

## **APPENDIX-D**

### **CONSTRAINTS COMMON TO EXISTING INDUSTRIES**

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## **APPENDIX-D**

### **CONSTRAINTS COMMON TO EXISTING INDUSTRIES**

#### **D.1 Common Constraints**

Through factory visits and interviews with the management of enterprises in the Hanoi area, a number of constraints common to the existing industries have been identified. Issues common to these enterprises are discussed in this Appendix.

##### **1) Changes in Market and Their Influence**

The recent government policy for industrial development puts more importance on the production of consumer goods than industrial goods. The expansion of consumer goods production will inevitably require more production facilities. However, Vietnamese production goods manufacturers have not yet adjusted themselves to the changes. Some notable facts are cited below.

##### **(a) Change in production goods**

After the domestic markets open to foreign products, new types of consumer goods have been introduced to Vietnam. Materials and production procedures for new consumer goods require new type of industrial goods.

##### **(b) Technical lag**

Most modern production equipment is operated by automatic control, however, development of automation lags considerably.

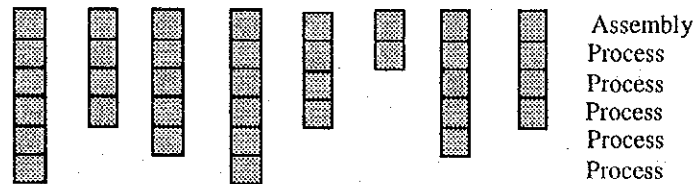
##### **(c) Facilities and Workers**

Demand for products has changed, but facilities and training of workers have not changed yet to meet the requirements. Consequently, many facilities become useless.

In order to accelerate industrial activities under the market-oriented economy, each factory should adopt new products to cope with market changes, re-educate engineers for automation, re-arrange and renovate facilities and train workers to meet production requirements.

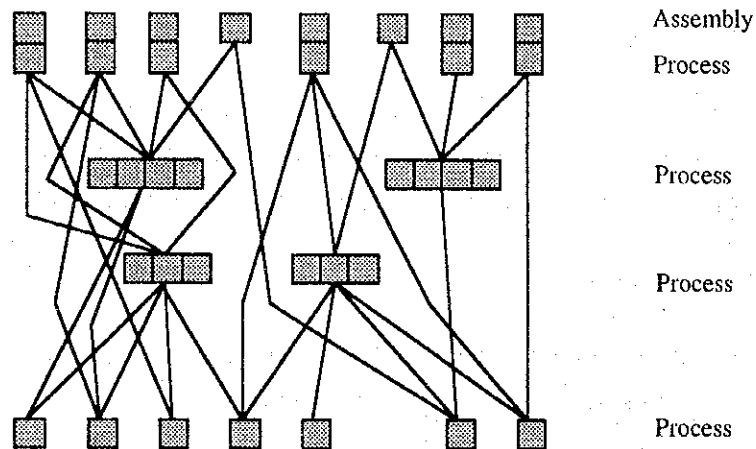
## 2) Divided Work System

The Vietnamese production system depends very little on subcontracting; each factory carries out whole processes independently as shown below.



Existing System

This is partly attributable to long years of war when factories could not receive parts or services from other factories. In industrialized countries, works are divided into specialized enterprises as illustrated below.



Divided Work System

The Vietnamese system causes considerable inconvenience in the development of industry.

### (a) Inefficiency

Every enterprise has all necessary workshops for production inside its own enterprise. Because of the small production scale, the individual workshops are small and inefficient. A typical workshop is a foundry, which produces too

small a quantity to support itself, therefore it is not well equipped and its operation becomes intermittent.

(b) Inadequacy in control and technology

Each enterprise has a principal work, and most attention is paid by management to such work. In minor workshops, no qualified engineers are in charge, and production control and technological development are disregarded.

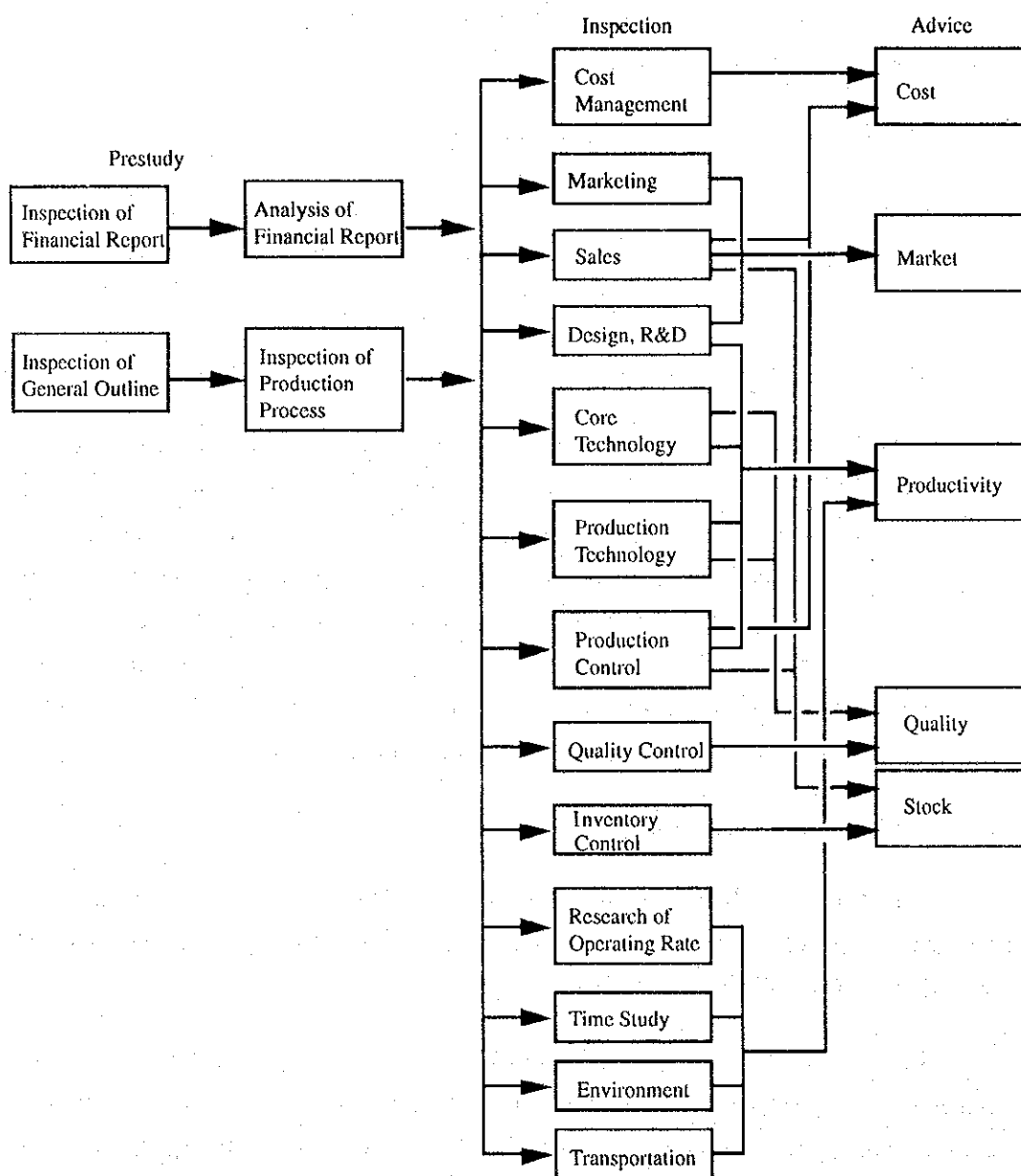
(c) Unavailability of other enterprises' facilities

It is difficult to use a workshop owned by another enterprise in general. It would be easy, if the main business of such an enterprise were to subcontract specialized work from other enterprises. In this case, any enterprise can order a service or production from the specialized workshop of the subcontractor, by giving drawings and specifications. It is of great significance to create private subcontractors for processes such as casting, machining, plating, etc. If they are created, venture businesses can also be initiated by starting with a small assembly and test shop without expensive production facilities.

3) Restructuring of Enterprises

Industries have difficulties with (i) small market demand, (ii) excess facilities, (iii) excess employment, and (iv) lack of new technologies. However, the industry has not yet initiated any adequate countermeasures.

In order to conquer these difficulties, each enterprise should be inspected to determine the possibility of renovation and restructuring. All aspects, including facilities, management, production control, production technology and quality control should be checked in accordance with the procedures shown in the following diagram.



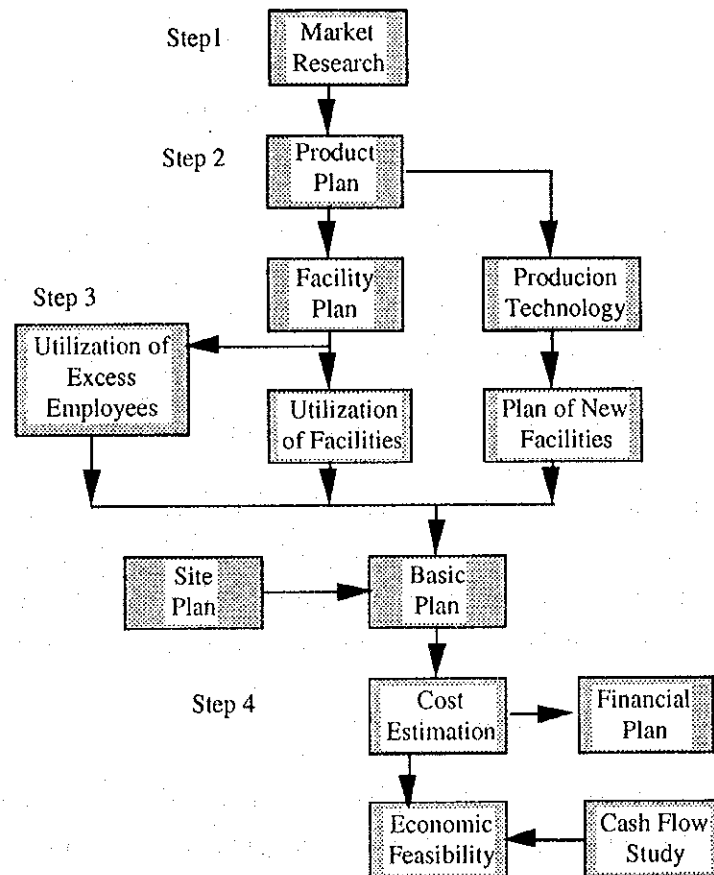
Procedure of Inspection and Advice

Guidance and advice by an experienced consultant will make the inspection more effective.

As shown in the figure on the next page, renovation and restructuring of the enterprise shall be carried out in the following steps:

- Step 1. Research the market and decide the adequate product mix and quantity of products.
- Step 2. Decide the facilities and number of employees adequate for the production.

- Step 3. Study ways to utilize excess employees and facilities.  
 Step 4. Introduce new facilities for new products.



#### Factory Renovation Planning

#### 4) Liquidation of Enterprises

A considerable number of state enterprises have faced danger of liquidation. Total liquidation of any state enterprise may cause a large problem in the local area. This may be alleviated when a part of the enterprise is saved by separation of the unfeasible part of the enterprise. For example, the Japanese National Railway has been privatized by separating it into two portions: i.e. feasible new companies and an unfeasible company to be liquidated.

The Vietnamese Government is enacting a Bankruptcy Law. Attention should be paid to the fact that bankruptcy of an enterprise may propagate bankruptcy of other enterprises which are owed money by the bankrupted enterprise. The Government should investigate the debt-credit relation among enterprises and prepare a necessary measure to prevent propagation of bankruptcy.



5) Introduction of New Technologies

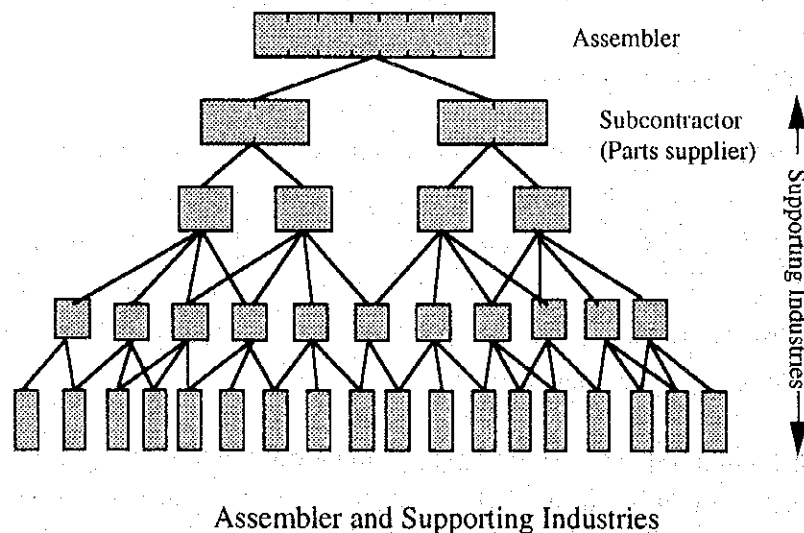
There is a strong desire to introduce new products and/or new technologies to industries in Hanoi, in order to increase job opportunities and production.

For introduction of new technology and/or new products, the following possibilities should be studied:

- (a) Establishing new companies as joint ventures with foreign enterprises.
- (b) Establishing new Vietnamese venture companies by introducing foreign technology and loans through state-owned commercial banks (SOCBs).
- (c) Transferring the excess facilities and workers to establish new companies.
- (d) Establishing small specialized companies using excess workers and excess facilities and extending concessions to them. (These new specialized companies will function as part of the divided work of the industry or will be cores of companies to create new products.)

6) Assembly Industry and Subcontractors

As is usual in the automobile industry and home-electronics industry in the world, an assembler and its subcontractors form a pyramid of enterprises as shown in the figure below.



In this system, an assembler has several parts suppliers, and each parts supplier also has several subcontractors. There are also subcontractors of subcontractors.

These chains of subcontractors form a network under an assembler. Under the modern divided work system, assemblers, parts manufacturers and specialized subcontractors cooperate well with each other.

The Vietnamese automobile industry and home electronics industry depend for their parts supplies on foreign manufacturers; the CKD (Complete Knock Down) system is commonly adopted. Vietnam needs more assemblers in such areas as electronics, motorcycles, and automobiles. At the same time, Vietnam should provide supporting industries for these assemblers, however no subcontractors are operating in the Hanoi area. In this context, many small workshops in the Hanoi area can potentially be expanded into supporting industries. Several small specialized workshops should be combined to form a supporting industry. It is therefore recommended that the Government should encourage supporting industries, by taking measures to strengthen small private ventures.

#### 7) Reform Toward a Market-oriented Economy

Since the reformation toward a market-oriented economy has started, many state enterprises in the Hanoi area have been forced to reduce employment. In order to develop the market-oriented economy, enterprises which meet market demand should create more jobs and reduce excess employment in the old industries. However, no enterprise has yet created enough jobs for this transfer of employment to take place.

A difference in average wages has been noted between the profit making and loss making enterprises. The difference in wages is primarily caused by difference in profitability of each enterprise. Profit permits capital accumulation, so that the enterprise can absorb more workers than if profit were used for the benefit of existing employees.

It is recommended to increase jobs in industries. Management of existing enterprises should direct his enterprise to the job increasing policy.

#### 8) Environmental Pollution and Preventive Facilities

Industries are not so large in scale in the Hanoi area as to cause insoluble problems of industrial pollution, although many factories are not in conformity with governmental regulations on environmental protection. However, industries will grow; then the total volume of pollutants may exceed danger limits, if no countermeasures are taken by the industries.

