table I.17). In Vietnam 70% of all households are farmer households. There are 4.1 - 4.8 persons per household, which is higher than the average 3.8 persons in the Red River Delta. It is reported that in the Red River Delta 37 % of the population is younger than 15 years old, and about 57% belongs to labor force.

In Kim No and Kim Chung communes, there are other work places than agriculture, e.g. factories and business. Some farmers who live next to the roads run up small tea-shops or other shops.

In practice, many families have some other occupation than farming in these communes. It is common that the wife takes care of farming and the husband works somewhere else. Members of the farmer households go often to Hanoi for work or sell agricultural products. Especially, young people try to find work in the city, but because of their low level of education they cannot get good jobs.

In every commune, there is a primary school and a secondary school, but the possibilities for higher education are limited. Officially there is no school fee, but expenditures for clothes, books, transportation, extra fees to the teachers, etc. constitute a burden for many poor families, especially in the countryside where it is harder to put children at school. In the Red River Delta years of schooling are 7.7 and literacy rate is 91.6%.

Interviews in the villages have revealed that all the people want to live in the villages but they want to do something else than farming. One reason why farmers are ready to give up cultivation is a low income. Another reason is that these communes are so close to Hanoi. Many pepole are already working in the City, at least temporarily, and they have seen that there are some other possibilities than hard agricultural work. The farmers know that in the city it is possible to get the same

money in one month as a farmer earns in a year. Therefore, they wish that their children could have more education and training, and have chances to work in factories.

(c) Land compensation

When asked how the farmers would like to have the compensation from their land, common opinion is that they want money, not land somewhere else.

The Thang Long North area has already experiences in big construction work, e.g. construction of the highway to Noi Bai Airport which runs through Hai Boi and Kim Chung communes. The main village in Kim Chung commune has been divided by the construction, however, people say that the construction of the highway has increased their living standards, and it doesn't cause any harm. It is reported that 54 houses have been demolished in constructing the highway, and all households got new places in the surrounding areas.

(2) Water and Sediment Quality in Irrigation Canals

Two water and sediment samples were taken from the irrigation canals in the Thang Long North area, and they were analysed as shown in Figure I.25 and Tables I.18 and I.19. Sampling was done in the beginning of June 1995. The turbidity of the water was quite high at the time of sampling.

Water quality in irrigation canals is almost the same as in the Red River, and there is no difference between two sampling points. BOD and COD values are low and indicate that there is no waste water pollution in these places. Concentration of nutrients (total nitrogen, total phosphorus, and dissolved nutrients) is quite low. The concentrations of mineral oils are reasonable. In general water quality is good in these irrigation canals.

The density of sediment samples is high because there was not only sediment, but also a lot of sand in the samples. COD and nutrient values are low. Concentrations of heavy metals like cadmium and mercury are also quite low. The analysis revealed that no any serious pollution source is detectable in the area.

(3) Forecast of the Thang Long North Area without Project

If the Thang Long North IE is not implemented in the proposed area, it is likely that the area will stay almost in the same condition as it is nowadays. Changes might happen in the area along the highway and railway, where many activities and business have already been in existence. It is likely that the construction will continue to grow

along the highway in unplanned and even illegal way, which would be undesirable considering the further development of the area.

(4) Impact of Project Implementation

(a) Environmental and biological impacts

The construction of a large industrial estate will have large impacts on the environment unless environmental protection is taken into account. The proposed plan envisages to construct a waste water treatment plant, and all the waste water will be treated. The proposed discharging point is located in the Red River so that the pollution can be minimized. The pollution of both surface water and groundwater can be prevented.

The present ecosystem will disappear totally, when the paddy fields are covered by land filling. Only on the banks of the irrigation canals, some vegetation would remain. However, it is noted that even now little nature is left because the whole area is cultivated intensively. It is also noted that the land use plan envisages four parks and two retention ponds, which can be developed in an environmentally sustainable way.

(b) Impact on Infrastructure

The industrial estate will have its own water supply and waste water treatment, so it will not change the current situation in the surrounding areas and villages. Drainage of the area is planned with construction of retention ponds. The condition and operation of the irrigation canals have to be guaranteed, because there are large agricultural areas depending on these canals.

There are at least four small cemeteries in the proposed industrial estate area, and the replacement has to be organized. Possible cultural buildings, e.g. temples and pagodas are located in the villages, and not in the paddy fields, and construction of the industrial estate doesn't have any impact on those.

The industrial estate will have relatively large indirect impacts on the surrounding areas. The new industrial estate will increase traffic, and it will enhance demand for housing and services in the area. Implementation of the industrial estate will also increase other activities and business in the area, and thus increase the number of workplaces in the service sector.

The landscape will change totally from paddy fields to the factory buildings. It is noted, however, that new preferable landscape of a modern industrial park with

green area will appear. In this relation, special attention should be paid to the location and architecture of factory buildings, particularly along the highway.

(5) Mitigation of Negative Impacts

The project implementation will have the largest environmental impacts in the stage of construction of buildings, infrastructure and land filling. The required fill volume is about 4.9 million m^3. The excavation and transportation of this volume will increase traffic in the area. During the construction work, there will be changes in the landscape, and the ecosystem will be destroyed. Therefore, it would be necessary to limit the changes only to the proposed area and to protect the surrounding areas.

Special attention during the construction work should be paid to prevent groundwater pollution and changes in the groundwater level, because the water supply of the industrial estate will be from on-site wells. Even quite small amounts of oil and lubricant can spoil groundwater for a long time. The safe use of oil and lubricants has to be also guaranteed during the operation of factories. Discharging oil to the surface water should be strictly prohibited.

The amount of suspended solids will probably increase in the existing canals and the Red River during the construction work. Sedimentation basins should be constructed during the construction period in order to settle soils.

The proposed waste water treatment process is conventional, but suitable for industrial waste water. Special attention should be paid to the operation and maintenance of the waste water treatment plant, because there has been no previous experience in running this kind of treatment system. Pumping of treated waste water into the Red River is possible, because the dilution capacity of the Red River is so great that the impact of treated waste water will be quite minimal.

Sorting of solid wastes should be properly done in every factory. As there may be several kinds of factories, it is better the factories make contract with suitable partners for recyclable waste collection. Every factory should have areas for recyclable waste, waste which can be composted, and waste which has to be transported to the landfill. There should also be a common store for hazardous waste, after pretreatment in factories. A toxic waste storage should be built to ensure that leakages cannot occur.

(6) General Assessment

By summarizing the impact statements, a preliminary environmental impact assessment of the Thang Long North industrial estate has been worked out as tabulated below.

	Low		Medium		High		No impact	
	1)	2)	1)	2)	1)	2)	1)	2)
Surface water		#			#			
Groundwater	#			#				
Solid waste			#	#				
Air	#			#				
Noise		#			#			
Increasing of traffic					#	#		
Ground		#			#			
Ecological system					#	#		
People's health		#					#	
Infrastructure					0	0		
Transportation					0	0		
Landscape				0	#			
Cultural values			#	#				

1) During construction, 2) During operation
0 = Positive impact, # = Negative impact

For implementation of the proposed industrial estate, it will be required to make more detailed studies concerning impacts on natural resources and socio-economy. An environmental monitoring program during the operation of the industrial estate should also be worked out for the implementaiton.

The detailed study on impacts on natural resource should include the following items: (i) quality and yield of groundwater sources through test pumping, (ii) quality of surface water in irrigation canals and in the proposed discharging point of treated water, and (iii) air quality during the operation of the factories. A detailed study on socio-economic impacts should continue with a more detailed interview survey in the surrounding villages. The questionnaire and interview survey should clarify the housing conditions including the type of houses and facilities; households' socio-economic characteristics including education, occupation and level of living standards; and opinions and compensation demands concerning the proposed industrial estate.

Risk analysis should be made for every factory to be installed in the industrial estate. Warning, rescue, protection and cleaning plans should be made available against accidents and risks for environmental pollution or public health in the estates.

3) Preliminary EIA on the Gia Lam Industrial Estate

(1) Present Socio-economic Status

The proposed Gia Lam industrial estate is located between Duong River and Route No. 5 from Hanoi to Hai Phong. Between the proposed area and the Route No. 5, there are already several factories and residential areas. The proposed area itself consists of fields surrounded by villages, factories, and small forests. There are also trees along irrigation canals in the middle of the fields. In the vicinity, on the other side of the Route No. 5, there are Gia Lam airport and a Korean industrial estate.

The land use and socio-economic characteristic in Gia Lam is more versatile than in Thang Long North. Agriculture is still important, but there are also other fields of activities. The Route No. 5 has especially large impacts on the area; it makes transportation easy and gives possibilities to run small business. The houses are constructed as a chain along the road. In general, it looks that the standard of living is reasonable in this area.

(2) Water and sediment quality in the Cau Bay River

One water and sediment sample was taken from Cau Bay River in the beginning of June 1995, and it was analyzed as shown in Figure I.25, Tables I.18 and I.19. The turbidity of the water was quite high at the time of sampling.

A slight impact of waste water is observed in the water quality analysis. BOD and COD values are slightly higher than in nonpolluted water, and there is also a small increase of components of nitrogen and phosphorus in the water. The amount of mineral oils is higher than the new proposed standard limit.

The density of sediment is high, because there is not only organic matter but also sand in the sample. COD is high, as same as concentrations of total nitrogen, ammonium, phosphorus and mineral oils. This indicates slight pollution. The concentrations of heavy metals (cadmium and mercury) are low.

(3) Forecast of Gia Lam Area without Project

Gia Lam is a well developed suburban area, and the development will continue in the future. Along the Route No. 5, there are many new factories, and there is demand to build more. Even if the proposed industrial estate is not implemented, it is possible that there will be some other alternative proposals later. It is also probable that the area of agricultural land will decrease, unless there will be some limitations by the Government.

Due to the location of Gia Lam near to the Route No. 5 and Hanoi City, there will be all the time business and construction in the area, and it appears that people are more willing to move from place to place than in areas dominated by agriculture.

(4) Impact of Project Implementation

(a) Environmental and biological impacts

The proposed plan envisages to construct a waste water treatment plant, and all the waste water will be treated. The proposed discharging point is so located that the pollution can be minimized. The flow and dilution capacity of Cau Bay River is not so large than the Red River or Duong River, but the treated water can be discharged into the Cau Bay River.

The contaminating impact on both surface water and groundwater can be prevented in the industrial estate, and at the same it should be demanded from the surrounding industry and residential area. The threat of air pollution depends on the type of industry. Due to the wind direction, it is not recommended to have any industry which can cause air pollution.

The present ecosystem will disappear totally, when paddy fields are covered by land filling. As far as possible, it is desirable that the existing trees are preserved. In the proposed area, there are some natural vegetations left on the banks of the ditches and roads. It is also noted that the land use plan envisages five retention ponds in the middle of the park. It is desirable that some more places are left for natural vegetation.

(b) Impact on infrastructure

The industrial estate will have its own water supply and waste water treatment, so it will not change the current situation in the surrounding areas and villages. Drainage of the area is planned with construction of retention ponds, from where water is drained into the Cau Bay River. The water quantity and quality in the Cau Bay River has to be guaranteed in implementing the industrial estate.

Although Gia Lam is a partly industrial area, the new industrial estate will have indirect impacts on the surrounding areas. New workplaces will increase the traffic and demand for houses and services in the area. Implementation of the industrial estate will also increase other activities and business in the area, and thus increase the number of workplaces in the service sector.

The impact on landscape is large, but it is not negative, because preferable landscape will be created by the modern industrial park with plenty of green. Possible

cultural buildings, e.g. temples and pagodas, are located in the villages and residential areas nearby, but they are not located in the proposed industrial areas.

