5-4 Petrochemical Industry

4.1 Policy Alternatives and Their Implications: Issues In Introducing Petrochemical Industry to Viet Nam

4.1.1 Situation of the Petrochemical Industry in Viet Nam and Abroad

Petrochemical products are international commodities. The Southeast Asian market soared (1994/4Q - 95/2Q), then slackened over 1996; and the performance of Korean petrochemical enterprises that count on export substantially fluctuated accordingly. In the Asian market, however, it is expected that the shortage of supply capacity, especially of ethylene derivatives, will continue toward the year 2000 due to delays in China's petrochemical projects.

The ASEAN countries are very eager to effect investment; and capacity expansion (annual average of 15.9% in the same period as above), which significantly exceeds the growth rate of demand (ditto 10.4%), is expected to continue, especially in Thailand and Malaysia.

This includes some projects which may be difficult to realize, such as Indonesia's, but it is also anticipated that some markets depending on products such as raw ethylene will ease up with supply and demand comparatively balanced. Viet Nam, for its part, should take notice of the trends in equipment reinforcement in ASEAN countries and the future situation of AFTA/CEPT.

Demand for petrochemical products in Viet Nam is on the order of 100,000-120,000 tons (ethylene equivalents, 1995) in terms of ethylene derivatives. Consumption of plastic is still small, about 1-2 kgs per person. A general-use resin plant does not exist in Viet Nam, and there is no demand for ethylene itself at this stage. Accordingly, Viet Nam has thus far relied on import of general-use resin, but the demand for petrochemical products is growing. Currently, a PVC plant (80,000 tons/year), Viet Nam's first full-scale general-use resin plant, is under construction in the south. Demand for ethylene derivatives is also estimated to reach the 300,000 tons level in 2000.

4.1.2 Industrial Characteristics of the Petrochemical Industry and Issues of Viet Nam

The petrochemical industry is an industry which materializes thanks to the existence of ethylene production plants and general-use resin (polymerization) plants in the upstream and to the widespread existence of plastic processing producers in the downstream who supply products to big users such as the automobile, electronics, electricity, machinery and textile industries, as well as to consumers of various daily necessities. One of the issues of the petrochemical industry in Viet Nam is that many of the molding and fabricating manufacturers, and the compound manufacturers who effect preprocessing for them, are either small and thin in stratum or are technically outdated.

Petrochemical products demand can be divided into: (1) pure domestic demand; (2) indirect export; and (3) direct export. It is thought that pure domestic demand, which covers domestic consumer goods such as construction materials, daily necessities, and sundries, increases in proportion to increases in income. Direct export, which is effected in the form of monomers and polymers or plastic resins (intermediate products), is exposed to competition in international markets. Subsequently, export-oriented business tends to become risky.

Indirect export, which is a demand incorporated in exports in other industries, is usually regarded as domestic demand. The weight of this category in the demand of each country increases with the growth of export industries such as automobile and auto parts, electronics, electric appliance and textile. Another issue to be addressed in order to realize the petrochemical business in Viet Nam, is the delay in the growth of these export industries.

On the basis of the above recognition, the direction and potentiality of the petrochemical industry in Viet Nam at the start of the 21st century is discussed in the next section.

4.1.3 Direction of the Petrochemical Industry in Viet Nam

(1) Construction of a petrochemical complex

In order to construct a petrochemical complex with a naphtha-based ethylene center as the moving force, the following requirement must first be met, for which the participation of foreign capital (e.g. foreign producers) is often effective.

- Capital required: Procurement of $ 2-3 billion
- Production technology: Introduction of various general use resins
- Balanced sales capability in derivatives (including export): Essential for cost reduction for ethylene

The ethylene center, which is positioned most upstream in the petrochemical industry, provides a base for the production and supply of ethylene which becomes the most basic general-use resin. Among the petrochemical plants, it has the characteristics of being especially capital-intensive. and of having economy of scale (construction cost: $ 100-150 million).

Therefore, the construction of an ethylene center, before downstream demand reaches a certain scale, involves a large business risk through an inevitable export orientation. A certain scale has meant a 400,000-500,000 t level in terms of ethylene equivalent according to the experience of ASEAN countries. This scale is about equivalent to those of recent ethylene plants.

In Viet Nam, with no downstream resin producers and few resin processing producers, adequate domestic demand for ethylene is virtually non-existent for the above size plant. In addition, it is very likely that a newly established facility, which is comparatively high in capital cost, including the development of infrastructure, would be placed in a disadvantageous position in terms of price competitiveness on international markets. Within the country as well, the import protection via customs duties will cause burdens on the downstream industrialists.

(2) General-use resin plant

1) Possibility of construction and type of general-use resin plant

The major general-use resins produced from ethylene are polyethylene, vinyl chloride monomer (VCM = materials of PVC), and styrene monomer (SM = materials of PS). Polypropylene (PP) is produced from propylene, a naphtha cracker derivative. Aromatic BTX (benzene, toluene and xylem) is extracted from cracked oil in the same manner, as are raw materials for PTA and polyester fiber.

Construction cost for a general-use resin plant is estimated at $ 10 million - $ 50 million for monomer, and $ 6 million - $ 10 million or thereabouts for polymer. Since the construction cost for a monomer plant is much larger than the cost for a polymerization plant, entry is more difficult. On the other hand, the marine transport of monomer (especially ethylene), which was said to be difficult in the past, has become much more available in recent years. Accordingly, it is thought that there is also a possibility that a polymerization plant using imported monomer could be selected at a time when the scale of demand has not reached a sizable amount.

2) From which resin is business to be realized?

When deciding which resin production system should be constructed first, it is important to estimate demand by taking into account the trend of resin processing producers, users of respective resins, and the trend of consumption resulting from economic development or the expansion of indirect export due to industrialization.

At the initial stage of economic development, demand is generally generated from PVC used for construction materials and agricultural sheets. As we can see in the experience in ASEAN countries, demand has been increasing for general-use resin resulting from the demand for PVC used for construction materials such as vinyl chloride pipes and for daily necessities and sundries, or PE, PP, PET(used for PET bottles). These trends have been seen in Viet Nam as well. When the types of demand of the ASEAN countries are compared, we can recognize the large weight placed on PS in Singapore and Malaysia and on PTA in Thailand and Indonesia. PE and PP are also used in films, sheets, formings, containers and packaging materials. This causes differentiation among the respective countries to be difficult. Viet Nam has had little demand yet for PS, for which there is big demand in countries such as Singapore and Malaysia. In these countries, industrialization has advanced in the field of home electric appliance and electronics industries. On the other hand, demand for PP for cement bags and rice bags has increased in Viet Nam.

(3) Location

With respect to the location of the petrochemical business, a master plan is currently under preparation in the Ministry of Industry, with two projects standing side by side; a plan for constructing a complex in Dung Quat together with a refinery; and another plan locating an ethylene center in the South and using natural gas (described later). In Dung Quat, a plant which utilizes co-products such as propylene, generated at oil refineries, is being considered. It is thought that a natural concentration of refining plants in the said area is possible if the ethylene center project is embodied and the development of infrastructure advances in the future.

However, if the proposed ethylene center is carefully examined and construction is delayed due to current domestic demand, the petrochemical business will start in the meantime by expanding primary processing using imported ethylene and other imported monomer and polymers. In that case, advantages of locating a plant in a consumption area are anticipated, and the location of general-use resin producers and processing manufactures on the outskirts of the consumption area will become an option before the construction of the general-use resin plant in Dung Quat.

(4) Petrochemical industry using natural gas

Production of natural gas is planned offshore in the south (South Conson Sea area), with pipelines planned to be constructed up to Phu My. There are examples of plants which produce ethylene from ethane, an ingredient of natural gas, in Malaysia (Ethylene Malaysia), Thailand (NPC), etc. Production in an ethane-based plant does not produce co-products such as propylene, but permits the use of simpler equipment, and accordingly is sometimes more advantageous than naphtha cracker in terms of cost.

This natural gas is planned to be used mainly for power plants, however, the deposits of natural gas, the production level a year and other factors still seem uncertain. So we have to pay attention to the progress of exploitation and the pipeline project. The master plan of petrochemical industry being prepared by MOI has three stages. In the second stage (2000-2005), they are making a policy to construct an ethane cracker for natural gas in the South preferentially rather than a naphtha cracker in Dung Quat. It will be difficult to establish two ethylene centers at around the same time. The timing of a naphtha cracker (in the middle of the country) or an ethane cracker (in the south part) will be decided upon after examining the integration trend of resin producers and resin processing producers in Dung Quat and the Vung Tau district.

(5) Introduction of foreign capital and incentives as well as industrial protection

Participation of foreign capital in the petrochemical industry is significantly effective in the introduction of technology, in addition to the capital procurement aspect. It is said that the world's general-use resin technology is under the control of four companies, Dow Chemical, BP, UCC, and EXXON. Therefore, both operation and sales capability effects can be expected by allowing these foreign enterprises which own technology to participate in the business.

One of the incentives for foreign enterprises to invest in Viet Nam is its promising market size, but if the various difficulties discussed above are taken into consideration, then Viet Nam must offer better incentives than other ASEAN countries.

In addition, from the viewpoint of nurturing domestic industries, protection via import duties will be necessary in the startup period in some cases. Indonesia offers an example of sales expansion of domestic products via customs duties. However, the deadline for AFTA/CEPT does not allow much time for enterprises to make inroads into Viet Nam under an expectation of protection.

4.2 Participation with AFTA and WTO, and Their Influence on Viet Nam

4.2.1 Import Tariff Levels and CEPT Schedule in ASEAN Countries

Many of the ASEAN countries have traditionally imposed high tariffs on petrochemical products to protect their own petrochemical industries. For example, Thailand maintains the BR (base rate) for major petrochemical products (ethylene, PVC, polypropylene, etc.) at high levels of 20-30 %, and even on CEPT, though the same products were designated as NT (normal track) starting at 25%, the schedule is reportedly being delayed because of opposition from the domestic industry.

Indonesia reorganized its import duty system in July 1996, when it abolished the surcharge, a supplementary levy that is now incorporated in the tariff. As a result new tariffs are higher, and not much different, overall, from "the old tariff + the surcharge." We made an inquiry of the AFTA Secretariat about the effects of this change on CEPT, but we could not get a clear answer from them. It is said that Indonesia's tariff policy is often hard to understand, but there is one example of Indonesia using a tariff as a way of protecting its domestic industry: Indonesia raised the tariff rate for ethylene from 0% to 25% again in order to make Company P, a domestic user, purchase the products of Company C, first domestic ethylene center in Indonesia. There is another information that Company P purchased some of the products because the government told them that the 25% rate was applicable only to ethylene used as the raw material for polyethylene (though this may be main use of ethylene), and that actually ethylene has never been imported at the 25% rate.

Tariff Rates in Malaysia and Singapore are fairly low. Especially in Singapore many products are tariff-free. On the other hand, in the Philippines the BR is low but many products are on TE of CEPT because petrochemical industry in Philippines is still underdeveloped.

4.2.2 Non-Tariff Barrier and WTO

A study of the ASEAN countries' policies to protect domestic industries shows that all have imposed high tariffs on competitive imported products. (Singapore is an exception.) Protective or supportive measures for domestic industries, besides the import tariff, include imposition of corporate taxes, import tax reduction or exemption for equipment and raw materials, financial support, and various subsidies. Some of these measures, which are aiming for export, constitute WTO violations. Also, control of import volumes clearly defies WTO's fundamental principles, and typical examples include Malaysia's AP system and import restrictions in Indonesia and Thailand.

1) Malaysia's AP (Approval Permit) system, etc.

This system was introduced in 1994 to coincide with the startup of a domestic petrochemical plant. It bans the import of polyethylene or polypropylene unless the importer obtains a letter (No Objection Letter) stating that it is impossible to have such a product supplied from a domestic producer in Malaysia. This is an outright violation of Article 11-1 of GATT.

Malaysia has another form of import control based on four classifications under the 1967 Tariff Law and other rules. Raw materials for plastics are categorized, along with cement and other items, as provisional import control items (15 items) for the sake of protecting the domestic industry. This may be a violation of GATT's Article 11.

2) Indonesia's import control on quantity

This has been practiced previously to protect domestic industries, among other purposes. However, because of recent deregulation, the number of target products has decreased annually. This control gives exclusive import rights for target products to "Sole Agents" and others selected through the government's appointment, and therefore violates Article 11 of GATT.

3) Thailand's import control under export/import control law

This is an import restriction practiced in accordance with Article 5 and other provisions of the 1979 Export and Import Control Law, and is applied to imports of 20 items including machinery, electrical equipment, and used automobiles. The reason for approximately 30% of this import control on such items is to protect domestic industries, liable to constitute a violation of GATT Article 11.

In AFTA, member countries that take restrictive measures are not requested to abolish non-tariff barriers unless they export a product at a CEPT rate. However, they would need to take some action (submission of a schedule for improvement, for example) when they affiliate with the WTO.

4.2.3 Influence on Industrial Policies in Viet Nam

All basic plastic products (polymer, etc.) such as polyethylene, polypropylene, and PVC are tariff-free in Viet Nam. For plastic intermediate products or semi-finished products and plastic products, the lower the degree of processing, the lower the rates. Especially monomers such as ethylene and many polymers are not even listed individually on the table of tariff rates, either because there are no finishing (downstream) facilities within the country or because there is no competitive domestic product available. As the petrochemical industry grows, tariff rates will first be set on polymers, and then on monomers, if and when these begin to be locally produced.

There were 857 Inclusion items on the original CEPT list which Viet Nam submitted in 1995, which is less than the average 7,300 items, for the other six countries (note). Also, the 44,642 items includes a total of 8,161 chemical and plastic items accounting for almost 20% of the total. Viet Nam, however, only submitted 43 chemical/plastic item or 5% of its total. The figures suggest that Viet Nam will have to add a large number of items to the Inclusion List as industrialization progresses. Petrochemicals will undoubtedly make up a major section on the list. Incidentally, the average number of items on the Exclusion List is 416. Viet Nam has placed a high number 1,189, of items on the list. Its total number of items, including the Inclusion List, is less than 25% of the six-country average.[4]

Chemicals and plastics are included in the 15 items on the AFTA's FT (Fast Track). Viet Nam has been requested to move these products, currently listed on TE, to the Inclusion List by the year 2003.

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[4] Based on AFTA Reader Volume IV. Data from Viet Nam shows that 1,661 items were listed on IL and 1,361 items on TEL, and that action was taken in 1996 for 857 of the IL items, that were carrying 5% or less tariff.

Based on regulations concerning FT items, this will also probably mean that, Viet Nam must lower tariff rates to 0 - 5% by 2003. Although other ASEAN countries will make the change by 2000 under the same regulation, in many cases the lists of those countries show such items on NT (Normal Track).

The import control on Quantity is another policy measure, besides import tariff, used to protect domestic industries. Quantitative control is an act that defies the WTO's fundamental principles, and as soon as a country affiliates with the WTO, it is requested to abolish such controls. Viet Nam, which is planning to join the WTO, would not be able to protect its industry by quantitative control, nor give hope for benefits from such control to foreign enterprises intending to enter the country.

Subsidy is another way to protect or foster domestic industries. WTO divides subsidy into three types; Red, Yellow, and Green. In addition to export subsidy and local content, subsidies such as low-interest loans, debt guarantees, equity investment, and preferential tax systems as quid pro quo for export are also prohibited subsidies (Red). — [Subsidy Convention]

The WTO is trying to prevent unfair trade through these conventions, but is fairly flexible regarding replacement of non-tariff barriers with tariffs. Viet Nam is well advised to join the WTO as soon as possible because it stands to receive significant benefits such as "Most-Favored-Nation Treatment" status on becoming a member. Disadvantages will include restrictions on the kind of measures, it can use to protect domestic industry. Viet Nam should therefore, try to raise the bound rate as high as possible when it negotiates for WTO affiliation since protective tariff is an effective way of attracting overseas investment.

Tariff Reduction schedule on CEPT scheme

Petrochemical Industry	Base Rate (other than ASEAN)	AFTA, CEPT (96-03)	WTO- related	Comment
Thailand ethylene PVC polypropylene	 20 30 40	 NT12- 5 NT25- 5 NT25- 5	Became a member in January 1995	Although the country has implemented an industrial protection policy, it takes a positive attitude forward the CEPT scheme.
Malaysia ethylene PVC polypropylene	 0 10 0	 FT - 0 NT - 5 TE	Became a member in January, 1995	The AP system, against which Singapore protested in the second half of 1995, has been virtually withdrawn.
Indonesia ethylene PVC polypropylene	 25 (Polyethylene) 20 40	 FT0- 0 FT -5 TE (Unconfirmed)	Became a member in January, 1995	A surcharge which was imposed to protect the domestic Ethylene Center, was abolished in July, 1996. Tariff rates was raised for some products (Ethylene for polyethylene: 0% to 25%).
Philippines ethylene PVC polypropylene	 0 20 10	 TE TE TE	Became a member in January, 1995	
Singapore ethylene PVC polypropylene	 0 0 0	 FT0- 0 FT0- 0 FT0- 0	Became a member in January, 1995	Encouraging the development of AFTA within the ASEAN region
Viet Nam ethylene PVC polypropylene	Tariff rates are not specified because there have been no imports to date	 TE (Unconfirmed) TE (Unconfirmed) TE (Unconfirmed)	Applying for membership. Member countries should be penalized for raising customs duties on products for which they were previously lowered (Reciprocity principle).	

4.3 Supplement 1: Possibility Of Step-by-step Petrochemical Industrialization in Viet Nam

4.3.1 Today's Petrochemical Industries in Viet Nam

The petrochemical industry in Viet Nam is still at the dawn of a formative period. Viet Nam imported 223,000 metric tons of plastic raw materials in 1995, which in monetary value ($230 million) is only approximately 25% of the total imports of petroleum products, Viet Nam's main import, and 40% of chemical fertilizers. The volume of plastic raw material imported has increased (at an average annual rate of 59%) to almost seven times the 350,000 metric tons that was imported in 1991, showing much faster growth than GDP during the same period. This is due to an increase in demand for various plastic products, and other fiber and apparel products made from plastic raw materials. Demand for plastics is expected to increase further in the future. Further development in the plastic processing and synthetic fiber industries—both downstream components in petrochemicals—holds the key to growth and expansion of the Vietnamese petrochemical industry.

(1) Demand for plastics in Viet Nam

Demand for basic plastic products, intermediate products (general-purpose resins) stands at around 115,000 metric tons in ethylene equivalence, or approximately 1.6 kg per capita. This is equivalent to 10% of the demand for plastics in Thailand, and only 50% or less the demand in Indonesia and the Philippines. As demonstrated in the next section, there is a distinctive correlation between this indicator (per-capita demand for ethylene) and per-capita GDP. Based on this respect, demand for petrochemical products in Viet Nam is expected to increase further.

The fact that Viet Nam still imports only limited volumes of plastics and plastic raw materials does not necessarily mean that the country is not dependent on imports. Rather, it suggests that processing industries have not yet full maturity. Although, of course, not all imported plastic and plastic raw materials are used for production of plastics, Table 4.1 demonstrates that the scale of production of plastics has not reached even 50% of the limited volumes of imported plastic and plastic raw materials. This also points to the lack of depth to be found in the plastic processing industry in Viet Nam.