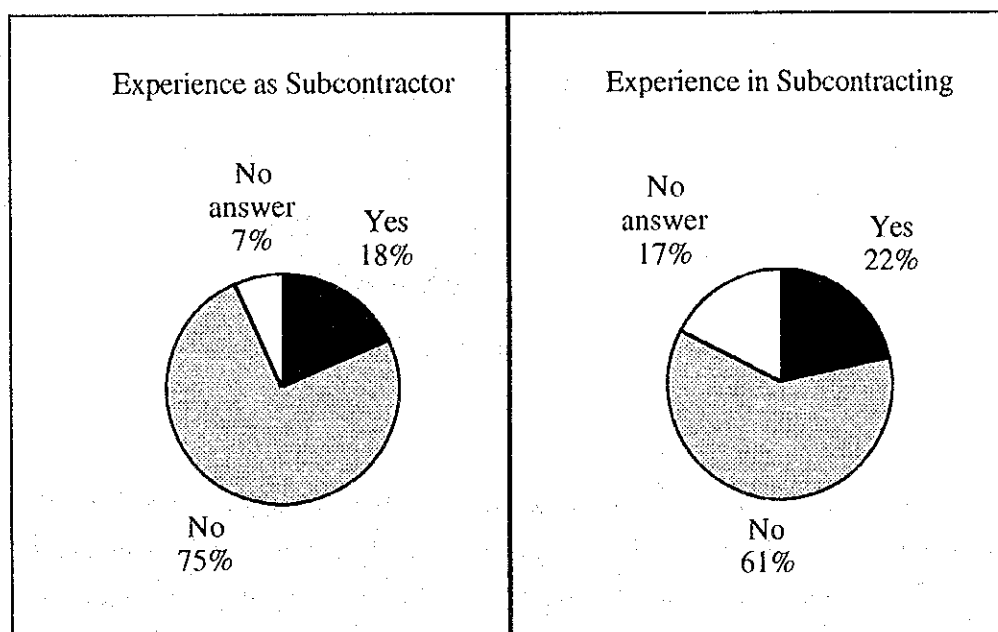
At present, each enterprise is too small to bear the environmental hazard prevention cost. It is therefore recommended that industries be divided by process and merged into enterprises large enough to bear the environmental cost by themselves. Re-organization of enterprises is required from the viewpoint of environment protection, as well.

## D.2 Divided Work System

### 1) Reorganization of Enterprises

Hanoi's enterprises should be re-organized in order to meet the demand of a market oriented economy; especially, enterprises in the machine and textile industries need to be re-organized.

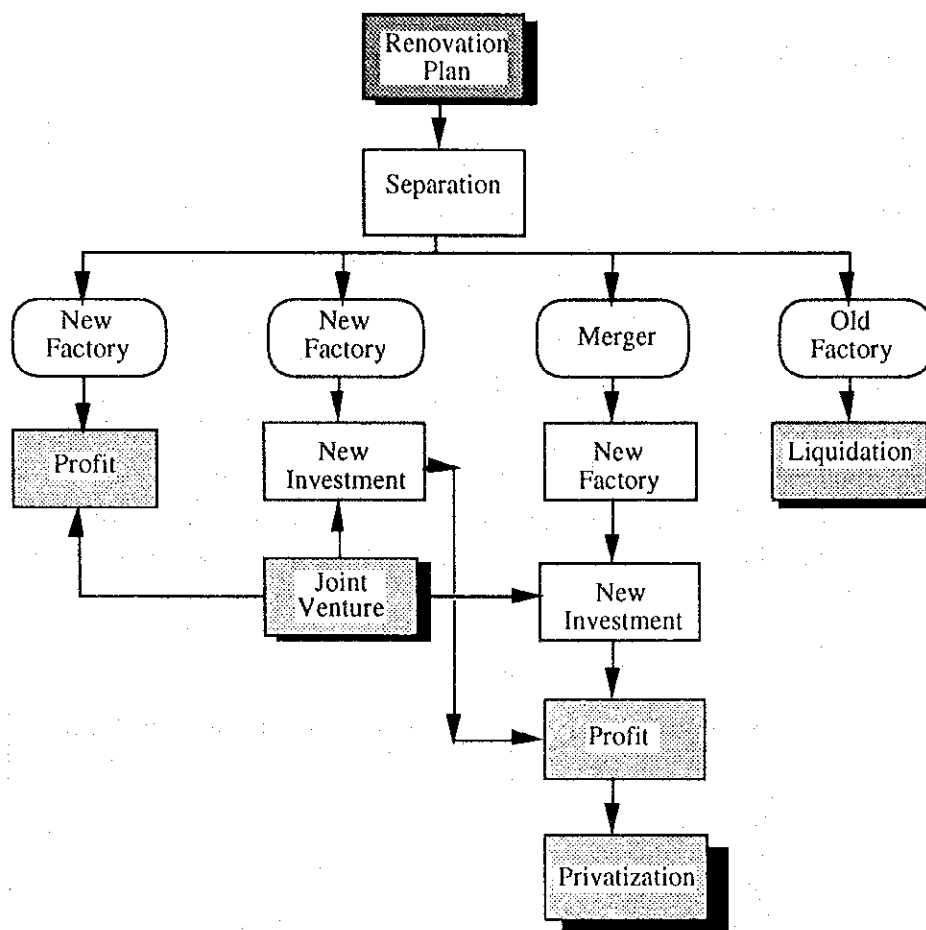
In other countries, the machine industry is totally dependent on a subcontract system; 100 percent of enterprises have both experiences as subcontractors and in subcontracting; however, answers to a questionnaire survey conducted by the Study Team show that only about 20% of machine enterprises have experience as subcontractors and/or in subcontracting in the Hanoi area, as shown below.



Experience as Subcontractors and in Subcontracting (Machine Industry)

As pointed out in the previous section, this situation is quite disadvantageous to Hanoi's industry. It should be re-organized into a divided work system.

The enterprises should be separated for specialization at the first step, then specialized enterprises should be merged into companies of adequate scale, as illustrated in the following diagram:



### Reorganization of Industries

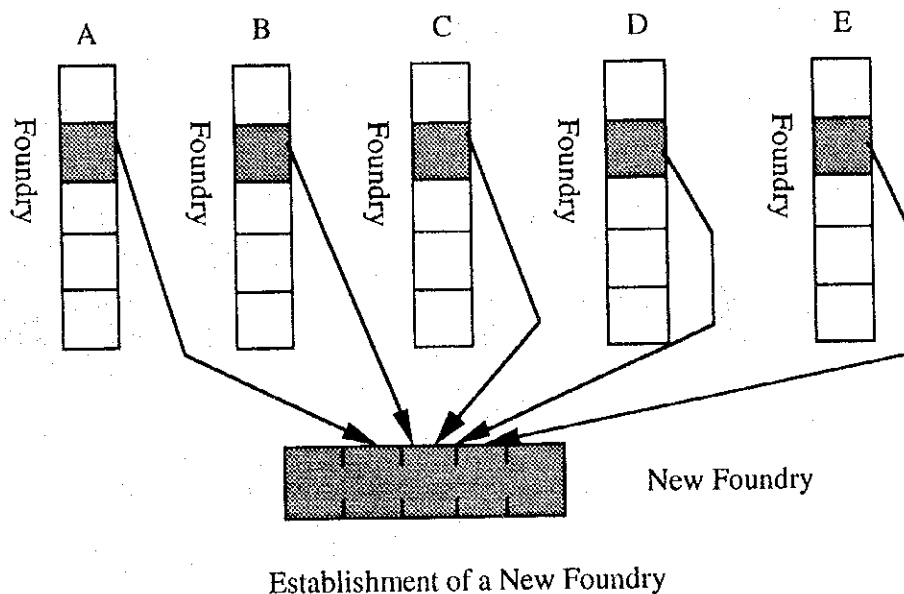
Each enterprises should also separate the profitable part of the work from the loss-making part and build new factories which will effectively expand the Vietnamese economy. The loss-making part of the work should change its products or should join the new business as a subcontractor under the newly organized divided work system.

#### 2) Separation and Merger (a proposal for reform of foundries)

The lack of a divided work system causes considerable disadvantages to the industries in Hanoi, as mentioned in section B.1(2). A typical example is foundries. Nearly a dozen machine and electric industries have foundries in the Hanoi area. Each foundry has one or two small cupola(s) and a workshop that occupy a rather wide area. Almost every factory also have a small electric arc furnace for steel casting. However, these facilities are used only intermittently, so that the operation rate is quite low. The technical levels of these foundries vary; some foundries are good, but others are

inferior. Facilities are generally old; technical differences are caused by management. There is also a new foundry which has not been used because of a product change.

Each enterprise should separate its foundry division and concentrate jobs of these divisions into one or two foundries as shown below. The new foundries should receive workers as well as jobs from the mother enterprises. These enterprises should then combine to form a new specialized foundry of which they are stockholders, so that the new foundries are in effect privatized.

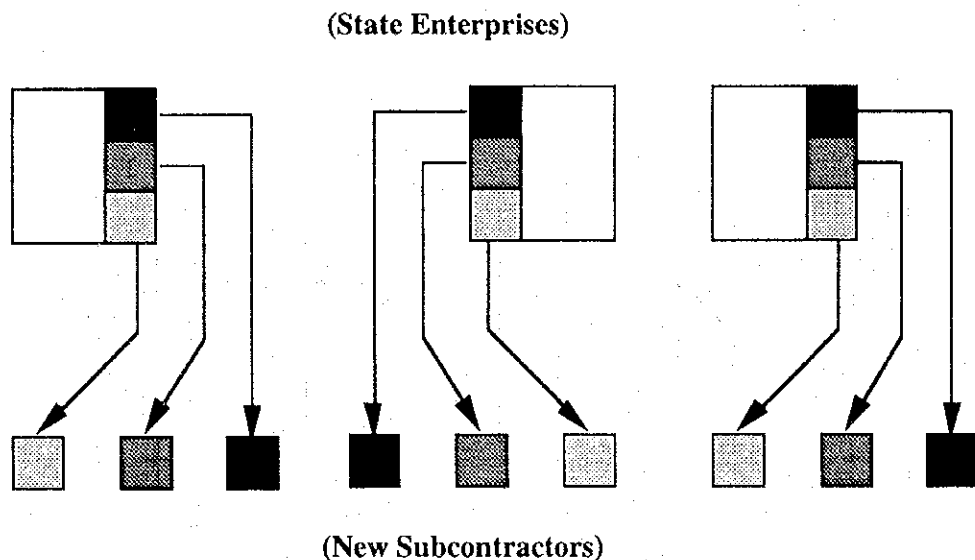


### 3) Sale of Unnecessary Equipment (Creation of Subcontractors)

Most of the machine industry operates only 20 percent of existing equipment; 80 percent of equipment, mostly machine tools, is abandoned without repair or maintenance. These unoperated machines occupy spaces in the factories and considerably disturb work. The managers may not remove equipment because it is state property. However, it is necessary to remove it from the factory in order to increase production efficiency. A desirable way to utilize these unoperated machines is to sell them to private individuals who have the intention to be subcontractors.

Many enterprises need to reduce employees. Early retirement is recommended. In this case, a worker or a group of workers who accept retirement from the enterprise shall be entitled to buy machines unoperated by the enterprise. Then, he or they can establish a new factory that specializes in subcontracting using the machines.

Electronic and motorcycle assemblers need many subcontractors for stamping work, so that mechanical presses are very useful for subcontractors, then large enterprises shall replace mechanical presses by hydraulic presses and sell the mechanical presses to new subcontractors. In addition to mechanical presses, small lathes, grinders, drills, etc., are useful for subcontractors. The figure below illustrates this process.



Establishment of Subcontractors by Sale of Unoperated Machines

### D.3 Enterprise Management

#### 1) Productivity

The net product per employee indicates the labor productivity of an enterprise or an industry. The following formula defines net product:

$$\text{Net product} = \text{Production} - \text{Material}$$

Where production means value of sales of produced items, excluding profit from commercial acts such as resale. Material includes not only the main material but also any subcontract fees and supplemental materials. For the practical purpose of estimating net production from answers to the questionnaire survey conducted by the Study Team, the value is calculated by the following formula:

$$\text{Net product} = \text{Sales} - \text{Material}$$

$$\text{Where: Material} = \text{Cost} \times \text{Material \%}$$

$$\text{Cost} = \text{Sales} - \text{Profit}$$

The results of the calculation are as follows:

(Unit: million dongs)

<u>Category</u>	<u>Net Product per Employee</u>	
	<u>Hanoi's Industry</u>	<u>Reference</u>
Textile	10	1,444
Garment	7	460
Chemical	20	1,572
Electric	18	746
Electronic	53	827
Metal/Machine	9	1,859

In this list, each category of industry is defined by the ISIC (International Standard Industrial Classification of all Economic Activities), as follows:

<u>Category</u>	<u>ISIC Number</u>
Textile	3211, 3213, 3214
Garment	322
Chemical	35
Electric	3831, 3833, 3839
Electronic	3825, 3851, 3832
Metal/Machine	37, 381, 3821, 3822, 3823, 3824, 3829, 384, 3852 and 3853



The values shown under "Reference" are the figures for small and medium scale Japanese enterprises based on government statistics in 1993.

The productivity of Hanoi's industries is extremely low if compared with the reference data. The difference is not explicable by simple difference of a worker's skillfulness nor facilities.

## 2) Profit

The profit before tax per sales of the industries is averaged as follows :

Category	Profit per Sales (%) Hanoi's Industries	Reference (%)
Metal/Machine	5	5
Electric	5	5
Electronic	6	4
Chemical	6	6
Textile	4	8
Garment	3	3
Others	7	NA
Average	6	NA

"Reference" in the above list shows the equivalent values of Japanese small and medium scale enterprises. The value of Hanoi's industries includes turnover tax as a part of profit before tax, so that profits per sales show a slightly higher value than actual values. Profit per sales comparable to "Reference" proves adequate competition among the enterprises in the market.

Profit per sales should be evaluated together with the capital rotation ratio, because capital investment should be evaluated as profit per capital as follows:

Profit	Profit	Sales
Capital	Sales	Capital

$$\text{Profit per Capital} = \text{Profit per Sales} \times \text{Capital Rotation}$$

No balance sheet data are provided; therefore, capital rotation has not been calculated.

### 3) Marketing

One of the major reasons for low productivity is poor marketing. Among industries, electronics has the highest net product per employee. The reason is clear: the industry has a good market for television sets.

Net product per employee of the metal/machine industry is 9 million dongs in the Hanoi area. In the industrialized countries, this category of industry has the highest net product per employee, such as equivalent to 1,859 million dongs in Japan. The metal/machine industry has the highest potential productivity. Marketing effort is especially needed in this area.

Marketing has the following two goals: (i) to plan for adequate production, and (ii) to expand sales and profits. Marketing should attempt to determine the scale of the market for each enterprise's products, namely its market share, actual sales area, number of customers, etc. In other countries, statistical data prepared by the central and local governments are useful for this stage of market research, however these data are poor in Vietnam. The Government should collect more statistical data and publish it in a form available to everybody.

For marketing, each enterprise should evaluate its own potential such as production capacity and competitiveness. Then, it can evaluate its expected market share and decide its strategy for competing with other companies. Based on the evaluation, the enterprise can choose an adequate production plan, so that inefficiencies such as overproduction, excess facilities and excess workers are avoided.

In order to expand sales, new products should be planned for. The market for a new product is not easy to assume. Consequently, a more detailed market survey is required. A questionnaire survey, trial sale survey, project team study, etc. are normally carried out. A feasibility study should be carried out on the basis of the market survey, if expansion or creation of a new factory is necessary.

In the Hanoi area, the improvement of facilities is a real necessity for development, therefore the market study and the feasibility study should be presented to potential investors in order to encourage investments. Foreign investors have difficulties in evaluating the Vietnamese market by themselves, and accordingly they feel a high risk in investing their capital. As a result, investment is made only in the case of high profit.

The establishment of good marketing conditions is really important for the promotion of direct foreign investment. In Vietnam, each enterprise should introduce a

more scientific marketing technique in parallel to the introduction of an advanced system of industrial statistics by the Government.