(5) Mitigation of Negative Impacts

The environmental impacts will probably be greater during the construction stage than during the stage of operation of the factories. There will be construction of factory buildings, and construction of infrastructure including about 27 km of roads of different levels, including a new ring road with an interchange, main roads and sub-main roads. Infrastructure construction also includes land filling to improve ground capacity and stormwater drainage. The required volume of soil is about 8.3 million m^3. During the construction work, there will be an increase in traffic, substantial changes in landscape. Therefore, it would be necessary to limit the changes only to the proposed area, and to protect the surrounding areas.

Special attention should be paid to the protection of groundwater during the construction work and during the operation of the factories. Even small amounts of oil and lubricants can spoil groundwater for a long time. Discharging oil into the surface water should be strictly prohibited.

Special attention should be paid to the operation and maintenance of the waste water treatment plant, because there has been no previous experience in running this kind of treatment system. Treated waste water should be so discharged as to cause as little impact as possible.

Several retention ponds have been planned to be created in the middle of the parks to drain stormwater. Retention ponds should be well maintained and will create a nice landscape at the same time.

Sorting, collection, recycling, and storage of solid waste should be done according to the Vietnamese standards, and the treatment of potential hazardous wastes must be done in factories. As there will be several different kinds of factories, it is preferable that the factories make contract with suitable partners for recyclable waste collection. Every factory should have areas for recyclable waste, waste which can be composted, and waste which has to be transported to the landfill. There should also be a common storage for hazardous waste, after pretreatment in factories. A toxic waste storage should be built to ensure that leakages cannot occur.

(6) General Assessment

Preliminary environmental impact assessment of Gia Lam industrial estate has been worked out as summerized below.

	Low		Medium		High		No impact	
	1)	2)	1)	2)	1)	2)	1)	2)
Surface water		#	#					
Groundwater	#			#				
Solid waste			#	#				
Air	#			#				
Noise		#			#			
Increasing of traffic					#	#		
Ground		#			#			
Ecological system					#	#		
People's health		#					#	
Infrastructure					0	0		
Transportation					0	0		
Landscape				0	#			
Cultural values			#	#				

1) During construction, 2) During operation
0 = Positive impact, # = Negative impact

For implementaiton of the proposed industrial estate at Gia Lam, it will be required to make more detailed studies concerning impacts on present natural resources and socio-economy. An environmental monitoring program during the operation of the industrial estate should also be worked out for the implementaiton.

The detailed study on impacts on natural resource should include: (i) yield and quality of the groundwater by test pumping, (ii) quality of surface water, and (iii) air quality during operation of the industrial estate. A detailed study on socio-economic impacts should be carried out in the surrounding villages and residential areas. Questionnaire and interview surveys should clarify the housing conditions including types of houses and facilities; households' socio-economic characteristics including education, occupation and level of living standards; and opinions and compensation demands concerning the proposed industrial estate.

Risk analysis should be made for every factory to be installed in the industrial estate. Warning, rescue, protection and cleaning plans should be made available against accidents and risks for environmental pollution and public health in the area.

I.4 Development Schedule and Estimated Cost

1) Development Schedule

For the implementation of the Thang Long North and Gia Lam IEs, it is proposed to follow a tentative development schedule shown in Figures I.26 and I.27.

For the Thang Long North IE, it is tentatively programmed that a developer or a J/V estate development company be formed and be authorized by the central and local governments (SCCI and HPC) by the end of 1995. The developer would start detailed design of the facilities, and at the same time start investment promotion. The construction work is scheduled to be implemented in 2 stages: the first stage (210 ha) would be constructed in 1997–1998, and the second stage (70 ha) in 1999–2000. It is scheduled that the construction of the industrial estate will be completed by the end of 2000.

For the Gia Lam IE, a more or less similar schedule of implementation is programmed. The Gia Lam IE will also be constructed in 2 stages: the first stage (290 ha) in 1997–1998 and the second stage (148 ha) in 1999–2000. All the construction work of the industrial estate is scheduled for completion by the end of 2000.

2) Conditions for Construction Cost Estimate

The major conditions applied to the estimate of construction costs are summarized below.

(a) All expenditures and revenues are presented in US dollars.

(b) Construction cost will cover the preparatory works, main works, engineering service costs, physical contingencies, and price escalation.

(c) Prices are based on labor, materials and equipment prices as of January 1995. The exchange rate applied in the estimate is 1.00 US dollar = 11,000 VN dong.

Additionally, it should be noted that the cost has been estimated on the basis of the following.

(a) Engineering Services Cost: The cost for engineering services is estimated in proportion to the direct construction cost to cover the engineering

works such as detailed design and construction supervision. This cost is estimated at about 8 % of the total direct construction cost.

(b) Taxes: Import tax is presumed to be excluded from the direct construction cost.

(c) Contingency: The physical contingency is estimated at 10% of the direct construction cost and engineering service cost. The price contingency or escalation is estimated at a rate of 3% and 10% per annum for the foreign and local portions, respectively.

(d) The foreign currency portion covers the expenses for materials and equivalents to be specially imported for the purpose of the Project and the local currency portion covers those which can be directly purchased in the domestic market.

3) Estimated Cost

Based on the conditions explained above, the construction costs of the Thang Long North IE and Gia Lam IE are estimated to be 54.7 million US$ and 92.5 million US$, respectively as shown below. The construction costs of external facilities such as the sewage treatment plant, the ring road, etc. are preliminarily estimated to be 73.6 million US$ for the Thang Long North IE and 150.5 million US$ for the Gia Lam IE. The detailed cost estimate is presented in Table I.20.

(US$ million)

	Thang Long IE	Gia Lam IE	Total
1 Industrial Estate	54.7	92.5	147.2
2 External Facilities	73.6	150.5	224.1
1) Cargo distribution center	14.5	13.8	28.3
2) Residential area	24.6	-	24.6
3) Other external infrastructure	34.5	136.7	171.2
3 Total	128.3	243.0	371.3

Note: 1. At 1995 prices
2. Price contingency is included
3. Community sewage improvement at Gia Lam is excluded from external infrastructure

The cargo distribution center, residential area, and relevant infrastructure tabulated below, are included in the external cost. The detailed cost of external facilities is presented in Table I.21.

	Thang Long North IE	Gia Lam IE
1. Cargo distribution center	O	O
2. Residential Area	O	-
3. Other external infrastructure		
1) Ring road	-	O
2) Regional road	O	O
3) Interchange of ring road	-	O
4) Drainage main channel	-	O
5) Water purification plant	O	O
6) Sewage treatment plant	O	O
7) Power substation	O	O
8) Telecommunication facilities	O	O

I.5 Financial and Economic Evaluation

1) Evaluation Method

(1) Financial evaluation method

The financial evaluation in this Study aims at assessing the financial viability of the investments in the construction of the Thang Long North IE and Gia Lam IE, from the viewpoint of HPC and the IE Developer (supposed to be a private/public Joint Venture).

Viability for HPC

The project performance is analyzed, taking the expenses for project implementation as cash outflows, and the income from operations as cash inflows. The cost of the compensation and the cost of the external infrastructure are main financial outflows from the point of view of HPC; the former is supposed to be financed from the state budget or the provincial budget, and the latter to be financed both through a Circular Fund for Industrial Estate Development*1 and by a 3-year advance payment for the land rents from the IE Developer. The income from land rents is the main inflow for HPC.

Viability for the IE Developer

The cost of construction of the industrial estate is the main financial outflow from the point of view of the IE Developer, and is supposed to be financed through equities and/or long-term debts. The land rents, being the cash inflows from the point of view of HPC, are financial outflows for the IE Developer. The income from lot sales is the main financial inflow for the IE Developer. All inputs and outputs are valued at the market prices (current prices).

The Project is evaluated in terms of "Financial Internal Rate of Return (FIRR)" based on the cashflow streams of revenues and expenses/costs. The internal rate of return is the discount rate at which the present value of cash inflows is equal to the present value of cash outflows. In other words, it is the discount rate at which the present value of the net receipts from the Project is equal to the present value of the investments.

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*1 Circular Fund for Industrial Estate Development

The Fund, amounting to 10 million US$, is reserved exclusively for the industrial development scheme.

The fund flow related to the industrial estate development is schematically explained on Figure I.28.

(2) Economic evaluation method

The economic evaluation in this Study aims at assessing the economic feasibility of the project from the viewpoint of the regional/national economy, in which the industrial (production) output to be generated in the industrial estate will be a dominant factor for the analysis. In principle, the economic feasibility is evaluated in terms of economic internal rate of return (EIRR).

2) Financial Evaluation

The evaluation is made, by placing more importance on provision of "indicative conditions" so as to ensure the financial viability of the Project. Under a pre-condition that the development of the industrial estates has been decided to be executed, it is important to prepare such an environment that the parties involved would be motivated to put investment, judging from their own interest. The project implementation structure, in physical and financial aspects, is highly recommended to be formed so as to ensure an adequate profit among the parties involved.

(1) Preconditions for financial analysis

(a) Land rent to be charged to the IE Developer

The land rent for the industrial estate can be calculated at 0.585 US$/m^2/year (refer to Table I.22). The IE Developer will pay to HPC a 3-year advance payment at the initial year and the remaining corresponding amount from the fourth year up to the final 50th year.

(b) Land compensation

The amount for land compensation should be determined in a reasonable manner not only to ensure the normal standard of living for the farmers who have to be relocated, but also to avoid an excessive rise of land price which will eventually distort of the regional economy or retard the sound economic development.

The amount of compensation in this Study is conservatively estimated at 2.0 US$/m^2 *2 . The cost for compensation is assumed to be borne by the State Budget as a financial outflow from the viewpoint of HPC.

(c) Construction cost for infrastructure outside IE

The scope and cost for the infrastructure outside IE is described in the previous chapter I.4. The cost is assumed to be borne by HPC, the fund of which will be covered in part by the Circular Fund and in other part by the advance payment from the IE Developer. It may be inevitable to raise fund from the international financial institutions.

(d) Construction cost for infrastructure inside IE

The cost for the infrastructure construction is to be borne by the IE Developer. This cost is inclusive of direct construction cost, administrative cost, O&M cost, etc., as a major financial outflow from the viewpoint of the IE Developer.

(e) Lot sales to enterprises/investors

The price of lot sales, tentatively estimated at 60 US$/m^2 at current price, being well competitive compared with that in other Asian countries*3 , is the most influential factor which affects the financial viability of the IE Developer, fully depending on the market conditions.

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*2 Valuation of Paddy Field

The present agricultural production is assumed as follows;

Rice field (Paddy)	Domestic Paddy Price/Exchange Rate	Rice revenue (max.)
8-10 tons/ha/year	2,300~2,900 VND/kg	2,100~2,600 US$/ha
(4-5 tons/ha/season)	US$1=11,000 VND	(0.21~0.26 US$/m^2)

The paddy field value may be assumed to be 1.3 - 1.6 US$/m2, under such conditions that the expenses such as family labour, seeds, fertilizer, etc. are 40 % of the revenues and the capitalization rate is 10 %.

(0.26 x (1-40%))/0.1=1.6US$/m^2 (0.21 x (1-40%))/0.1=1.3US$/m^2

When a social cost as an unemployment allowance be added, the compensation is estimated at 2.0 US$/m^2.

*3 Lot Sales Price in other Asian countries for reference

Indonesia 60 ~ 80 US$/m^2 China 70 ~ 90 US$/m^2 Thailand 45 ~ 70 US/m^2

(f) Taxation

Several taxes, such as corporate tax, import duties, real estate property tax, turnover tax (or value-added tax) in association with the transactions traded during the period of the infrastructure construction in and outside the estate and during the period of the estate operation, are supposed to be imposed on the IE Developer, but they are assumed to be subject to tax exemption at this stage of the study because of uncertainties of taxation related to this kind of infrastructure construction.*4

(g) Operation & maintenance cost

The O&M cost is assumed to be 5.0 % of the construction cost for the infrastructure in the industrial estate.