The breakdown of demand shows that polyvinyl chloride (PVC) and various polyethylene (PE) account for most of the demand for plastic resins, and the percentage of demand going to polypropylene (PP), the polymer of propylene, is distinctively high compared to similar breakdowns in other ASEAN countries. This is because in Viet Nam, demand for PP for cement bags and rice bags is growing.(See Table 4.2)

Experience in industrialized countries has shown that demand for PVC develops earlier than other plastic resins, because it is used for construction materials and agricultural sheeting, etc. from the earliest stages of economic development. This can be seen in Japan, too, where housing, construction and civil engineering (PVC pipe, etc.) accounts for more than 40% of demand, and packaging/physical distribution materials and wire and cable materials approximately 10% each. In Japan only about 6% of the total demand for PVC is used for agricultural materials, but this percentage is believed to be much higher in Viet Nam.

A survey made by Viet Nam (Table 4.3) shows that household goods and daily necessities still represent extremely large applications of all plastic products. This also explains why demand for PP is so high. The survey also indicates that the production capacity for packaging materials of PP increased fivefold from 20 million pieces in 1991 to 100 million pieces in 1995. It is noted in the survey that the quantity included high-quality products for exports, and would be equivalent to 400 million pieces if the capacity was used entirely to make ordinary products. This seems to substantiate

the popular observation that production technology for plastic products in Viet Nam has not reached the levels required by the international market. This will be a significant factor when Viet Nam tries to boost demand by promoting exports in the future.

(2) Plastic resin plants in Viet Nam

At present, Viet Nam does not possess the facilities to produce general-purpose plastic resins, and subsequently there is no demand for ethylene, the upstream product. Therefore, as stated previously, Viet Nam is entirely dependent on imports for general-purpose resins. A PVC plant (80,000 tons/year), the first full-scale resin plant in Viet Nam, is now under construction. Table 4.4 lists 10 projects, including the above PVC plant project, to build industrial plants capable of producing general-purpose resins in the near future, based on an influx of investment from overseas.

These 10 projects are representative of Viet Nam's petrochemical fields, and their feasibility is believed to be high. The Vietnamese government, however, has given full investment approval only to the top 4 projects. The remaining projects are still at the planning or feasibility study phases. Besides the PVC project presently under construction, another PVC plant project is listed as authorized, but its scheme has to be re-constructed after Occidental Chemical pulled out of the project.

As shown above, construction of general-purpose resin plants in Viet Nam has only just started. Foreign investors are now watching closely growth of demand in the downstream segment and developments in the business environment (the effects of AFTA/WTO and reordering of laws) in Viet Nam.

4.3.2 Petrochemical Industrialization in ASEAN Countries

In ASEAN countries, demand for petrochemical products is increasing rapidly against the backdrop of recent economic growth. As a result, these countries are now aiming to begin local production and achieve self-sufficiency in petrochemical products, putting the petrochemical industry at the center of their industrialization programs. It is not an overstatement to say that in contrast to advanced countries where maturing of markets and excessive supplies have become problems, East Asian countries have started to build petrochemical plants as national projects to promote industrialization. The following will offer an overview of these shifts toward industrialization in the petrochemical sector in ASEAN and other countries—for consideration whether Viet Nam can follow suit.

(1) Characteristics of the petrochemical industry and industrial policies of ASEAN countries

The petrochemical industry is composed such upstream facilities as ethylene plants and general-purpose resin plants (polymerization) and a broad variety of large and small plastics processing operations which make up the downstream segments. The following will discuss the background, on both the demand side and the supply side, of the growing trend in East Asian countries, the ASEAN countries in particular, to construct upstream petrochemical plants.

1) Demand side

Domestic demand for plastic products is twofold: they are used as the raw materials for domestic consumer goods such as general construction materials, daily necessities, and fiber/apparel products, and are also used as components in products for export. In the normal sense the latter would be an indirect export rather than domestic consumption, but is usually categorized as domestic demand. These needs in various countries will expand with the growth of such export-oriented industries as fibers, automobiles and automobile parts, home appliances and electronic devices. And there is a strong correlation between total demand, including real domestic demand and indirect exports, and

GDP. In other words, the per-capita consumption of resins and other petrochemical products rises in proportion to the growth of per-capita GDP. There are the relationships between per-capita GDP and per-capita consumption of plastics (in ethylene equivalence) in ASEAN countries. Figure 4.2 summarizes the data for three countries, Thailand, Indonesia and Malaysia, in one chart. It clearly shows a proportional correlation. Also, when GDP reaches a certain level, consumption begins to increase faster than GDP (GDP's elasticity value is larger than 1). The structure for supply will form only after such an expansion of domestic demand has boosted the scale of demand for petrochemical products to a certain level.

2) Supply side

The upstream part of the petrochemical industry is capital-intensive industry requiring massive investment, and one that can enjoy economies of scale. One aspect of it is that even developing countries can introduce the equipment and technologies as long as they have the capital. On the other hand, however, low labor cost, a strength of developing countries, is not necessarily a favorable factor. (Labor cost as a percentage of the total cost to produce a petrochemical product is low.)

Therefore, for ASEAN countries, many of which are developing nations, the real issue has been to secure good economic and competitive strength to compete against the less expensive imported products. An examination of the progress in the various countries' efforts to organize supply readiness reveals the following three key points:

- Scale of demand;
- Introduction of foreign direct investment;
- Protection and fostering of industry.

First of all, since this is a process industry with substantial economies of scale, ethylene centers were built in all countries when the demand in ethylene equivalence had exceeded 400,000-500,000 metric tons/year (except for Singapore in the 1980s). The capital investment at the time covered plants of general-purpose resins as well as the ethylene centers, and in many cases reached more than US$1 billion (US$ 2 billion to US$ 3 billion for the more sophisticated petrochemical complexes). Under these conditions, how to raise investment funds is a major point, and many ASEAN countries induced foreign capital and formed joint ventures. In some cases, projects were subdivided into smaller portions to make foreign investment less risky.(See Table 4.5, 4.6, Figure 4.3)

Another characteristic is that ASEAN countries have taken various measures to protect and foster the industry in order to improve profitability. These include offering favorable prices for raw materials, which occupy a large portion of production cost (Malaysia), reorganizing infrastructure at national expense (Singapore for one), reduction of or exemption from corporate income taxes for several years following the startup of the plant (Malaysia and many other countries), and imposition of high tariffs on imported petrochemical products (all countries except Singapore). These measures also helped induce foreign capital, and conversely speaking, countries that did not take such measures were not able to attract investment from overseas.[5]

(2) Developments in ASEAN countries

The petrochemical complex brought on stream in Singapore in 1984 was the first such facility in the ASEAN area. Following this success, many petrochemical projects were implemented in other ASEAN countries. The following will show developments in the four ASEAN countries in order,

[5] This forces the users of petrochemical products in the country to buy more expensive raw materials and supplies; however, these countries are taking measures that give priority to the development of the petrochemical industry.

specially from the viewpoint of the three key areas discussed above.

1) Singapore

The petrochemical industry started when SPC, founded in May 1972, began producing PVC. Later, in February 1984, a petrochemical complex, a joint venture with Japan (Sumitomo Chemical) began operation as a national project, and now forms the core of Singapore's industrialization program. The main enterprises are PCS (a producer of ethylene; capacity - 300,000 metric tons/year in 1985, compared to 320,000 metric tons of demand for ethylene) and TPC (a producer of polyethylene and polypropylene). The initial equity holdings of the Singaporean government have been transferred to the Shell group.

The characteristics of the Singaporean petrochemical industry are that domestic demand is limited, and that it has become the supply base in the ASEAN region. It continues to operate at high rates close to 100% capacity. To cope with this situation, a landfill and reclamation project centered around Jurong Island, and a project to build a new petrochemical plant are now being undertaken. Probably the reason why such an export-dependent project is viable is because Singapore has prospects of being able to secure sales for its products, even to meet increasingly sophisticated customer needs, on the strength of its technological prowess, which has allowed it to continue to supply high-quality products, and its well-organized infrastructure.

2) Thailand

The first-phase petrochemical complex project (NPC-1) authorized in 1982 was completed in July 1989. The ethylene plant, the core of the project, produces ethylene by cracking the ethane made from local natural gas as the feed stock, and produces propylene by propane dehydrogenation. (Ethylene capacity in 1990: 315,000 metric tons compared to 430,000 metric tons of domestic demand. Both are figures for the year, and as are the figures below.) Decision for the second-phase project (NPC-2) was made in 1988 to meet brisk demand, and was completed in 1995 (350,000 metric tons in ethylene capacity). NPC-2 produces a broad variety of products from olefins to BTX, using naphtha/condensate as the feed stock. Thailand is more active than any other ASEAN country in investing in petrochemical facilities. In addition to the above two projects, it plans to build NPC-3, and also has projects, already under way, of TPI (Thai Petrochemical), the first ethylene center to be built by private concerns, and of ROC (Rayong Olefins) to be organized around Siam Cement. The total ethylene capacity of the three projects will reach 1,250,000 metric tons, and it is expected that for some of the derivatives there will be considerable extra capacity that can be diverted for exports.

Thailand's industrialization was led by the equity investment of PTT, the public oil corporation, in a first ethylene center—investment in an activity which requires economies of scale and which is characterized by difficulty in gaining economic viability. PTT supplies ethane and naphtha, the feedstocks, to the facility stably, and the petrochemical complexes are concentrated around that facility in the Rayong and Map Ta Phut districts.

3) Malaysia

The Malaysian petrochemical industry in the 1980s only had two PS plants and two PVC plants, but early 1990s, plants for PP, ABS and other derivatives were constructed and put into operation. After these, the first ethylene plant was built in the fourth quarter of 1993 by Titan Petrochemical, a joint venture between Australian and Taiwan entities and a Malaysian investment company. Then Ethylene Malaysia, a joint venture between Japan and Petronas, a state-owned oil company, and began operation of an ethane-based ethylene plant (320,000 metric tons in capacity) in September

1995, bringing the country's supply-demand balance in ethylene equivalence for petrochemical products closer to self-sufficiency. (Domestic demand in 1994: 430,000 metric tons)

Petronas is reportedly supplying ethane produced from natural gas to the latter-mentioned ethylene plant at a price lower than the international price. Also, the plant, which uses ethane for feed stock, does not produce by-products as a naphtha-based plant does, but has a compact equipment arrangement. For these reasons, the plant is believed to be supplying a highly competitive product. (A polyethylene plant is the only downstream facility built with it.)

4) Indonesia

Demand for Petrochemical products in Indonesia includes PVC, PS, and also PTA, the principal raw material for polyester fibers, which was commercialized because production of the fibers had increased. Plans for several olefin centers were announced in the late 1980s to make coherent production from upstream on down possible, but most industrial development projects were delayed because of the national debt problem. The first olefin center, Chandra Asri (annual capacity: 540,000 metric tons), was finally completed in 1995 and began operations in September of the same year. However, demand in ethylene equivalence had reached almost 700,000 metric tons by 1994, and a second olefin center project is now taking shape.

There is a complex of general-purpose resin plants in the Merak district where Chandra Asri is located. However, since downstream plants were built first, it can hardly be said that the plants are integrally organized in terms of layout and raw material supplies. In other words, as separate infrastructure and utilities were built for each plant, it is said, for example, that this investment accounted for more than 30% of almost $2,000 million of total investment for Chandra Asri, and has become a significant negative factor in the price competitiveness of the product. Indonesia has set high tariffs for ethylene and other petrochemical products to be able to compete with imports favorably, and it is necessary by 2003 to make adjustments with the AFTA/CEPT schedule.

4.3.3 Possibilities of Introducing ASEAN's Experiences to Viet Nam

The foregoing has discussed the characteristics of the petrochemical industry from both the supply side and the demand side, and also the ASEAN countries' experiences in petrochemical industrialization. The following will consider the relevance to the present state of the Vietnamese petrochemical industry discussed in Section 1 and the possibilities of applying ASEAN lessons to Vietnamese industrial policy.

Firstly, the timing of capital investment is important. The current demand in ethylene equivalence in Viet Nam is slightly higher than 100,000 metric tons, which is too low to justify construction of ethylene and other monomer plants which largely rely on economies of scale. (Export cannot be contemplated unless the raw materials can be supplied at very low prices.) Demand in Viet Nam is expected to increase rapidly in the future with economic development, improvement of income, and population growth. However, the actual examples in the ASEAN countries show that it will make better economic sense, based on the current scale of the ethylene plants, for the country to rely on imports until demand in ethylene reaches the equivalent of at least 400,000 to 500,000 metric tons.

First step to accelerate the increases in demand is to strengthen operations which process imported intermediate materials (operations such as molding) and then commercialize PVC and synthetic fiber production. Research relative to Taiwan and South Korea has demonstrated how the backward-linkage effect of the development of downstream industries in such a round-about production process as this would help boost demand for petrochemical products and facilitate the growth of the industry. The petrochemical industries of these two countries are typical examples of the "Flying Geese Pattern

of Development," and it has also been pointed out that they are enjoying the "relative late-occurring benefits" when compared with Japan.

Secondly, the use of foreign capital should be considered. A study of the four ASEAN countries reveals that many projects in those countries have been promoted through joint ventures with foreign concerns.[6] This benefits of working with foreign concerns is substantial in the procurement of funds, grant of production technology, and securing of sales routes. Conversely, the participation by a foreign concern underwrites feasibility of the project.

Thirdly, it is necessary to have measures to protect and to foster the industry. This, too, was discussed in the previous section and so will not be repeated here, but conditions for raw material supplies, organizing industrial infrastructure, tax exemption and reduction, and protection through import duties are all important industrial measures to improve the profitability of the projects. However, now that Viet Nam is already affiliated with AFTA and submitted a CEPT schedule, there has been considerable change in the industry protection measures such as the tariffs which the ASEAN countries have imposed in the past, and it is now more difficult to take similar action. Also, Viet Nam has filed a membership application to WTO. Once its application is accepted, Viet Nam will even have considerable difficulty in imposing non-tariff protective measures. In other words, Viet Nam will have to search for its own path. The experiences, however, of the four ASEAN countries and the NIE countries in East Asia certainly have elements that will offer important lessons to Viet Nam.

4.4 Supplement 2: Demand for and Export-Promotion of Petrochemical Products in ASEAN Analysis Based on Input-output Tables

4.4.1 Demand for Petrochemical Products and Industrial Structure

The chemical products produced by the petrochemical industry (synthetic resins = plastics, raw materials for synthetic fibers, synthetic rubbers, etc.) are processed in the plastics processing industry, fiber industry, rubber industry, etc. into industrial materials used in the automobile industry, home appliance/electronics industry, and housing industry, or into items of daily use such as household goods, sundry items, and packages and containers. They are also used as basic materials for dyes, pigments, agricultural chemicals, and pharmaceuticals. Attempts to quantitatively identify the consumer sectors of petrochemical products have been made by questionnaire surveys and other means. However, the only way to identify an entire country's demand composition by industry for chemical products and their raw materials—which go through primary and secondary processing, and then divergent production and distribution processes—is to make analysis based on monetary values, using an Input-Output Table. The following analyzes the supply flows of basic petrochemical products to plastic products (hereinafter called "petrochemicals/plastics") into all industries (products) in six countries around Viet Nam, using Input-Output Tables of those countries and also taking chronological changes into account.

(1) Consumer industries

Table 4.7 shows the value-based (producer price based) splits of petrochemicals/plastics supplied (=input) to various industries and products. The table shows how much petrochemicals/plastics were supplied to what industries or for what products, with the total value of such supplies (excluding

[6] In Thailand, there is no foreign investment in the ethylene centers such as NPC which is partly owned by PTT, but the general-purpose resin projects are joint ventures.

values of exports) expressed as 100. There are slight differences in the way that industries are categorized in each country; in the table the statistics have been reordered into the same 13 industry types. For the supply side, products ranging from basic petrochemical products to plastic products (including supplies "from basic raw material to basic raw material" or "from plastic to plastic") were selected for the study.

The following summarizes the significant points readable from Table 4.7:

- The percentages of supplies to chemical products and to plastic/rubber products are generally high, at 15-40% respectively, in all countries (except for Thailand for the former and Malaysia for the latter, where the percentages are less than 10%).
- Categories other than chemical and plastic/rubber products that generally occupy high percentages include "apparel/fiber" ("Wearing, Textile prods." In the Tables, hereinafter) and "home appliance/electronics." ("Electronics & electric equip." in the Tables, hereinafter.)
- In "apparel/fiber," Thailand (41.9%) is markedly high, but historically its percentage is declining. On the other hand, Indonesia (15.4%) is increasing and Taiwan is also relatively high, at 12.5%.
- "Home appliance/electronics" occupies 6-9% in all countries. (The 0% for Indonesia may be because of the industry categorization.)
- Supplies of petrochemicals/plastics for "Construction" show relatively high percentages in South Korea (6.9%) and Japan (5.8%).
- "Transportation machinery" (automobiles) is another category where only South Korea and Japan show high percentages (5 - 8%).

Supplies of chemical fertilizers and insecticides for farm products and coconut oil are supposed to explain why supplies to "agricultural, forestry, fishery/mining" in Malaysia are exceptionally high. Another feature about Malaysia is that supplies of plastics to "food products" show a high percentage.[7]

The state of supplies by industry in each country shown above supports general observations about demand and use for petrochemical products. For example, synthetic fibers produced in the "apparel/fiber" industry are products that are domestically produced as raw materials and supplied for the downstream, labor-intensive sewing/apparel industry in developing countries. This is made evident by contrasting shifts in Thailand and Indonesia.

Products in the "home appliance/electronics" industry also use plastics as the materials for their principal components. For automobiles, too, a 1-ton passenger vehicle consists of approximately 100 kg of plastic. Quantities supplied to these industries will increase with the sophisticated of the industries from now on; however, in Taiwan, for example, which despite being significantly industrialized , has no large domestic auto-makers, the percentage of supplies to the "transportation machinery" category is extremely small.

(2) Relations with industrial structures by countries

Table 2.2 shows the composition, by industry, of supply values (producer prices), which is equal to the composition of production values in each country. A comparison of the percentage breakdowns in Tables 4.7 and 4.8 does not present a common pattern. Probably, because the strength of demand by industries can be variable. This demonstrates the importance of promoting industries with a large demand for petrochemicals/plastics.

An industry-to-industry comparison of Tables 4.7 and 4.8 reveals significant differences in the

[7] In the Input-Output Table for Malaysia, chemical fertilizers are included among petrochemical products.

percentages of various industries by countries, and no common characteristics among the six countries. For example, in Malaysia the supply values of "agricultural, forestry, fishery/mining" and "food products" are relatively high, generally coinciding with the breakdown pattern of petrochemicals/plastics demand. On the other hand, in Indonesia the supply values of "agricultural, forestry, fishery/mining" are high (20.2%), yet the breakdown pattern of petrochemicals/plastics demand is low (3.6%). For "apparel/fiber," Thailand shows high percentages for both supply values and petrochemicals/plastics demand, while Indonesia and Taiwan show low percentages for supply values but high percentages for the input of petrochemicals/plastics.