#### 4) Cost and Quality

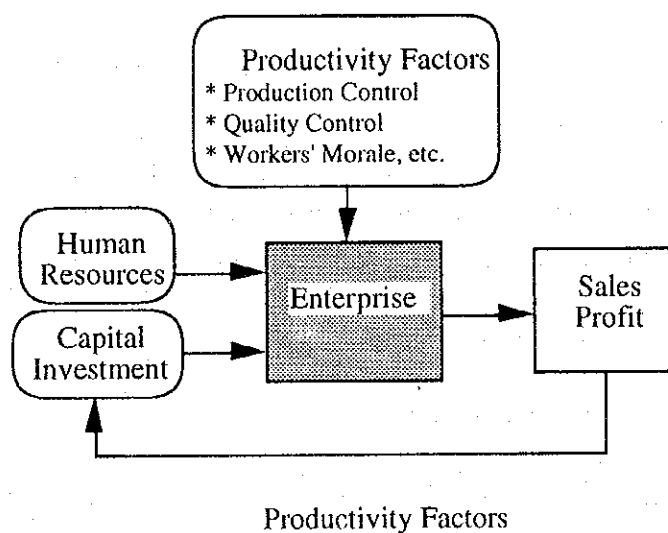
Many managers give the Vietnamese preference for low price as an excuse for producing low cost but low quality things. There is some truth to this, but Vietnamese consumers also prefer higher quality. For example, the bicycle industry manufactured cheap but low quality bicycles, then ran into difficulty with competition from imported and smuggled bicycles. Another example is motorcycles; Vietnamese prefer a brand which is rather expensive but of good quality. The managers should consider producing products that will give customers their money's worth.

Cost and quality do have a relationship, however high cost does not always mean high quality. Consequently a value analysis (VA) is necessary to evaluate how to effectively allocate expenditure on quality, in order to avoid products of unreasonably high cost to the customer.

#### D.4 Production / Quality Control

##### 1) Productivity

The productivity of an enterprise depends basically on two factors: capital investment and human resources. However, productivity is not explicable by these two factors only, because even given the same level of capital investment and human resources, productivity differs among enterprises. Productivity factors such as production control, quality control, workers' morale, etc. have strong influence on productivity, as illustrated in the figure below.



Vietnam has few resources for new capital investments, so Vietnamese managers should make the best effort to improve productivity for efficient utilization of capital.

##### 2) Good Factory Upkeep - The 5S Initiative

Most of the factories in the Hanoi area lack good upkeep. Their machines are not well maintained, their workshops are dirty with scraps and their working environment is far from comfortable. It is highly recommended to learn from the Japanese 5S Initiative in order to establish good factory upkeep.

The 5S Initiative has been used by Japanese factories since the 1960s. The aim of the initiative is basically to keep workshops clean and orderly. The name "5S" is taken from five Japanese words which start with S, namely:

*Seiri*  
*Seiton*  
*Seiso*  
*Seiketsu*  
*Shitsuke*

Generally "*seiri-seiton*" is a word which means to put things in order, however, the word is divided into the two words "*seiri*" and "*seiton*". "*Seiri*" means to separate necessary things from unnecessary things, and "*seiton*" has the meaning of arranging the necessary things in order. "*Seiso*" means cleaning, "*Seiketsu*" means a clean condition and "*Shitsuke*" means worker discipline.

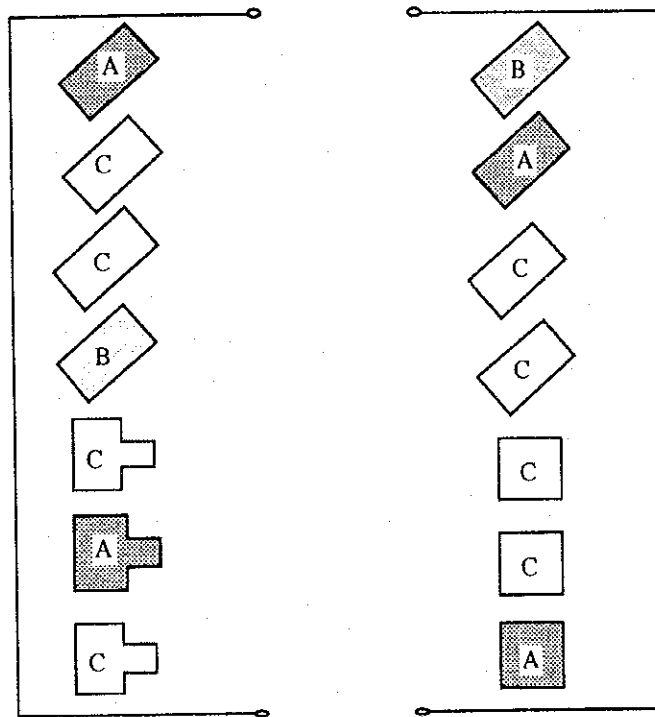
An example of the 5S Initiative applicable in the Hanoi area is explained below.

*Seiri*

The manager of the factory should appoint a leader in charge of the 5S Initiative who is responsible for classifying the machines into three categories, namely;

- Class A: High-use machinery
- Class B: Low-use machinery
- Class C: Redundant machinery

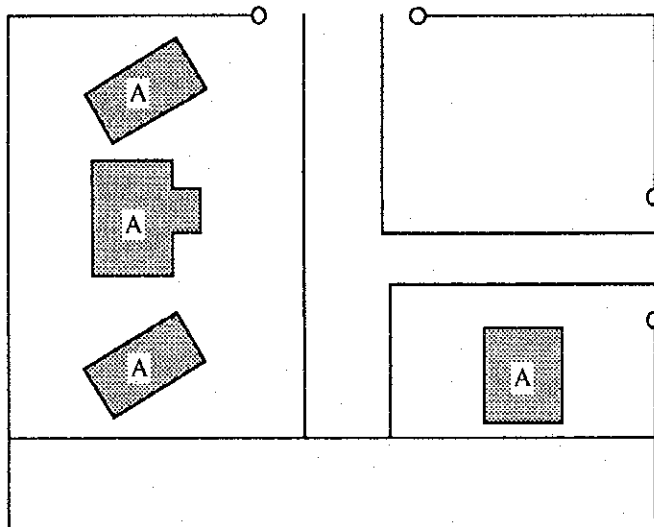
An example is shown in the diagram illustrated below. Among 14 machines in the workshop, 4 machines classified "A" are used daily, 2 machines classified "B" are used once a week, and 8 machines indicated as "C" have not been used for one year. In this example, the classification of machines is not difficult, however if a more accurate category definition is necessary, the operating rate should be evaluated by the working sample method.



A signal label method is recommended. In this method, the leader attaches labels to the machines. On high-use class A machines, a green label is attached, on low-use class B machines, a yellow label, and on redundant class C machines, a red label. If the manager or the foreman has any objection to the leader's decision, they can discuss it with him. Here, the example shows the categorization of machines, however the same method can be applied to materials, intermediate products, jigs, and tools in a workshop.

### Seiton

Red labeled machines should be removed from the workshop and kept in a store house, to be utilized by other workshops or sold out. Yellow labeled machines should be moved to the place designated for low-use machines. Green labeled machines should be re-arranged in order. As shown in the diagram below, the area of the workshop will be reduced. When the workshop area is reduced, it makes it easy to improve lighting and floor paving, etc.



### Seiso

Every operator is requested to keep his machine and the allocated area clean. Solid waste including cut chips should be removed from the machine and dumped in a solid waste collection can. Solid waste should be collected every day by a collector and deposited at a suitable place. Metal and other waste should be separated from each other, and the metal should be further sorted by type for recycling.

After *seiri* and *seiton*, *seiso*: cleaning will be easier, because the number of machines and areas to be cleaned are limited to those of high use.

### Seiketsu

As mentioned before, the operating area of the factory should be paved and lighting should be improved. Also, adequate ventilation should be provided and in precision workshops, air conditioning should be provided. Oil leakage from machines should be well checked and prevented by maintenance. In the high-use area, these improvements will be cost effective. Workers should wear clean and comfortable working clothes.

After these improvements have been implemented, the workshop will be safe and comfortable for every worker. Consequently, more efficient work will be assured.

### Shitsuke

Every worker is requested to keep his working place clean and tidy. The manager instructs the workers according to an enterprise-wide rule on how to keep the

factory clean and safe. Every worker should obey the rule and make his best effort to keep his working place clean and safe.

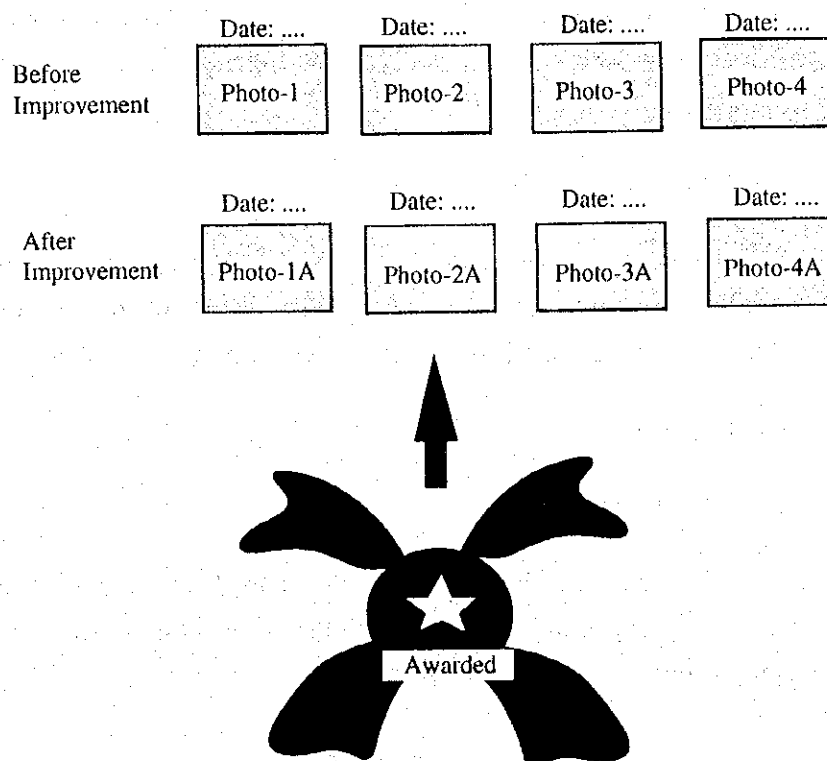
The 5S goal will be achieved by friendly collaboration between workers, because the initiative is basically for their benefit.

#### Photo-shot inspection

One leader of the 5S Initiative is appointed at each workshop. The 5S initiative leaders periodically inspect every workshop in the factory, and point out for each other any disorder or dirty place which needs attention. The leaders are provided with a camera, and they take photos of any disorder or dirty place they find.

The photos are exhibited on a board located at a place visible to all workers. After a week or so, the leaders take another photo which shows some improvement. When remarkable improvement is achieved, the manager awards a prize to the workers who contributed to the improvement.

The second photo is then exhibited under the previous photo with a red ribbon indicating the award recipient, as shown below.





### Utilization of excess machines and workers

*Seiri* and *Seiton* will identify any excess machinery and excess workers. Thus, if the manager does not clearly take an initiative in utilizing excess workmen to other tasks, collaboration of the workers with the Initiative will be difficult.

Excess workers should be utilized effectively. The suggested measures are:

(i) Salesmen

Existing enterprise has almost no marketing and sales functions, so that employees who have aptitude as salesmen should be adopted by the sales department.

(ii) Servicemen

An enterprise should make service centers for the repair and maintenance of its product after it has been sold to the customer. These centers will need servicemen.

(iii) Creation of new products

New products should be created by utilizing excess machinery. If some machines are lacking for the new project, the manager can obtain them from other enterprises' excess. Excess workers should also be absorbed in the new production line.

(iv) Creation of subcontractors

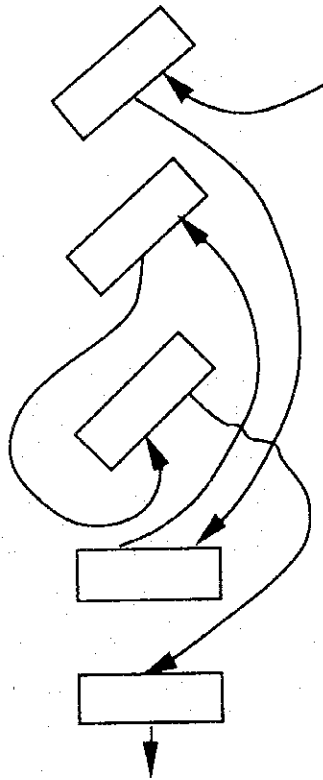
When a worker or a group of workers accept retirement, they should be entitled to receive some excess machines to establish their own new enterprise. These enterprises can then be accepted as subcontractors.

3) Production Control

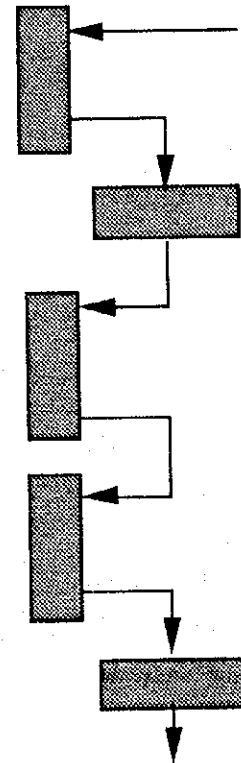
(a) Arrangement of machines

Vietnamese production facilities are poorly arranged in general. Production lines and flow are not arranged in accordance with the production procedure shown in (a) of the diagram below.

**Specialized Work Line  
(a)**



**Modern Production Line  
(b)**



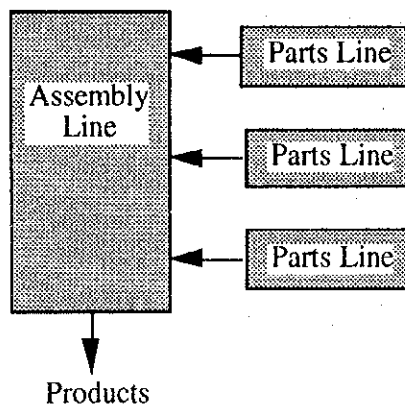
**Production Line Concept**

This may be due to a lack of production planning. The production line should be arranged in accordance with the production procedure of the product as shown in (b) of the diagram.

As pointed out before, many machines which are either unnecessary or rarely used for production remain in the factories at present. These machines are not properly maintained in general, and obstruct production flow. These machines should be removed from the factory, and the processes which need to use these machines should be subcontracted.

**(b) Arrangement of workshops**

Vietnamese factories are organized as a congregation of specialized workshops, but not in accordance with production flow. A modern workshop has a tendency to be arranged in such a manner as illustrated below.



Concept of a Modern Workshop Arrangement

Small workshops scattered in a wide yard is rather common to the factories in Hanoi. This system has an advantage of developing specialized technique in each workshop; however, it has large disadvantages of transportation and responsibility for the completed product, because workers do not see the consequences of quality they have produced. Workshops should also be rearranged in accordance with production procedure, and factory management should establish clear responsibility for the product.

(c) Production scheduling

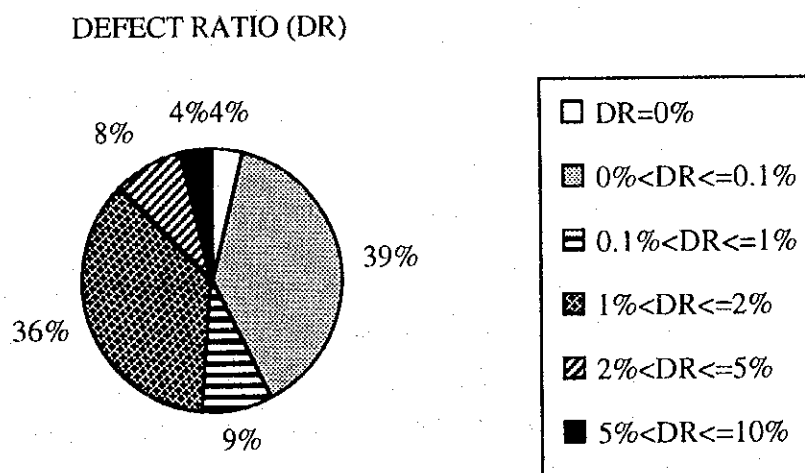
In order to improve utilization of the machines and workmen, production scheduling is most important. Production should be planned on three levels, namely for the long term, middle term and short term. The long-term plan assumes a production potential of 3 ~ 5 years based on market research. This plan is used for modification of the factory in accordance with future market demand. The middle-term plan is prepared for 1 ~ 6 month intervals based on the loading schedule of principal facilities or man-hours. It is used for a sales plan. The short-term plan is made using a Gantt chart, which shows the schedule of each machine's operation and each employee's work. Based on the result of the scheduling, machine operators and assembly workers are instructed. Adherence to the plan at every level must be carried out. For a long-term large scale project, PERT is used for scheduling. In this method, a computer is commonly used and the schedule is shown by an arrow diagram.