(h) Gross profit from utility operation

The gross profit (defined as revenue minus O&M cost for utility service) is tentatively estimated at 10 % of the investment cost of the facility, where the capitalization rate of the facility is assumed to be 10 %.

(i) Lot sales projection for the IE Developer

	Year 1 (1996)	Year 2 (1997)	Year 3 (1998)	Year 4 (1999)	Year 5 (2000)	Year 6 (2001)	Year 7 (2002)	Year 8 (2003)
Thang Long	0%	0%	15%	20%	20%	20%	15%	10%
Lot sales (ha)			30	40	40	40	30	17
Acc. Lot Sales (ha)			30	70	110	150	180	197
Gia Lam	0%	0%	15%	20%	20%	20%	15%	10%
Lot sales (ha)			45	60	60	60	45	7
Acc. Lot Sales (ha)			45	105	165	225	270	277

*4 Custom duty (Import duty)

Several kinds of equipment, mechanical and electrical, to be imported for the infrastructure construction in the Industrial Zone, are supposed to be subject to import duties exemption.

Tax incentives for Infrastructure Development Companies (IDSs) in the Industrial Zone

"The tax rate shall be fifteen (15) percent of the profit. The IDSs are entitled to enjoy an exemption of profit tax for two (2) years from the first profit making years and half of the tax rate for the following four (4) years".

(2) Results of Financial Analysis

(a) Thang Long North Industrial Estate

The financial cashflow streams are shown in Tables I.23 and I.24. The results are summarized below.

Viability from the viewpoint of the IE Developer

Lot sales price (US$/m^2)	Land rent (US$/m^2/year)	IE construction	FIRR (%)
60	0.585	54.7 million US$	17.2 %

Viability from the viewpoint of HPC

Land rent (US$/m^2/year)	Infra. cost outside IE	FIRR (%)
0.585	73.6 million US$	4.5 %

(b) Gia Lam Industrial Estate

The financial cashflow streams are shown in Tables I.25 and I.26. The results are summarized below.

Viability from the viewpoint of the IE Developer

Lot sales price (US$/m^2)	Land rent (US$/m^2/year)	IE construction	FIRR (%)
60	0.585	92.5 million US$	12.2 %

Viability from the viewpoint of HPC

Land rent (US$/m^2/year)	Infra. cost outside IE	FIRR
0.585	150.5 million US$	3.7 %

(3) Sensitivity Analysis

A sensitivity analysis of viability from the viewpoint of the IE Developer has been carried out in which the land rent and lot sale price are adopted as variable parameters. The results are summarized below.

Thang Long North IE

Lot sales price (US$/m2)	Land rent (US$/m2/year)	FIRR (%)
60	0.585	17.2
60	0.7	12.7
62	0.7	16.8

Gia Lam IE

Lot sales price (US$/m2)	Land rent (US$/m2/year)	FIRR (%)
60	0.585	12.2
60	0.7	8.6
62	0.7	13.5

A sensitivity analysis of viability from the viewpoint of HPC has also been carried out in which the land rent is adopted as a variable parameter. The results are summarized below.

Thang Long North IE

Land rent (US$/m2/year)	FIRR (%)
0.585	4.5
0.7	5.1
0.8	5.7

Gia Lam IE

Land rent (US$/m2/year)	FIRR (%)
0.585	3.7
0.7	4.2
0.8	4.6

(4) Financing for external infrastructure construction by HPC (Thang Long North)

As shown in Table I.24, it is quite necessary to make a financial arrangement to implement the external infrastructure construction. Here, it is assumed that concessional loans from international financial institutions will be provided under the following conditions:

Loan amount	:	85 % of total cost
Repayment period	:	30 years
Grace period	:	10 years
Interest rate	:	2.3 %

The debt services for the loan which can't be covered only by the land rents, will inevitably be taken care of by the State Budget, that is, a part of tax revenue from the production activities in the industrial estate.

The development of infrastructure in relation to the industrial estate will bring about several taxes to the Government of Vietnam, such as turnover tax, corporate tax, etc. from enterprises/investors' industrial activities in the industrial estate. These taxes*5 could be regarded to be direct benefits of the Project from the viewpoint of HPC. Hence, it is assumed that 30 % of the tax revenues from the above activities will be reserved for the "Circular Fund" and be utilized to make up for the cash shortage in HPC's cash position in relation to the repayment of the loan.

If the above conditions are satisfied, the Project will turn out to be marginally viable from the viewpoint of HPC, indicating an IRR of 14.5% as shown in Table I.27.

A sensitivity analysis has been carried out, for reference, in which the rate of tax effect is adopted as a variable parameter. The results are shown below.

Results of Sensitivity Analysis by Tax Effect

Tax effect	IRR (%)
30 %	14.5%
50 %	19.2 %
20 %	11.8 %

3) Economic Evaluation

(1) Economic Implication of Industrial Estate Development

The effect of the industrial estate development could be evaluated by comparison of productivity between the agricultural production ("without Project") and the industrial production ("with Project"). Here, the discussion is focused on the case of the Thang Long North IE.

*5 Tax revenues are said to be around 10 % of GDP in Vietnam, which is low by international standards. (Tax Reform in Vietnam : Progress and Needed Measures, April 1994, IMF)

Agricultural production

1) Yield : 5 tons/ha/crop (2 crops/year, in other term, cropping intensity 200 %)
2) Market price : 2,300 VND/kg of paddy (See Table I.28)

The productivity in and around Hanoi where the paddy yield is said to be rather high compared with other localities, can be preliminary estimated at 2,100 - 2,600 US$/ha.

Industrial production

The industrial productivity is assumed to grow in terms of "net product per employee" at the rate as shown in Table I.29, under the foreign direct investments. In this table, the net product is defined as turnover (sale) minus material cost, that means, including labour cost, depreciation, interest, profit before tax, etc..

On the other hand, the capital investment by sector to be required to induce such industrial production is estimated as shown in Table I.30, based on the past historical performance in other Asian countries, that is, the trend of "machine/equipment asset per employee". The value of "machine/equipment asset per employee" is tentatively estimated at 10,000 US$/employee.

Comparison Between Agricultural Production and Industrial Production

If direct expenses such as seed, fertilizer, chemicals, etc. are deducted from the agricultural output, the ratio of productivity will further increase to more than 1:1,000 in 2010 when the factories in the industrial estate are in full operation.

	2000	2010
Agricultural production (Table I.30)	585,000	585,000 US$/year
Industrial production*6 (Table I.29) (in term of value-added)	143,000,000	366,000,000 US$/year
Ratio	1 : 240	1 : 625

*6 The recent gross domestic product in the manufacturing sector is shown for reference.

		1993	1994 (Proj.)
GDP	(VND trillion)	165.6	193.0
	(US$ million)	15,054	17,545
Manufacturing sector			
	(US$ million)	3,420	4,123

(2) Economic Analysis

Method of economic analysis

The economic analysis of the industrial estate development is made by the comparison of production output between the present agricultural production ("without Project") and the expected industrial production ("with Project"). The industrial production will be estimated based on several indicators such as "productivity per employee", "number of employees required to run a lot factory", "capital investment", etc. in accordance with the industrial development scheme.

EIRR is calculated on a cashflow basis, consisting of the following;

Input	
(+) IE construction cost	103 million US$*
(+) Capital investment in IE factory lots	450 million US$**
(-) Agricultural production (negative value)	585,000 US$/year
Output	
(+) Industrial net production from IE factory lots	366 million US$/year (2010)

* Excluding price escalation cost
** Capital investment $375 million plus 20% working capital

EIRR has been calculated to be 39.4 % as shown in Table I.31.

In this analysis the "machine/equipment asset par employee" is assumed to be 10,000 US$/employee.

From the economic viewpoints, it can be said that the Project will have a significant impact on the industrial development in the Hanoi area, under such condition that the environment for foreign direct investment will be properly prepared and be attractive for foreign investors.

4) Concluding Evaluation

The Project could be viable from the viewpoint of the IE Developer, with FIRR being more than 10 % of the opportunity cost for both the Thang Long North and Gia Lam IEs, if the sale price is set at 60 US$/$m^2$ in current monetary terms.

On the other hand, the infrastructure outside the industrial estate should be implemented on a governmental initiative, judging from the fact that the viability of the Project is low: 4.5% for the Thang Long North IE and 3.7% for the Gia Lam IE in terms of FIRR. That is why concessional loans should be required from foreign financial institutions so as to ensure the implementation of the Project, not only from the financial viewpoint, but also from the viewpoint of credibility of the Project itself.

The factor vital to the implementation of the Project is "how to finance the infrastructure construction outside the industrial estate". As shown in Tables I.24 and I.26, it is quite clear that the "Circular Fund" is too vulnerable to meet the financial requirement in the initial stage of the implementation. Even in the case that concessional loans*7 from foreign financial institutions are provided for the Project, a fund shortage will come out even before the repayment commences.

To solve this problem, it will be indispensable to work out a system to flow back to the "Circular Fund", some taxes, that is, "turnover tax", to be collected from enterprises/investors expected to operate in the industrial estate. It should be noted that the "Circular Fund" plays an important role in the development of the industrial sector in and around Hanoi.

As a whole, the implementation of the Thang Long North IE is economically justified from the following reasons;

(a) The promising enterprises are expected to invest in the Thang Long North IE, a total amount of around 450 million US$ including working capital, which is 20% of the investment capital. The annual turnover is estimated to be around 915 million US$ in 2010, or 800 times as much as that of agricultural output. The foreign currency earned is estimated to be around 30% of the turn-over.

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*7 Concessional Loan
For example, the loan conditions are as follows:

Loan amount	85% of the project cost
Interest	2.3%
Repayment period	30 years
(Grace period:	10 years)

	2010
Net product	366 million US$
(Net product/ha)	1.94 million US$
Turnover	915 million US$
(Turn-over/ha)	4.84 million US$
Foreign currency	275 million US$
(Foreign currency/ha)	1.46 million US$

(b) The annual receipt from the turnover tax, profit tax and others (in total, provisionally estimated at 10% of the net product) is estimated to be around 36 million US$.

(c) About 40,000 persons job opportunities are expected to be created.

(d) Modern technologies and advanced management experiences will be acquired. It is important for Vietnam to establish a proper environment so that transfer of knowledge to the Vietnamese is attained in an efficient and effective manner for the future development of the Hanoi area.