Specialization of product mix in some industries is believed to be responsible for the marked differences found in each countries. The tables suggest that Indonesia, presumably, does not use petrochemicals/plastics widely in its "agricultural, forestry, fishery/mining" sector, and also suggest that in Indonesia and Taiwan, "apparel/fiber" products are relatively low priced. This is, however, may not in fact be the case.

Except for Indonesia (data is not available), the percentages of supplies of "home appliance/electronics" are fairly high (6-10%). The percentage of petrochemicals/plastics input for the industry are also high, as already indicated. This may suggest that there are no major national differences by countries because of the nature of the products of the "home appliance/electronics" industry. It is necessary to obtain more detailed classified Input-Output Tables developed by using a classification system common to all countries and information based on questionnaire surveys in the field and direct interviews before any definite judgment about the facts can be made.

Finally, looking at the percentage of "petrochemicals/plastics" in total supply of each country, Taiwan and Indonesia show by far the highest ratios, 5.7% and 4.3%, respectively, and weight of petrochemical raw products in particular are high in both countries. This suggests that the percentages of other high-value products are small, but in the case of Taiwan, it should be taken as the result of efforts made to bolster the petrochemical industry.

4.4.2 Export-Promotion of Petrochemical Products

(1) Direct export and indirect export

Demand consists of domestic demand and export. However, in the case of basic materials such as petrochemical products, many are ultimately exported in the form of raw materials, components, or packaging materials. This can be called "indirect export." Indirect exports are usually treated as domestic demand at the level of "petrochemicals/plastics."

Direct export refers to the export of monomers such as ethylene, polymers (polymerized products), and plastic resins (intermediate products). In the next section, values of indirect exports are estimated on the basis of the Input-Output Table data of each country, and compared with the values of direct exports shown on the same Table in order to analyze the national characteristics.

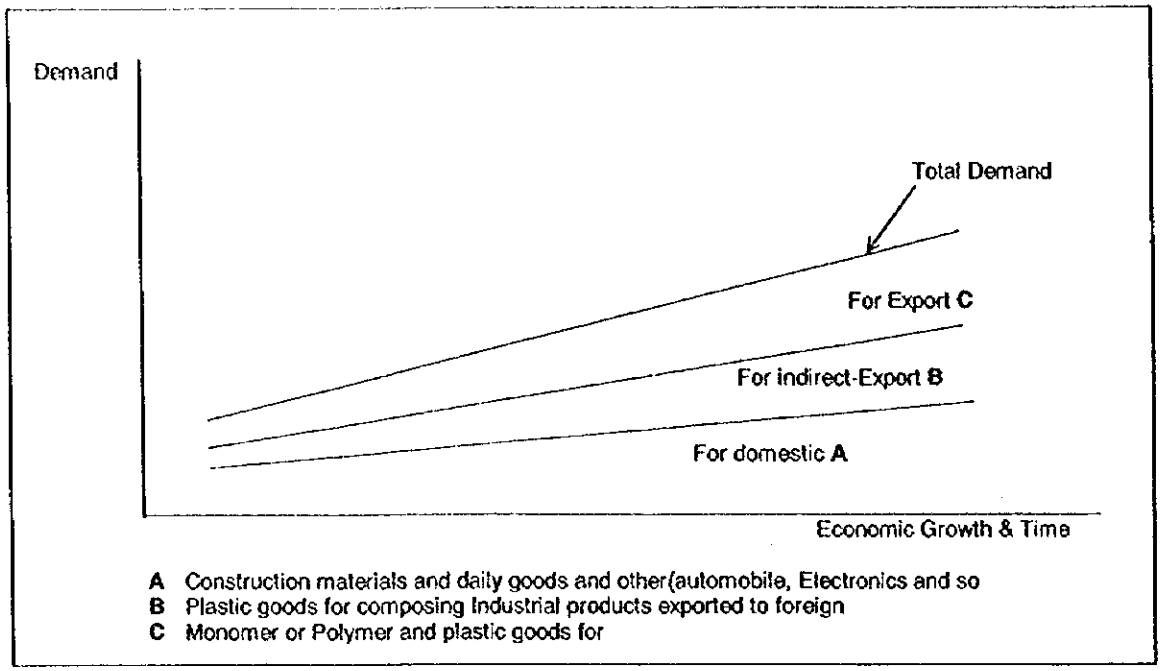


Figure 4.1 Demand for petrochemical products (image)

(2) Indirect export

Indirect Export value of petrochemicals/plastics exported by the each country was estimated using the following formula:

Indirect exports = Values of petrochemicals/plastics supplied to each industry × percentage exports (= export ratio) by industry *

Notes * : Pct exports = Values of exports by industry ÷ values of supplies by industry (incl. exports)

Table 4.9 shows the value of indirect exports calculated using the above formula, and Table 4.10 shows the percentage split by industry. Table 4.9 also shows the export value of petrochemicals/plastics and shows all industries' percentage split of (direct) exports by countries.

The characteristics of indirect exports shown in Tables 4.9 and 4.10 are summarized as follows:

- In Thailand, apparel/fiber (7.5% export ratio; the same hereafter) is large, and home appliance/electronics (34.4%) has shown continued growth.
- In Indonesia, apparel/fiber (40.6%) and wood products/paper (57.7%) are increasing.
- In Malaysia, home appliance/electronics (93.1%) is large.
- In Taiwan, apparel/fiber (50.6%), home appliance/electronics (65.8%) and other industries (64.5%) are large.
- In South Korea, home appliance/electronics (37.7 and 55.8%) have large portion, followed by apparel/fiber (57.3%) and transportation machinery (14.2% for automobiles).
- In Japan, home appliance/electronics (27.4%) and transportation machinery (23.6%) have large portion.

The numbers in parentheses after each industry refer to the export ratios of sub-industries

(products) that can be subdivided from items on the Table. A study of these numbers reveals that virtually all such products (industries) show very high export ratios compared with the average of all industries of each country and that export ratio is a major factor in the formula for the calculation of indirect exports. In other words, it means that promoting industries that are consumers of petrochemicals/plastics and have high export ratios will contribute to an increase in exports of petrochemicals/plastics.

(3) Export promotion of petrochemicals/plastics

These indirect exports (estimated values), together with the value of direct exports, should be regarded as the total exports of petrochemicals/plastics. A side-by-side comparison with direct exports revealed the following:

- No indirect exports exceed direct exports in any country, but come fairly close;
- In most cases, indirect exports exceed 50% of direct exports, making substantial contributions to the promotion of exports of petrochemicals/plastics;
- Malaysia is an exception: the direct export ratio of petrochemical products is outstandingly high, at 61%, and the ratio of indirect exports to direct exports, 14.8%, is not significant.

A study of export ratios in each country shows that in Thailand and Indonesia the export ratios of petrochemical products are lower than the export ratios across all industries, and that plastics exceed the cross-industry export ratio. The data of Japan, South Korea, Taiwan, and Malaysia show the reverse pattern: export ratios of petrochemical products are higher, and those of plastics are smaller, than all industries. When these findings are compiled and examined in light of this, it might appear that the following scheme of international division of labor exists:

Division	Type	Conditions or ind. type
Direct export of petrochemical products	Advanced country type	Petrochemical technical prowess and price competitiveness
Direct export of plastic products	Developing country type	Low processing degree, labor-intensive
Indirect export	Advanced country type	Home appliance/electro. & auto in particular
	Developing country type	Apparel/fiber

Notes
This classification will not apply to Malaysia in 1987, possibly because of its small domestic market and joint venture partners such as export-oriented Japanese firms. (It is also necessary to consider that the parameters are too narrow.)

The petrochemical industry is a processing industry; therefore, developing countries can produce products equal to those of industrialized countries after introducing appropriate technology and equipment. However, there is the question of cost. If a developing country, devoid of technical development capability, introduced all new technology and facilities, it is obvious that the products of the country would not be cost-competitive with products manufactured by industrialized countries. Therefore, developing countries tried to increase demand for their petrochemicals/plastics by first exporting low-processed plastic products (e.g., simple plastic packages and polyethylene buckets) using imported petrochemical products such as raw materials and labor-intensive apparel/fiber products, rather than building large-scale petrochemical plants from the start. Thus, in many cases, the NIEs and ASEAN countries waited for sufficient growth of their domestic industries and domestic consumer demand, before constructing general-purpose resin plants or ethylene centers.

Appendix

Table 4.1 Import and production of plastic (thousands of tons)

	1993	1994	1995
Import of Plastic & material	138.9	223.7	223.1
Production of Plastic	70	85	105

Source Report of Viet Nam Economic Association (Statistics of GSO)

Table 4.2 Result of demand by products (1995) (thousands of tons)

	Ethylene	Derivative	PE	PVC	Propylene	PP	PS	PTA
Thailand	648	943	577	388	396	391	192	424
		100	61.2	41.1	42.0	41.5	20.4	45.0
Indonesia	518	844	513	219	245	367	73	543
		100	60.8	25.9	29.0	43.5	8.6	64.3
Malaysia	261	540	343	155	185	172	140	123
		100	63.5	28.7	34.3	31.9	25.9	22.8
Philippines	0	225	160	75	0	150	48	35
		100	71.1	33.3	0.0	66.7	21.3	15.6
Singapore	385	184	91	38	188	31	71	0
		100	49.5	20.7	102.2	16.8	38.6	0.0
Viet Nam	0	115	92	39	0	68	8	0
		100	80.0	33.9	0.0	59.1	7.0	0.0

Numerical values in lower rows are an index: Derivatives = 100

Table 4.3 Usage structure of plastic products (%, thousands of tons)

	1990	1995	2000 (Proj)
Packages	25%	25%	50~180
Construction materials	8%	10%	100~180
Home & individual appliance	63%	56%	100~150
High grade Plastic	4%	9%	50~90
Total	100%	100%	300~600

Source Report of VEA

Table 4.4 List of projects in petrochemical industry (thousands of tons)

Products	Capacity	Location	Foreign Partners	Condition & Prospect
PVC	Ph.1: 80 Ph.2: 100	Dong Nai	MTC Thai Plastic	Under construction (will be in operation 98/7)
PS	30	ditto	Sritheptai	License granted (96/6)
DOP	30	ditto	LG Chem & others	License granted (95/6)
PVC-2	200	Vung Tau	Marubeni & others	ditto & under consideration
PS-2	30	ditto	Marubeni & others	FS under preparation
PS-3	30	Da Nang	LGChem, MTC	ditto
DOP-2	30	Bien Hoa	Hoechst, Mitsui	Invest. Ap. submitted
Methanol	600	Vung Tau	Lurgi, Bumiray	Calling for investment
PES	250	Dong Nai	Hualon	Under study
PES-2	40	Tuy Ha	Samsung	ditto

Source Data from Report of VEA (Foreign Partners are not confirmed)

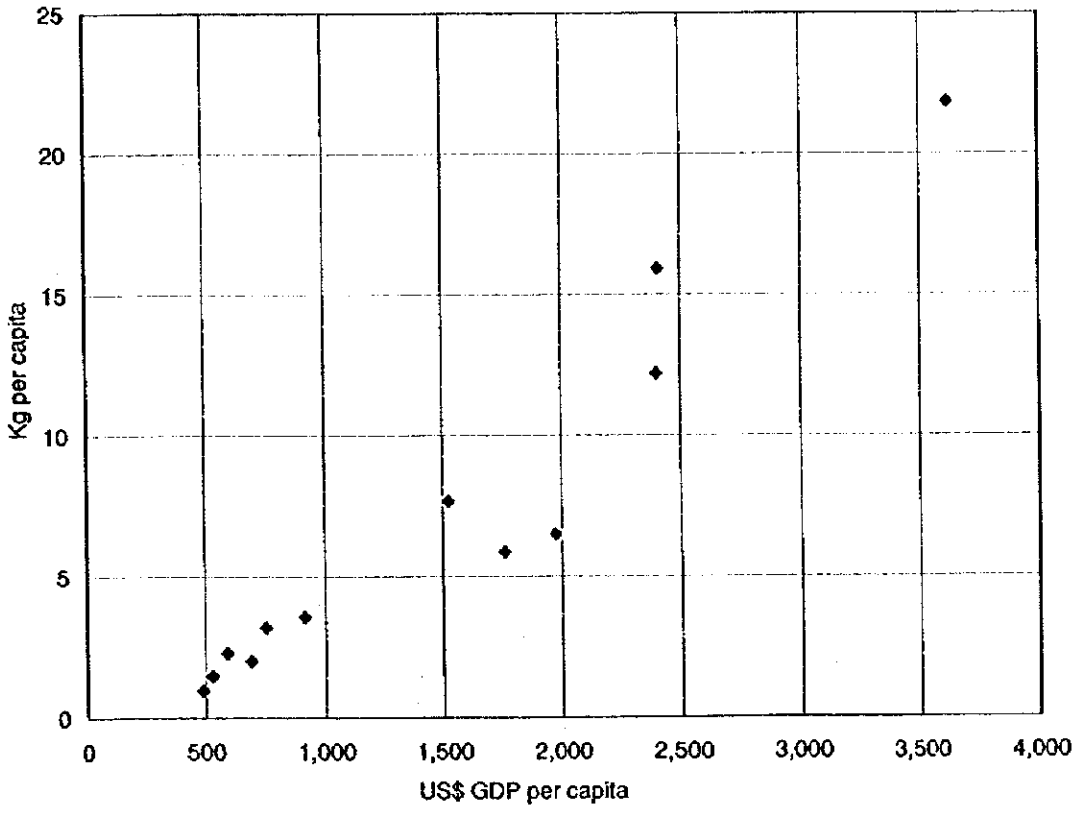


Figure 4.2 Correlation between per capita ethylene consumption and per capita GDP in ASEAN countries (Thailand, Indonesia, Malaysia)

Table 4.5 Ethylene derivatives supply/demand and investment timing in ASEAN countries (thousands tons)

			1980	1985	1990	1992	1994	Remarks
Thailand	Demand	ethylene derivatives	94	166	430	585	946	
		(Ethylene)	(–)	(42)	(200)	(276)	(474)	
	Production	Ethylene	-	-	155	200	345	
		Derivatives	42	115	530	685	977	
	Eth. consumption per capita		2.0	3.2	7.7	10.1	15.9 Kg	
	Ethylene production capacity		-	-	315	315	315	
	(Major Capital Investments)				NPCI plant opened in February 1990			
Indonesia	Demand	ethylene derivatives	144	245	412	468	683	
		(Ethylene)	(–)	(–)	(61)	(80)	(417)	
	Production	Ethylene	–	–	–	–	–	
		Derivatives	45	92	370	523	1,287	
	Eth. consumption per capita		1.0	1.5	2.3	2.5	3.6 Kg	
	Ethylene production capacity		–	–	–	–	–	540
	(Major Capital Investments)						Chandi asuri plant opened in September 1995	
Malaysia	Demand	ethylene derivatives	81	102	217	316	426	
		(Ethylene)	(–)	(–)	(–)	(–)	(190)	
	Production	Ethylene	–	–	–	–	190	
		Derivatives	25	25	73	89	414	
	Eth. consumption per capita		5.9	6.5	12.2	17.0	21.8 Kg	
	Ethylene production capacity		–	–	–	–	230	320
	(Major Capital Investments)				Tuban plant opened in January 1994		Ethylene Malaysia plant opened in September 1995	
Philippines	Demand	ethylene derivatives	64	74	137	185	207	
		(Ethylene)	(–)	(–)	(–)	(–)	(–)	
	Production	Ethylene	–	–	–	–	–	
		Derivatives	34	25	48	68	73	
	Eth. consumption per capita			1.1	1.8		2.5 Kg	
	Ethylene production capacity		–	–	–	–	–	
	(Major Capital Investments)							
Singapore	Demand	ethylene derivatives	57	67	118	147	189	
		(Ethylene)	(–)	(321)	(424)	(403)	(455)	
	Production	Ethylene	–	330	438	403	462	
		Derivatives	15	413	541	504	619	
	Eth. consumption per capita		24.8	26.8	43.7	52.5	65.2 Kg	
	Ethylene production capacity		–	300	440	440	450	
	(Major Capital Investments)			PCS plant opened in February 1984		Capacity expanded by 140,000 tons between 1987-1989		

Notes

1) Total of ethylene+derivatives in the demand column is defined as the total ethylene after conversion of derivatives into ethylene.

2) The numerical values in the columns are given as [production + imports − exports].

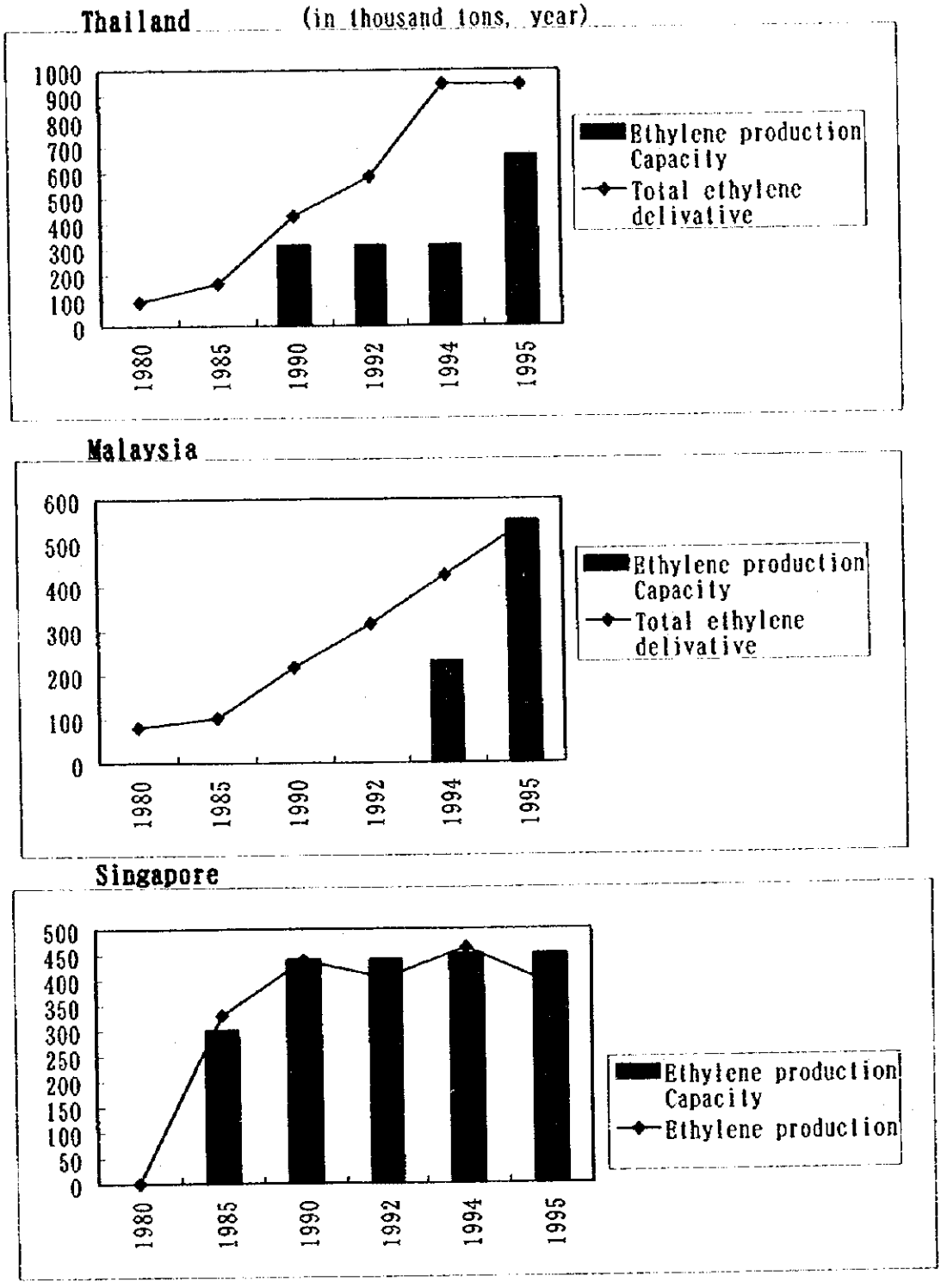


Figure 4.3 Demand for ethylene and investment timing (graph)