In Vietnam at present, factories have large numbers of excess machines and workmen, consequently managers may not feel any need for production scheduling. As pointed out in Section 2) above (5S Initiative), this situation should be improved. After this improvement has been made, production scheduling will be more effective and important.

#### 4) Quality Control

##### (a) Quality level of products

The current quality level of Vietnamese products is not acceptable by international standards. Answers to the questionnaire survey conducted by the Study Team show that the defect ratio during production is high. The figure below indicates the ratio of defects in the machine industry weighted by production cost.

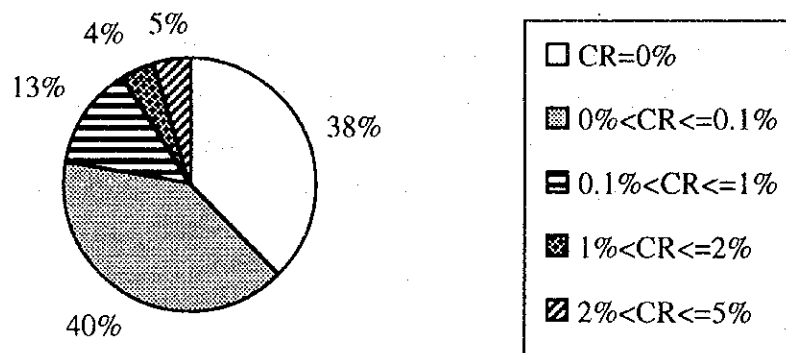


##### Defect Ratio During a Process in the Machine Industry

The result of the survey and analysis indicates that about 50 percent of production has more than 1.0 percent defect. Some enterprises answered that the defect ratio is zero; however, this is impossible. Such answers indicate indifference by the managers who answered the questionnaire.

Answers to the questionnaire on complaints from the customers of the machine industry are summarized below.

### CUSTOMER'S COMPLAINTS RATIO (CR)



#### Customer's Complaints Ratio in the Machine Industry

In this case, the complaints rate is weighted by sales amount. Here also 38% answered zero, which appears unreasonable. Customers' complaints ratios are lower than defect ratios; however, these two ratios show normally similar values. Therefore, this result may show that many enterprises do not respond to customers' complaints.

Fault finding and responding to customers' complaints are important for achieving better quality, because they provide suggestions for important improvement in many cases. 1% of defects is far from the acceptable level for international companies, because it means that one of every hundred products requires action by the company to be taken abroad. A very low level such as one per million orders may be requested in most cases.

#### (b) Statistical sampling inspection

An important factor for a successful divided work system is inspection at both the subcontractor and the main contractor. Mass produced intermediate products must be inspected by sampling. If many samples are taken, the inspection will require more inspectors and time, consequently the sampling inspection becomes expensive. However, if few samples are taken, the inspection will be rough and may cause errors.

In order to avoid any conflict between a supplier and a customer, a statistical inspection method should be introduced. The Operation Curve (OC) has already been invented for this purpose. The OC clearly shows the supplier's risk and the customer's risk with sampling inspection. Various other procedures for sampling inspection are also already standardized in the industrialized countries. It is suggested that Vietnamese industries will study them.

(c) Control chart

Stable production is important to secure a good reputation for quality. A powerful method to keep the production process stable is a control chart.

The method uses data collected from inspection. The  $\bar{x}$  - R chart is a common example.  $\bar{x}$  is calculated as an average value of several continuous inspection measurements and R is calculated by the difference between the maximum and minimum values among these measurements. Both  $\bar{x}$  and R should be recorded continuously on the chart. Abnormalities can be checked by the upper and lower critical limits for  $\bar{x}$  and R, respectively. These critical limits are decided as  $3\sigma$  (sigma = standard deviation) equivalent, based on mathematical theory, and shown on the chart. The number of defects (pn), defect rate (p), defect per unit (c) and defect per piece (u) are also controlled by a respective control chart.

Procedures for preparing these control charts are standardized in the industrialized countries. Adoption of a control chart does not require any difficult mathematical study by workers nor a superintendent to prepare it, but it gives him a useful tool to identify any abnormalities in the process.

The machine industry adopts  $\bar{x}$  - R, pn and p charts normally. The textile / garment industry and the chemical industry adopt c and u charts. Many industrialists consider that the adoption of control charts is the most important criteria in distinguishing enterprises of good quality control from others.

5) Industrial test laboratory

In order to help develop small and medium size industries in the Hanoi area, the Government should establish a local test laboratory to assist material analysis and testing for industry. In general, small and medium size industries are unable to have their own laboratory to test materials, even though material testing is important to keep the quality of their products.

In Japan, state-owned or small local government owned laboratories is playing an effective role in this area. The laboratory should be equipped with basic test equipment and operators. Each enterprise pays a small sum of charges when it uses the test laboratory.

For immediate reference, the following test facilities are recommended to be equipped in the laboratory:

- Material component analyzer (Spectrophoto analyzer with computer and printer)

- Universal testing machine for strength of materials
- Impact test machine
- Hardness tester
- Microscope for metals
- Precision projector for shape and dimension measurement
- Machine tools for preparation of test pieces
- Mold sand testing equipment
- 3-dimensional precision measuring equipment with recorder
- X-ray equipment
- Ultrasonic testing equipment
- Magnetic testing equipment

It is recommended to obtain foreign assistance during the initial phase of the laboratory to acquire such facilities and to train operators of equipment.

## **D.5 Training in the Industrial Sector**

### **1) Vocational Training**

At present, the metal/machinery industry has large numbers of excess engineers and workers in its enterprises, and there are few opportunities to recruit newcomers. Under this situation, the education and training of young people as metal/machine engineers or workers, are wasted. Further, if the metal / machine industry were changed to produce new market-oriented commodities, reeducation would be necessary. The industry, however, has not yet shown any signs of change.

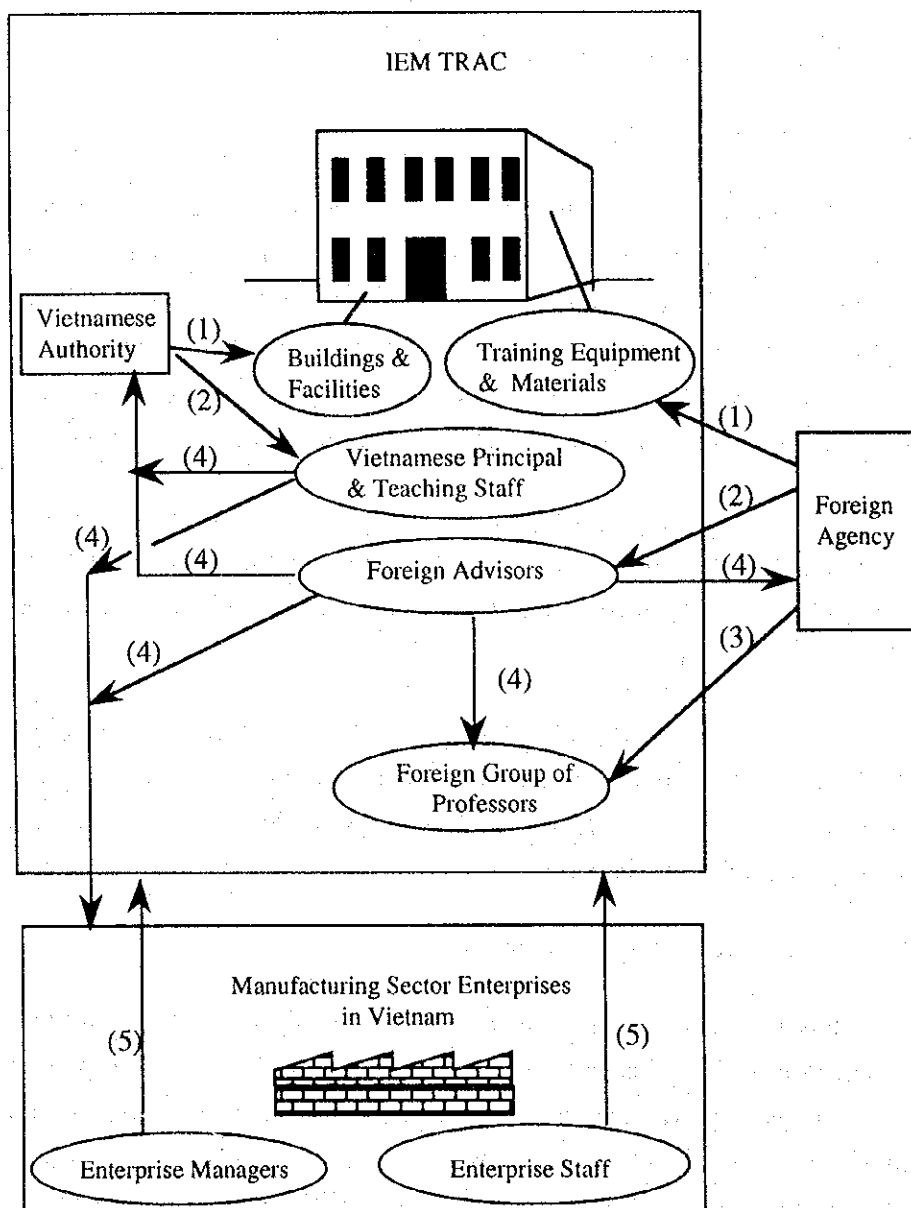
The experiences in developing countries show that vocational and technical education promoted and sponsored by the Government initiative have limited effects on the advancement of industry, when no adequate jobs can be found upon completion of the training or education.

Vocational training would be more effectively carried out by enterprise themselves. This method was proven to be effective in Japan at its developing stage and also in many other countries. It is suggestible that the Government would encourage the effort and initiative of these enterprises for training of their employees.

### **2) Training for Enterprise Management**

It is a large concern in Vietnam that the management and accounting systems of the industrial enterprises have not yet been established in a form acceptable by international standards. It is urgent that managers and accountants be educated and trained right up to the international level. In order to achieve the improvement, it is recommended to establish an Industrial Enterprise Management Training Center (IEM TRAC) with assistance of a foreign agency under a technical cooperation program. The IEM TRAC concept is proposed as shown below.





- (1) Provide (2) Long-term dispatch (3) Short-term dispatch (4) Coordinate  
(5) Attend courses

An IEM TRAC will be established in the Hanoi area using buildings and facilities provided by a certain Vietnamese authority such as HPC, MHI or MLI, and training equipment and materials provided under the technical cooperation program of a foreign agency.

The center shall be organized by a Vietnamese principal in collaboration with foreign advisors. Foreign and Vietnamese teaching staff, will be invited to IEM TRAC. The Vietnamese principal must have experience in the Vietnamese manufacturing sector

and be familiar with enterprise management. Interpreters and other necessary staff will be provided by the Vietnamese authority. Foreign advisors, who have extensive knowledge in the management of manufacturing companies, positive intention for nurturing Vietnamese enterprises and the ability to make plans for training courses, will be dispatched by the foreign agency. The foreign agency will also dispatch foreign specialists as professors for individual classes.

The Vietnamese principal and the foreign advisors jointly arrange training courses. In response to the organizers' invitation, enterprise managers and staff will attend the training courses. Training will be intended for managers and staff of manufacturing enterprises in Northern Vietnam at the initial stage. The number of lessons will be one to three times per week, for example, for a duration of three to six months, although actual times will be decided on the basis of the contents of lectures and assignment schedule of professors.

A curriculum will be drawn up as practical as possible, in the light of the present status of the Vietnamese enterprises. Two kinds of subjects, namely subjects common to the whole manufacturing sector and specific subjects for individual product categories, will be provided. Examples of these two kinds of subjects are given below.

#### Examples of training courses

Common subjects	
1)	Production control
2)	Quality control
3)	Cost control
4)	Purchasing control
5)	Inventory control
6)	Accounting
7)	Marketing strategy and planning
8)	New product development strategy and planning
9)	Intellectual property rights
10)	Environmental control
Specific subjects	
11)	Design control (design method, design schedule control, standardization)
12)	Facility planning
13)	Facility maintenance
14)	World technology trends

Local teaching staff could be invited to intensive training courses held by the foreign agency abroad. After three to five years, the center will be fully operated by a Vietnamese principal and his staff.

## **D.6 Comparative Advantages and Disadvantages**

### **1) Competition with Ho Chi Minh City**

Hanoi City has population of about 2 million while Ho Chi Minh City has about 4 million. The market size of consumer goods corresponds roughly to the population size in the area. Consequently, Hanoi City has less advantage in market size.

Concentration of an industry to one area is advantageous in general. Experience shows that an area where an industry has been initiated or developed earlier than the other areas, attracts more enterprises and forms the largest concentration of the industry in the country. From this viewpoint, Hanoi has a strong advantage in the machine / metalworking industry. On the other hand, Ho Chi Minh City has an advantage in the textile / garment industry and other consumer goods industries at present. Manufacturing industries have not developed yet in Vietnam, so that each area has the possibility to develop any industry. It should be noted, however, that Hanoi would require more efforts than Ho Chi Minh City to attract the manufacturing industries.

Differentiation from Ho Chi Minh City is an important strategy for Hanoi to develop its industries. Differentiation means that Hanoi's industry should neither imitate nor follow in the wake of any products produced in Ho Chi Minh City. In this way Hanoi's industry can establish an independent market from that of Ho Chi Minh City's industry even in the Ho Chi Minh City area. For instance, the textile/garment industry can create unique fashion in Hanoi. The electronic industry can create products of superior quality and design in Hanoi, if compared to Ho Chi Minh City.

### **2) Competition with China**

The Chinese border is located about 150 km from Hanoi. The distance from Hanoi to Canton is shorter than that to Ho Chi Minh City. Borders with China to the north and east surround northern Vietnam, and Hainan island is located just off its coastline. Although a national border does exist, Chinese industry still has a large influence on the economy in the Hanoi area. Considerable amounts of consumer goods and intermediate products are imported from China in exchange for fishery and agricultural products from Vietnam.

Canton is currently a center of rapid economic development in China. Although Hanoi's industry has a potential market in Canton, Hanoi has not yet realized that its manufacturing industries are competitive in the Canton market.

As mentioned in the preceding Section, differentiation is a very important strategy. In order to achieve differentiation from the Canton area, different technologies and products should be introduced from foreign countries. Then trade between the two areas will be much easier.

It is noted, in this respect, that China has been carefully devaluating their currency in order to keep its manufacturing industries competitive in the international market. Vietnam should be more attentive to the exchange rate, because overvaluation of the dong has a potential to spoil competitiveness of Vietnamese manufacturing industries, especially in competition with China.

### 3) Competition in ASEAN

Vietnam has a development history different from other ASEAN countries. Consequently, the machine industry has differentiated technologies such as foundry and machine tools. This advantage can be utilized to the utmost extent to contribute to the development of ASEAN.

Many enterprises will come to invest in Vietnam from other ASEAN countries seeking cheaper labor. However, these industries do not have high productivity because it is not sustainable with increased wages in their mother countries. Vietnam will have to accept these industries for enhancement of its own employment at present. However, Vietnam should adopt higher technologies and join the ASEAN market with the industries whose products are demanded by ASEAN countries for their development, and become a respectable member of ASEAN.

Opening of the domestic market to foreign investors is an important policy for attracting high technology and high productivity industries because it attracts market-seeking industry. Vietnam is an attractive potential market for ASEAN investors.

In this context, too, the machine industry is the most promising industry in the Hanoi area. Differentiation will develop in such industries that have markets not only in the country but also in ASEAN countries.

## **D.7 Environmental Protection**

### **1) Environmental Legislation and Management**

Environmental legislation, standardization, and management are quite new in Vietnam. The Law on Environmental Protection and Government Degree on providing Guidance for the Implementation of the Environmental Protection were ratified in 1993 and 1994, respectively. The Hygienic Regulations and Administrative Penalty in Health Services were issued in 1991. The Provisional Environmental Criteria issued in 1993 are still in use because the preparation of the final Environmental Standards is under way.