Table I.01 Area Distribution Plan by Category

ISIC	Factory Lot Size (ha)								Planned Area (ha)		
	0.2	0.2~0.5	0.5~1	1~2	2~5	5~10	10~	Total		Thang Long N.	Gia Lam
31 Food											
311-313 Food and beverage	0	0	0	0	0	0	10	10	14.2%	28	39
32 Textile, Apparel, Leather											
321 Textile	0	0	0	0	2	0	0	2	2.8%	6	8
322 Apparel	0	0	0.5	0	0	0	0	0.5	0.7%	1	2
323 Leather products	0	0	0.5	0	2	0	0	2.5	3.6%	7	10
33 Wood, Furniture											
331 Wood products	0	0	0	0	0	0	0	0	0.0%	0	0
332 Furniture	0	0	0.5	0	0	0	0	0.5	0.7%	1	2
34 Paper Products											
341 Paper products	0	0	0	0	0	0	0	0	0.0%	0	0
35 Chemicals											
351 Industrial chemicals	0	0	0	0	0	5	0	5	7.1%	14	20
352 Other chemical/drugs	0	0.2	0	0	2	0	0	2.2	3.1%	6	9
355 Rubber products	0	0	0	0	0	0	0	0	0.0%	0	0
356 Plastic products	0	0	0	0	2	0	0	2	2.8%	6	8
36 Non-Metallic Mineral Products											
361 Pottery, earthware	0	0	0	0	0	0	0	0	0.0%	0	0
362 Glass, kitchenware	0	0.2	0	0	0	0	0	0.2	0.3%	1	1
369 Tiles, bricks	0	0	0	0	0	0	0	0	0.0%	0	0
37 Basic Metal											
372 Non-ferrous metals	0	0	0.5	0	0	0	0	0.5	0.7%	1	2
38 Fabricated Metal, Machinery											
381 Fabricated Metal	0	0.2	0	0	0	5	0	5.2	7.4%	15	20
382 Machinery	0	0	0	3	0	0	0	3	4.3%	8	12
383 Electrical Machinery	0	0.6	1	1	4	5	20	31.6	45.0%	89	125
384 Transport Equipment	0.2	0	0	2	2	0	0	4.2	6.0%	12	17
385 Professional and scientific equipment	0	0.4	0	0	0	0	0	0.4	0.6%	1	2
39 Others	0	0	0.5	0	0	0	0	0.5	0.7%	1	2
Total	**0.2**	**1.6**	**3.5**	**6**	**14**	**15**	**30**	**70.3**	100%	197	277
	0%	2%	5%	9%	20%	21%	43%	100%		(ha)	(ha)
Planned Area, Thang Long North (ha)		7	10	20	40	40	80	197 (ha)			
Planned Area, Gia Lam (ha)		12	15	30	60	60	100	277 (ha)			

Table I.02 Land Use Plan of Thang Long North Industrial Estate

	Area (ha)	(%)	Remarks
I Industrial Estate	280.0	100.0	
1 Factory Lot	197.0	70.3	
2 Road	22.7	8.1	
1) Main road (32.5 m)	12.4		L=3,800m
2) Sub-main road (28 m)	7.0		L=2,500m
3) Collector road (21 m)	3.4		L=1,600m
3 Utility	21.2	7.6	
1) Water supply facility	2.0		
2) Sewage treatment plant	9.0		
3) Electric facility	0.6		Switching Station
4) Toxic waste stock yard	3.5		
5) Retention pond	6.2		
4 Industrial Estate Center	0.8	0.3	
5 Park	9.0	3.2	
6 Others	29.3	10.5	
1) Canal	7.8		
2) Electric transmission line	6.5		
3) Buffer green	12.2		
4) Reserved area	2.8		
II External Facility	117.3		
1 Cargo Distribution Center	50.0		
2 Residential Area	50.0		
3 Regional Road	14.3		
1) 21 m road	8.7		4,150 m
2) 28 m road	5.6		2,000 m
3) 32.5 m road			
4 Electric Substation	3.0		
III Total	397.3		

Note: Future expansion area of 50 ha is exclusive.

Table I.03 Main Specifications of Water Supply, Sewerage, and Drainage Facilities

(Thang Long North)

Items	Description	Remarks
1. Water supply system		
Demanded water flow:	30,000m3/d(maximum)	factory lot 197ha x 150m3/ha.d cargo center 50ha x 5.0m3/ha.d
Supplied water flow	33,000m3/d(daily maximum) 4,300m3/h(hourly maximum)	leakage 10% 10hrs operation fluctuation coeff. 1.3
Equipment and Materials:		
Intake wells:	80mDepth x (10+2)wells	drilled inside IE
Conveyance pipes	ductile cast iron pipes	
Purification facilities	acration + 2-step sand filtration	
Distribution basin	18,600m3	
Distribution pumps	9.0m3/min x 75kw x (8+2) units	
Distribution pipes	ductile cast iron pipes	service area of 330 ha
Hydrant equipment	1.0m3/unit.min	
Location of purification facilities	north area of IE	
Area for purification facilities	2.0ha	
2. Sewerage system		
Sewer flow	33,000m3/d(daily maximum) 4,300m3/h(hourly maximum)	infiltration 10% 10hrs operation fluctuation coeff. 1.3
Water qualities		
Influent	BOD 200mg/l SS 200mg/l	
Effluent	BOD 40mg/l SS 80mg/l	
Equipment and Materials:		
Collection system	Separated collection by gravity and pumping	
Sewer collection pipes	RC pipes	service area of 330 ha
Waste water treatment facilities	Oxidation ditch type + sludge drying beds	
Treated waste water discharge point	overhead pipe -> Red River(by pump up)	
Location of treatment facilities	south area of IE	
Area for treatment facilities	9.0ha	
3. Drainage facilities		
Service basin	330ha	IE 280ha cargo center 50ha
Storm water collection pipes	RC pipes + open canals	
Retention ponds	Total 173,600m3(6.2ha x 2.8mD)	
Storm water discharge points	partly modified drainage canal for agriculture-> Van Tri Lake	

Table I.04 Estimated Qualities of Groundwater in Hanoi Area

Items	Unit	Concentration
Turbidity	NTU	ND
Color	-	ND
Temperature	degree	24 -27
pH	-	6.5 - 6.8
Total iron(Fe)	mg/l	10- 22
Total manganese(Mn)	mg/l	0.4 - 2.0
Ammonia(NH4)	mg/l	0.7 - 1.0
Calcium(Ca as CaCO3)	mg/l	55
Carbonate(HCO3 as CaCO3)	mg/l	9
Alkalinity(as CaCO3)	mg/l	200
Total hardness(as CaCO3)	mg/l	180
Chlorine ion(as chloride)	mg/l	7.0
Nitrite(NO3)	mg/l	ND
Nitrate(NO2)	mg/l	ND
Phosphorous(PO4)	mg/l	3.0
Sulfate(SO4)	mg/l	4.0

Note : The qualities are estimated based on several relevant reports.

Table I.05 Standard of Drinking Water Qualities in Viet Nam

Characteristics	Unit	Standard	Remarks
Color	-	less than 10	
Taste	-	0	
Total dissolved solids(TDS)	mg/l	less than 1,000	
pH	-	6.5 - 8.5	
Total hardness	odH	12	
Sodium Chloride(NaCl)	mg/l	less than 400	in sea area
Sodium Chloride(NaCl)	mg/l	less than 100	in normal area
Nitrate(NO^3-)	mg/l	less than 6	
Nitrite(NO^2-)	mg/l	0	
Hydrogen sulfide(H2S)	mg/l	0	
Ammonia	mg/l	0	for surface water
Ammonia	mg/l	less than 3	for ground water
Lead(Pb)	mg/l	less than 0.1	
Copper(Cu)	mg/l	less than 3	
Zinc(Zn)	mg/l	less than 5	
Total iron(Fe)	mg/l	less than 0.3	
Total manganese(Mn)	mg/l	less than 0.2	
Fluoride(F)	mg/l	0.7 - 1.5	
Iodin(I)	mg/l	0.005 - 0.007	
Calcium(Ca)	mg/l	75 - 100	
Chromium(Cr)	mg/l	0	
Cyanide(CN)	mg/l	0	
Phenol	mg/l	0	
Total residual chlorine	mg/l	0.5	
Residual free chlorine	mg/l	0.05	
Chemical oxygen demand(COD)			
Fecal coliform	num/100ml	0	water entering
Coliform	num/100ml	0	distribution system
Fecal coliform	num/100ml	0	water in
Coliform	num/100ml	less than 3.0	distribution system

Table I.06 Effluent Standards of Waste Water in Vietnam (tentative)

Items	Unit	Classification of discharged river		
		Class-1	Class-2	Class-3
(General)				
Temperature	℃	40	40	45
Dissolved solids		1,000	1,500	2,000
pH	-	6 - 9	5.5 - 9	5 - 9
Suspended solids	mg/l	50	100	200
Biological oxygen demand(BOD)	mg/l	20	50	100
Chemical oxygen demand(COD)	mg/l	50	100	400
Mineral oil	mg/l	not detectable	0.1	10
Chlorine(Cl)	mg/l	400	500	1,000
Phenol	mg/l	0.001	0.05	1.0
Sulfide(S)	mg/l	0.2	0.5	1.0
Nitrogen(N)	mg/l	-	-	-
Fluorine(F)	mg/l	1.0	2.0	5.0
Phosphorous(P)	mg/l	-	-	-
Anionic surfactant	mg/l	0.1	1.0	10
Copper(Cu)	mg/l	0.2	1.0	5.0
Zinc(Zn)	mg/l	1.0	2.0	5.0
Manganese(Mn)	mg/l	0.2	1.0	5.0
Organic phosphorous	mg/l	-	-	-
Iron(Fe)	mg/l	1.0	5.0	10.0
Coliform	number/cm3	20,000	50,000	-
Tin(Sn)	mg/l	0.2	1.0	5.0
(Toxic/hazardous))				
Total mercury(Hg)	mg/l	0.005	0.01	0.5
Cyanide(CN)	mg/l	0.05	0.1	0.2
Alkylmercury(alk-Hg)	mg/l	-	-	-
Cadmium(Cd)	mg/l	0.010	0.2	0.5
Total chromium(Cr)	mg/l	0.2	1.0	2.0
Hexavalent chromium(Cr6+)	mg/l	0.05	0.05	0.5
Arsenic(As)	mg/l	0.05	0.1	0.5
Lead(Pb)	mg/l	0.1	0.5	1.0
Nickel(Ni)	mg/l	0.2	1.0	2.0
Polychloride biphenol(PCB)	mg/l	-	-	-
Trichloro ethylene	mg/l	-	-	-
Tetrachloro ethylene	mg/l	-	-	-

Remarks : each classification is identified as follows:-
Class-1 : River used for water supply and bathing,
Class-2 : River used for fisheries, irrigation, transportation and tourism,
Class-3 : River used for other purpose.

Table I.07 Power Demand Projection of Thang Long North Industrial Estate

	Area (ha)	Unit Demand (MW/ha)	Electric Demand (MW)	Remarks
I Industrial Estate				
1.Factory	196.96	0.30	59.09	Electronic &Electric Products,Mashinery,etc
2.Water supply plant			1.80	
3.Sewerage treatment plant			0.90	
4.Industrial estate center			0.20	
5.Street lighting			0.05	
Sub total			62.04	
II Cargo Distribution Center	50.00	0.10	5.00	
III Other Facilities				
1.Residential house			5.00	2,000hos×2.5kW/ho
Grand total			72.04	

Table I.08 Telephone Demand of Thang Long North Industrial Estate

	Area (ha) 1)	Nos.of Factory 2)	Demand Rate (line/ha)/* 3)	Demand Rate (line/fact) 4)	Required Demand 5)=1)×3)	Required Demand 6)=2)×4)	Required Capacity Max (5),6))
I Industrial Estate							
1.Factory	196.96	109	4	3	788	327	788
2.Water supply plant							3
3.Sewerage treatment plant							3
4.Industrial estate center							5
5.Switching station							3
Sub-total							802
II Cargo Distribution center	50		1		50		50
Total							852
							≒860
III Other Facilities							
1.Residential house	50	6000 (hos)		0.75 (line/ho)		4,500	4,500
Grand Total							5,360