Table 4.6 Ethylene derivative production capacity in typical petrochemical complex in ASEAN

(In thousands of ton)

Raw materials for ethylene center		NPC2 (Thailand) NG*Naptha	Chandraasuri (Indonesia) Naptha	Ethylene Malaysia (Malaysia) Ethane	PCS(first stage) (Singapore) Naptha
Ethylene		**350**	**540**	**400**	**450**
	LDPE	70	200	245	160
	HDPE	240	350		180
	PVC	250	315	150	
	PS	(SM)200	300	(SM)200	
	EG		208		87.5
	EO				35
Propylene		**190**	**240**		**225**
	PP	490	340		193
	AN	-	-		-
	C4	308	*320		
	(MTBE)	(52)	(160)		(55)
	(Butadiene)	(140)	(100)		(53)
BTX		**268**	***820**		**174**
	PTA	1,320	*350		
Acethlene					**6**
Start Operation		**95/6**	**95/9**	**95/9**	**84/2partly**
Investment Amount		**$1,500mil.**	**$1,200--2,000mil.**	**$700bil.**	

(Comparative study of international competitiveness)

	wt				
Scale of production	2	△	◎	△	○
Raw materials (prices,purchasing)	5	△ ~ ○	△	◎ → ○ Purchase of inexpensive Ethane from petronas	○
The cost of equipment (inc.infrastructure)	4	○	× High cost of infrastructure	△ ~ ○	◎
Consumption of derivatives by products	3	○	△ ~ ○ A complex	○	○ No equipment to designed to consume derivatives
Technical power	2	○	○	○	◎
Transportation (raw materials products)	3	○	△	○	◎
(Labor costs)	1	△	○	△	×
Synthetic Valuation		**34.5**	**23 - 26**	**40 - 35**	**47**

Notes ◎3points, ○2points, △1point, ×0point

Table 4.7 Composition of plastic material input to industries (%)

	Thailand		Indonesia		Malaysia	Taiwan	Korea	Japan
	1982	1990	1980	1990	1987	1994	1993	1990
Agri., forest, fish & Ming.	2.9	1.5	7.1	3.6	29.6	0.3	0.9	0.6
Foods	2.6	3.9	2.9	2.1	5.2	1.1	4.8	3.3
Wearing, textile prods.	49.4	41.9	12.1	15.4	1.8	12.5	3.6	1.1
Wooden prods. Paper	0.5	2.1	2.3	4.6	2.1	1.1	1.7	3.2
Chemical prods.	5.7	9.2	24.2	29.1	24.0	40.2	34.6	30.7
Plastic & rubber prods.	14.2	15.9	15.4	19.4	6.9	21.7	22.8	27.5
Metal & metal prods.	0.4	0.8	1.4	2.2	0.7	1.1	1.1	1.1
Machinery	1.8	0.2	2.4	2.1	0.4	0.6	1.8	1.4
Electronics & electric equip	6.8	7.7	0.0	0.0	8.0	8.3	8.8	8.2
Transport machinery	5.0	2.6	2.6	1.3	0.2	1.2	8.1	5.1
Other industrial prods.	0.2	2.5	0.2	0.7	1.0	3.7	1.8	3.1
Constructions	2.3	2.5	7.8	4.3	3.3	3.5	6.9	5.8
Other services	8.3	7.9	21.7	14.8	16.8	3.9	3.0	4.9
Unknown	0.0	1.3	0.0	0.4	0.0	0.8	0.2	3.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 4.8 Composition of total supply (%)

	Thailand		Indonesia		Malaysia	Taiwan	Korea	Japan
	1982	1990	1980	1990	1987	1994	1993	1990
Agri., forest, fish & Ming.	15.6	8.2	35.6	20.2	17.4	4.6	4.8	3.4
Foods	12.8	9.2	8.2	9.4	11.2	4.3	6.0	4.7
Wearing, textile prods.	6.2	8.5	2.1	4.0	2.1	4.4	5.1	1.8
Wooden prods. Paper	1.9	2.7	1.4	3.4	3.7	2.9	2.7	3.5
Chemical prods.	3.0	3.0	2.3	3.6	3.2	5.8	4.6	3.1
Plastic & rubber prods.	6.9	5.9	4.6	7.0	7.4	5.7	6.3	4.3
Metal & metal prods.	4.0	4.3	2.8	3.3	2.5	7.6	7.0	5.9
Machinery	1.8	3.3	3.2	5.3	1.4	3.4	4.1	3.6
Electronics & electric equip	2.9	6.9	—	—	6.2	10.4	6.4	5.8
Transport machinery	3.5	6.1	4.0	2.9	1.4	3.9	5.4	5.1
Other industrial prods.	1.0	2.6	0.3	0.4	0.6	2.1	0.6	1.4
Constructions	6.6	7.9	8.7	9.2	6.9	5.6	10.5	9.7
Other services	33.4	30.7	26.4	31.1	35.9	37.9	36.4	46.7
Unknown	0.5	0.7	0.4	0.2	—	1.2	0.1	0.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Petrochemical goods	0.3	0.7	1.8	3.0	3.6	3.6	1.7	1.3
Plastics	0.3	0.6	0.5	1.3	2.1	2.1	1.2	1.1
Total	0.6	1.3	2.3	4.3	5.7	5.7	2.9	2.4

Table 4.9 Indirect export of plastic

	Thailand		Indonesia		Malaysia	Taiwan	Korea	Japan
	1982	1990	1980	1990	1987	1994	1993	1990
Agri., forest, fish & Ming.	7,105	37,892	65,135	81,122	71,468	97	3,643	336
Foods	30,692	457,562	606	37,780	20,294	689	25,555	3,272
Wearing, textile prods.	228,161	2,768,349	3,731	330,391	18,587	42,926	252,920	13,930
Wooden prods. Paper	2,867	136,802	2,839	159,079	9,076	1,549	11,223	8,003
Chemical prods.	5,083	46,610	4,868	130,662	30,586	4,129	263,381	172,920
Plastic & rubber prods.	13,181	424,473	4,285	33,566	28,224	799	104,107	97,630
Metal & metal prods.	5,621	90,367	549	17,587	4,403	3,265	29,442	14,401
Machinery	2,559	3,775	565	3,745	1,898	1,199	80,588	52,883
Electronics & electric equip	57,495	1,504,468	0	4,427	140,384	24,035	459,538	375,520
Transport machinery	759	24,258	264	4,427	81	1,841	185,167	242,503
Other industrial prods.	1,957	493,967	19	9,142	13,053	14,257	98,806	82,008
Constructions	0	0	0	0	0	0	152	0
Other services	42,599	209,373	3,302	45,081	37,783	1,217	28,972	12,715
Unknown	0	327	0	491	0	303	17,500	32,743
Total	398,078	6,198,224	86,165	853,073	357,566	96,306	1,560,992	1,108,861
Total direct export	933,878	7,809,791	215,601	2,587,044	2,410,716	253,355	3,341,374	1,571,297
Petrochemical goods	294,288	778,246	208,839	635,969	2,268,139	110,354	2,622,308	1,276,984
Plastics	639,590	7,031,545	6,762	1,951,075	142,577	143,001	719,066	294,313
Export ratio (%) Petrochemical	4.7	2.0	1.3	5.1	61.0	18.9	25.2	11.2
Export ratio (%) Plastic	11.1	20.3	0.1	36.0	16.9	41.2	9.7	2.8
Export ratio (%) All industry	8.8	10.4	18.6	12.8	29.1	17.1	12.8	5.2

Table 4.10 Composition of indirect export (%)

	Thailand		Indonesia		Malaysia	Taiwan	Korea	Japan
	1982	1990	1980	1990	1987	1994	1993	1990
Agri., forest, fish & Ming.	1.8	0.6	75.6	9.5	20.0	0.1	0.2	0.0
Foods	7.7	7.4	0.7	4.4	5.7	0.7	1.6	0.3
Wearing, textile prods.	57.3	44.7	4.3	38.7	5.2	44.6	16.2	1.3
Wooden prods. Paper	0.7	2.2	3.3	18.6	2.5	1.6	0.7	0.7
Chemical prods.	1.3	0.8	5.7	15.3	8.6	4.3	16.0	15.6
Plastic & rubber prods.	3.3	6.8	5.0	3.9	7.9	0.8	6.7	8.8
Metal & metal prods.	1.4	1.5	0.6	2.1	1.2	3.4	1.9	1.3
Machinery	0.6	0.1	0.7	0.4	0.5	1.2	5.2	4.8
Electronics & electric equip	14.4	24.3	0.0	0.5	39.3	25.0	29.4	33.9
Transport machinery	0.2	0.4	0.3	0.5	0.0	1.9	11.9	21.9
Other industrial prods.	0.5	8.0	0.0	1.1	3.7	14.8	6.3	7.4
Constructions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other services	10.7	3.4	3.8	5.3	5.5	1.3	1.9	1.1
Unknown	0.0	0.0	0.0	0.0	0.0	0.3	1.1	3.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

5-5 Urea Fertilizer

5.1 Policy Alternatives and Their Implications for Viet Nam

(1) Trade imbalance in rice production

Viet Nam is undergoing a transition from an agricultural economy to the early stages of industrialization. This transition is evident in the change in trade structure. In 1995, crude petroleum, clothes, coffee, rice and marine products were the biggest export items while miscellaneous goods, petroleum products, machine equipment, fertilizer and motor bikes were the biggest imports.

The agricultural sector exhibited a trade surplus in 1995. Viet Nam exported $1,128 million of agricultural products and fertilizer imports amounted to $545 million. However, for the production of rice, $343 million of urea fertilizer was imported, which was two third of rice export of $530 million. Viet Nam imported as much as 1.5 million tons of urea fertilizer, more than 60% of which was from Indonesia.

Table 5.1 Urea fertilizer trade in Asia in 1995

(1000t)	Consumption		Import		Export		Exp-Imp
China	23,207	40%	6,854	47%	0	0%	-6,854
India	18,882	32%	3,582	25%	0	0%	-3,582
Indonesia	3,923	7%	0	0%	1,972	64%	1,972
Pakistan	3,185	5%	205	1%	0	0%	-205
Bangladesh	1,941	3%	0	0%	415	14%	415
Viet Nam	1,633	3%	1,524	10%	0	0%	-1,524
Other Asia	5,665	10%	2,367	16%	682	22%	-1,685
Asia	58,436	100%	14,532	100%	3,069	100%	-11,463
World	88,803	*66%*	24,999	*58%*	24,696	*12%*	

Source FERTICON

(2) Policy alternatives and their implications

In order to rectify this imbalance, the government of Viet Nam is now considering the possibility of a urea fertilizer production project. In this project, natural gas produced in the bottom of the South Con Son sea will be used as a raw material.

We now examine this urea plant construction project, including such details as the national economy, trade deficit, industrial policies, agricultural policies, and fertilizer business characteristics. Policy alternatives and their implications will be scrutinized from long-term prospects.

There are currently three possible policy choices.

a. Discontinue:

Discontinue the urea plant construction project.

b. Alternative project:

Proceed with a mixing-sales project instead of the urea plant construction project.

c. Proceed:

Proceed with the urea plant construction project.

In order to proceed with the urea plant construction project, the conditions mentioned in C must be fulfilled. If the conditions cannot be fulfilled, there will be no choice but to discontinue the project or to consider an alternative project. In making the choice, it will be important to reflect upon the cost of construction of new facilities, the influence upon the trade balance and the agriculture sector.

5.1.1 Discontinue the Urea Plant Construction Project

If the urea fertilizer project is discontinued, it will mean that the rapidly increasing demand for urea fertilizer in the country will have to be met by imports for the time being. There are three points to be considered regarding the import of urea fertilizer: 1) import estimates based on the outlook of the domestic demand for urea, 2) the availability of an exporter to provide the volume required, 3) forecasts of the price of imported urea fertilizer based on the balance between supply and demand in the international market.

According to statistics published by the Vietnamese government, urea fertilizer imports totaled $343 million and the average price was $253 per ton in 1995. The domestic demand for urea in the year 2000 is expected to be 2.1 million tons. If this quantity is purchased on the international market at the price level of 1995, it will cost more than $500 million.

More than 60% of urea fertilizer is imported from Indonesia. Indonesia is now constructing three urea plants and is expected to expand its production capacity to 1.7 million tons by 2000. The biggest determinant of the international price of urea fertilizer is the volume of imports by China and India, the two countries with the largest urea consumption in the world.

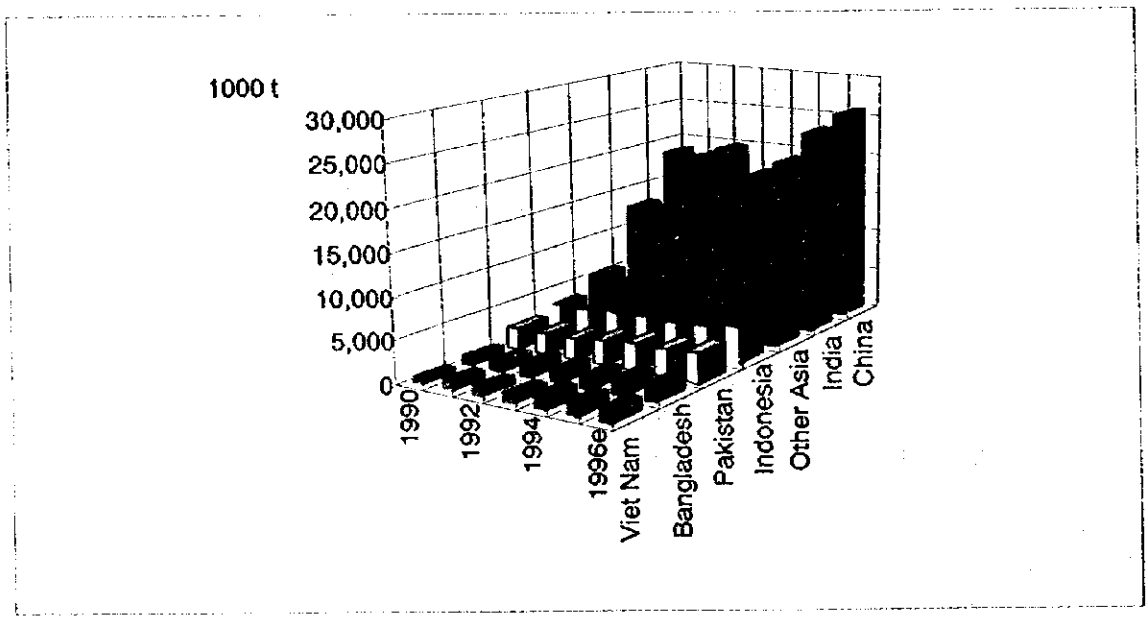


Figure 5.1 Urea consumption in Asia

Source FERTICON

5.1.2 Proceed with Mixing-sales Project

If the mixing-sales project is carried out instead of the urea plant construction project, chemical products will be imported as raw materials, mixed into fertilizers, and distributed and sold in the country. In this case, imported chemicals, which have lower value-added than finished fertilizer, would become substitutes for the urea in the balance of trade. The import amount can be reduced by the price difference between the fertilizer and chemical product and thus helps to save foreign currency.

This project can begin with a smaller initial investment than that of the urea plant construction

project. In this project, a plant with an annual production capacity of 240,000 tons will be constructed with an investment of $36 million. The production capacity of this project will be less than half that of the urea plant construction project, although the total investment is less than one-tenth of that required for the urea plant.

In the appraisal of this policy alternative, an investigation of the fertilizer distribution system is important. Through which route are farmers getting the urea fertilizer? What is the price farmers pay for the urea? In a market economy, the producer price which the producer receives upon the sale of urea and the consumer price which farmers pay is different. The price difference falls in the hand of distributors such as wholesalers, carriers and retailers.

When the mixing-sales project is adopted, the plant will generate value-added benefits for three sectors: manufacturing, distribution and agriculture. The producer who assumes the mixing-sales project will receive the value-added gains, the distribution sector will make money by carrying and selling fertilizer, and in the agricultural sector, farmers can improve productivity by using the fertilizer suitable for different crop types.

5.1.3 Proceed with the Urea Plant Construction Project

The merits of this project are as follows; should the urea manufacturing plant project be completed, imports of 570,000 tons of urea fertilizer would be replaced. If the plant is completed by the end of 1999 as planned and is able to carry out its full production of 570,000 tons in the year 2000, $144 million in foreign currency will be saved. As domestic natural gas would be used to produce the fertilizer, most of the value-added from the sale of urea would remain in the country.

The project is expected to cost $400 million, broken down into: 1) infrastructure, 2) peripheral facilities, 3) equipment, and 4) interest expense during construction. Each is estimated to be around $100 million based on the cost structure of urea plants in neighboring countries. Of this $400 million investment, the amount which remains in the country is the cost of construction for infrastructure. The remainder is paid to foreign contractors and financial institutions.

At present, it is difficult for the government or any private enterprises in Viet Nam to raise the $400 million in funds for construction. Therefore, this project is planned as a joint venture between foreign partners and the domestic state-owned enterprises. It is necessary to make the project profitable enough to induce foreign partners to invest in the project.

Box 5.1
Discounted cash flow method

When a foreign company examines the feasibility of a project and makes some decision on investment, a discounted cash flow (DCF) method of analysis is typically used. DCF is a method to calculate the net present value (NPV) which, if positive, indicates that the investment should be undertaken. The net present value is calculated through the following three steps. First, estimate cash out-flows at the stage of construction. Second, forecast cash in-flow after the business starts operation. Third, discount those cash flows back into present value by using a discount rate which reflects the interest rate and project risk.

There are many measures to increase the net present value of a project, and those measures can be classified into the following three categories: 1) measures to minimize cash out-flow during construction, 2) measures to enlarge cash in-flow after beginning operation, and 3) measures to lower the discount rate by reducing risk.

There are four kinds of policies the government can adopt to improve the commercial profitability of a project:

Policies to reduce cash out-flow during construction

Policies to expand sales

Policies to reduce cost
Policies to reduce risk

(1) Policies to reduce cash out-flow during construction

The Vietnamese government can undertake infrastructure preparations in order to reduce the cost of construction which is paid from project funds. When this policy is adopted, funds from the government budget or from ODA will be needed.