MOSTE was re-organized from the former State Committee for Science and Technology in October 1992. The main duty of MOSTE is to assist the Government in the strategies and policy planning related to science, technology and environment. Monitoring and analysis of all kinds of industrial wastes are the responsibility of the local environmental authorities. However, the financial resources, staff and laboratories are insufficient to carry out these duties in a proper way.

According to the Government Degree both old and new factories have to make Environmental Impact Assessments (EIAs) following the instructions given in the Degree.

### **2) Environmental Problems Caused by Industry**

The frequent environmental problems in the Hanoi area caused by industries are pollution of surface water and groundwater, air pollution, disposal of hazardous wastes and soil pollution. From the viewpoint of the environment, the most problematic branches of industry are chemicals, textile dyeing factories, leather tanneries, and all kinds of food production including breweries.

All factories in the Hanoi area, both old and new, lack waste water and solid waste treatment facilities. Only 23 factories have contracts with the Urban Environmental Company (URENCO) to collect solid waste. The collected volume of total industrial solid waste in the city area is estimated to be about 25 %. Air pollution is possible from certain factories; reported air emissions are manifold compared with the permissible limits.

Relocation of factories from the inner city area to the suburbs has already been studied by MOSTE, Hanoi Environmental Division, and Hanoi University of Civil Engineering. MOSTE will collect information from the other authorities and then

submit a proposal for relocation to the Government, which will make a final decision. There have been several proposals to relocate the most polluting factories located in the middle of residential or office areas, but in practice no relocation has been finalized yet in Hanoi. For reference, it is reported that about 50 factories have been relocated in the Ho Chi Minh City.

The most polluting factories which should be relocated from the inner city area are Hanoi Alcohol Factory (gas emissions and waste water) and Ba Nhat Chemical Factory (dust and noise from producing calcium carbonate). Some mechanical and electrical factories have been proposed for relocation, including Trang Hung Dao Mechanical Factory where production is still going on. According to the land use plans for the West Lake area, the shores will be used for residential and recreational purposes, and the existing factories are planned to be relocated.

It appears that financial and land use reasons for relocation are more important than environmental reasons. For instance, where land is used more profitably for other purposes than industry, e.g. joint-venture hotels and offices, the factory would receive land from the Government to continue industrial production somewhere else, but if the factory is profitable it can stay.

#### Surface and ground water pollution

All industrial waters are discharged into channels, river, and lakes without any treatment. There is no inceptor or other methods in use to separate oil from waste water. In the inner city area of Hanoi, there are numerous factories which discharge their waste straight to the surface water.

The volume and quality of industrial waste water are unknown, because the factories themselves do not know how much waste water they are discharging. It is also difficult to obtain information about the volume and type of chemicals used in factories. According to the available studies on quality of waste water, the amounts of BOD, COD and phosphorus are reported to be high. Lack of oxygen, eutrophication and odor caused by industrial waste water are obvious in many areas. There might also be some factories where heavy metals or other toxic substances are used in their process, e.g. textile dyeing factories and leather tanneries.

Many factories are located in the upper reaches of rivers and channels, having a wider environmental impact. There are also factories in residential areas causing local problems in the neighborhood. Combination of domestic waste water and industrial waste water is hazardous for water quality and the ecosystem.

Groundwater pollution has already been observed in the southern part of the city. The upper aquifer is only 2-4 meters below the ground surface and the thickness of the aquifer is 25-40 meters. Groundwater is usually taken from the lower aquifer, which is located at a depth of about 70 meters. In the long run, pollution will advance to the lower aquifer if discharges of untreated waste water are further increased.

#### Air pollution

When factories are comparatively small, air pollution is usually a local problem. A number of old factories were originally established outside the city, but they are now located inside the residential areas due to encroachment of urban areas. Besides, there still remain some industrial areas, e.g. Minh Khai, almost in the city center. Most factories have no treatment facilities in use to remove gas and dust; therefore, these emissions will cause health problems to the workers of factories and people living in the surrounding areas. According to the available record of emissions, the volume of dust, SO<sub>2</sub>, CO<sub>2</sub> and CO, are several times higher than permissible criteria.

#### Disposal of hazardous waste

There is no hazardous waste treatment system in any factory or landfill. Possible hazardous wastes are mixed with other wastes without sorting. Solid hazardous wastes are brought to landfill or, in the worst situation, just thrown somewhere, even into lakes and rivers. Liquid hazardous wastes are also discharged straight into channels, rivers and lakes, causing environmental and health problems. According to a few available data, the measured chemical contents always exceed permissible limits.

The most problematic factories are chemical factories, textile dyeing factories and leather tanneries, which utilize chemicals and heavy metals in their processes. At the present production capacity, the amounts of toxic substances may not be high. In the future, however, the amount of hazardous wastes will increase in line with the changes in type and quantity of industrial production.

#### Soil pollution

Industrial wastes are often stored or just thrown outside the factory halls without any cover or floor, causing contamination of the soil. Especially, liquids and oil flow from factories or are discharged straight to the soil. Contaminants are leaching little by little into the groundwater through soil.



### 3) Mitigation of Environmental Pollution Caused by Industry

More studies are needed to estimate the quantity, quality and impact of polluting substances discharged from industries, and some studies have been started by the Hanoi University of Civil Engineering. A polluter register should be established and updated to control the situation continuously.

Along with the improvement in production technologies, improvement of waste treatment technologies should be promoted in factories. Old technologies should be modernized, and if modernization is not financially viable, old-fashioned factories should be closed down.

The Hanoi area can be divided into several categories from the viewpoint of the environmental and socio-economic impact of industrial activities. In the inner city area, the polluting factories should be moved from residential and office areas, and no new polluting industries should be established.

In the areas between the inner city and the proposed outer ring road, the treatment systems for waste water, gas and dust emissions and solid waste should be improved. New factories to be located in this zone should have adequate and sufficient treatment facilities.

Special areas for polluting industries should be created outside the proposed outer ring road. Same categories of industry should be located in one place so that the control and monitoring of impacts can be arranged in the most effective way. Modern production and treatment technologies should be applied in such areas for polluting industries.

**APPENDIX-E**

**DIRECTION OF INDUSTRIAL DEVELOPMENT**

APPENDIX X

DIRECTORY OF INDUSTRIAL DEVELOPMENT

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## **APPENDIX-E**

### **DIRECTION OF INDUSTRIAL DEVELOPMENT**

#### **E.1 Industrial Development Policy**

##### **1) National Industrial Policy**

In 1986, Vietnam adopted a fundamental economic reform policy toward a market-oriented economy. Principal factors of this policy comprise:

- a) To transform state enterprises into self-reliant and self-financing enterprises;
- b) To actively promote the activities of private enterprises and joint venture companies teamed up with foreign investors; and
- c) To commercialize the production system based on the market mechanism.

Being the focal sector of the economic reform, as well as the principal pulling force of the national economy, the industrial sector has been directed to adopt the basic policies as follows:

- a) To place highest priority on developing light industries;
- b) To promote the production of essential consumer goods;
- c) To promote the production of export goods by means of joint venture with foreign capital, including garment, knit, artificial leather, plastic products and electrical parts;
- d) To promote processing industries based on the primary industries, i.e. agriculture, forestry, and fishery;
- e) To strengthen the exploitation of minerals, oil and gas; and
- f) To develop oil refineries and petroleum gas-based chemicals.

In terms of industrial categories, the basic policy set by the Government accorded priority to the development of the following:

- a) Petroleum and gas-based chemical industry;
- b) Fertilizer industry;

- c) Cement industry;
- d) Steel and metal industry;
- e) Energy industry;
- f) Light and processing industries; and
- g) Machinery and electronic industries.

To accelerate the industrial development of the country, two strategic areas have been identified; the South Economic Triangle and North Economic Triangle. These two areas are relatively well equipped with economic infrastructure together with natural and human resources and expected to assume the role of spearhead for industrial development in the country.

## 2) Regional Industrial Policy

### (a) Economic Zones

According to the current economic characteristics, as well as the socio-economic and infrastructure conditions of the areas, Vietnam is divided into 8 economic zones for the purpose of national economic planning, as shown in Figure E.1. Among the eight zones, the Red River Delta (North Economic Triangle) and South Northeast Region (South Economic Triangle) are the most developed and are expected to continue to play the leading role in the national economic development, particularly in the industrial development.

### (b) North Economic Triangle (NET)

Being endowed with natural resources including iron ore, coal, mineral phosphate and limestone, NET has developed basic industries together with various light industries. At present, electricity supply in the region is in surplus and further power development is envisaged. NET has, however, various constraints which should be overcome in the future. These constraints include inadequate capacity of the Hai Phong port and road network within the area. Major difficulties for the industrial development in NET are old and obsolete production facilities with small production capacity, as well as outdated production and management technologies.

For the development of NET, priority has been accorded to the following industrial categories:

- i) Heavy industries including steel, cement and machinery;
- ii) Chemical industry for consumer goods;
- iii) Light industries including spinning, plastic products, food processing;

- iv) Electronics;
- v) Labor-intensive export industries including apparel, footwear and leather products; and
- vi) Export-oriented processing industry.

In time frame, the following development strategy has been envisaged by the Government.

#### Short -and medium- term strategy

- i) To upgrade and expand the production capacity of the existing factories with relatively small amount of investment mainly for machinery, spinning, plastic products, food processing and other medium-scale light industries;
- ii) To diversify the product mix for the above-mentioned industrial categories and export these products, with foreign technical assistance and capital;
- iii) To build new factories for export-oriented light industries including apparel, footwear, and leather by joint venture capital, in parallel with the expansion of the existing factories;
- iv) To promote basic industry, particularly cement industry, utilizing the Government finance; and
- v) To develop the machinery industry both for domestic and export markets.

#### Long-term strategy

- i) To construct new machinery factories and establish the electronic industry with the most advanced technologies;
  - ii) To establish new export-oriented light industries including high grade garment; and
  - iii) To construct new factories for the production of steel, cement, coal-based fertilizer, processing of agricultural products and food, and spinning.
- (c) South Economic Triangle (SET)

SET comprises Ho Chi Minh City, Dong Nai province and Ba Ria-Vung Tau province and their surrounding areas. SET has an area of 5,343 km<sup>2</sup>, or 1.6% of the



total area of the country, with a population of 5.15 million which accounts for 7.9% of the country's population.

Though light industries are dominant in this area, SET has a potential for industrial development with the oil and gas resources off Vung Tau, agricultural products in the Mekong Delta, fishery resources along the coast, and the past experience in market economy. Under these conditions, economic development in SET has been fastest in the country, attracting the largest foreign direct investments. This area, however, suffers from several weak points which should be overcome for further development of the regional economy, including shortage of electricity, inadequate transportation network, traffic congestion, and aged and obsolete production facilities.

For accelerated development of SET, priority has been accorded to the following industrial categories:

- i) Oil and petroleum and gas-based industries including oil refinery, petrochemical, LPG and fertilizer;
- ii) Fertilizer and agricultural chemicals;
- iii) Basic chemicals and medicines;
- iv) Rolled steel and machine tools;
- v) Spinning;
- vi) Plastic products;
- vii) Food processing;
- viii) Expansion of labor-intensive industries including apparel, leather and footwear; and
- ix) Processing industry for export.

In time frame, the following development strategy has been envisaged by the Government.

#### Short and medium-term strategy

- i) To modernize the existing factories by means of small-scale domestic investments for industries of spinning and apparel, leather, footwear, plastic products, machinery, food processing, rolled steel, glass, brick and tiles;
- ii) To construct LPG factories;
- iii) To modernize the export-oriented light industry by domestic and foreign direct investments and to construct new factories,

- iv) To develop labor-intensive ceramic-made electronic parts, by means of the foreign direct investments, either in the form of joint venture or 100% foreign capital; and
- v) To develop petrochemical projects including the production of PVC and polyester mainly by means of foreign investments.

Long-term strategy

- i) To construct new spinning factories;
  - ii) To construct factories for producing export products including high grade garment, leather, footwear, electronics parts and fishery product processing; and
  - iii) To construct oil refineries and fertilizer factories;
- (d) Central Region

Da Nang is a center of the Central Region. With the deepest commercial sea-port at Da Nang, some industrial estates and EPZs are being developed in this area.

It is reported recently that the Government is studying to build its first oil refinery at Dung Quat in Quang Ngai province. The expected capacity is around 125,000 barrels per day. Along with the refinery, such industries as petrochemical steel mill and other heavy industries, as well as light industries including electronics, are envisaged to be developed. For the development at Dung Quat, it is planned to construct a deep sea-port which would be able to handle up to 100 million tons of cargo per annum together with containers. A new town to house the employees of industrial enterprises would be created for an expected population of 400,000 - 600,000. A final decision has not been taken on the implementation of this huge project.

This national project, once implemented, would help the central region catch up with the rapid development which has been mainly concentrated in the southern and northern regions of the country. The central region, in particular the corridor connecting Hue, Da Nang and Dung Quat, would emerge as the third growth pole of the country in the next century.

## **E.2 Development Direction**

### **1) Direction of National Industrial Development**

From the viewpoint of economic and industrial development, Viet Nam may be characterized by the following salient conditions :

#### **a) Relatively rich natural resources**

Viet Nam is considered as relatively well endowed with natural resources including petroleum, natural gas and coal, as well as agricultural and marine resources including rice, rubber, coffee, timber, and shrimp. In particular, the country has a potential of producing 100 to 200,000 barrels per day of crude oil, though there remains uncertainty on the actual volume to be exploited.

#### **b) High quality labor**

With the economically active population accounting for about 46% of the total population, the country has about 33 million workers. For a developing country, the education level is quite high with about 157,000 students enrolled in colleges and universities and 703,000 students attending secondary schools in 1993 - 1994. The literacy rate is as high as 87.6% in 1990. Since the people are commonly recognized to be industrious, the human resources of the country is judged to be quantitatively and qualitatively rich.

#### **c) Fairly large domestic market**

Vietnam has population of about 72 million which is the second biggest in the ASEAN countries. With a low per capita income of around US\$200, the current purchasing power remains small. With the high growth rate of economy expected for the coming years, the overall purchasing power of the country will quickly grow, providing a fairly large market for the industrial products.

#### **d) Experience of market economy in the past**

Viet Nam has certain experience of market economy before entering into the centrally planned economy. The country possesses such human resources that have accumulated managerial know-how in the market economy particularly in the southern area, as well as returnees from overseas market economies.

- e) Central location of the country in the high-performing economies

Viet Nam is favorably located in the midst of the high-performing and emerging economies including NIEs, ASEAN and South Asian countries. These economies are closely inter-related, sharing work both horizontally and vertically. If rightly directed, Vietnam can join this rapidly growing society.

- f) Relatively small share of SOEs

As of 1989, value-added of SOEs accounted for 23.7% of GDP, absorbing 7.7% of the labor force. In the industry sector, SOEs generated about a half of the value-added in the sector. These figures are by far lower than those of other centrally planned economies in East Europe and the former Soviet Union. In other words, share of SOEs in GDP of Vietnam was similar to that of Malaysia.

- g) Difficulty in preventing smuggling

Having long border lines with the neighboring countries, as well as a long coastal line, thorough prevention of smuggling is quite difficult despite the continuous efforts of the Government. In consequence, Vietnamese products are essentially compelled to compete with foreign products even in the domestic market, regardless of the import duties rates imposed on foreign products.

Considering the advantages/disadvantages and initial conditions of the country as noted above, it may be advisable to adopt an open and outward economic policy for the early takeoff of the country toward an industrialized status. Foreign direct investments should be promoted particularly for the development of the industrial sector, which would bring in the technology, managerial skill, capital and markets simultaneously for the products. Taking advantage of high quality labor at cheaper wage rates, Vietnam can enjoy comparative advantages in such sectors as machinery industries, as well as the so-called labor-intensive industries for exports.

Vietnamese products are destined to compete with foreign products even in the domestic market, specially in the case of consumer goods. In this context, Vietnamese products should inevitably be export-oriented, and Vietnam should adopt an outward economic policy promoting export of industrial products.