*Unit Telephone Demand Per Factory Area

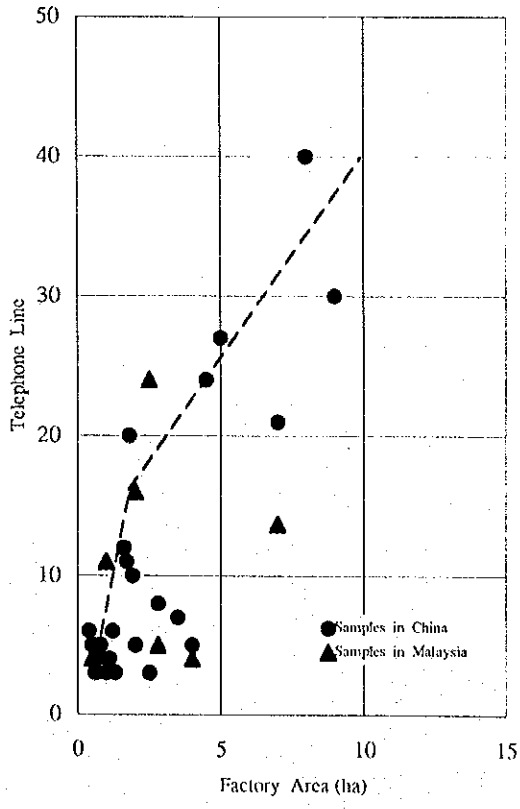


Table I.09 Detailed Land Use Plan of Gia Lam Industrial Estate

	Area (ha)	(%)	Remarks
I Industrial Estate	442.0	100.0	
1 Factory Lot	301.7	68.3	
2 Road	52.3	11.8	
1) Main road (32.5 m)	15.6		L=4,800m
2) Sub-main road (28 m)	30.8		L=11,000m
3) Collector road (21 m)	5.9		L=2,800m
3 Utility	33.5	7.6	
1) Water supply facility	4.0		
2) Sewage treatment plant-1	10.0		for industrial estate
3) Electric facility	0.5		Switching station
4) Toxic waste stock yard	5.0		
5) Retention pond	14.0		
4 Industrial Estate Center	-		
5 Park	38.9	8.8	
6 Others	15.6	3.5	
1) Transmission line	5.6		
2) Canal	4.5		
3) Oil pipeline	5.5		
II External Facility	239.0		
1 Cargo Distribution Center	90.0		
2 Ring Road (32.5 m)	17.6		L=5,400m
3 Interchange	98.8		
4 Regional Road	9.7		L=2,980m, W=32.5m
5 Sewage Treatment Plant-2	20.0		for Gia Lam community
6 Electric Substation	3.0		
IV Total	681.0		

Table I.10 Detailed Land Use Alternative of Gia Lam Industrial Estate

(Second Plan)

	Area (ha)	(%)	Remarks
I Industrial Estate	438.0	100.0	
1 Factory Lot	277.3	63.3	
2 Road	52.3	11.9	
1) Main road (32.5 m)	15.6		L=4,800m
2) Sub-main road (28 m)	30.8		L=11,000m
3) Collector road (21 m)	5.9		L=2,800m
3 Utility	51.0	11.6	
1) Water supply facility	4.0		
2) Sewage treatment plant-1	10.0		for industrial estate
3) Electric facility	0.5		Switching station
4) Toxic waste stock yard	5.0		
5) Retention pond	31.5		
4 Industrial Estate Center	-		
5 Park	38.9	8.9	
6 Others	18.5	4.2	
1) Transmission line	5.6		
2) Canal	7.4		
3) Oil pipeline	5.5		
II External Facility	239.0		
1 Cargo Distribution Center	90.0		
2 Ring Road (32.5 m)	17.6		L=5,400m
3 Interchange	98.8		
4 Regional Road	9.7		L=2,980m, W=32.5m
5 Sewage Treatment Plant-2	20.0		for Gia Lam community
6 Electric Substation	3.0		
IV Total	677.0		

Table I.11 Main Specifications of Water Supply, Sewerage, and Drainage Facilities

(Gia Lam Industrial Estate)

Items	Description	Remarks
1. Water supply system		
demanded water flow:	42,000m3/d(maximum)	IE 277ha x 150m3/ha.d cargo center 90ha x 5.0m3/ha.d (excluding Taiwan EPZ)
Supplied water flow	46,000m3/d(daily maximum) 6,000m3/h(hourly maximum)	leakage 10% 10hrs operation fluctuation coeff. 1.3
Equipment and Materials:		
Intake wells:	80mDepth x (13+3) wells	drilled inside IE
Conveyance pipes	ductile cast iron pipes	
Purification facilities	aeration + 2-step sand filtration	
Distribution basin	27,900m3	
Distribution pumps	12.2m3/min x 90kw x (9+3) units	
Distribution pipes	ductile cast iron pipes	service area of 532 ha
Hydrant equipment	1.0m3/unit.min	
Location of purification facilities	plant site for Gia Lam urban area outside IE	
Area for purification facilities	4.0ha	
2. Sewerage system		
Sewer flow	46,000m3/d(daily maximum)	infiltration 10% from IE & cargo center (excluding Taiwan EPZ)
	6,000m3/h(hourly maximum)	10hrs operation fluctuation coeff. 1.3
Water qualities		
Influent	BOD 200mg/l SS 200mg/l	
Effluent	BOD 40mg/l SS 80mg/l	
Equipment and Materials:		
Collection system	separated collection by gravity and pump	
Sewer collection pipes	RC pipes	service area of 532 ha (IE 438ha cargo center 90ha)
Waste water treatment facilities	oxidation ditch type + sludge drying beds	
Treated waste water discharge point	newly constructed canal -> Cau bay River	
Location of treatment facilities	south east outside in IE	
Area for treatment facilities	10ha	
3. Drainage facilities		
Service basin	1,200 ha	
Storm water collection pipes	RC pipes and open canals	
Retention ponds	total 925,000m3(36.5ha x 2.5mD)	
Storm water discharge points	newly constructed canal -> Cau Bay River	

Table I.12 Main Specification of Sewerage

(Gia Lam community)

Items	Description	Remarks
1. Water supply system	not studied	
2. Sewerage system		
Sewer flow	in 2010 55,000m3/d(daily maximum) 2,980m3/h(hourly maximum)	177,006cap x max.210L/cap.d fluctuation coeff. 1.3
Water qualities		
Influent	BOD 270mg/l SS 200mg/l	
Effluent	BOD 40mg/l SS 80mg/l	
Equipment and Materials:		
Collection system	separated collection with gravity and pump	
Sewer collection pipes	RC pipes	service area: about 2,500 ha (excluding IE and air port)
Waste water treatment facilities	oxidation ditch type + sludge drying beds	
Treated waste water discharge point	Cau Bay River	
Location of treatment facilities	east side of Cau Bay River	
Area for treatment facilities	20 ha	

Table I.13 Power Demand Projection of Gia Lam Industrial Estate

	Area (ha)	Unit Demand (MW/ha)	Electric Demand (MW)	Remarks
I Industrial Estate				
1.Factory	301.70	0.40	120.68	Metal Products Machinery,Food etc.
2.Water supply plant			2.40	
3.Sewerage treatment plant			1.30	
4.Street lighting			0.11	
Sub total			124.49	
II Cargo Distribution Center	90.00	0.10	9.00	
III External Facility				
1.Ngoc Thuy district	61.00		8.30	in 2010
(1)Factory	13.00	0.30	3.90	
(2)Residential house	19.00		2.00	800hos×2.5kw/ho
(3)Business/Commercial zone	19.00	0.10	1.90	
(4)Others	10.00		0.50	(Road,Park,etc.)
2.Gia Lam district	188.00		23.30	in 2010
(1)Factory	21.00	0.30	6.30	
(2)Residential house	77.00		13.50	5400hos×2.5kw/ho
(3)Business/Commercial zone	25.00	0.10	2.50	
(4)Others	65.00		1.00	(Road,Park,etc.)
3.Duc Giang district	300.00		40.80	in 2010
(1)Factory	69.00	0.30	20.70	
(2)Residential house	75.00		12.00	4800hos×2.5kw/ho
(3)Business/Commercial zone	71.00	0.10	7.10	
(4)Others	85.00		1.00	(Road,Park,etc.)
4.Sai Dong	296.00		72.60	in 2010
(1)Daewoo I.E.	80.00		40.00	
(2)Factory	51.00	0.30	15.30	
(3)Residential house	80.00		13.00	5200hos×2.5kw/ho
(4)Business/Commercial zone	33.00	0.10	3.30	
(5)Others	52.00		1.00	(Road,Park,etc.)
5.Taiwan I.E.	63.00	0.40	25.20	
6.Sewerage treatment plant			1.40	
Sub-total			171.60	
Grand total			305.09	

Table I.14 Telephone Demand of Gia Lam Industrial Estate

	Area (ha) 1)	Nos.of Factory 2)	Demand Rate (line/ha) 3)	Demand Rate (line/fact) 4)	Required Demand 5)=1)×3)	Required Demand 6)=2)×4)	Required Capacity Max (5),6))
I Industrial Estate							
1.Factory	301.7	106	4	3	1207	318	1207
2.Water supply plant							3
3.Sewerage treatment plant							3
4.Switching station							6
Sub-total							1219
II Cargo Distribution center	90		1		90		90
Grand total							1309
							≒1310

Table I.15 Projects Requiring EIA Reports

Project	Responsible authority	
	Ministry of Science, Technology and Environment	Local Department/Service for Science, Technology and Environment
Mine exploitation	large and middle scale mines	small scale
Drilling for investigation, oil exploitation, oil and gas pipeline	all	
Chemical factory	all	
Steel and cast-iron factory	all	
Other metal factories	all	
Leather factory	over 1,000 ton/year	smaller
Textile factory	over 30 million m/year	smaller
Pesticide factory	all	
Rubber and paint factory	all	
Plastic factory	over 1,000 ton/year	smaller
Projects which use radioactivity	all	
Airport	all	
Export processing zone	all	
Water reservoir, hydroelectric dam	over 100 million m3	smaller
Irrigation system		
Thermoelectric station	over 30 MW	smaller
Cement factory	over 500,000 ton/year	smaller
Pulp and paper mill	over 40,000 ton/year	smaller
Pharmaceutical factory	centrally-run	
Fertilizer factory	over 100,000 ton/year	smaller
Food processing factory	over 1,000 ton/year	smaller
Sugar factory	over 100,000 ton/year	smaller
Hospital	over 500 beds	smaller
Railway and road levels 1, 2, 3	over 50 km	smaller
Electrical transformer station	over 110 kV	smaller
Tourist and recreational area	over 100 ha	smaller
Petroleum store	over 3,000 m3	smaller
Hazardous chemical store	all	
Farm	over 2,000 ha	smaller
Forestation for wood exploitation	over 3,000 ha	smaller
Forestation for industrial growing	over 2,000 ha	smaller
Sea product breeding area	over 200 ha	smaller
Port	over 100,000 ton	smaller
Artificial plywood factory	over 500,000 m2/year	smaller
New housing areas	over 500 households	smaller
Use of alluvial ground	over 500 ha	smaller
Chemical factory	over 50,000 ton/year	smaller
Telecommunication unit	centrally-run radar station and wave distribution station	
Freezing factory	large and middle scale	small scale
Building material processing	large and middle scale	small scale
Hotels and commerce centers	large and middle scale	small scale

Source: Government Decree on Guidance for Implementation of Law on Environmental Protection (Annex II)

Table I.16 The Present Land Use in Thang Long North Area (Source: HUPI)

	Total area of the whole commune	Total studied area	Percentage of land in the studied area	Agricultural land in the studied area		Village area in the studied area		Channels and Ponds in the studied area		Agricultural land/ Farmer household in the whole commune
	ha	ha	%	ha	%	ha	%	ha	%	ha
Dai Mach	850	35.5	4.2	33.6	94.6			1.9	5.4	0.23
Kim No	657	20.3	3.1	8.4	41.4			0.5	2.5	0.21
Hai Boi	806	111.1	13.8	57.5	51.8	2.3	2.1	11.6	10.4	0.26
Vong La	734	320.7	43.7	198.4	61.9	58.0	18.1	28.8	9.0	0.18
Kim Chung	660	186.4	28.2	137.7	73.9	18.2	10.0	19.9	10.7	0.24
Total	3,707	674.0		435.6		78.5		62.7		

Table I.17 The Present Population in Thang Long North Area (Source: HUPI)

	Total number of people (whole commune)	Total number of households (whole commune)	Persons/ Household	Farmers (whole commune)	Percentage of farmers from the whole population %	Farmer household	Percentage of farmer household from all household %
Dai Mach	7,926	1,642	4.8	7,926	100	1,642	100
Kim No	9,551	2,143	4.5	8,341	87	1,611	75
Hai Boi	6,257	1,520	4.1	6,189	99	1,300	86
Vong La	5,531	1,320	4.2	5,531	100	1,320	100
Kim Chung	7,494	1,729	4.3	7,339	98	1,709	99
Total	36,759	8,354		35,326		7,582	