(2) Policies to expand sales

The sales amount for this project is the volume of urea fertilizer sold multiplied by the price of shipment. Viet Nam's demand for urea fertilizer has been increasing rapidly, and the demand in 2000 is estimated to be 2.1 million tons. Therefore, if the new factory operates at full capacity, sales of 570,000 tons can be expected. Thus, one policy which the government can undertake to expand sales is to increase the price. The policies which the government can take to increase the price of urea are as follows: a) government direct control over the price of urea at the factory shipment, b) government purchase of urea fertilizer from the factory at a minimum price, c) border protection measures such as import quotas or high tariff rates.

Direct control of prices was the measure used during the centrally planned economy in Viet Nam. The purchase of fertilizer by the government was the measure implemented in Thailand. When the government sells fertilizer at a cheaper price than the price at which it purchases the fertilizer, the difference is covered by a government subsidy. If a protectionist policy is implemented, the farmers, who are the final consumers, bear the burden of the high price of urea. The benefit of protective trade barriers is enjoyed by the distributors of fertilizer and the domestic producers.

Chemical fertilizer, including urea fertilizer, is an important agricultural input, and thus the tariff rate is usually low, from 0% to 3% in ASEAN countries. In Indonesia and Malaysia, where natural gas — a raw material of urea fertilizer — is produced, state-owned urea fertilizer facilities are running. In ASEAN countries, the tariff on imported fertilizer is not used as an industrial policy tool because such a policy puts a burden on farmers.

(3) Policies to reduce cost

Production facilities for the urea fertilizer project are capital-intensive and thus labor costs are small compared with the total amount of investment. In this capital intensive project, interest payments, the repayment of loans and natural gas purchases occupy a large portion of the cost. The period of depreciation of production facilities is estimated to be about 20 years. If the project can borrow $400 million at an annual interest rate of 10%, annual interest payments will be $40 million. If the loan is repaid in 20 years, the annual repayment is $20 million. If 570,000 tons of urea fertilizer is produced annually, the interest rate of urea fertilizer per ton will be $70 and the principle repayment will be about $35 for a total of $105 per ton. The cost of natural gas must be added to this total.

The government can undertake two policies to minimize cost: 1) reduce the interest payment by granting low-interest rate loans from ODA or governmental financial institutions, and 2) set a low price for the purchase of natural gas.

(4) Policies to reduce risk

International prices for urea fertilizer fluctuate significantly. The FOB price of Indonesia, which is the biggest exporter of urea fertilizer to Viet Nam, fell to a level of $60 per ton in the middle of 1980's, then rose over a level of $150 per ton in 1991. After that, it went down again to $102 per ton in 1993,

rose rapidly to $240 per ton and went down again to a little less than $200 per ton in the latter part of 1996. The risk of the urea fertilizer project is very large, because sales fluctuate in line with the international market while fixed costs, such as interest payments and depreciation, is relatively stable. As a result of this operational leverage, profit and cash flow of the project are expected to be very volatile.

As a possible policy to reduce the risk, the government can offer certain subsidies when the urea fertilizer plant goes into the red. If such a policy is undertaken, the net present value of this project will be higher.

The break-even point of the urea plant operating at full capacity is estimated to be $100 to $120 per ton in Indonesia. This competitive level is due to the fact that natural gas can be supplied cheaply because the pipeline is only several kilometers offshore, reducing transportation costs for the gas. Indonesia is now constructing three natural gas-based urea plants and is expected to expand its production capacity by as much as 1.7 million tons by 2000. Viet Nam's urea fertilizer plant would compete with Indonesia's new plant in terms of cost. The high costs for natural gas in Viet Nam due to the long pipeline (360 km to the factory), a higher level of required investment in infrastructure, and the high rate of repayment is expected to make the production cost in Indonesia's new plants lower than the one in Viet Nam.

5.2 Characteristics of the Fertilizer Business

5.2.1 Three Types of Fertilizer Businesses

The fertilizer business can be divided into the following three categories.

1) Import-sales
2) Mixing-sales
3) Urea manufacturing

Table 5.2 Characteristics of the fertilizer business

	Import-sales	Mixing-sales	Urea manufacturing
Import goods	Fertilizer as product	Chemical products as raw material	(Capital goods)
Production process	Bagging	Mixing and bagging	Synthesize ammonia and Urea fertilizer
Products	Bagged fertilizer	NPK fertilizer	Urea fertilizer
Distribution system	Truck, warehouse	Ship, truck, distribution center, warehouse	
Sales	to wholesaler	to wholesaler and retailer	
Debt collection	from wholesaler	from wholesaler, retailer, farmer	
Investment area	Distribution	Manufacturing and distribution	Manufacturing
Production capacity	None	250,000 t/y	570,000 t/y
Investment size	$1 million	$40 million	$400 million

Notes

1) Import-sales consists of marketing only and does not include production.

2) Mixing-sales places more importance on marketing than on production. Estimation of domestic demand, procurement of raw materials from the international market, and investment in the distribution system are key factors for profitability.

3) The manufacture of urea fertilizer using natural gas is a heavy chemical industry in which the geographical conditions of raw materials and investment procurement are important. It differs considerably from the fertilizer business.

5.2.2 Experience in Neighboring Countries

Thailand began industrialization and the change in economic structure from an agricultural economy to an industrial economy in the 1970s. The country relied on fertilizer imports at that time, and a large number of business-persons entered into the fertilizer market. In 1972, a joint venture mixing-sales business was set up between a Japanese trading company and a local private capitalist in Thailand. This company started production in 1975. Currently, the fertilizer market is dominated by four companies which handle two-thirds of the fertilizer trade in Thailand.

In 1982, the Thai government set up a state-run fertilizer company with the aim of using natural gas resources to replace imports of urea fertilizers. Their plans to construct a urea manufacturing plant were discontinued due to several reasons including the slump in the international market at the time, risks from large investments, and high costs due to the long natural gas pipeline. (This was reported in Phase 1)

In Indonesia, where natural gas is rich and produced near the coast, there are eleven urea plants enjoying the benefit of cheap raw materials. The country is currently constructing three more plants.

5.2.3 Distribution System of Fertilizer

From a national welfare viewpoint, both the retail price which the farmer has to pay to buy fertilizer, and the ex-factory price which the fertilizer plant receives are important.

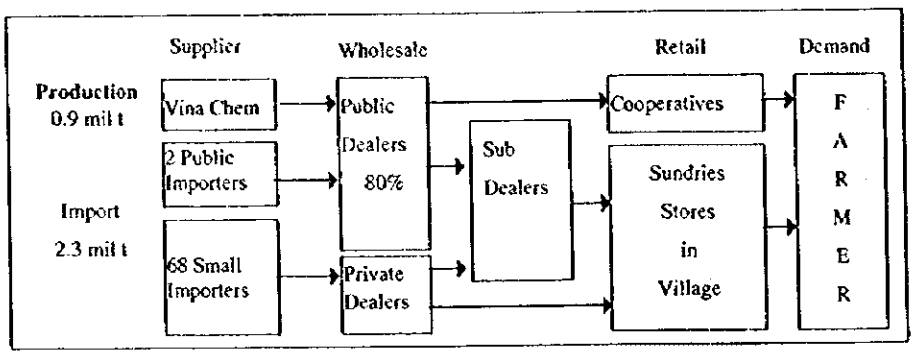


Figure 5.2 Distribution system of fertilizer in Viet Nam

In Viet Nam, more than 90% of fertilizer consumption comes from imports. Half of the fertilizer imports are made by state-run agricultural material enterprises and Grain Co., a public company. The rest is imported by 68 small sized trade companies. No foreign trade company is permitted to enter into the fertilizer import business.

In the domestic distribution system, 80% of wholesale volume is assumed by public dealers. Retail sales of fertilizer takes place primarily through sundries stores in villages and only a small percent is bought through agricultural cooperatives. The payment cycle of fertilizer, which consists of getting fertilizer, using it, harvesting of crops, crop sales, and the cash payment for fertilizer, takes about three months. Sub-dealers usually sell fertilizer to farmers on three month credit.

5.3 Fertilizer Industry in Viet Nam

5.3.1 Urea market conditions in Asia and Viet Nam

(1) Urea market in Asia

The world demand for urea fertilizer was 94 million tons in 1996. Of this amount, 65% or 61 million tons was demand from Asia. Urea demand in China and India is much greater than in other Asian countries. In 1995, China's demand was 26 million tons and imports were 6.9 million tons. India's demand was 18 million tons and imports were 3.6 million tons.

The international market is influenced greatly by the volume of imports of these two big agricultural countries. Since 1993 the price of urea fertilizer has been rising because the volume of imports of these two countries has been increasing, reflecting the improvement of foreign exchange reserves. The FOB price of Indonesia has been rising from $102 per ton in 1993 to $240 per ton in 1995.

(2) The chemical fertilizer market in Viet Nam

Viet Nam's chemical fertilizer consumption in 1995 was 3.2 million tons. Of this, 72% or 2.3 million tons were imported. The import of chemical fertilizer amounted to $545 million, of which 63% or $348 million was urea. This corresponds to 6.7 % (4.2% for urea only) of total 1995 imports of $8.155 billion.

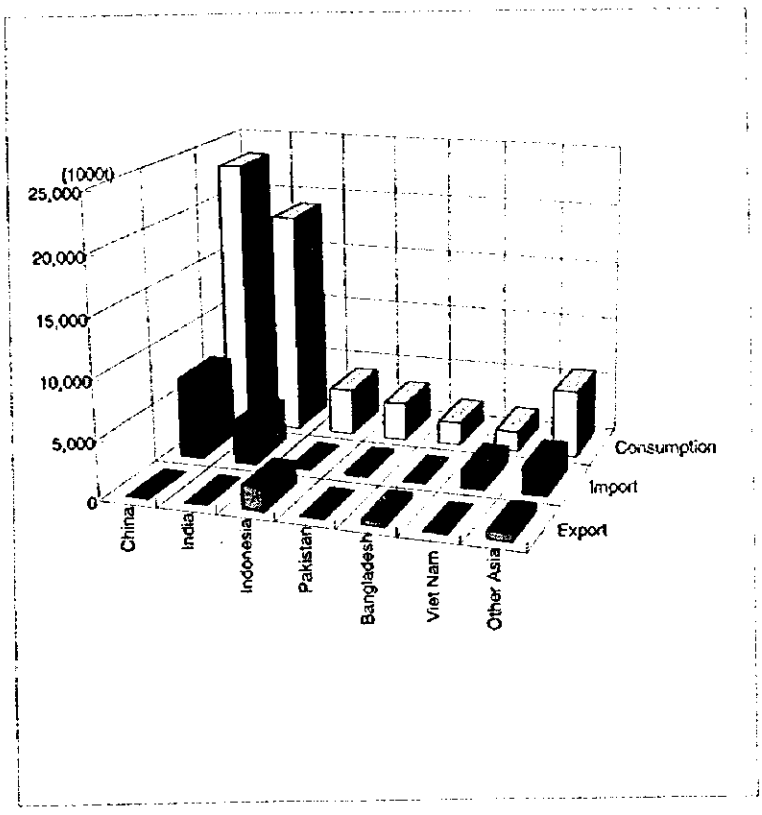


Figure 5.3 Urea consumption and trade in 1995

Viet Nam's demand for urea fertilizer has been increasing rapidly since the beginning of the 1990s as the main input of rice farming. A rapid increase in the annual growth rate to 15% has increased imports from 0.76 million tons in 1990 to 1.76 million tons in 1996. As for domestic production, Vina Chem urea plant, the state-owned chemical company, has been producing at a full capacity of 0.1 million tons. In 1995 Viet Nam had no choice but to depend on imports of 1.5 million tons. Viet Nam's 1995 imports of 1.5 million tons ranks fourth in the world following China's 6.9 million tons, India's 3.6 million tons and America's 2.7 million tons. In 1995, Viet Nam bought 1.0 million tons of urea fertilizer from Indonesia. This accounts for 64% of Viet Nam's urea imports and 49% of Indonesian urea exports.

5.3.2 Fertilizer Projects under Consideration in Viet Nam

Four fertilizer projects are now under consideration in Viet Nam.

Table 5.3 Fertilizer project under consideration or construction

#	Project	Type of business	Status
1	Building Urea plant	Urea manufacturing	Re-F/S
2	Expansion of existing plant	Urea manufacturing	F/S
3	DAP plant	Mixing-sales	F/S
4	NPK plant	Mixing-sales	Construction

A comparison of the urea fertilizer facilities construction project (#1) and NPK factory construction project (#4) is tabulated below.

Table 5.4 Comparison of project #1 and #4

	Import-sales	Mixing-sales	Urea manufacturing
Capacity		240,000 t/y	575,000 t/y
Investment		$36 million	$400 million
1995 Import		NPK	Urea
Amount		$68,766,000	$343,122,000
Volume		318,004 t	1,356,241 t
Average price		216 $/t	253 $/t
Size comparison			
Based on $ value		0.52	1.16
Based on volume		0.75	0.42

Notes
Calculation of size comparison
Based on $ value = Investment / Import $ amount in 1995
Based on volume = Production Capacity / Import volume in 1995

(1) Urea fertilizer facilities construction project

Currently, a urea fertilizer facilities construction project, representing a $400 million investment, is under consideration in Viet Nam. $400 million is 1.16 times the amount of imported urea fertilizer in 1995. The facilities will produce 0.57 million tons, using natural gas as a raw material. This production capacity will cover one-third of the consumption in 1996, and one-fourth of the consumption in 2000. This project is planned by a joint venture. First, a group of foreign companies consisting of several plant engineering companies in which an Australian mining company BHP is taking acts as leader. 70% of the investment will be made by this foreign group. Second, a group of

domestic state-owned enterprises consisting of a chemical company and an agricultural material company will cover 30% of the investment.

(2) Relationship with other projects

The project mentioned above is planned as an integral part of the South Sea natural gas utilization plan. This plan consists of the following four projects;

Project 1:	Natural gas development and production	JV with FDI
Project 2:	Gas pipeline construction and operation	JV with FDI
Project 3:	Electric power plant	BOT
Project 4:	Urea fertilizer production	JV with FDI

All four projects depend on foreign contribution and are interrelated. In other words, all four projects must be commercially feasible or the whole plan will fail. In Project 1, exploration of natural gas in Nam Con Son sea is currently proceeding and a natural gas field has already been found. Project 2 is the construction of pipelines from the gas field, which is 360 km offshore, to Phu My. In Project 3, an electric power plant is to be constructed on the same site as Project 4.

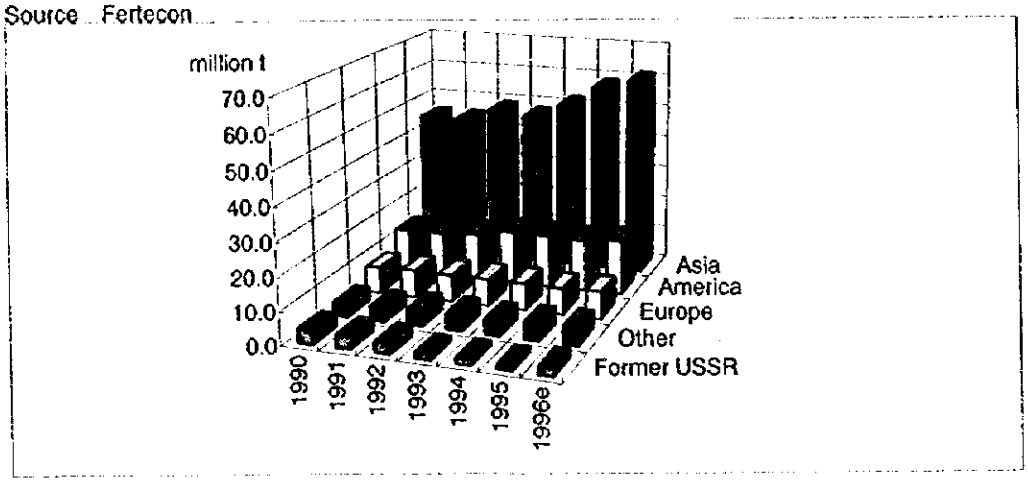
As for the urea production project, agricultural policy requires the sale of urea fertilizer at the international market price. Joint venture partners of the urea project request that the government buy natural gas at one-third the price paid for Project 3. Project 1, however, requires a profitable price for natural gas.

Appendix

World Urea Consumption

(million t)	1990	1991	1992	1993	1994	1995	1996e	1996%
Former USSR	4.3	3.8	3.4	1.7	1.7	1.5	2.3	2%
Other	4.4	4.3	5.1	5.0	4.8	5.3	5.5	6%
Europe	8.0	8.3	8.0	8.1	8.1	7.9	8.3	9%
America	13.2	13.2	14.0	15.9	16.0	15.7	16.7	18%
Asia	45.1	44.9	48.9	47.6	51.8	58.4	61.3	65%
World Total	74.9	74.5	79.3	78.3	82.5	88.8	94.1	92%

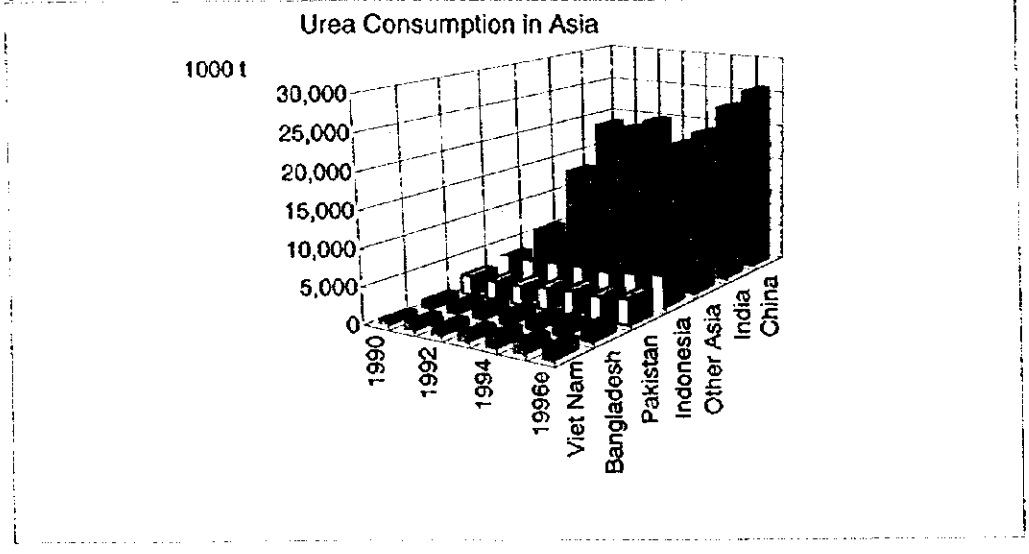
Source: Fertecon



Urea Consumption in Asia

(1000t)	1990	1991	1992	1993	1994	1995	1996e	1996%
Viet Nam	760	1,131	1,173	1,157	1,686	1,633	1,755	3%
Bangladesh	1,190	1,271	1,633	1,592	1,511	1,941	2,050	3%
Pakistan	2,597	2,454	2,568	2,949	3,218	3,185	3,550	6%
Indonesia	3,486	3,310	3,617	3,671	3,688	3,923	4,400	7%
Other Asia	5,501	5,028	5,185	5,810	5,770	5,665	5,830	10%
India	12,835	13,212	14,757	15,633	17,047	18,882	17,750	29%
China	18,692	18,468	19,948	16,781	18,921	23,207	25,940	42%
Asia	45,061	44,874	48,881	47,593	51,841	58,436	61,275	100%