Five distinct development stages may be perceived: (i) exporting traditional commodities, (ii) substituting imports of light industry products, (iii) exporting light industry products, (iv) substituting imports of heavy industry products, and (v) exporting heavy industry products.

At present, exports of crude oil and rice account for the major portion of the exports (1st stage). However, imports of light industry products have been shrinking during 1989 - 1992, while imports of TVs have steady increased during the same period. Increase in exports of certain light industry goods was also observed during the same period (textile fabrics, for example, being increased by 385%). Therefore, it may be envisaged that Vietnam would go through a telescoping process of staged development. Namely, the first three stages (i) to (iii), mentioned above will overlap each other to some extent.

## 2) Development Direction of NET and the Hanoi Area

### (a) Regional Perception of Foreign Investors

The three major economic focal areas have their respective locational advantages as well as disadvantages. Before defining basic directions and strategies for the industrial development in each area, these advantages and disadvantages should firstly be reviewed. Foreign investors' perception may be a good indication of their locational advantages/disadvantages for various categories of industries.

In this context, the foreign direct investments approved in the manufacturing industries during 1988-1994 have been compiled and analyzed by category of industry.

As shown in Table E.01, the non-metal industry attracted the largest amount of foreign investments, followed by chemicals industry. Light industries, like textile, food, beverage and footwear, as well as industry like electrical and transport, have also been highly ranked.

In the case of NET, machinery and fabricated metal industries attracted a sizable amount of foreign investments showing high locational coefficients (refer to Table E.02). Presumably, it is due to a relatively strong accumulation of machinery industries and technical skills/knowhow in this area.

Category	Locational Coefficient*
Electrical	2.44
Transport	1.60
Fabricated Metal	2.91
Iron & Steel	2.48

Remark: \* Regional share divided by the national share of the category.

On the other hand, SET is characterized by light and labor-intensive industries and chemical industry, while Quang Nam - Da Nang province (Central Region) is featured by local-resource-based industries, like food, wood, non-metal minerals, glass and furniture, as well as shipbuilding and labor-intensive industries like wearing apparel (refer to Table E.03 and E.04).

With regards to NET, the trend of investments has been analyzed by sub-region, as shown in Table E.05. In terms of total foreign direct investments, Hanoi accounted for 60.4% of the total investment in NET, while Hai Phong represented 36.6%. The remaining 3% has been invested in Quang Ninh province.

In terms of industrial categories, Hanoi is characterized by investments in the machinery-type industries, i.e., electrical, transport and fabricated metal categories. These three leading categories together accounted for about 64% of the total foreign direct investments in the manufacturing industry in Hanoi. In the case of Hai Phong, investments are mainly made in non-metal industries, including cement and iron and steel, which accounted for about 82%. In Quang Ninh province, the only significant investment was for coal development in Hon Gai area.

(b) Locational Advantages of NET

In terms of industrial activities, NET generated 2,284.8 billion dongs of gross output or about 11% of the total output in the country in 1993. SOEs are dominant in the industrial activities in this area, with 430 industrial SOEs.

The locational advantages of NET for investors in the industrial sector are perceived as follows:

- i) Administrative center: With Hanoi being the capital city, all the Government organizations including Ministries, Committees, Institutions are located in this zone. Investors can enjoy easier access to the various government services, including application for various licenses and permissions.
- ii) International information: With Hanoi being the capital of the country, investors can enjoy prompt access to the international business information.
- iii) Educational and scientific research institutions: In Hanoi, there exist 29 universities with about 36,000 students, as well as several scientific/research institutions which would provide the investors with qualified manpower and opportunities to utilize these for R&D activities.

- iv) Labor force: According to the Socio-Economic Master Plan of Hanoi City to the year 2010, the population in the Hanoi area is estimated to reach 2.5 million in 2000 and 2.7 million in 2010. Together with the educational and scientific/research institutions located in the area, Hanoi would provide adequate manpower to the industrial activities.
  - v) Infrastructure: Hanoi has Noi Bai international airport. In Hai Phong, river ports are in operation, which can accommodate vessels of up to several thousand tons. It is envisaged to construct a deep seaport in Cai Lan which would accommodate up to 40,000 DWT class vessels. The inland transportation network will be upgraded and expanded. In particular, the Route No.5 is under detailed design, Route No. 18 under feasibility study, and Route No. 1 under rehabilitation. Power supply exceeds the current demand in the zone.
  - vi) Industrial Estates/EPZs in NET: There are several industrial estates and EPZs, either being developed or studied in Hanoi City, Hai Phong City and Quang Ninh province, as shown in Figure E.2. Two industrial estates and one EPZ are being constructed in Hanoi. In Hai Phong, an industrial estate is scheduled to be developed, and 2 industrial estates and one EPZ have been planned. In Cai Lan, an EPZ is proposed to be developed behind the Cai Lan deep seaport.
  - vii) Mineral resources: NET has good access to the mineral resources which are produced/reserved in the northern area of the country; (i) coal, (ii) iron ore, (iii) lime stone, and (iv) mineral phosphate.
  - viii) Market for products: NET has a population of 9.36 million as of the end of 1993, including Hanoi with 2.25 million and Hai Phong with 1.59 million population. As economy grows, the zone itself will provide a sizable market for its products.
- 3) Proposed Direction of Industrial Development in NET and the Hanoi Area
- NET is divided into 4 sub-zone based on their characteristics, as follows:
- (a) Hai Phong sub-zone : Coastal area with port
  - (b) Cai Lan sub-zone : Coastal area with port
  - (c) Area along Route No.5 and Route No.18 : Inland zone
  - (b) Hanoi sub-zone : Capital city

By reviewing the locational advantages of each sub-zone, the industrial development in these sub-zones is proposed to be promoted in the direction indicated below.

(a) Hai Phong Area

Major advantages perceived in this sub-zone are: (i) existing three river ports, (ii) coastal location facilitating the discharge of drainage/sewage water and cooling water, and (iii) availability of marine resources.

To exploit these advantages, the following industries are proposed to be located in the Hai Phong area:

(i) Heavy industry

- Steel mill
- Shipbuilding

(ii) Chemical and resource - based industry

- Chemical fertilizer
- Sea food processing

(iii) Port-based and relatively low pollution type industries

- Ship breaking
- Ship repair
- Chemical industries (film, tape, tire, rubber tube, detergent, paint, battery, industrial rubber, glass, oxygen)
- Packaging material

(b) Cai Lan Area

Major advantages perceived in the Cai Lan area are: (i) existing and planned sea port (1 wharf for up to 20,000 DWT vessels at present and 20 more wharves are envisaged by the year 2010), (ii) coastal location facilitating the discharge of drainage/sewage water and cooling water, (iii) good access to the mineral resources such as coal and limestone, and (iv) availability of marine resources.

To exploit these advantages, the following industries are proposed to be located in the Cai Lan area:

(i) Heavy industry

- Steel mill
- Shipbuilding

(ii) Chemical and resource - based industry

- Coal based products



- Sea food processing

(iii) Port-based type

- Ship breaking
- Ship repairing
- Chemical industries (film, tape, tire, rubber tube, detergent, paint, battery, industrial rubber, glass, oxygen)
- Packaging material

(c) Area along National Roads No.5 & No. 18

Rehabilitation of Route No. 5 (Hanoi - Hai Phong) will be started shortly, and construction work of Route No. 18 is to be started after 2000, connecting Cai Lan with Ni, near Noi Bai airport. The advantages perceived in this sub-zone are: (i) good access to a port, (ii) good access to markets (Hanoi, Hai Phong), (iii) cheap and abundant labor, (iv) cheap and spacious land, and (v) good access to mineral phosphate.

To exploit these advantages, the following industries are proposed to be located in the area. It is noted that higher priority should be placed on the development along Route No. 18, in view of the fact that land use, mainly paddy field, is more intensive along Route No.5 than along planned Route No. 18B.

(i) Labor/land intensive type

- Garment, knitting
- Leather
- Footwear (shoes, sandal)
- Brick, tile
- Sanitary ware
- Glass
- Food processing (non-marine); tobacco, candy, biscuit
- Beverage; beer, soft drink
- Toy

(ii) Other

- Phosphate fertilizer
- Coal based fertilizer
- Granite stones
- Cement
- Roofing material (Zn, etc.)
- Automobile
- Motorcycle
- Pump
- Food processing (tea, vegetable, etc.)

(d) Hanoi Area

The Hanoi area has advantages for industrial development, in the light of (i) 2nd biggest market in Vietnam, (ii) good access to an airport, (iii) fair access to a port, (iv) good access to public services including investment application/approval, (v) good access to international market information, (vi) availability of abundant skilled labor and engineers.

To make the best use of these advantages, the following industries are proposed to be located in the Hanoi area:

(i) Knowledge-intensive/High technology/airport-related type industry

- Electronics
- Medicines
- Cosmetics
- Computer & parts
- Telecommunication equipment
- Printing/publishing
- Clocks, watches, timers
- Apparel: lingerie, lady dress

(ii) R&D oriented

- Computer software
- R&D

(iii) Metal-working/Machinery

- Fabricated metal
- Foundries
- Machine tools
- Pump
- Automobile
- Motorcycle
- Industrial machinery
- Precision machinery

(iv) Textile

- Spinning
- Weaving
- Dyeing

(v) Consumers goods

- Home electric appliances
  - Radio
  - TV
  - Air conditioner
  - Video
  - Cassette/CD deck
  - Refrigerator
  - Washing machine

- Vacuum cleaner
- Range
- Foodstuff & beverages

(vi) Others

- Plastic products
- Rubber, seal, belt
- Construction materials

4) Overall Industrial Development Direction

(a) Decisive factors

Various scenarios may be contemplated for the overall industrial development of NET. Among the factors which may affect the direction of development, transport infrastructure and environmental conservation would be the most decisive factors. Vigorous efforts should be made in the coming years for the rapid upgrading of the transport infrastructure in NET, particularly seaport and road network.

(a) Cai Lan port development

By the year 2000, 7 berths should be developed with an annual handling capacity of 2.5~3.0 million tons, accommodating up to 40,000 DWT vessels. Subsequently, additional 14 berths should be developed with a total annual handling capacity of about 14 million tons by 2010.

(b) Road and bridges rehabilitation

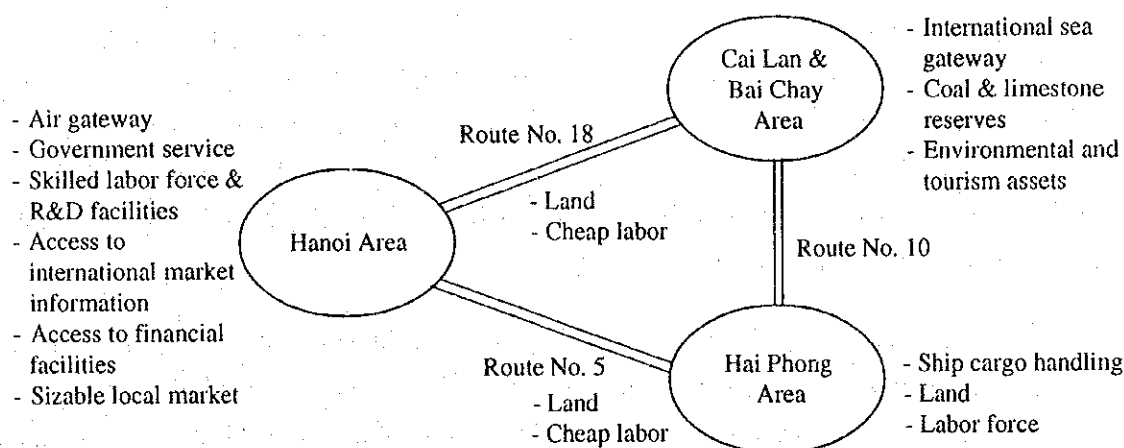
Route No. 18A and Route No. 10 should be upgraded by the year 2000, together with bridge construction to replace the existing ferry services by the year 2000. By 2010, all sections of Route No. 18 should be upgraded. Consequently, the time distance among Hanoi, Hai Phong and Cai Lan would be cut by less than a half.

(c) Environmental conservation of Ha Long Bay

Conservation of the world asset class natural beauty of the Ha Long Bay should be fully considered in the industrial development of the Cai Lan area.

(2) Inter-dependence and overall industrial development direction

Infrastructure development being implemented as envisaged in the foregoing paragraph, development and inter-dependence among the 3 sub-zones may be expressed as shown below.



Hanoi would play the role of the brain of NET with R&D activities and financial facilities. Hanoi also provides international air gateway and access to the international information as well as a sizable local market for NET.

Cai Lan's role in the overall socio-economic development of NET would substantially be reinforced if the proposed deep seaport is realized. Together with the upgrading of the roads/bridges linking with the other two sub-zones, Cai Lan would serve as a gateway for the other sub-zones. Cai Lan/Ha Long Bay will offer first-grade amenities both for Vietnamese and foreign tourists/investors and thereby stimulate the regional economy at the same time.

Hai Phong, having a major local trading port, as well as a relatively large-scale land area and labor force, can be developed for a variety of heavy industries.

The three sub-zones would supplement the functions to each other, and produce multiplier effects for the industrial and socio-economic development of NET.

### E.3 Industrial Area Redistribution in Hanoi

#### 1) Present Distribution of Industrial Area

Due to historical reasons and rapid urban sprawl in the last decades, existing factories are scattered in and around Hanoi city. There are numerous large industrial quarters and factories in the inner city area in the midst of residential and office areas. For instance Hanoi Liquor Company is located in Hai Ba Trung District. Further, there are several industrial areas along the main roads in the urban area. Originally, these areas have been outside the city, but because of the rapid sprawl and unplanned growth of the city, these industrial areas, e.g. Minh Khai, Thuong Dinh and Truong Dinh, are now in the midst of residential areas.

In Hanoi City, there are 9 industrial areas which are scattered on the fringe of the inner city as illustrated in Figure E.3. These industrial areas were built in the 1960s and their facilities are outdated. The industrial areas are affected by environmental problems, conflict with the neighboring residents and congested traffic caused by inadequate infrastructure and mixed land use in the vicinity. The existing industrial areas and their characteristics are listed below.

Major Industrial Area	1992			Principal Types of Industry (descending order of severity)
	Number of Enterprises	Factory Land Area (ha)	Number of Employees	
1 Minh Khai-Vinh Tuy	38	81	15,912	textile, machinery, construction materials
2 Truong Dinh-Giap Bat	13	32	3,764	food, machinery, glassware, wood products
3 Van Dien-Phap Van	14	39	5,895	chemical fertilizer, machinery, construction materials, pottery, wood products
4 Thuong Dinh-Nguyen Trai	29	76	17,264	food, rubber, soap, tobacco, machinery, leather shoes, weaving, pottery, apparel
5 Cau Dien-Mai Dich	8	27	1,946	food chemical, construction materials, wood processing
6 Gia Lam-Yen Vien	21	38	10,227	machinery, wood products, chemical, oil refinery, pottery, food, leather shoes, apparel
7 Dong Anh	22	68	8,284	machinery, metal, construction materials, printing, food
8 Chem	5	14	2,309	construction materials, weaving, packaging
9 Cau Buou	5	4	1,386	chemical, machinery, construction materials
Total	155	379	66,987	

The Hanoi Master Plan for 2010 proposes that the existing industrial areas should be rehabilitated through replacement of polluting factories and development of infrastructure. The industrial areas have limitation for expansion, except for a few areas located in the suburban areas having a vacant land around the area.

The basic concept for rehabilitation of the existing industrial areas proposed by HPC are summarized below. Five industrial areas have no room for expansion, and the other four are planned to accommodate the polluting factories to be relocated from inner city.