Table I.18 Water Quality Results from Thang Long North and Gia Lam in June 199

	Parameter	Unit	Thang Long No.1	Thang Long No.2	Gia Lam No. 3
1	pH		7.7	7.8	7.7
2	Conductivity	µS/cm	243	226	386
3	Organic substance (loss of weight)	mg/l	62	56	79
4	Turbidity	FTU	90	160	95
5	Total N	mg/l	2.4	2.2	4.1
6	Total P	mg/l	0.29	0.26	0.37
7	BOD5	mg/l O2	2.6	2.2	14.7
8	COD	mg/l O2	16	13	47
9	Ammonium (N-NH4)	mg/l N	0.14	0.17	0.85
10	Nitrate (NO3)	mg/l	1.9	2.1	2.3
11	Sulphate (S04)	mg/l	13.8	14.2	32.6
12	Phosphat (PO4)	mg/l	0.59	0.57	0.72
13	Total Hardness	mg/l CaCO3	80	74	126
14	Mineral Oils	mg/l	2.93	1.91	7.22

Table I.19 Sediment Quality Results from Thang Long North and Gia Lam in June 1995

	Parameter	Unit	Thang Long No.1	Thang Long No.2	Gia Lam No. 3
1	pH		7.9	7.8	7.8
2	Total solids	g/kg	759	649	488
3	Volatile solids	g/kg (of Total solids)	13.1	38.2	49.0
4	Moisture content	%	22	34	50
5	Density	kg/m^3	2165	1892	1752
6	COD	mg/kgO_2	320	380	5992
7	Total N	mg/kgN	156.0	187.2	343.2
8	Total P	mg/kgP	93.3	84.7	156.8
9	Ammonium NH_4	mg/kgN	4.6	5.4	18.5
10	Arsenic (As)	mg/kg (Dry-weight basis)	0.22	0.64	0.4
11	Cadmium (Cd)	mg/kg (Dry-weight basis)	1.1	2.3	2.5
12	Chromium (Cr^{6+})	mg/kg (Dry-weight basis)	7.0	14.1	10.2
13	Total (Cr)	mg/kg (Dry-weight basis)	21.2	23.9	18.3
14	Cobalt (Co)	mg/kg (Dry-weight basis)	5.3	7.6	2.5
15	Copper (Cu)	mg/kg (Dry-weight basis)	7.6	23.7	18.5
16	Lead (Pb)	mg/kg (Dry-weight basis)	32.7	48.2	46.4
17	Mercury (Hg)	mg/kg (Dry-weight basis)	0.04	0.04	0.01
18	Nickel (Ni)	mg/kg (Dry-weight basis)	8.2	10.7	10.2
19	Zinc (Zn)	mg/kg (Dry-weight basis)	227.6	236.4	222.7
20	Cyanide (Cn)	mg/kg	0.80	0.54	0.92
21	Mineral Oils	mg/kg	285	80	455

Table I.20 Preliminary Estimate of Construction Cost

(Unit: US$ 1,000)

	Thang Long North IE			Gia Lam IE			Total		
	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	Total
I Construction Cost	38,665	45,188	83,853	77,757	86,659	164,416	116,422	131,847	248,269
1 Industrial Estate									
1) Land Grading	2,156	10,830	12,986	2,214	10,798	13,012	4,370	21,628	25,998
2) Road	1,284	7,057	8,341	2,619	14,191	16,810	3,903	21,248	25,151
3) Water Supply	2,727	897	3,624	5,629	1,751	7,380	8,356	2,648	11,004
4) Sewerage	1,309	412	1,721	2,132	582	2,714	3,441	994	4,435
5) Drainage	4,215	2,493	6,708	8,751	6,666	15,417	12,966	9,159	22,125
6) Electric Facility	700	78	778	1,362	151	1,513	2,062	229	2,291
7) Telecommunication	0	0	0	0	0	0	0	0	0
8) Other relevant facility /1	510	2,579	3,089	999	4608	5,607	1,509	7,187	8,696
9) Sub total	12,901	24,346	37,247	23,706	38,747	62,453	36,607	63,093	99,700
2 External Facility									
1) Cargo Distribution Center	1,562	4,404	5,966	2,632	5,987	8,619	4,194	10,391	14,585
2) Residential Area	9,135	6,289	15,424	0	0	0	9,135	6,289	15,424
3) Other External Infrastructure	15,067	10,149	25,216	51,419	41,925	93,344	66,486	52,074	118,560
5) Sub total	25,764	20,842	46,606	54,051	47,912	101,963	79,815	68,754	148,569
II Engineering Service Cost	5,367	1,342	6,708	10,523	2,631	13,153	15,889	3,972	19,862
1 Industrial Estate	2,384	596	2,980	3,997	999	4,996	6,381	1,595	7,976
2 External Facility	2,983	746	3,728	6,526	1,631	8,157	9,508	2,377	11,886
1) Cargo Distribution Center	382	95	477	552	138	690	933	233	1,167
2) Residential Area	987	247	1,234	0	0	0	987	247	1,234
3) Other External Infrastructure	1,614	403	2,017	5,974	1,494	7,468	7,588	1,897	9,485
III Price Contingency	4,770	21,351	26,121	9,008	34,326	43,334	13,778	55,677	69,455
1 Industrial Estate	1,274	8,269	9,543	2,528	14,129	16,657	3,802	22,398	26,200
2 External Facility	3,496	13,082	16,578	6,480	20,197	26,677	9,976	33,279	43,255
1) Cargo Distribution Center	593	6,142	6,735	383	2,851	3,234	976	8,993	9,969
2) Residential Area	1,622	4,086	5,708	0	0	0	1,622	4,086	5,708
3) Other External Infrastructure	1,281	2,854	4,135	6,097	17,346	23,443	7,378	20,200	27,578
V Physical Contingency	4,880	6,788	11,668	9,729	12,362	22,090	14,609	19,150	33,759
1 Industrial Estate	1,656	3,321	4,977	3,023	5,388	8,411	4,679	8,709	13,388
2 External Facility	3,224	3,467	6,691	6,706	6,974	13,680	9,930	10,441	20,371
1) Cargo Distribution Center	254	1,064	1,318	357	898	1,254	610	1,962	2,572
2) Residential Area	1,174	1,062	2,237	0	0	0	1,174	1,062	2,237
3) Other External Infrastructure	1,796	1,341	3,137	6,349	6,076	12,425	8,145	7,417	15,562
VI Grand Total	53,682	74,669	128,350	107,016	135,977	242,994	160,698	210,646	371,344
1 Industrial Estate	18,215	36,532	54,747	33,254	59,263	92,517	51,469	95,795	147,264
2 External Facility	35,467	38,137	73,604	73,762	76,714	150,477	109,229	114,851	224,080
1) Cargo Distribution Center	2,791	11,706	14,496	3,923	9,873	13,797	6,714	21,579	28,293
2) Residential Area	12,919	11,684	24,603	0	0	0	12,919	11,684	24,603
3) Other External Infrastructure	19,758	14,747	34,505	69,839	66,841	136,680	89,597	81,588	171,185

Remarks:

/1 Toxic waste deposit, industrial estate center, park are inclusive.

/2 See Table I.17 for the detailed cost of external facility

Table I.21 Detailed Construction Cost of External Facility

(Unit:US$ 1,000)

	Thang Long North IE			Gia Lam IE			Total		
	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	Total
I Cargo Distribution Center	1,562	4,404	5,966	2,632	5,987	8,619	4,194	10,391	14,585
II Residential Area	9,135	6,289	15,424	0	0	0	9,135	6,289	15,424
III Other External Infrastructure									
1 Road and Drainage									
1) Regional road	676	3,829	4,505	987	3,643	4,630	1,663	7,472	9,135
2) Ring road	0	0	0	2,268	12,852	15,120	2,268	12,852	15,120
3) Interchange	0	0	0	2,500	9,800	12,300	2,500	9,800	12,300
4) Drainage (Main Channel)	0	0	0	10,339	4,431	14,770	10,339	4,431	14,770
5) Land grading	152	765	917	1,066	5,171	6,237	1,218	5,936	7,154
6) Subtotal	828	4,594	5,422	17,160	35,897	53,057	17,988	40,491	58,479
2 Plant									
1) Water Purification Plant	3,528	1,992	5,520	4,764	2,727	7,491	8,292	4,719	13,011
2) Sewage Tratment Plant	5,918	3,033	8,951	11,699	1,342	13,041	17,617	4,375	21,992
3) Subtotal	9,446	5,025	14,471	16,463	4,069	20,532	25,909	9,094	35,003
3 Electric and Telecommunication Facility									
1) Electric Substation	3,852	428	4,280	16,442	1,813	18,255	20,294	2,241	22,535
2) Telecommunication Facility	941	102	1,043	1,354	146	1,500	2,295	248	2,543
3) Subtotal	4,793	530	5,323	17,796	1,959	19,755	22,589	2,489	25,078
4 Total	15,067	10,149	25,216	51,419	41,925	93,344	66,486	52,074	118,560
IV Grand Total	25,764	20,842	46,606	54,051	47,912	101,963	79,815	68,754	148,569

Table I.22 Methods for Determiniry Land Rentals

		A		B		C		D
Land Rental ($US/m^2/year)	=	Basic rate as stipulated for each type of city	x	Coefficient of place	x	Coefficient of Infrastructure	x	Coefficient of branches and jobs

in which:

- The basic rate is the minimum rate in the frame of the rentals as stipulated for each type of city

- Coefficients shall be determined according to the standard stipulated in the frame of rentals from 1 to 2.

1. Thang Long North

		A	B	C	D
Land rental ($US/m^2/year)	=	0.375	1.3	1.2	1.0
	=	0.585			

2. Gia Lam

		A	B	C	D
Land rental ($US/m^2/year)	=	0.375	1.3	1.2	1.0
	=	0.585			

Source : Regulations on the Rents of Land, Water and Sea Surfaces for the Forms of Foreign Investment in Vietnam, Hanoi December 31, 1994.
(Promulgated in attachment with the Decision No. 1417 TC/TCDN dated December 31, 1994 of the Ministry of Finance)

Table I.23 Viability Study for I.E. Developer (Thang Long North Industrial Estate)

Project Location : Thang Long North — Land Area 280 ha — Grand-Total (ha) 397.31 — (External facilities 17.31 — Residential 50 — Cargo D.C.) 50

Gia Lam — Land Area 0 ha

1

		Cash Outflows				Cash Inflows					FIRR 17.2%	FIRR
		Annual rental fee (1,000 US$/year)	I.E. Construction (1,000 US$)	O & M Cost	Total	Lot Sales US$/m2	Revenues (1,000 US$)	Lot Sales Area (m2)	Facility Operation Net Revenues		Annual Net Cashflow	Cumulative Net Cash US$/m2
1995	0											
1996	1	4,914	3,422	1,024	9,360		0	0%	0		-9,360	-9,360
1997	2	0	17,797	1,639	19,436	60	0	0%	0		-19,436	-28,796
1998	3	0	19,182	2,049	21,231	60	17,640	15%	294.000		-3,591	-32,387
1999	4	1,638	6,898	2,049	10,585	60	23,520	20%	392.000		12,935	-19.451
2000	5	1,638	7,448	2,049	11.135	60	23,520	20%	392.000	0	12,385	-7,066
2001	6	1,638		1,639	3.277	60	23,520	20%	392.000	0	20,243	13,177
2002	7	1,638		1,024	2,662	60	17,640	15%	294.000	0	14,978	28,155
2003	8	1,638		615	2,253	60	11,760	10%	196.000	0	9.507	37,662
2004	9	1,638		615	2,253	60	0	0%	0	0	-2,253	35,410
2005	10	1,638		615	2,253		0	0%	0	0	-2,253	33,157
2006	11	1,638		615	2,253		0	0%	0	0	-2,253	30,905
2007	12	1,638		615	2,253		0	0%	0	0	-2,253	28,652
2008	13	1,638		615	2,253		0	0%	0	0	-2,253	26,399
2009	14	1,638		615	2,253		0	0%	0	0	-2,253	24,147
2010	15	1,638		615	2,253		0	0%	0	0	-2,253	21,894
2011	16	1,638		410	2,048		0	0%	0	0	-2,048	19.847
2045	50	1,638		410	2,048		0	0%	0	0	-2,048	-49,776
Total		81,900	54,747	30,729	167,376		117,600	100%	1,960,000	0	-49,776	