Source: Fertecon



Urea Consumption and Production In Asia

Urea Consumption

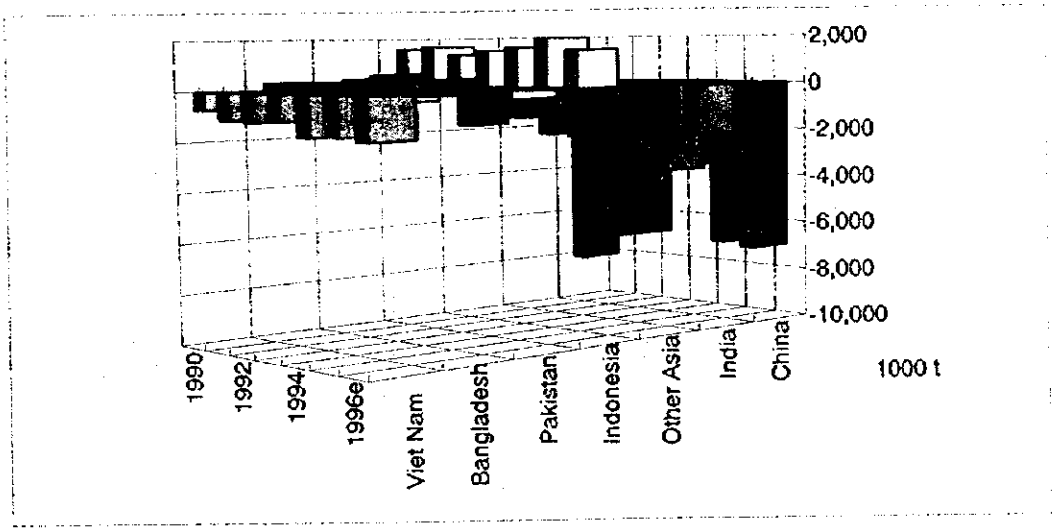
(1000t)	1990	1991	1992	1993	1994	1995	1996e	1996%
Viet Nam	760	1,131	1,173	1,157	1,686	1,633	1,755	3%
Bangladesh	1,190	1,271	1,633	1,592	1,511	1,941	2,050	3%
Pakistan	2,597	2,454	2,568	2,949	3,218	3,185	3,550	6%
Indonesia	3,486	3,310	3,617	3,671	3,688	3,923	4,400	7%
Other Asia	5,501	5,028	5,185	5,810	5,770	5,665	5,830	10%
India	12,835	13,212	14,757	15,633	17,047	18,882	17,750	29%
China	18,692	18,468	19,948	16,781	18,921	23,207	25,940	42%
Asia	45,061	44,874	48,881	47,593	51,841	58,436	61,275	100%

Urea Production

(1000t)	1990	1991	1992	1993	1994	1995	1996e	1996%
Viet Nam	40	45	62	105	103	109	105	0%
Bangladesh	1,466	1,355	1,950	2,065	2,157	2,357	2,550	5%
Pakistan	2,070	1,926	2,056	2,702	3,140	3,121	3,250	6%
Indonesia	5,051	4,974	4,950	5,133	5,289	5,895	5,900	12%
Other Asia	3,736	3,649	3,803	3,794	3,682	3,791	3,750	7%
India	12,835	12,832	13,126	13,150	14,137	15,300	15,750	31%
China	10,622	11,465	13,168	13,227	15,336	16,400	19,000	38%
Asia	35,820	36,246	39,115	40,176	43,844	46,973	50,305	100%

Urea Balance (Production-Consumption)

(1000t)	1990	1991	1992	1993	1994	1995	1996e
Viet Nam	-720	-1,086	-1,111	-1,052	-1,583	-1,524	-1,650
Bangladesh	276	84	317	473	646	416	500
Pakistan	-527	-528	-512	-247	-78	-64	-300
Indonesia	1,565	1,664	1,333	1,462	1,601	1,972	1,500
Other Asia	-1,765	-1,379	-1,382	-2,016	-2,088	-1,874	-2,080
India	0	-380	-1,631	-2,483	-2,910	-3,582	-2,000
China	-8,070	-7,003	-6,780	-3,554	-3,585	-6,807	-6,940
Asia	-9,241	-8,628	-9,766	-7,417	-7,997	-11,463	-10,970



	General situation of capital investment		Historical supply and demand							
	Capacity (as of the end of 1996)	Principal capital investment plans	(1000t)	1990	1991	1992	1993	1994	1995	1996
Thailand	Capacity 0 Standard size 0 Plants 0 Firms 0	No plans since suspension in the 1980s	Apparent domestic consumption Production of urea fertilizer Export and Import Dependence on imports	457 0 - 457 100%	370 0 - 370 100%	377 0 - 377 100%	574 0 - 574 100%	634 0 - 734 100%	490 0 - 490 100%	600 0 - 600 100%
Malaysia	Capacity 622,000t/y Standard size 570,000t/y Plants 1 Firms 1	Petronas 561,000 t/y, scheduled for 1999. Subsidiary of state- owned oil and gas corporation. Input: natural gas delivered by pipeline	Apparent domestic consumption Production of urea fertilizer Export and Import Export ratio	405 446 41 9%	225 453 228 50%	299 627 328 52%	337 613 276 45%	422 569 147 26%	388 607 219 36%	425 625 200 32%
Indonesia	Capacity 6,431,000t/y Standard size 570,000t/y Plants 11 Firms 6	KALTIM 572,000 t/y, scheduled for 1999. Expansion of a state- owned urea fertilizer company. Input: natural gas delivered by pipeline	Apparent domestic consumption Production of urea fertilizer Export and Import Export ratio	3,486 5,051 1,565 31%	3,310 4,974 1,664 33%	3,617 4,950 1,333 27%	3,671 5,133 1,462 28%	3,688 5,289 1,601 30%	3,923 5,895 1,972 33%	4,400 5,900 1,500 25%
Philippines	Capacity 0 Standard size 0 Plants 0 Firms 0	No plans	Apparent domestic consumption Production of urea fertilizer Export and Import Dependence on imports	608 0 - 608 100%	451 0 - 451 100%	588 0 - 588 100%	680 0 - 680 100%	619 0 - 619 100%	642 0 - 642 100%	600 0 - 600 100%
Singapore	Capacity 0 Standard size 0 Plants 0 Firms 0	No plans	Apparent domestic consumption Production of urea fertilizer Gap between supply and demand Export ratio							
Viet Nam	Capacity 100,000t/y Standard size 570,000t/y Plants 1 Firms 1	Phu My 575,000 t/y, scheduled for 2000. A joint venture between state- owned chemical company and foreign partner. Input: natural gas delivered by pipeline.	Apparent domestic consumption Production of urea fertilizer Export and Import Dependence on imports	760 40 - 720 95%	1,131 45 - 1,086 96%	1,173 62 1,111 95%	1,157 105 - 1,052 91%	1,686 013 - 1,583 94%	1,633 109 1,524 93%	1,755 105 -1,650 94%

Source Various sources

Notes Dependence on imports = import/domestic demand, export ratio = export/production
Source Fertecon

Tariff reduction schedule on CEPT scheme

urea fertilizer	Base Rate (other than ASEAN)	AFTR.CEPT (96-03)	WTO- related	Comment
Thailand Urea fertilizer Mixed fertilizer	 5 0	 FT 10 - 3 FT 5- 10 - 5	Became a member in January, 1995. State-run fertilizer firm was the sole importer in 1982-1991 when construction of a urea fertilizer plant was planned by this firm.	Agricultural policy is important. Import restrictions were abolished in 1979. Tariffs were reduced to the current level in 1993. There are no urea fertilizer plants in operation or under construction.
Malaysia Urea fertilizer Mixed fertilizer	 0 0	 FT 0 - 0 FT 0 - 0	Became a member in January, 1995. No restrictions are imposed on imports.	Agricultural policy is important and no tariffs are imposed. All urea plants are state-owned and use natural gas. Capacity exceeds domestic demand, which allows exports. There is one fertilizer plant operating and another under construction.
Indonesia Urea fertilizer Mixed fertilizer	 0 0	 FT 0 - 0 FT 0 - 0	Became a member in January, 1995. No restrictions are imposed on imports.	Agricultural policy is important; no tariffs are imposed. All urea plants are state-owned and use natural gas. Capacity exceeds domestic demand, which allows export. Eleven urea fertilizer plants are operating, with three under construction.
Philippines Urea fertilizer Mixed fertilizer	 3 3	 FT 3 - 3 FT 3 - 3	Became a member in January, 1995.	
Singapore Urea fertilizer Mixed fertilizer	 0 0	 FT 0 - 0 FT 0 - 0	Became a member in January, 1995.	No significant agriculture
Viet Nam Urea fertilizer Mixed fertilizer	 (0) (0)	 TE TE	Applying for membership. In the past, a state-owned firm was solely responsible for importing agricultural inputs. Small, private trading companies now import as well.	The world's fourth biggest importer country of urea fertilizer. In 1995, one million tons out of a total of 1.5 million tons was imported from Indonesia. One urea fertilizer plant is operating and produces 100,000 tons. A state-owned plant using natural gas is planned.

5-6 Cement Industry

6.1 Characteristics of the Cement Industry

6.1.1 Profitability During Initial Stage of Industrialization

(1) Rapid demand growth

The experience of neighboring countries shows that domestic demand for cement sharply increases during early stages of economic development and the accompanying industrialization of the economic structure. Per capita cement consumption and per capita GDP in the NIEs and ASEAN countries are correlated closely. During development, when per capita GDP rises from $400 to $10,000, domestic demand for cement increases sharply due to the multiplier effect of population growth and per capita cement consumption growth.

(2) Natural protection

Transportation costs for cement are very high, especially by truck, and therefore pricing is made on a consumption spot basis. Cement is thus a "local industry" in terms of its basic industrial characteristics. As a result, cement has a low international distribution rate of 7% (marine transport) against 35% for steel. Due to high land transportation costs, its domestic price is not as volatile as the international market. This high land transportation cost creates a "natural protective barrier" for domestic cement producers from imported cement.

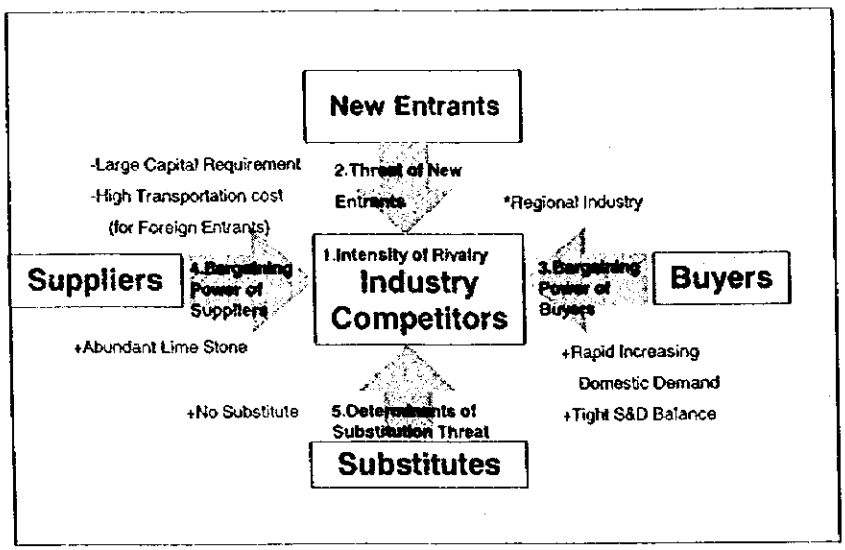


Figure 6.1 Competitive force of cement industry

Source M. Porter

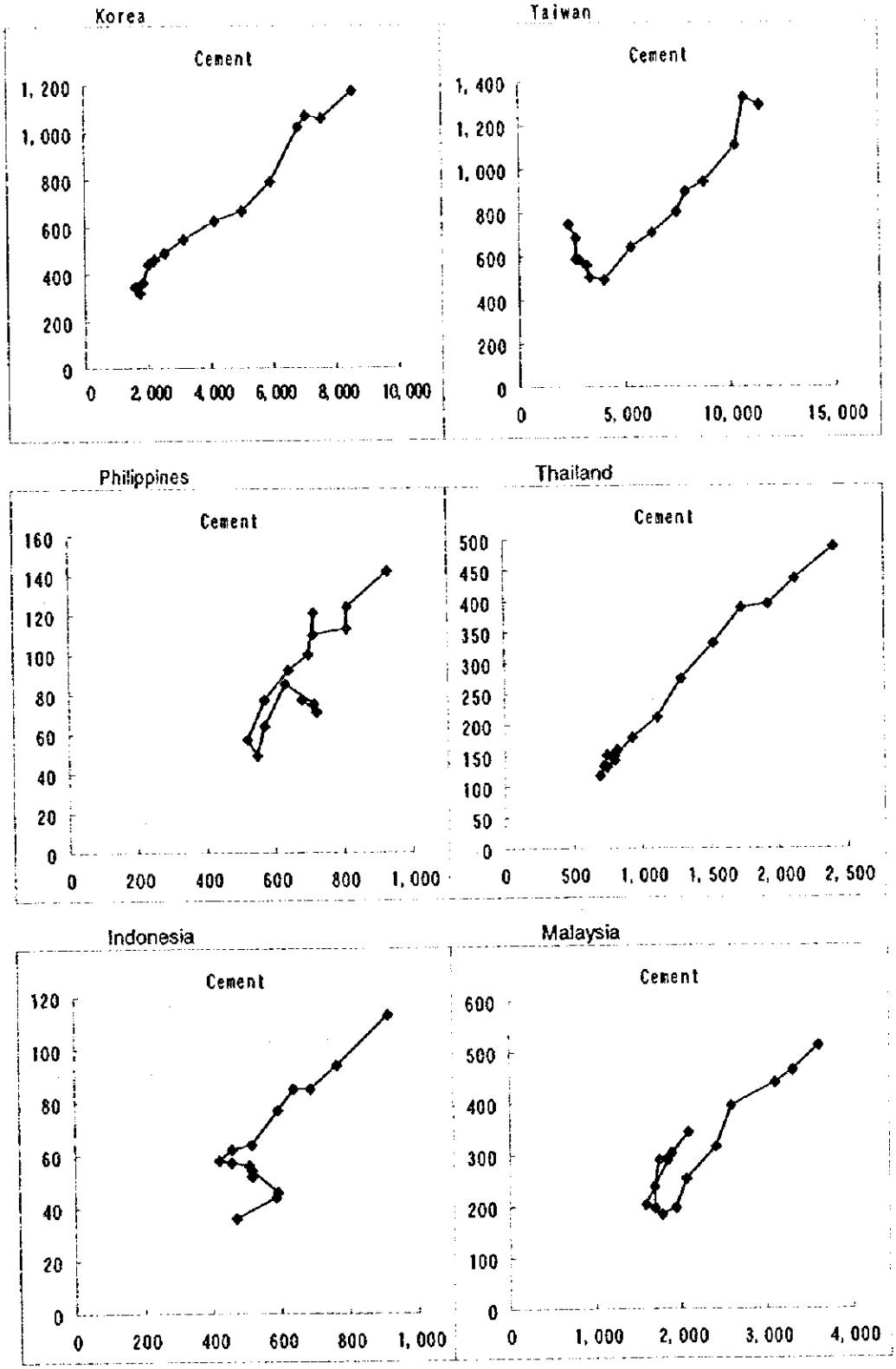


Figure 6.2 Correlation between per capita cement consumption and per capita GDP

Notes Vertical axis: Cement consumption (kg/c), Horizontal axis: per capita GDP ($/c) (1980-1994)

(3) Favorable business environment

Competition in the cement industry during the early stages of industrialization can be classified as follows: 1) competition among cement manufacturers, 2) threat of new entrants to the domestic market, 3) bargaining power of the buyers, 4) bargaining power of material suppliers, and 5) threat of substitute products. The cement industry is usually established by state-owned enterprises during the early stages of industrialization. Therefore, the state-owned enterprise enjoys a monopoly in the domestic cement market. The appropriate size of production capacity which is necessary to take advantage of economies of scale is 2 million tons per year, requiring an investment of $300 million. Such a sizable investment generally precludes domestic entrepreneurs during the early stages of economic development, thereby reducing the threat of new entrants. In addition, the domestic price of cement typically rises due to the rapid growth in demand coupled with natural protection from international suppliers. And given that lime stone is usually taken from a quarry which is owned by the manufacturer, the bargaining power of the supplier is negligible. Cement is a basic material for construction and requires a relatively mature level of technology for its production. Hence, there is almost no threat from substitute products. As a result, the cement industry enjoys a very favorable business environment during the early stages of industrialization.

(4) Cradle for industrial investor

In Viet Nam today, there are few private direct investors in the manufacturing industry. Likewise, the capability of domestic financial markets to mobilize the capital necessary to facilitate investment is still undeveloped. Therefore, it may be possible to utilize the favorable business environment of the cement industry to overcome these problems and cultivate domestic industrial investors.

The Siam cement group in Thailand began operating in 1913 as a joint venture with foreign investors. In 1975, the company was listed on the Bangkok stock exchange and a Thai citizen held the office of president for the first time. Since then, with profits accumulated in the cement industry, the group has entered into the construction materials, ceramics, and iron and steel industries to meet the rising demand from construction. In recent years, the group, which has become the biggest domestic industrial capital group in Thailand, is entering into sectors such as electronics, automobile parts and petrochemicals.

6.1.2 Development Pattern of the Cement Industry

(1) The cement market situation in ASEAN countries in the 1990s

Demand for cement in Asia has increased rapidly since the 1980s, reaching about 700 million tons in 1995. Demand in the six ASEAN countries totaled 92 million tons, exceeding the level for Japan. Demand in China is a gigantic 440 million tons. In ASEAN countries, demand for cement expanded during the latter half of the 1980s. After 1990, however, there was a "Cement Crisis" involving shortages of cement, a rapid increase in imports, and a steep climb in domestic prices. Investment in new cement plants occurred and the new plants are expected to begin operating after 1996. They are expected to ease the domestic supply and demand imbalance and stabilize prices in each country.