Major Industrial Area	Principles for Rehabilitation
1 Minh Khai-Vinh Tuy	<ul style="list-style-type: none"> <li>- replace functions of some factories</li> <li>- maintain the same scale of employment opportunities</li> <li>- attain the efficient land use</li> <li>- treat the waste water</li> </ul>
2 Truong Dinh-Giap Bat	<ul style="list-style-type: none"> <li>- replace the polluting factories (wood processing, glass factory)</li> <li>- maintain the same scale of employment opportunities</li> <li>- develop new infrastructure</li> <li>- prevent environmental pollution</li> </ul>
3 Van Dien-Phap Van	<ul style="list-style-type: none"> <li>- replace the polluting factories (battery and fertilizer factory)</li> <li>- develop additional local industries</li> <li>- maintain the same scale of employment opportunities</li> <li>- develop new infrastructure</li> <li>- prevent environmental pollution</li> </ul>
4 Thuong Dinh-Nguyen Trai	<ul style="list-style-type: none"> <li>- prevent environmental pollution</li> <li>- replace polluting factories (rubber, soap, tobacco)</li> <li>- replace the residential area</li> <li>- maintain the same scale of employment opportunities</li> </ul>
5 Cau Dien-Mai Dich	<ul style="list-style-type: none"> <li>- <u>establish new industrial lands</u> for electric/electronic industries (20 ha)</li> <li>- establish medium and small scale industries</li> <li>- prepare new lands acceptable for existing factories located in inner city (30 ha)</li> <li>- develop new infrastructure (waste water treatment)</li> <li>- prevent environmental pollution</li> </ul>
6 Gia Lam-Yen Vien	<ul style="list-style-type: none"> <li>- develop additional infrastructure, especially waste water treatment and fuel storage areas</li> <li>- prevent environmental pollution</li> <li>- <u>develop additional lands</u> for factories to be relocated from the inner city (30 ha)</li> </ul>
7 Dong Anh	<ul style="list-style-type: none"> <li>- develop suitable infrastructure</li> <li>- <u>develop new industrial estates</u> for utilization of the local industries that will relocate from inner the city</li> </ul>
8 Chem	<ul style="list-style-type: none"> <li>- no expansion is allowed</li> </ul>
9 Cau Buou	<ul style="list-style-type: none"> <li>- <u>develop additional medium and small scale industries</u></li> <li>- develop new infrastructure</li> </ul>

Note: Tile factories in Thach Ban of Gia Lam, Huu Hung and Dai Thanh of Cau Buou, are proposed to limit additional development.

Hanoi Construction Planning and Design Institute has also proposed to construct the following new industrial areas, principally to receive the polluting industries.

- Duc Giang area (30 ha): adjacent to the chemical complex in Gia Lam
- Nhuy Dien area (30 ha): along the Nhue river in Tu Liem District

The factories planned to be relocated are leather factory, paper mill and brewery from the south shore of the West Lake; electric motor factory and office stationery factory along Ly Thuong Kiet Street, and mechanical factory from Ba Trieu Street. Relocation of the factories in these new industrial areas is planned to be completed by 2005.

## 2) Basic Concept for Redistribution of Existing Industrial Areas

In order to harmonize the urban land use and industrial production activities in Hanoi, the following principles will inevitably be adopted:

- (a) Mixed land use with residence, commerce and manufacturing should be avoided.
- (b) Polluting industries, in particular, should be isolated from the populated urban area.
- (c) Effective distribution of industrial land use should be attained to avoid a profligate use of human resources and natural resources.
- (d) Transportation means related to the industrial productivity should be carefully studied, and road and railroad networks of Hanoi City be improved at the earliest.

The concept for redistribution of the existing industrial areas in Hanoi has been formulated in the light of the principles mentioned above.

### Scrapping and building of existing industrial areas

In the long run, all industrial areas located in the urbanized inner city of Hanoi will be relocated or demolished in view of the in conflict with surrounding residential and commercial/business areas and insufficient productivity if compared with an increasingly high land value in the inner city. The polluting industries, in particular, should be relocated to the outskirts of the city or outside the city, far from the populated areas. The remaining land after relocation of factories shall be scrapped and reused for the urban purposes.

### Relocation of existing industries

Considering that the urbanized area will expand up to the third Ring Road by 2010, as shown in Figure E.3, the new industrial area to receive the factories relocated from the inner city shall be constructed outside the third Ring Road.

The structure of the city has been substantially changed so that the location of the industries has to be reviewed once again. For instance, the West Lake area has been planned to be a high quality residential and recreational area, and industrial land use has not been envisaged. In practice, however, no relocation has been realized yet: and those factories which have been proposed to be relocated are still in their places, even though their production has decreased.

A conceptual plan of industrial area distribution in the future is illustrated in Figure E.4. While the non-polluting industries will move to the new industrial area developed between the third Ring Road and the outer Ring Road, the polluting industries should be relocated outside the outer Ring Road or the city boundary. Air polluting industries shall be moved to Tu Liem district, the western part of the city, in view of the wind direction which is dominantly south - east in the summer season and north - east in the winter season.

### Relocation of polluting industries

The polluting industries located in the inner city of Hanoi, as listed below, are requested to relocate due to the environmental problems. Many of these factories need urgent modernization through improvement in waste treatment and renovation of buildings. It appears, however, to be more practical to relocate the factories than to invest in improvement at the present location. Factories, which have at least some kind of waste treatment facilities, at present, such as Van Dinh Fertilizer Factory and Hanoi Beer Company, can be relocated in a longer term.

When the factories agree to relocate, the new industrial area shall be developed to receive the relocated factories. The new area should be equipped with adequate infrastructure effective for pollutant disposal, such as waste water treatment plant. Funds for the factory relocation should be prepared through the two-step loans proposed in Appendix-B.4, Section 3).

Land use should be strictly controlled in and around the new industrial area, so as to avoid disordered scattering of residences. A land use zoning system, which is to be enacted by the City Planning Law, is a suitable method for the land use control. The industrial areas should be used exclusively for industrial purposes.



Location	Factory	Environmental Problem	Target Area to be Relocated (proposal of the Study Team)	
			Short Term	Long Term
Truong Dinh - Giap Bat	1) Wood Processing	noise, dust		outside the third ring road
	2) Thanh Duc Glass Factory	air pollution, dust		outside the third ring road
Phap Van - Van Dien	3) Hanoi Battery Corporation	air pollution, waste water	should be relocated in the integrated industrial estate equipped with industrial waste water pre-treatment facilities.	
	4) Van Dien FMP Fertilized Co.	air pollution, waste water		outside the outer ring road (should be equipped with anti emission devices)
Thuong Dinh - Nguyen Trai	5) Sao Vang Rubber Co.	air pollution, odor		outside the third ring road
	6) Hanoi Soap Co. (HASOCO)	waste water, odor		outside the third ring road
	7) Vietnam National Tobacco Corp.	waste water, odor		outside the third ring road
South shore of West Lake	8) Thuy Khue Leather Factory	waste water, odor	should be relocated in the integrated industrial estate equipped with industrial waste water pre-treatment facilities	
	9) Truch Bach Paper Mill	waste water, odor	outside the outer ring road	
	10) Hanoi Beer Co. (HABECO)	waste water, odor		outside the third ring road
City Center	11) Hanoi Liquor Co. (HALICO)	waste water, odor		outside the third ring road
	12) Trang Hung Dao Mechanical Factory	air pollution, noise	outside the city center	
	13) Electric Motor Factory	air pollution, noise	outside the city center	
	14) Hong Ha Stationery Factory	unsuitable land use		outside city center
	15) To Chau Dying Company	waste water	should be relocated in the integrated industrial estate equipped with industrial waste water pre-treatment facilities	
Bach Mai	16) Ba Nhat Chemical Factory (CaCO <sub>3</sub> )	air pollution, noise		outside the third ring road
Outside City Center	17) Tile and Brick Factory	air pollution, dust	limited to expansion	western fringe of the city

### Long-term plan

In a longer term, it is planned that further industrial development in Hanoi will be concentrated on 2 main axes: The Route 5 corridor and Route 18 corridor linking the Hanoi area with the seaports. When high standard freeways are constructed on

these corridors, new industrial areas for higher technology and high value added products will be developed along the routes.

Since the Route 18 freeway will improve the access to the port from Noi Bai Airport and the west part of Dong Anh district to the north of the Thang Long bridge, the industrial development potential in and around Noi Bai Airport and west part of Dong Anh district will be further enhanced.

When the Routes 5 and 18 corridors in the northern and eastern parts of Hanoi City are developed along with the industrialization, the western part of the City will be the major center for urban development in view of the drain problems in the southern part of the City, Thanh Tri district. Consequently, the western part of the city, Tu Liem district, should be reserved for urban uses such as residence, business/commerce, research development institutions, sports and recreational facilities, etc. The area surrounded by the Red River and the Route 32, in particular, should be reserved for new urban development in the Hanoi City in the future.

Table E.01 Foreign Direct Investments in the Manufacturing Sector  
Approved During 1988-1994 (Whole Country)

Industrial Category	Amount of Investment (US\$10 <sup>3</sup> )	Number of Projects
1. Non-Metal	525,719	16
2. Chemicals	396,579	10
3. Others	327,163	3
4. Textile	323,958	12
5. Electrical	316,424	38
6. Transport	234,564	21
7. Food	218,533	59
8. Beverage	167,909	18
9. Footwear	161,333	24
10. Glass	125,503	7
11. Apparel	118,582	61
12. Rubber	104,636	10
13. Fabricated Metal	93,825	13
14. Iron & Steel	81,908	9
15. Other Chemical	78,320	15
16. Paper	63,035	16
17. Petroleum & Coal Products	60,060	9
18. Non-Ferrous	55,000	2
19. Plastic	49,708	21
20. Machinery	46,268	19
21. Wood	33,836	18
22. Pottery	31,703	5
23. Professional Equipment	21,454	9
24. Leather	7,950	6
25. Furniture	6,931	4
26. Tobacco	3,500	1
27. Printing	1,250	2
Total	3,655,651	428

Table E.02 Foreign Direct Investments in the Manufacturing Sector  
Approved During 1988-1994 (North Economic Triangle\*)

Industrial Category	Amount of Investment (US\$10 <sup>3</sup> )	Locational Coefficient**	Number of Projects
1. Non-Metal	297,017	1.75	3
2. Electrical	248,832	2.44	14
3. Others	127,409	1.21	23
4. Transport	120,935	1.60	3
5. Fabricated Metal	88,197	2.91	8
6. Beverage	77,873	1.44	4
7. Iron & Steel	65,481	2.48	2
8. Petroleum & Coal Products	53,065	2.74	6
9. Food	35,449	0.50	16
10. Plastic	16,214	1.01	6
11. Machinery	14,486		5
12. Paper	11,163		4
13. Apparel	7,855		8
14. Leather	5,130		2
15. Furniture	3,835		2
16. Professional Equipment	3,777		3
17. Tobacco	3,500		1
18. Pottery	1,743		2
19. Chemicals	701		2
20. Other Chemicals	550		1
21. Wood	377		1
22. Textile	107		1
23. Glass	99		1
Total	1,183,795		118

Remarks; \* : Hanoi, Hai Phong and Quang Ninh province

\*\* : Estimated up to the 10th biggest category

Table E.03 Foreign Direct Investments in the Manufacturing Sector  
Approved During 1988-1994 (South Economic Triangle\*)

Industrial Category	Amount of Investment (US\$10 <sup>3</sup> )	Locational Coefficient**	Number of Projects
1. Chemicals	395,878	1.56	8
2. Textile	323,851	1.57	11
3. Non-Metal	252,515	0.75	11
4. Others	199,754	0.96	57
5. Food	171,259	1.23	39
6. Footwear	152,333	1.48	23
7. Apparel	109,727	1.45	52
8. Rubber	102,636	1.53	10
9. Beverage	89,997	0.84	14
10. Transport	89,028	0.59	17
11. Other Chemicals	74,634		11
12. Electric	67,592		24
13. Non-Ferrous	55,000		2
14. Paper	51,872		12
15. Plastic	33,494		15
16. Machinery	31,782		14
17. Pottery	29,960		3
18. Wood	28,549		14
19. Glass	24,927		5
20. Professional Equipment	17,677		6
21. Iron & Steel	16,427		7
22. Petroleum & Coal Products	6,397		2
23. Fabricated Metal	3,928		4
24. Leather	2,820		4
25. Furniture	2,198		1
26. Printing	1,250		2
Total	2,335,485		368

Remarks; \* : Ho Chi Minh City, Dong Nai province and Ba Ria-Vung Tau province

\*\* : Estimated up to the 10th biggest category

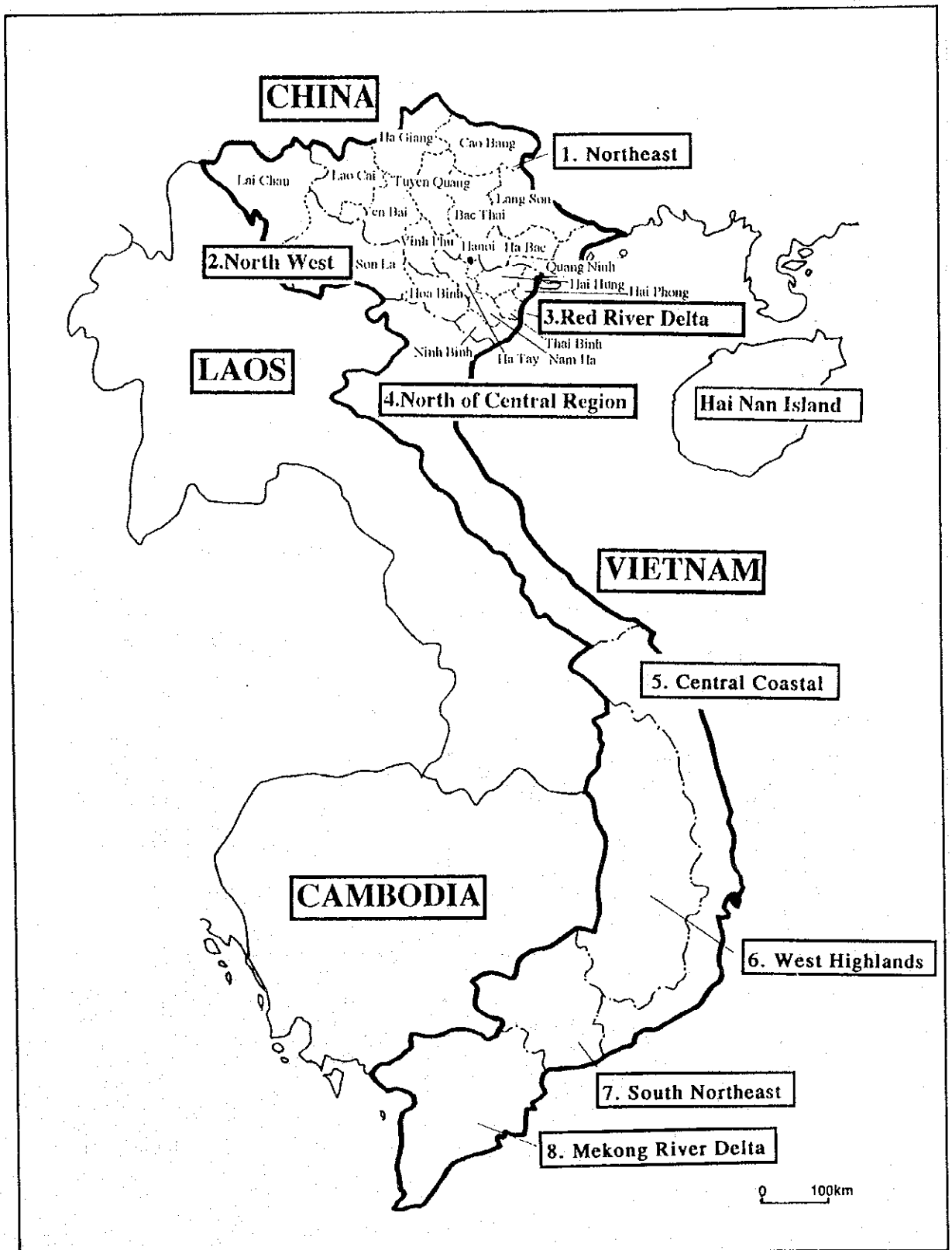
Table E.04 Foreign Direct Investments in the Manufacturing Sector  
Approved During 1988-1994 (Quang Nam-Da Nang province)

	Amount of Investment (US\$10 <sup>3</sup> )	Locational Coefficient**	Number of Projects
1. Transport	24,601	6.18	1
2. Food	11,826	3.19	4
3. Footwear	9,000	3.29	1
4. Wood	4,911	8.52	3
5. Non-Metal	3,187	0.36	2
6. Other Chemicals	3,136	2.36	3
7. Fabricated Metal	1,700	1.07	1
8. Glass	1,113	0.52	1
9. Wearing Apparel	1,000	0.50	1
10. Furniture	898	7.63	1
11. Petroleum & Coal Products	598		1
Total	61,970		19

Remarks; \* Estimated up to the 10th biggest category.