Facility Construction & Operation — Cap. rate

Water Purification Plant	0	3%
Sewage Treatment Plant	0	3%
Telecom./Electricity	0	0%

A I.E. Construction

Unit Cost 19.6 US$/m2

Construction Cost 54,747 x 1,000 US$ ← Input data

B O & M Cost 2,049 x 1,000 US$/year

5% of construction cost

C Annual Rental Fee 1,638,000 US$/Year

0.585 US$/m2/year

D Lot Sales Price

Initial year 60.0 US$/m2

E Lot Sale Area 196 ha

70% of development area with 280 ha

Construction cost (=direct construction cost + physical contingency)

Thang Long North 40.972

Gia Lam 68.698

Result of financial analysis FIRR= 17.2%

Table I.24 Viability Study for HPC (Thang Long North Industrial Estate)

Project Location:	Thang Long North	280 ha
	Gia Lam	0 ha

Taxation effect considered: 0

(Unit : 1,000 US$)

397.31 ha | 2.00 US$/m2 | 73.61 million US$ | 280 ha | 0.59 US$/m2/year | IRR 4.5%

1		Cash Outflows		Cash Inflows		Net Cashflows	Financial Support from Foreign Financial Institutions						HPC's cash position Funds Balance	
							85% of External I.E.	62,564	2.3% Interest	Repayment Conditions 30 years (Grace:10years) Debt Services		Debt	(Fund required to avoid	
		Land Compensation	External Infrastructure	Land Rental Fee	Facility Operation	(A)	External Debts		Payable	Interest	Principal	Outstanding	cash shortage)	Accu. Reserves(X)
0														
1	1996	1,589	0	4,914	0	3,325	0	0	0	0	0	0	3,325	3,325
2	1997	1,589	16,756	0	0	-18,345	14,243	14,243	164	164	0	14,243	-4,266	-942
3	1998	1,589	22,097	0	0	-23,686	18,782	33,025	544	544	0	33,025	-5,447	-6,389
4	1999	1,589	4,612	1,638	0	-4,563	3,920	36,945	805	805	0	36,945	-1,448	-7,837
5	2000	1,589	4,897	1,638	684	-4,164	4,162	41,108	898	898	0	41,108	-899	-8,736
6	2001		5,206	1,638	1,141	-2,427	4,425	45,533	996	996	0	45,533	1,001	-7,734
7	2002		5,541	1,638	1,825	-2,078	4,710	50,243	1,101	1,101	0	50,243	1,531	-6,204
8	2003		4,439	1,638	2,281	-520	3,773	54,016	1,199	1,199	0	54,016	2,055	-4,149
9	2004		4,820	1,638	2,281	-901	4,097	58,113	1,289	1,289	0	58,113	1,907	-2,242
10	2005		5,237	1,638	2,281	-1,318	4,451	62,564	1,388	1,388	0	62,564	1,746	-496
11	2006			1,638	2,281	3,919	0		1,439	1,439	3,128	59,436	-648	-1,143
12	2007			1,638	2,281	3,919			1,367	1,367	3,128	56,308	-576	-1,719
13	2008			1,638	2,281	3,919			1,295	1,295	3,128	53,180	-504	-2,223
14	2009			1,638	2,281	3,919			1,223	1,223	3,128	50,051	-432	-2,655
15	2010			1,638	2,281	3,919			1,151	1,151	3,128	46,923	-360	-3,015
16	2011			1,638	2,281	3,919			1,079	1,079	3,128	43,795	-288	-3,303
17	2012			1,638	2,281	3,919			1,007	1,007	3,128	40,667	-216	-3,519
18	2013			1,638	2,281	3,919			935	935	3,128	37,539	-144	-3,663
19	2014			1,638	2,281	3,919			863	863	3,128	34,410	-72	-3,735
20	2015			1,638	2,281	3,919			791	791	3,128	31,282	0	-3,735
21	2016			1,638	2,281	3,919			719	719	3,128	28,154	72	-3,663
22	2017			1,638	2,281	3,919			648	648	3,128	25,026	144	-3,520
23	2018			1,638	2,281	3,919			576	576	3,128	21,897	216	-3,304
24	2019			1,638	2,281	3,919			504	504	3,128	18,769	288	-3,016
25	2020			1,638	2,281	3,919			432	432	3,128	15,641	360	-2,657
30	2025			1,638	2,281	3,919			72	72	3,128	0	719	220
31	2026			1,638	2,281	3,919							3,919	4,140
32	2027			1,638	2,281	3,919							3,919	8,059
33	2028			1,638	2,281	3,919							3,919	11,979
40	2035			1,638	2,281	3,919							3,919	39,415
50	2045			1,638	2,281	3,919							3,919	78,610
		7,946	73,605	81,900	18,298	102,103	62,564		23,493	23,493	62,564		78,610	

Table I.25 Viability Study for I.E. Developer (Gia Lam Industrial Estate)

Project Location : Thang Long North — Land Area 0 ha — Grand-Total (ha) 677.00 — (External facilities 149.00 — Residential 0 — Cargo D.C.) 90

Gia Lam — Land Area 438 ha

0

FIRR 12.2%

		Cash Outflows				Cash Inflows						
		Annual rental fee (1,000 US$/year)	I.E. Construction (1,000 US$)	O & M Cost	Total	Lot Sales US$/m2	Revenues (1,000 US$)	Lot Sales Area (m2)	Facility Operation Net Revenues		Annual Net Cashflow	Cumulative Net Cashflow
1995	0						0	0%	0		-12,273	-12,273
1996	1	7,687	2,869	1,717	12,273		0	0%	0		-31,977	-44,250
1997	2	0	29,229	2,748	31,977	60	0	0%	0		-4,054	-48,304
1998	3	0	28,213	3,435	31,648	60	27,594	15%	459,900		15,293	-33,011
1999	4	2,562	15,502	3,435	21,499	60	36,792	20%	613,200		14,090	-18,922
2000	5	2,562	16,705	3,435	22,702	60	36,792	20%	613,200	0	31,482	12,560
2001	6	2,562		2,748	5,310	60	36,792	20%	613,200	0	23,314	35,874
2002	7	2,562		1,717	4,280	60	27,594	15%	459,900	0	14,803	50,678
2003	8	2,562		1,030	3,593	60	18,396	10%	306,600	0	-3,593	47,085
2004	9	2,562		1,030	3,593	60	0	0%	0	0	-3,593	43,492
2005	10	2,562		1,030	3,593		0	0%	0	0	-3,593	39,899
2006	11	2,562		1,030	3,593		0	0%	0	0	-3,593	36,307
2007	12	2,562		1,030	3,593		0	0%	0	0	-3,593	32,714
2008	13	2,562		1,030	3,593		0	0%	0	0	-3,593	29,121
2009	14	2,562		1,030	3,593		0	0%	0	0	-3,593	25,528
2010	15	2,562		1,030	3,593		0	0%	0	0	-3,593	22,279
2011	16	2,562		687	3,249		0	0%	0	0	-3,249	19,030
2045	50	2,562		687	3,249		0	0%	0	0	-3,249	-88,197
Total		128,115	92,518	51,524	272,157		183,960	100%	3,066,000	0	-88,197	

Facility Construction & Operation

		Cap. rate
Water Purification Plant	0	3%
Sewage Treatment Plant	0	3%
Telecom./Electricity	0	0%

A I.E. Construction
Unit Cost 21.1 US$/m2
Construction Cost 92,518 x 1,000 US$ ← Input data

B O & M Cost 3,435 x 1,000 US$/year
5% of construction cost

C Annual Rental Fee 2,562,300 US$/Year
0.585 US$/m2/year

D Lot Sales Price
Initial year 60.0 US$/m2

E Lot Sale Area 307 ha
70% of development area with 438 ha

Construction cost (=direct construction cost + physical contingency)
Thang Long North 40,972
Gia Lam 68,698

Result of financial analysis FIRR= 12.2%

Table I.26 Viability Study for HPC (Gia Lam Industrial Estate)

Project Location:	Thang Long North	0 ha
	Gia Lam	438 ha

Taxation effect considered: 0

(Unit : 1,000 US$)

740.14 ha | 2.00 US$/m2 | 150.48 million US$ | 438 ha | 0.59 US$/m2/year | IRR 3.7%

0		Cash Outflows		Cash Inflows		Net Cashflows	Financial Support from Foreign Financial Institutions						HPC's cash position Funds Balance	
							85%	127.906	2.3%	Repayment Conditions 30 years (Grace:10years)				
							of External I.E.		Interest	Debt Services		Debt	(Fund required to avoid	
		Land Compensation	External Infrastructure	Land Rental Fee	Facility Operation	(A)	External Debts		Payable	Interest	Principal	Outstanding	cash shortage)	Accu. Reserves(X)
0														
1	1996	2.961	2,144	7.687	0	2,582	1,822	1.822	21	21	0	1.822	4.384	4.384
2	1997	2.961	31.468	0	0	-34.429	26.748	28.570	350	350	0	28.570	-8.030	-3.646
3	1998	2.961	37.404	0	0	-40.365	31.793	60.364	1.023	1.023	0	60.364	-9.594	-13.240
4	1999	2.961	39.847	2.562	0	-40.245	33.870	94.234	1.778	1.778	0	94.234	-8.153	-21.394
5	2000	2.961	39.615	2.562	1.461	-38.552	33.673	127.906	2.555	2.555	0	127.906	-7.434	-28.827
6	2001		0	2.562	2.435	4.998	0	127.906	2.942	2.942	0	127.906	2.056	-26.772
7	2002		0	2.562	3.897	6.459	0	127.906	2.942	2.942	0	127.906	3.517	-23.254
8	2003		0	2.562	4.871	7.433	0	127.906	2.942	2.942	0	127.906	4.491	-18.763
9	2004		0	2.562	4.871	7.433	0	127.906	2.942	2.942	0	127.906	4.491	-14.272
10	2005		0	2.562	4.871	7.433	0	127.906	2.942	2.942	0	127.906	4.491	-9.781
11	2006			2.562	4.871	7.433	0		2.942	2.942	6.395	121.511	-1.904	-11.685
12	2007			2.562	4.871	7.433			2.795	2.795	6.395	115.116	-1.757	-13.442
13	2008			2.562	4.871	7.433			2.648	2.648	6.395	108.720	-1.610	-15.051
14	2009			2.562	4.871	7.433			2.501	2.501	6.395	102.325	-1.463	-16.514
15	2010			2.562	4.871	7.433			2.353	2.353	6.395	95.930	-1.316	-17.830
16	2011			2.562	4.871	7.433			2.206	2.206	6.395	89.534	-1.169	-18.998
17	2012			2.562	4.871	7.433			2.059	2.059	6.395	83.139	-1.021	-20.020
18	2013			2.562	4.871	7.433			1.912	1.912	6.395	76.744	-874	-20.894
19	2014			2.562	4.871	7.433			1.765	1.765	6.395	70.348	-727	-21.621
20	2015			2.562	4.871	7.433			1.618	1.618	6.395	63.953	-580	-22.202
21	2016			2.562	4.871	7.433			1.471	1.471	6.395	57.558	-433	-22.635
22	2017			2.562	4.871	7.433			1.324	1.324	6.395	51.163	-286	-22.921
23	2018			2.562	4.871	7.433			1.177	1.177	6.395	44.767	-139	-23.060
24	2019			2.562	4.871	7.433			1.030	1.030	6.395	38.372	8	-23.051
25	2020			2.562	4.871	7.433			883	883	6.395	31.977	155	-22.896
30	2025			2.562	4.871	7.433			147	147	6.395	0	891	-19.913
31	2026			2.562	4.871	7.433							7.433	-12.480
32	2027			2.562	4.871	7.433							7.433	-5.047
33	2028			2.562	4.871	7.433							7.433	2.386
40	2035			2.562	4.871	7.433							7.433	54.418
50	2045			2.562	4.871	7.433							7.433	128.749
		14.803	150.478	128.115	28.623	180.074	127.906		51.324	51.324	127.906		128.749	