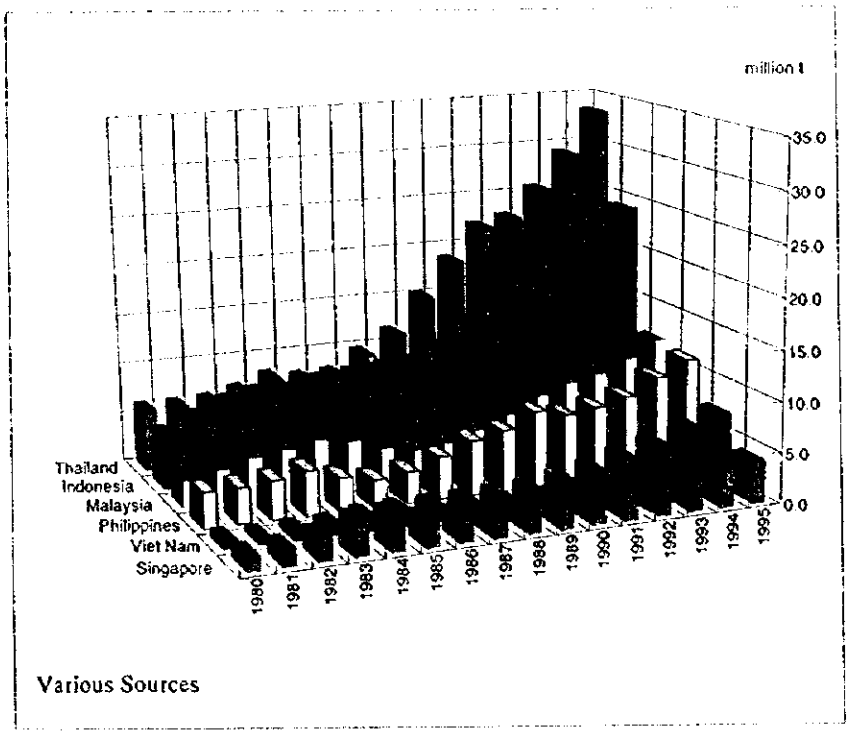


Figure 6.3 Cement consumption in ASEAN 6

The emphasis of industrial policy in ASEAN countries has shifted from border protection to price monitoring mechanisms in order to prevent cartels. Because of the relatively small size of the domestic market and the huge investment required to attain economies of scale, the cement market in developing countries tends towards oligopoly. Domestic demand for cement is exploding due to the early stage of industrialization, and an ample and stable supply of cement for the construction sector, especially infrastructure, is the policy priority. The tariff rate on cement is 0% in ASEAN countries.

Table 6.1 Cement Industry in ASEAN

	Plant Investment								Consumption, Production, Trade and Price											
	Capacity 1996			On-going Investment				(million t)	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	*1996e*
Thailand	Clinker	NA	mil t/y	Siam	1.7	mil t/y	1997	Consumption	7.8	7.9	9.7	11.6	15.2	18.7	22.1	22.8	25.6	29.1	33.4	*37.8*
	Cement	41.4	mil t/y	Siam	1.7	mil t/y	1997	Production	7.9	7.9	9.8	11.7	15.4	18.0	18.8	22.4	27.8	31.7	33.4	*41.4*
	State	0		Asia	2.3	mil t/y	1997	Export	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	2.0	2.7		
	Private	8		Siam	2.3	mil t/y	1998	Import	0.0	0.0	0.0	0.0	0.3	3.0	5.9	3.0	0.0	0.1		
								Exp-Imp	0.0	0.0	0.1	0.0	-0.3	-3.0	-5.9	-3.0	2.0	2.6	0.0	*3.6*
								Dom Price (B/t)	1,371	1,311	1,265	1,285	1,343	1,740	2,032	1,621	1,387	1,352	1,380	*1,361*
Indonesia	Clinker	NA	mil t/y	Gresik	2.5	mil t/y	1997	Consumption	9.1	9.5	9.9	10.0	11.4	13.8	15.5	15.8	17.8	21.5	24.1	*27.9*
	Cement	26.9	mil t/y	Indocement	1.3	mil t/y	1997	Production	9.9	11.3	12.3	13.2	15.7	16.3	16.7	18.3	19.6	22.0	23.1	*27.1*
	State	5		Cibinong	2.5	mil t/y	1997	Export	0.8	1.7	2.3	3.1	4.1	2.3	1.0	2.6	1.4	0.5	0.1	*0.5*
	Private	4		Gresik	2.3	mil t/y	1998	Import	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.2	1.1	*1.8*
				Padang	2.3	mil t/y	1998	Exp-Imp	0.8	1.7	2.3	3.1	4.1	2.3	1.0	2.6	1.3	-0.7	-1.0	*-1.3*
				Indokodeko	2.3	mil t/y	1998	Dom Price (thR/t)	83	85	90	94	108	128	131	137	154	188	210	
Malaysia	Clinker	9.2	mil t/y	APMC	1.8	mil t/y	1997	Consumption	4.7	3.6	3.0	3.4	4.3	5.6	7.2	8.2	8.8	10.0	13.8	*14.9*
	Cement	12.9	mil t/y	APMC	1.8	mil t/y	1997	Production	4.2	3.6	3.9	5.2	6.2	6.7	7.9	8.5	9.1	8.6	11.1	
	State	3		Tasek	0.8	mil t/y	1997	Export	0.3	0.5	0.9	1.9	1.9	1.1	0.5	0.0	0.0	0.2	0.0	
	Private	8		Perak	1.5	mil t/y	1998	Import	1.0	0.0	0.0	0.0	0.0	0.1	0.6	1.2	1.4	1.6	2.7	
				Pahang	1.2	mil t/y	1998	Exp-Imp	-0.7	0.5	0.9	1.9	1.9	1.0	-0.1	-1.2	-1.4	-1.4		
								Dom Price (R/t)	180	180	180	180	180	180	180	180	180	180	198	*198*
Philippine	Clinker		mil t/y	Davao	1.0	mil t/y	1997	Consumption	2.7	3.1	4.2	5.4	6.1	7.6	6.9	7.3	8.0	9.6	11.1	*12.8*
	Cement	10.6	mil t/y	Hi Cement	1.5	mil t/y	1997	Production	3.1	3.3	4.3	5.5	6.4	6.6	6.9	6.7	8.0	6.6		
	State			FR Cement	1.1	mil t/y	1997	Export	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
	Private			Republic	1.0	mil t/y	1997	Import	0.0	0.0	0.1	0.1	0.5	0.9	0.2	1.3	0.6	0.4		
				Fortune	1.0	mil t/y	1997	Exp-Imp	0.4	0.1	-0.1	-0.1	-0.5	-0.9	-0.2	-1.3	-0.6	-0.4		
				Northern	1.0	mil t/y	1997	Dom Price (P/t)	1,130	1,200	1,300	1,300	1,350	1,470	1,780	1,800	1,800	2,000		
Singapore	Clinker	0.0	mil t/y					Consumption	2.6	2.4	2.2	2.0	2.1	2.1	2.8	3.2	3.7	4.2	4.2	*4.2*
	Cement	0.0	mil t/y					Production	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0.0*
	State							Export												
	Private							Import												
								Exp-Imp	-2.6	-2.4	-2.2	-2.0	-2.1	-2.1	-2.8	-3.2	-3.7	-4.2	-4.2	*-4.2*
								Dom Price ($/t)												
Viet Nam	Clinker	NA	mil t/y	Trang Kenh	1.4	mil t/y	1996	Consumption	1.5	1.5	1.6	1.7	1.8	2.6	3.3	4.3	6.0	6.7	7.3	*8.4*
	Cement	5.3	mil t/y	Mornig Star	1.8	mil t/y	1997	Production	1.5	1.5	1.6	1.7	1.8	2.6	3.3	3.9	4.8	5.3	6.0	*6.0*
	Vertical	0.3	mil t/y	Bim Son Rh	0.6	mil t/y	1998	Export	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*0.0*
	State	1		But Son	1.4	mil t/y	1998	Import	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.2	1.4	1.3	*2.4*
	JV	0		Nghi Son	2.3	mil t/y	1999	Exp-Imp	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-1.2	-1.4	-1.3	*-2.4*
								Dom Price (D/t)									670	760	1,660	*1,040*

Various sources

Table 6.2 Tariff reduction schedule on CEPT scheme

Cement	Base Rate (other than ASEAN)	AFTA.CEPT (96-03)	WTO- related	Comment
Thailand Cement Clinker	 0 0	 FT 0 - 0 FT 0 - 0	Became a member in January, 1995. Import ban on cement was lifted between 1989-1992 because of a cement shortage.	Price controls, which were imposed on cement as a basic infrastructure construction material, were canceled in July, 1991 because of a cement shortage.
Malaysia Cement Clinker	 0 0	 FT 0 - 0 FT 0 - 0	Became a member in January, 1995. Restrictions on imports were withdrawn due to the rapid expansion of domestic demand in the 1990s.	Mandatory price ceilings are enforced on cement as a basic infrastructure construction material. The ceiling was raised by 10% in August, 1995 for the first time in 15 years due to a cement shortage.
Indonesia Cement Clinker	 0 0	 FT 0 - 0 FT 0 - 0	Became a member in January, 1995. No restrictions are imposed on imports, but export volume is controlled.	There is a reference price system applied to cement as an basic infrastructure construction material, but this is not a price ceiling.
Philippines Cement Clinker	 0 0	 FT 10 - 3 FT 10 - 3	Became a member in January, 1995.	
Singapore Cement Clinker	 0 0	 FT 0 - 0 FT 0 - 0	Became a member in January, 1995.	
Viet Nam Cement Clinker	 10 5	 TE 5 TE 5	Applying for membership. Based on the speculative price rises in cement in May, 1995, the decision-making authority on import volume was transferred from the VNCC to the Ministry of Commerce.	Mandatory price ceilings are enforced.

Variouse sources

(2) Development of a market network

In the cement industry, investment in the distribution system and marketing functions is as important as investment in production. Cement is bulky and deteriorates quickly, so reducing its distribution cost is important for the efficiency of the national economy.

The evolution of the cement market network can be characterized as follows. Demand for cement increases sharply during the early stages of economic development, but as industrialization proceeds further, the demand structure changes. Demand for large infrastructure projects and for the construction of huge manufacturing plants is soon accompanied by additional demand for small private construction. As a result, the distribution and consumption systems change from transportation in bags and mixing on the construction site to transportation in bulk and delivery in ready-mixed concrete form.

The evolution of the cement distribution network can be measured by the bulk transportation ratio (amount of cement transported in bulk form / total cement production). The bulk transportation ratio varies by country and a high ratio indicates that the market network is highly developed. In 1994, the bulk transportation ratio in Japan was 93%, Korea 71%, Thailand 30%, Indonesia 15%, and Viet Nam 5%.

To learn from the experience of ASEAN countries, it is useful to review the market system of Indonesia and Thailand. The bulk transportation ratio of Indonesia is 15% and that of Thailand is 30%, and thus the cement market system in Thailand appears more evolved than that of Indonesia. The biggest difference between the two countries is the governance structure of distributors. In Indonesia, cement distributors are separated from cement producers and distributors enjoy favorable price hikes during a cement shortage. In Thailand, cement producers invest in distributing facilities such as cement terminals and cement tanks and assume marketing and transportation activity.

1) Cement distribution system in Indonesia

In Indonesia, there are a total of nine cement manufacturers: 5 public and 4 private enterprises. 70% of the demand is for small private construction. The sale contract is "ex-factory." Under this contract, the distributor comes to the factories to pick up bagged cement. Sales of cement manufactures is based on the ex-factory price. The cement distributor must invest in transportation facilities such as cement terminals, ships, trains and trucks. In return for this investment in the distribution system, the distributor can enjoy the profits of a rising price for cement. Cement distributors' stock is not listed on the stock exchange.

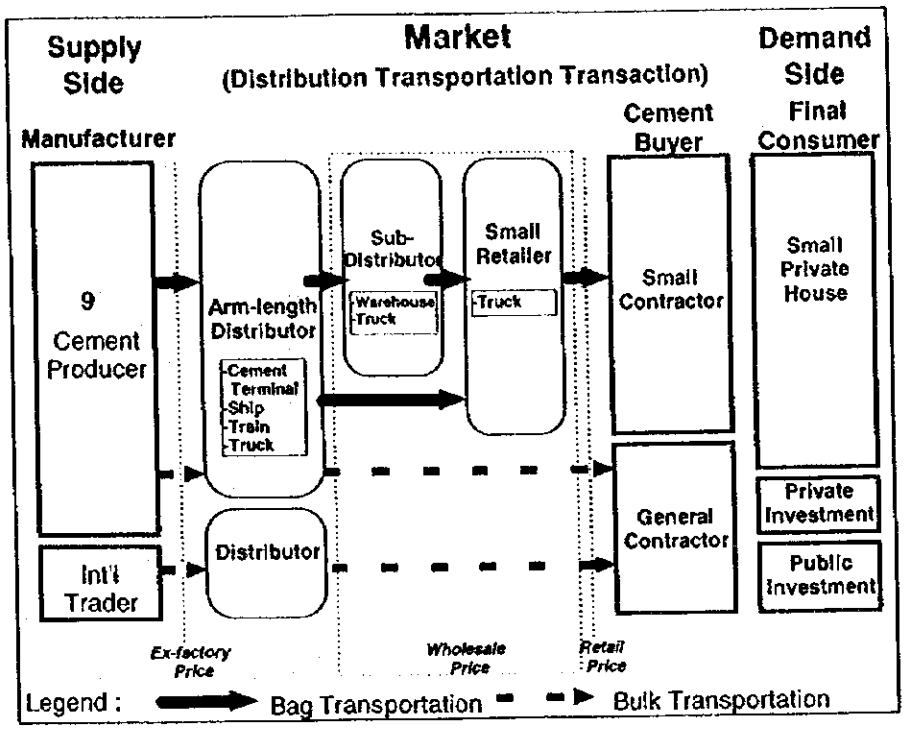


Figure 6.4 Cement distribution system in Indonesia in 1997

2) Cement distribution system in Thailand

In Thailand, there are 8 private cement manufacturers. Half of the demand for cement is for small private construction, the rest is for large scale private and public investment. 70% of transportation is in bagged form. The manufacturers invest in distribution facilities such as cement terminals, ships, trains and trucks and thereby assume transportation costs. The sales contract of cement is mainly "on site" whereby the manufacturer is responsible for transportation to the construction site and the price of cement under the contract includes the cost of transportation. However, profits from a rise in cement prices is enjoyed by the cement manufactures.

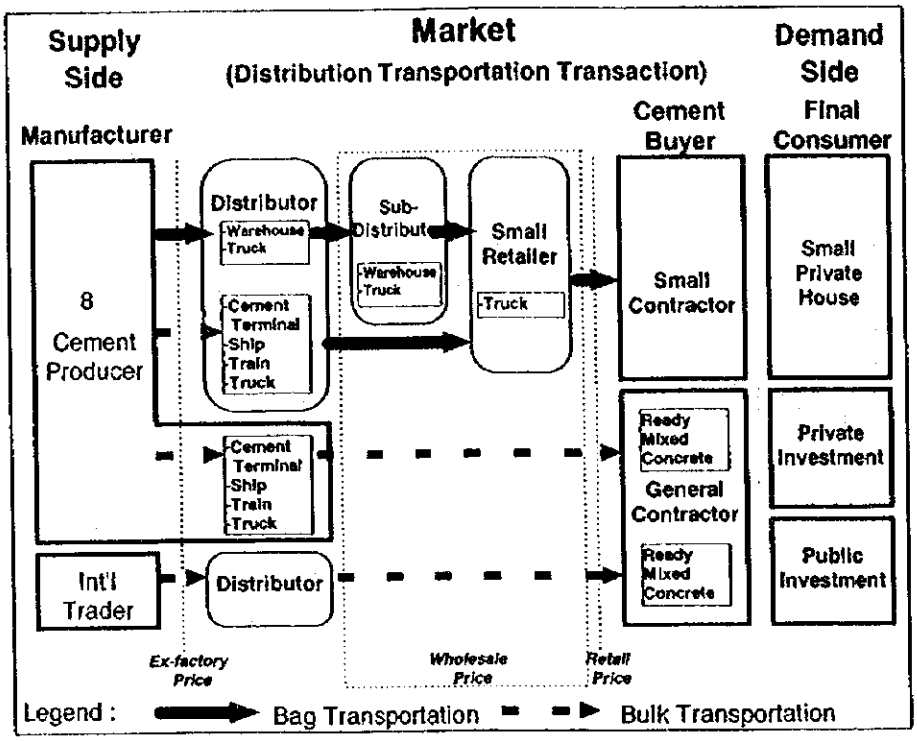


Figure 6.5 Cement distribution system in Thailand in 1997

3) Expected cement distribution system in Viet Nam in 2000

Currently, almost all cement in Viet Nam is transported in bagged form on trucks and mixed at the construction site. This transportation mode requires frequent loading and unloading which incurs significant labor costs. A bulk transportation system utilizing ships and rail has not been developed yet. It is anticipated that by the year 2000 the VNCC and three joint ventures will be operating in Viet Nam's cement market. Such joint ventures will invest in the distribution system of cement and its transportation cost is expected to be lower than that of the VNCC. Three joint ventures will be more cost competitive than the VNCC because of this efficient distribution system

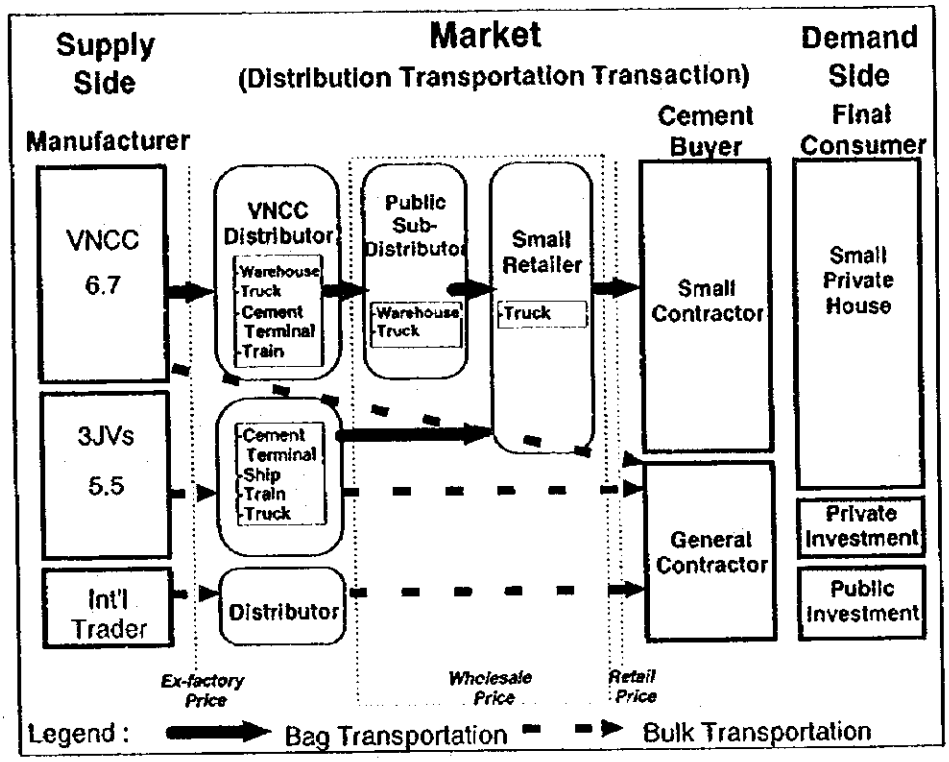


Figure 6.6 Expected cement distribution system in Viet Nam in 2000

6.2 Viet Nam's Cement Industry

6.2.1 Current Status of Viet Nam's Cement Industry

(1) Demand and supply situation in cement market

Domestic demand for cement in Viet Nam rapidly increased in the 1990s, growing at an annual rate of 21% from 2.6 million tons in 1990 to 8.2 million tons in 1996. The total production capacity of VNCC's four plants at the end of 1996 was 5.3 million tons per year. And in local provinces, there are 27 small vertical kiln facilities which account for 2 million tons of annual production capacity. In order to meet the domestic demand of 8.2 million tons in 1996, the four VNCC plants produced in excess of full operation capacity, but the production of vertical kiln cement—which is inferior in quality—was curtailed, causing 2.4 million tons of clinker and cement to be imported.