Table E.05 Foreign Direct Investments in the Manufacturing Sector  
Approved During 1988-1994 (Hanoi, Hai Phong, Quang Ninh)

Manufacturing Classification	Hanoi		Hai Phong		Quang Ninh		North Economic Triangle	
	No. of Projects	Investment (US\$10 <sup>3</sup> )	No. of Projects	Investment (US\$10 <sup>3</sup> )	No. of Projects	Investment (US\$10 <sup>3</sup> )	No. of Projects	Investment (US\$10 <sup>3</sup> )
1. Non-Metal	2	8,717	1	288,300	-	-	3	297,017
2. Chemicals	2	701	-	-	-	-	2	701
3. Others	21	126,543	-	-	2	866	23	127,409
4. Textile	1	107	-	-	-	-	1	107
5. Electrical	14	248,832	-	-	-	-	14	248,832
6. Transport	3	120,935	-	-	-	-	3	120,935
7. Food	11	28,054	3	5,681	2	1,714	16	35,449
8. Beverage	3	35,873	1	42,000	-	-	4	77,873
9. Footwear	-	-	-	-	-	-	-	-
10. Glass	1	99	-	-	-	-	1	99
11. Apparel	8	7,855	-	-	-	-	8	7,855
12. Rubber	-	-	-	-	-	-	-	-
13. Fabricated Metal	8	88,197	-	-	-	-	8	88,197
14. Iron & Steel	-	-	2	65,481	-	-	2	65,481
15. Other Chemicals	1	550	-	-	-	-	1	550
16. Paper	2	1,650	2	9,513	-	-	4	11,163
17. Petroleum & Coal Products	3	14,650	1	4,977	2	33,438	6	53,065
18. Non-Ferrous	-	-	-	-	-	-	-	-
19. Plastic	3	9,464	3	6,750	-	-	6	16,214
20. Machinery	3	10,686	2	3,800	-	-	5	14,486
21. Wood	1	377	-	-	-	-	1	377
22. Pottery	2	1,743	-	-	-	-	2	1,743
23. Professional Equipment	1	2,450	2	1,327	-	-	3	3,777
24. Leather	-	-	2	5,130	-	-	2	5,130
25. Furniture	2	3,835	-	-	-	-	2	3,835
26. Tobacco	1	3,500	-	-	-	-	1	3,500
27. Printing	-	-	-	-	-	-	-	-
Total	93	714,818	19	432,959	6	36,018	118	1,183,795


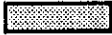
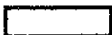


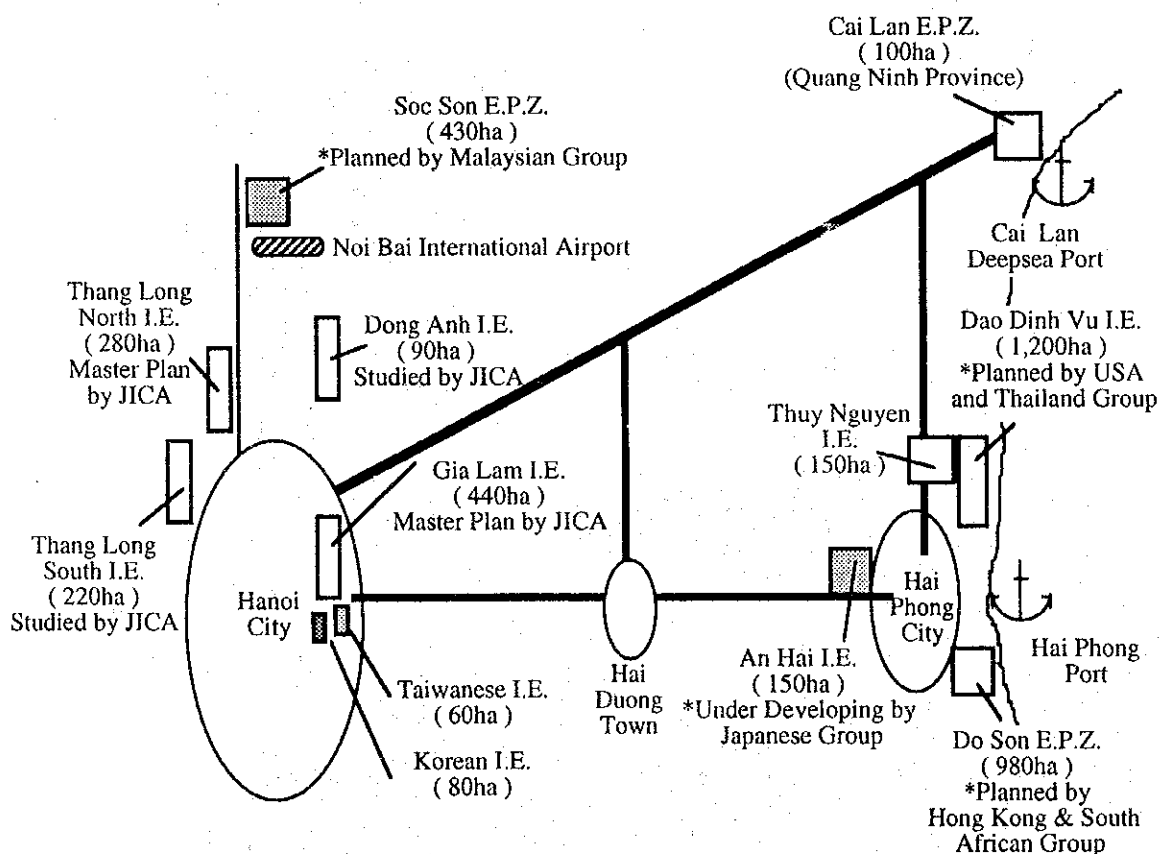
	JAPAN INTERNATIONAL COOPERATION AGENCY
	HANOI PEOPLE'S COMMITTEE
	SOCIALIST REPUBLIC OF VIETNAM
	MASTER PLAN OF INDUSTRIAL DEVELOPMENT IN THE HANOI AREA
	Figure E.1 Division of Economic Zones
	NIPPON KOEI CO., LTD. TECHNO CONSULTANTS, INC. PACIFIC CONSULTANT INTERNATIONALS



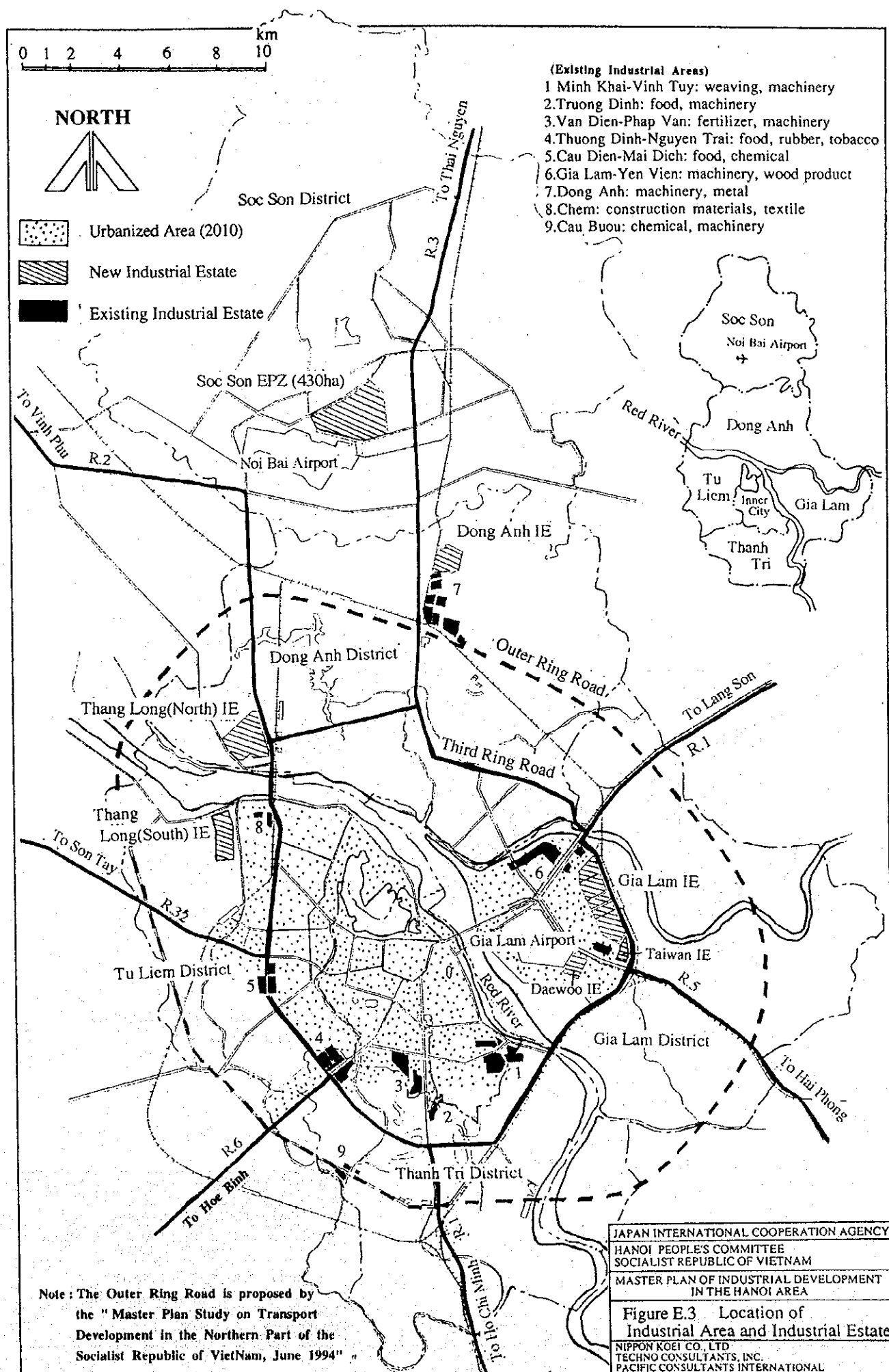
## INDUSTRIAL DEVELOPMENT IN THE RED RIVER DELTA AT A GLANCE

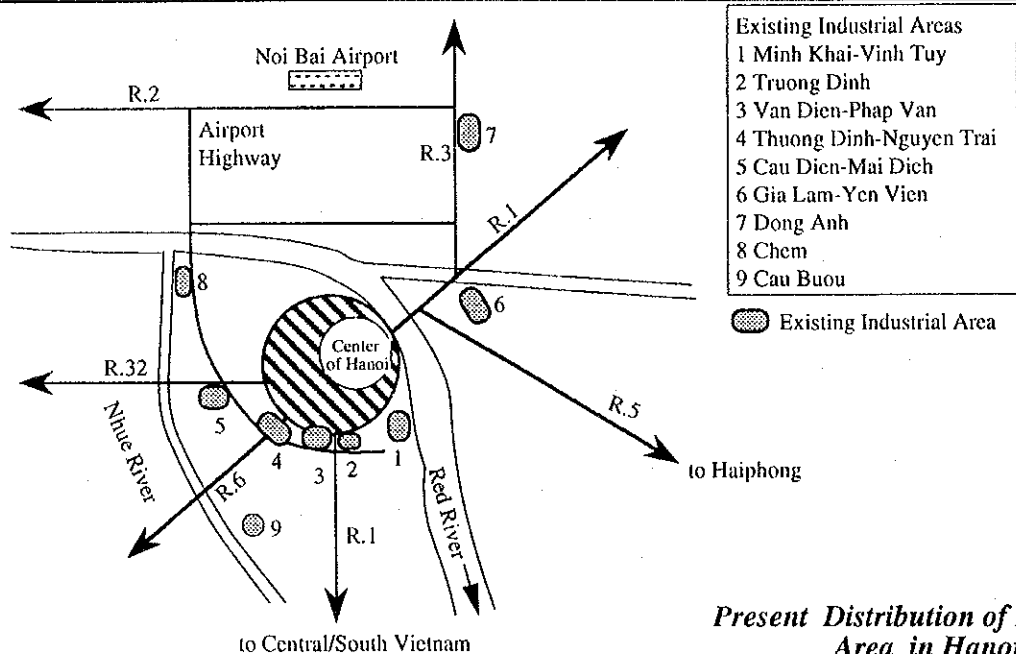
LEGEND : Existing Situation on the Industrial Estate

-  Under Operation
-  Under Development
-  Planned

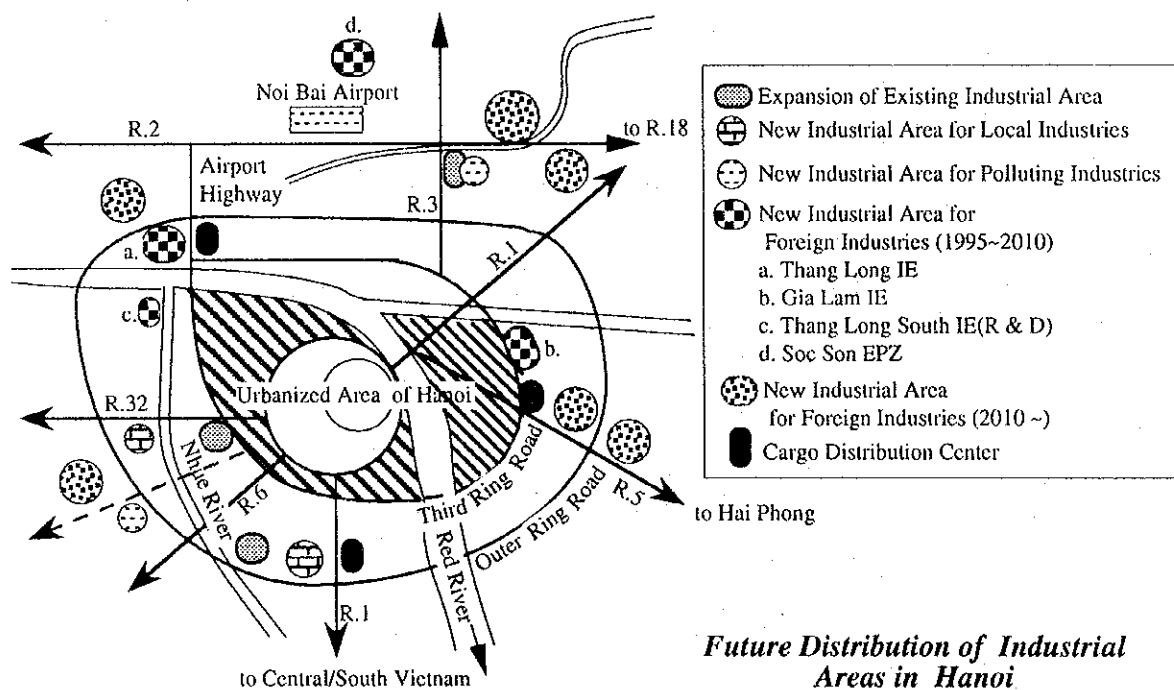


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MASTER PLAN OF INDUSTRIAL DEVELOPMENT
IN THE HANOI AREA
Figure E.2 Industrial Development in
the Red River Delta
NIPPON KOEI CO., LTD
TECHNO CONSULTANTS, INC.
PACIFIC CONSULTANTS INTERNATIONAL





**Present Distribution of Industrial Area in Hanoi**



**Future Distribution of Industrial Areas in Hanoi**

JAPAN INTERNATIONAL COOPERATION AGENCY  
 HANOI PEOPLE'S COMMITTEE  
 SOCIALIST REPUBLIC OF VIETNAM  
 MASTER PLAN OF INDUSTRIAL DEVELOPMENT  
 IN THE HANOI AREA  
 Figure E.4 Concept of Industrial  
 Area Distribution in Hanoi  
 NIPPON KOEI CO., LTD  
 TECHNO CONSULTANTS, INC.  
 PACIFIC CONSULTANTS INTERNATIONAL