Table I.27 Viability Study for HPC (Tax effect considered) Thang Long North

Pre-conditions 1 Expected Value-added 366.218 (1,000 US$)

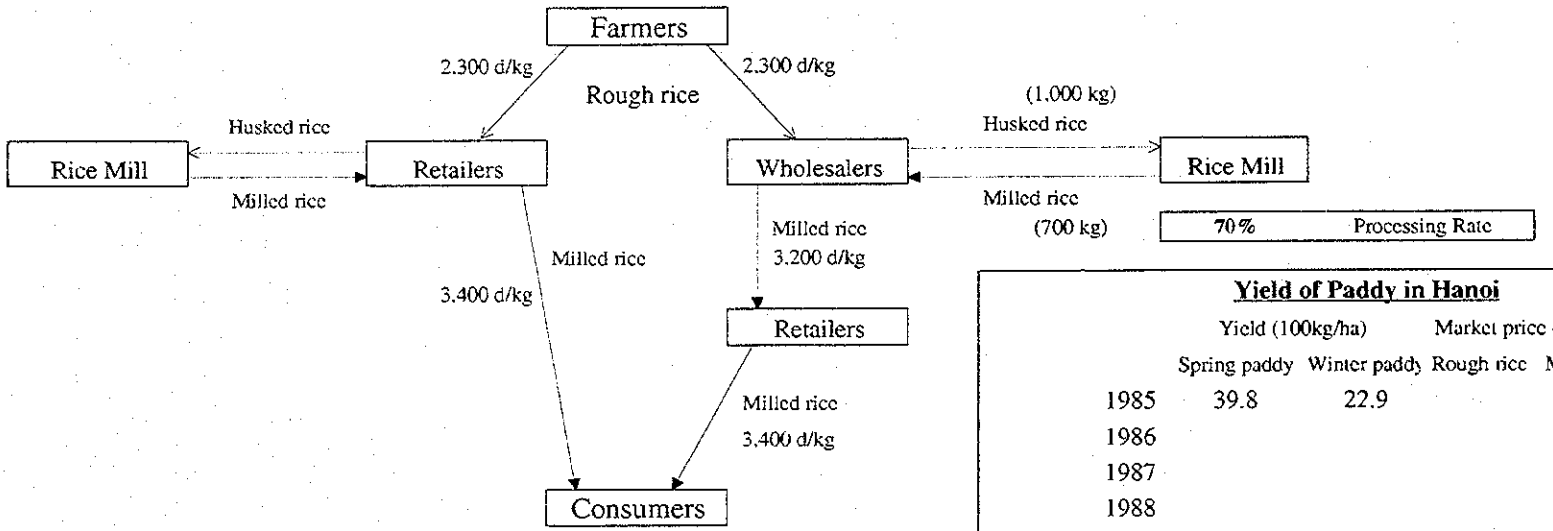
2 Tax Revenues : **10%** of value-added. **30%** of which is assumed to be allocated for the Fund.

1 Project
0 Tax

Fund's Budgetary Forecast

			Expected Value-added 366.218 (1,000 US$)			IRR= 14.5%	HPC's cash position	
			Tax Revenues 36.622 (1,000 US$)			Net cashflow with tax revenue	inclusive of debt services and tax revenue	
		Factory Net Working Rate	Expected Tax Revenue from I.E. Activities	Amount transferred from Tax Revenue to the Fund (C)	Accumulated (B)	(A)+(C)		Accumulated
0								
1	1996	0%	0	0	0	3.325	3.325	3.325
2	1997	0%	0	0	0	-18.345	-4.266	-942
3	1998	0%	0	0	0	-23.686	-5.447	-6.389
4	1999	10%	3.662	1.099	1.099	-3.465	-349	-6.738
5	2000	20%	7.324	2.197	3.296	-1.966	1.298	-5.440
6	2001	25%	9.155	2.747	6.043	319	3.748	-1.692
7	2002	30%	10.987	3.296	9.339	1.218	4.827	3.135
8	2003	40%	14.649	4.395	13.733	3.875	6.449	9.584
9	2004	50%	18.311	5.493	19.226	4.593	7.400	16.985
10	2005	70%	25.635	7.691	26.917	6.373	9.437	26.421
11	2006	80%	29.297	8.789	35.706	12.709	8.142	34.563
12	2007	90%	32.960	9.888	45.594	13.807	9.312	43.875
13	2008	95%	34.791	10.437	56.031	14.357	9.933	53.808
14	2009	95%	34.791	10.437	66.469	14.357	10.005	63.814
15	2010	95%	34.791	10.437	76.906	14.357	10.077	73.891
16	2011	95%	34.791	10.437	87.343	14.357	10.149	84.040
17	2012	95%	34.791	10.437	97.780	14.357	10.221	94.261
18	2013	95%	34.791	10.437	108.217	14.357	10.293	104.555
19	2014	95%	34.791	10.437	118.655	14.357	10.365	114.920
20	2015	95%	34.791	10.437	129.092	14.357	10.437	125.357
21	2016	95%	34.791	10.437	139.529	14.357	10.509	135.866
22	2017	95%	34.791	10.437	149.966	14.357	10.581	146.447
23	2018	95%	34.791	10.437	160.403	14.357	10.653	157.099
24	2019	95%	34.791	10.437	170.841	14.357	10.725	167.824
25	2020	95%	34.791	10.437	181.278	14.357	10.797	178.621
30	2025	95%	34.791	10.437	233.464	14.357	11.157	233.684
31	2026	95%	34.791	10.437	243.901	14.357	14.357	248.041
32	2027	95%	34.791	10.437	254.338	14.357	14.357	262.398
33	2028	95%	34.791	10.437	264.776	14.357	14.357	276.754
40	2035	95%	34.791	10.437	337.836	14.357	14.357	377.251
50	2045	95%	34.791	10.437	442.208	14.357	14.357	520.818
			1.474.027	442.208		544.311	520.818	

Table I.28 Rice Distribution System in Hanoi



Average price of ordinary rice in some localities			(Unit : dong/kg)
	Hanoi City	HCM city	Mekong River Delta
1988	750	550	400
1989			
1990	900	1,100	950
1991	2,050	2,000	2,240
1992	1,900	2,100	1,800
1993	1,800	2,000	1,800
1994	2,900	2,450	2,250

Yield of Paddy in Hanoi

	Yield (100kg/ha)		Market price (dong/kg)	
	Spring paddy	Winter paddy	Rough rice	Milled rice
1985	39.8	22.9		
1986				
1987				
1988				
1989	37.7	31.9		
1990	35.8	29.0		
1991	13.1	33.5		2,000-2,300
1992	33.7	29.1		1,750-2,500
1993				1,700-2,200
1994				2,150-3,100
1995*			2,300	3,300-3,700
1995.5.23-30			2,300	3,700
1995.5.30-6.6			2,300	3,700

(Source : Statistical Yearbook 1993 & Institute of Market and Prices)

300-336 US$/tonne

Table I.29 Productivity for Industrial Production

	Net Product/Employee (Million dongs) 1993	2000	2010	Expected Occupied Area(ha)	Nos. of Employment per ha	Nos. of Employment (Thang Long N. I/E) 1993	2000	2010	Total Net Product (Million dongs) 1993	2000	2010
				Lot occupancy ratio -->		0%	70%	100%			
1) Metal/Machine/Elec	11	26	200	38	150	0	3,990	5,700	0	103,740	1,140,000
2) Electronic	53	85	100	89	250	0	15,575	22,250	0	1,323,875	2,225,000
3) Textile/Garment	9	14	50	14	350	0	3,430	4,900	0	48,020	245,000
4) Chemical	20	31	100	26	100	0	1,820	2,600	0	56,420	260,000
5) Others	13	20	60	22	120	0	1,848	2,640	0	36,960	158,400
			102	189			26,663	38,090	0	1,569,015	4,028,400
					Average employee/ha	141		202		142,638	366,218 (1,000 US$)
										5,350	9,615 (US$/employee)
										755	1,938 (1,000 US$/ha)

Turn-over*	1,887	4,844 (1,000 US$/ha)

* Net product (Value-added) is assumed to be equal to 40% of Turn-over.

Foreign currency * to be obtained	566	1,453 (1,000 US$/ha)

* Foreign currency is assumed to be 30% of the turn-over.

Table I.30 Capital Investment/Production for Agricultural Production

Capital Investment

Capital Investment (50% of Japanese standards)

	Machine Equipment (1,000 $/ha) (Japan)	(Vietnam, 50% of Japan)	Area (ha)	Capital Investment for Total Area (1,000$)	
1) Metal/Machine/Electric	4,500	**2,250**	38	**85,500**	
2) Electronic	4,300	**2,150**	89	**191,350**	
3) Textile/Garment	3,500	**1,750**	14	**24,500**	
4) Chemical	4,400	**2,200**	26	**57,200**	
5) Others	1,500	**750**	22	**16,500**	
Total				375,050	10

Machine equipment rate/employee
(375,050/40,000)

Productivity for Agricultural production

Agricultural production

10 ton/ha/year

2,300 Dong/kg for paddy

2,091 US$/ha

585,455 US$/year for 280 ha

Table I.31 Economic Analysis

EIRR Calculation

Net Product is estimated at a growth of 3% after 2010 up to 2015 and 0 % onwards.

Investment = Investment capital + Working capital (20%) of the investment capital

(1,000 US$)

		I/E Infrastructure Development		Enterprise Activities			Balance	
		Investment (1)	Minus Agri. Production (2)	Investment (3)	Net Product (4)	(4)/ Total (3)	(4) - (1) - (2) - (3)	
	1995							
1	1996	3,291	585				-3,876	
2	1997	30,725	585				-31,310	
3	1998	34,668	585	90,012			-125,265	
4	1999	9,033	585	90,012			-99,630	
5	2000	9,110	585	90,012	142,638		42,930	
6	2001	3,805	585	90,012	164,996		70,593	
7	2002	3,836	585	90,012	187,354		92,920	
8	2003	3,051	585		209,712		206,075	
9	2004	2,586	585		232,070		228,898	
10	2005	2,624	585		254,428		251,219	
11	2006		585		276,786		276,201	
12	2007		585		299,144		298,559	
13	2008		585		321,502		320,917	
14	2009		585		343,860		343,275	
15	2010		585		366,218	81%	365,633	37.6%
16	2011		585		377,205		376,619	
17	2012		585		388,521		387,935	
18	2013		585		400,176		399,591	
19	2014		585		412,182		411,596	
20	2015		585		424,547	94%	423,962	39.1%
21	2016		585		424,547		423,962	
50	2045		585		424,547		423,962	39.4%
		102,729	29,273	450,060	17,537,756		16,955,694	

Employment			Production		Production value	
Agriculture	10	persons/ha	10	ton/ha/10 persons	209	US$/person/year
Factory	200	persons/ha	102	mil. dongs/person (in 2010)	9,273	US$/person/year (in 2010)