(2) The role of the cement industry in Viet Nam

The cement industry, especially the VNCC, is requested to accomplish several tasks according to the administrative organs in Viet Nam. Under such circumstances, there is significant potential for coordination failures during the transition process from a centrally planned economy to a market economy.

The VNCC, which is placed under the umbrella of the Ministry of Construction, is requested, above everything, to supply the construction industry with cement, a basic construction material, in a quantitatively stable manner and at a low price. As seen from the Ministry of Finance, the VNCC is a one of the biggest sources of revenue for the authorities. However, when examined from the perspective of foreign exchange income and expenditure, $100 million of hard currency is required in order to import 2 million tons of cement at $50 per ton.

In order to curb inflation, a price ceiling is applied locally on cement in each region. The ceiling is decided upon by the Government Pricing Committee after listening to the opinion of the concerned ministries. The price ceiling for cement is fixed lower in the central area and higher in the north and south areas. Given that cement production must be located near a limestone source, there are more cement plants in the north and less in the central and southern regions. Within the VNCC, it is assumed that losses on shipments to the center are compensated for by profits from shipments to the south and north. The redistribution of income resulting from the establishment of regional prices is intended to cope with the current government fiscal status in which the fiscal system depends considerably on contributions to the National Treasury from state-owned enterprises. This dependence is in turn the result of a taxation system that is still in the course of development, and a fiscal fund distribution system between the central government and provinces that no longer functions.

6.2.2 The Supply and Demand Situation Anticipated in 2000

Demand forecasts for the year 2000 vary widely. The most bullish forecast is 18 million tons, which assumes an annual growth rate of 21%. The most conservative one is 13 million tons, which assumes an annual growth rate of 12%.

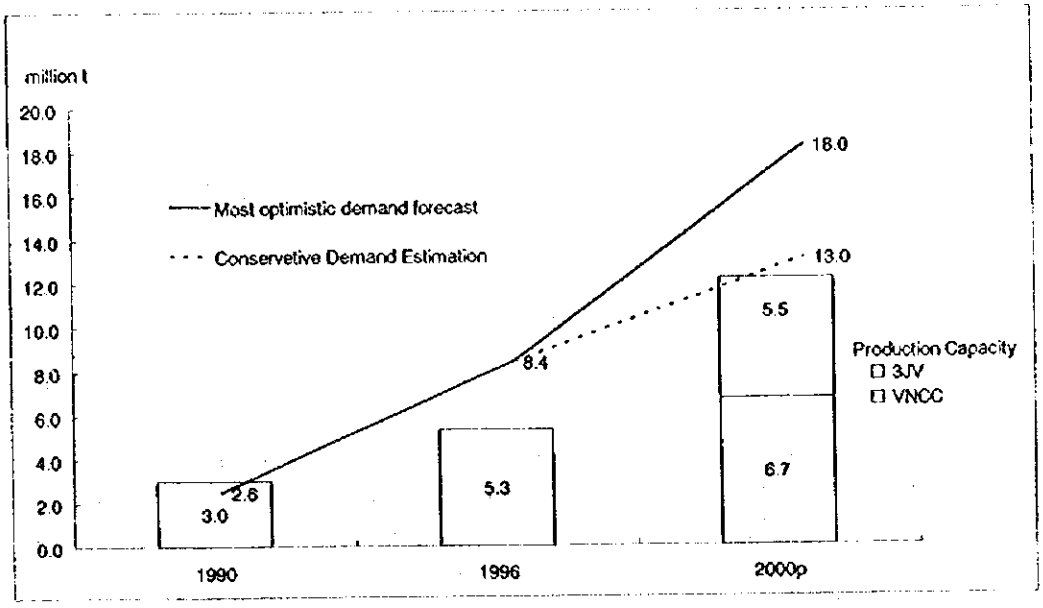


Figure 6.7 Cement demand and production capacity

In response to the growth in demand, VNCC facilities will increase production capacity by 1.4 million tons in 1998. 1.4 million tons, 1.8 million tons, and 2.3 million tons of new capacity will come on stream by a joint venture between foreign capital and the VNCC in 1997, 1998, and 1999 respectively. As a result, the production capacity will double from 5.3 million tons in 1996 to 12.2 million tons in 2000.

The supply and demand gap ratio [(demand - capacity)/capacity] indicates the tightness in the market. The higher this gap ratio is, the higher the pressure on price hike is. The gap ratio was 58% in 1996 and is predicted to reduce to a range of 48% to 7% for the year 2000. Rising pressure on cement prices is expected to be alleviated in 2000.

6.3 Policy Issues to be Addressed in the Cement Industry

We now review the problems which the Vietnamese government is currently facing with regard to the cement industry. Problems are analyzed from either a structural adjustment view or a long-term development view.

6.3.1 Structural Adjustment

(1) Market Reform

At present, the Vietnamese government exercises control over the VNCC with respect to the customers and local price of cement. This control has gradually been liberalized in the transition process from a centrally planned economy to a market economy. The cement price ceiling is itself a measure to curb inflation and facilitate the development of infrastructure. This price ceiling is also utilized for the redistribution of resources to the central area. In order to cope with the anticipated

competition with foreign joint ventures, it was decided that the price ceiling system would be changed into a less enforceable standard price system. This standard price system operates in an environment in which price pressures have been easing. MPI guaranteed the three foreign joint ventures when the investment was approved that no restrictions would be imposed on either sales quantity or sales price. Attempts to control the shipment or sales price of joint ventures are considered contrary to the goals of the transition to a market economy.

(2) Reform of State-owned Enterprises

In the year 2000, the annual production capacity of the three foreign joint ventures will total 5.5 million tons, compared with the VNCC's 6.7 million tons. These four firms will compete in Viet Nam's cement market with a total demand of 13 million tons to 18 million tons. Unlike the steel industry, troubled with low-priced imports, a favorable business environment will permit the VNCC to coexist and cooperate with the joint ventures.

There are four generations of cement manufacturing technology: 1) vertical shaft kiln, 2) wet kiln, 3) suspension pre-heater kiln (dry) and 4) new suspension pre-heater kiln (new dry). The newer the technology is, the higher the quality of cement and the lower the energy cost is. The VNCC applies wet technology to 2.0 million tons out of its equipment capacity of 6.7 million tons, generating relatively poor energy efficiency. The VNCC also maintains employees in non-productive functions, such as in schools or hospitals, which require several times as many employees as are engaged in production. Therefore, the VNCC's cost is higher than that of foreign joint ventures which have the latest technology. However, the VNCC may still be profitable because it is able to charge high prices due to unmet domestic demand.

Projections of domestic demand will be decisive with respect to determining which scenario is realized. The production plan, currently prepared by the VNCC and the Ministry of Construction, is formulated by following a procedure in which an investment plan is developed first, and if domestic demand does not reach the projections, any surplus is passed on to the export market. This is a typical material mobilization-driven idea from the age of the centrally planned economy. In a market economy, however, changes in the supply and demand balance in the long run and the direction of price fluctuations is obtainable from projections regarding the demand and the outlook for equipment investment. A basic understanding of this price dynamic will become more important for the reform of state-run enterprises in a market economy.

6.3.2 Long-term Development

(1) Mobilization of Domestic Capital

The VNCC needs money to replace the outdated wet technology equipment with new and cost effective dry technology equipment in order to improve cost competitiveness. In the reform of the VNCC, there are two alternatives to finance the investment of new equipment: bring money from outside the VNCC or use money accumulated by the VNCC. In a market economy, corporate management regards accumulated internal reserves as funds which the management can use at its own disposal. In Viet Nam today, a financial system to mobilize domestic capital has not yet developed and self investment by internal reserves can play a vital role in financing investment.

The VNCC, which made a profit in 1996, contributes a significant amount to the national treasury. It is also inferred that the VNCC has distributed a large portion of its profit to its employees. As a result, the VNCC has accumulated a very small portion of its profit as internal reserves which can be used for reinvestment. The current contribution-subsidy relationship between the national treasury and a state-owned enterprise is understandable in the context of the development of a taxation system.

The burden of non-productive activity is also a typical development issue at the stage when a social safety net is under construction.

(2) Development of a Market Network and Industrial Capitalists

In the cement industry, investment in the distribution and sales functions is as important as investment in production equipment. Cement is bulky and deteriorates quickly, so that reducing its distribution cost is important not only for the profitability of the cement producer but also for the efficiency of the national economy. If cement producers sell products on ex-factory contract, and distributors shoulder the burden of investment in distribution and transportation costs, then the risk and most of returns from cement price fluctuations will be enjoyed by distributors. If cement producers sell cement with an on-site delivery contract, the price which the producer receives will include transportation cost. In this case, producers have to invest in distribution and assume transportation costs. The risk and returns from cement price fluctuations will be enjoyed, or borne, by the cement producers.

In Indonesia, the responsibility for cement transportation is borne by the distributor. Cement producers in Thailand, including Siam Cement, invest in distribution and sell cement with an on-site delivery contract. As mentioned above, Siam cement has grown into the biggest industrial group in Thailand.

Appendix

Cement Consumption and Trade

World Cement Consumption and Trade

(million t)	1989	1990	1991	1992	1993	1994
Production	1,144.9	1,154.3	1,156.2	1,225.8	1,295.9	1,371.4
Consumption	1,142.8	1,150.9	1,155.4	1,222.1	1,290.3	1,358.4
Export	67.5	71.1	74.7	78.0	82.4	94.0
Exp/Prd	6%	6%	6%	6%	6%	7%
Asia	371.9	395.8	443.2	518.6	592.1	641.2
Asia/World	33%	34%	38%	42%	46%	47%

Source: Various Sources

World Steel Consumption and Trade

(million t)	1989	1990	1991	1992	1993	1994
Consumption	657.8	646.4	617.4	599.3	616.2	616.6
Import	168.8	162.4	165.7	177.8	207.8	218.7
Imp/Cns	26%	25%	27%	30%	34%	35%

Source: IISI

Cement Consumption and Trade in Asia (1995)

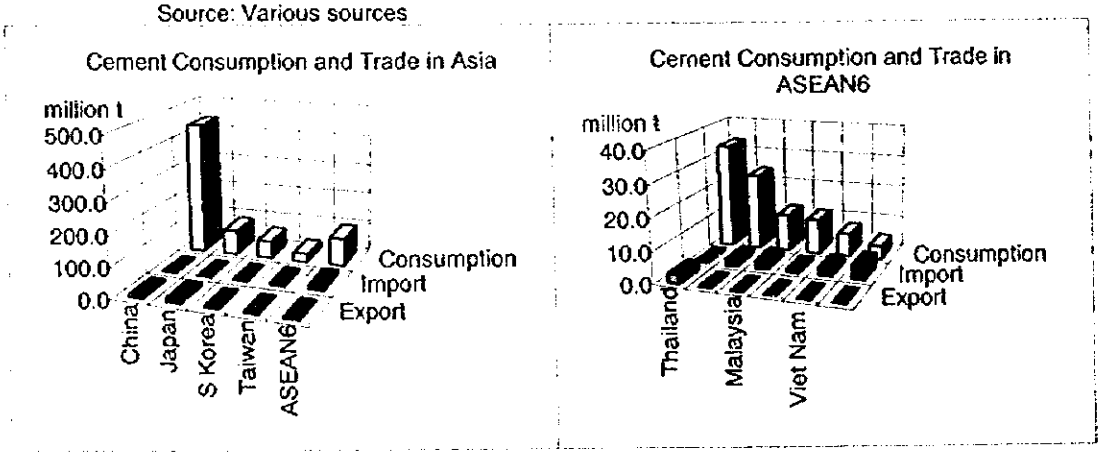
(million t)	Consumption	Import	Export	Exp-Imp net	Exp/Cns
China	438.5	0.7	7.3	6.6	2%
Japan	80.4	0.6	13.4	12.8	16%
S Korea	56.5	2.1	3.7	1.6	3%
Taiwan	25.9	5.0	0.6	-4.4	-17%
ASEAN6	91.7	13.6	3.3	-10.3	-11%
Total	693.0	22.0	28.3	6.3	1%

Source: Various sources

Cement Consumption and Trade in ASEAN6 (1995)

(million t)	Consumption	Import	Export	Exp-Imp net	Exp/Cns
Thailand	33.4	0.8	3.0	2.2	7%
Indonesia	24.1	2.1	0.2	-1.9	-8%
Malaysia	11.7	2.7	0.0	-2.7	-23%
Philippines	11.1	1.0	0.0	-1.0	-9%
Viet Nam	7.2	2.6	0.0	-2.6	-36%
Singapore	4.2	4.4	0.1	-4.3	-102%
ASEAN6	91.7	13.6	3.3	-10.3	-11%

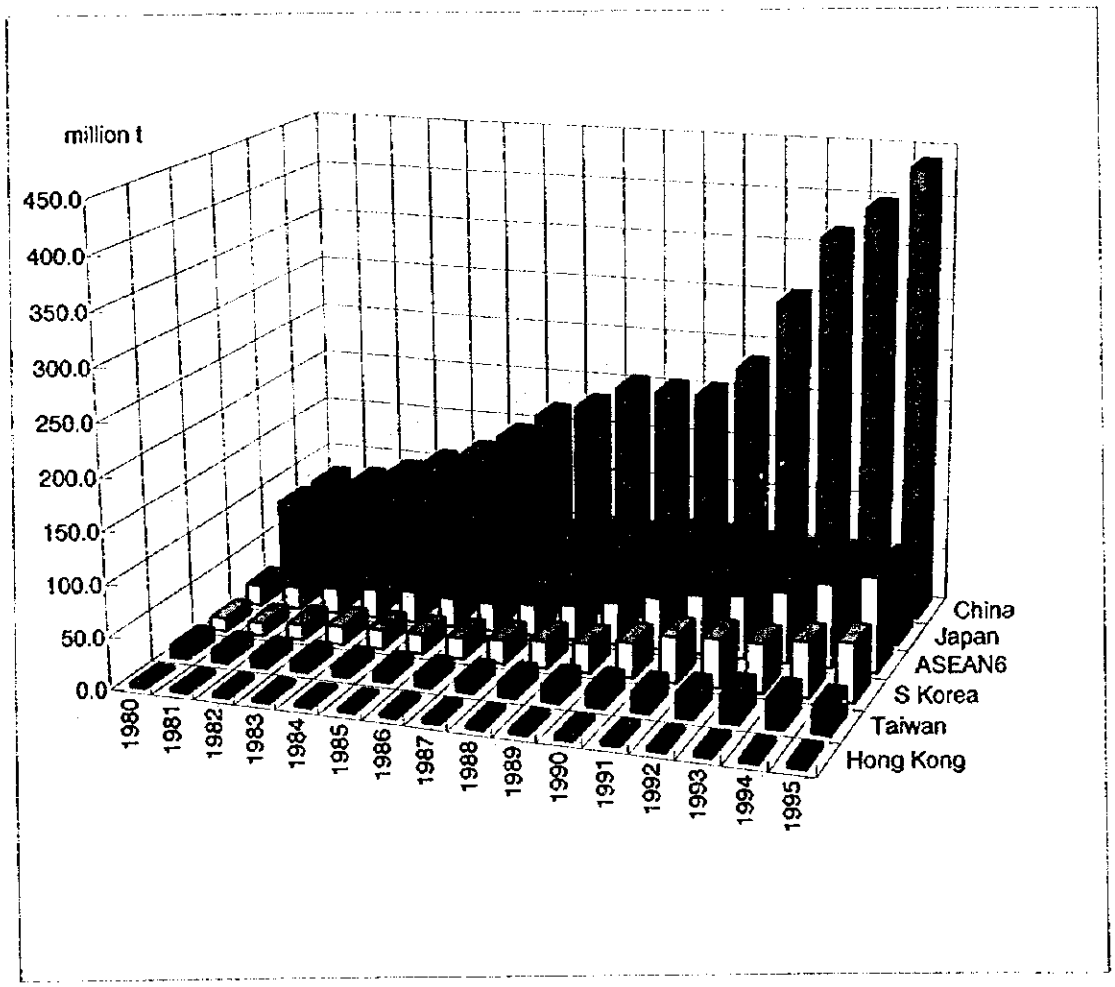
Source: Various sources



Cement Consumption In Asia

(million t)	China	Japan	S Korea	Taiwan	Hong Kong	ASEAN6	Total
1980	79.4	80.3	13.2	13.3	3.2	20.0	209.4
1981	82.3	76.9	12.4	12.4	3.4	22.2	209.6
1982	94.9	72.4	14.3	10.9	3.3	25.5	221.3
1983	109.3	69.7	17.6	10.9	3.2	28.8	239.5
1984	122.3	70.2	18.5	10.6	3.0	29.9	254.5
1985	144.2	68.0	19.0	10.6	2.8	28.4	273.0
1986	168.9	69.5	20.4	11.3	3.4	28.0	301.5
1987	181.8	73.5	22.8	12.7	3.6	30.6	325.0
1988	204.3	77.5	26.2	14.2	4.0	34.1	360.3
1989	203.8	78.8	28.2	16.3	3.9	40.9	371.9
1990	203.3	86.3	34.0	18.1	3.8	50.3	395.8
1991	233.0	85.3	44.2	19.2	4.0	57.5	443.2
1992	302.2	82.1	46.7	22.9	3.5	61.2	518.6
1993	366.8	78.6	46.7	27.6	3.7	68.7	592.1
1994	396.9	79.7	52.7	27.2	4.1	80.6	641.2
1995	438.5	80.4	56.5	25.9	4.5	91.7	697.5

Source: Various Sources



Cement Consumption in ASEAN6

(million t)	Thailand	Indonesia	Malaysia	Philippines	Viet Nam	Singapore	ASEAN6
1980	6.2	5.4	2.7	3.5	0.8	1.4	20.0
1981	6.3	6.7	3.4	3.5	0.6	1.7	22.2
1982	6.4	7.9	4.2	3.8	0.8	2.4	25.5
1983	7.1	8.5	4.6	4.4	0.9	3.3	28.8
1984	8.2	8.4	5.2	3.3	1.3	3.5	29.9
1985	7.8	9.1	4.7	2.7	1.5	2.6	28.4
1986	7.9	9.5	3.6	3.1	1.5	2.4	28.0
1987	9.7	9.9	3.0	4.2	1.6	2.2	30.6
1988	11.6	10.0	3.4	5.4	1.7	2.0	34.1
1989	15.2	11.4	4.3	6.1	1.8	2.1	40.9
1990	18.7	13.8	5.6	7.6	2.5	2.1	50.3
1991	22.1	15.5	7.2	6.9	3.0	2.8	57.5
1992	22.8	15.8	8.2	7.3	3.9	3.2	61.2
1993	25.6	17.8	8.8	8.0	4.8	3.7	68.7
1994	29.1	21.5	10.0	9.6	6.2	4.2	80.6
1995	33.4	24.1	11.7	11.1	7.2	4.2	91.7

Source: Various Sources