



TOGETHER
for a sustainable future

OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.



TOGETHER
for a sustainable future

DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

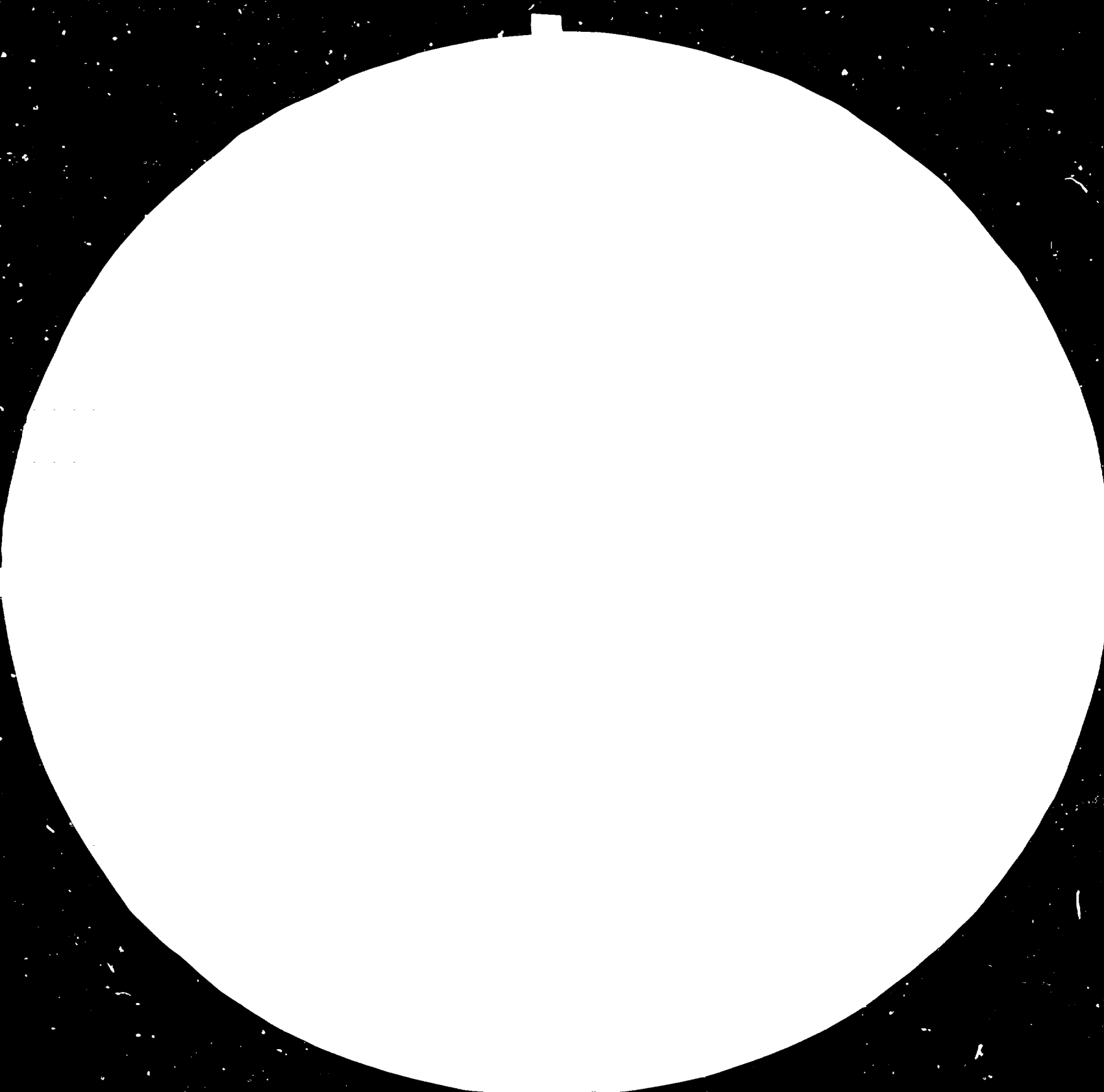
FAIR USE POLICY

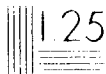
Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org





1.4

1.6

12737

Distr.
RESTRICTED
UNIDO/IS/R.10
3 August 1983
English

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

INDUSTRIAL RESTRUCTURING IN THAILAND -
SOME OBSERVATIONS ON THE CHEMICAL INDUSTRY

Interim Report*

Prepared for the Government of Thailand

Mario Trezoz

Report No. 5 in series of policy papers on industrial restructuring in Thailand, by the Regional and Country Studies Branch, Division for Industrial Studies.

* This document has been reproduced without formal editing.

7.83-89019

Table of contents

<u>Chapter</u>	<u>Page</u>
I. INTRODUCTION	1
II. CONCEPTUAL ASPECTS OF INDUSTRIAL RESTRUCTURING IN THE CHEMICAL INDUSTRY	2
III. POSSIBLE PATHWAY TO RESTRUCTURING	4
- General model	4
- Growth poles	4
Natural gas	4
Agriculture-related industries	7
Mineral resources	9
- Specific chemical industries with growth potential .	9
APPENDIX I List of persons contacted	15
APPENDIX II List of references consulted	16

Chapter I

INTRODUCTION

The United Nations Industrial Development Organization (UNIDO) is currently co-operating with the Government of Thailand on the field of industrial restructuring. As part of that programme, UNIDO was requested through the National Economic and Social Development Board (NESDB) and the Industrial Restructuring Committee (RESCOM) for which it is the Secretariat, to provide some observations on the restructuring of the chemical industries in Thailand.

The present document has been prepared by Dr. Marios Tsezos^{1/}, UNIDO adviser, in consultation with staff of the Regional and Country Studies Branch of the Division for Industrial Studies. It follows a four-day mission to Bangkok in May 1983, and is based on discussions held at that time with several government officials, representatives of the industry and banking systems (see Appendix I). The adviser was able to draw on some background material available in English (see Appendix II), but not on documents written in Thai. The present report should only be regarded as a tentative analysis of the present situation in Thailand, given the limited time and data available on the subject.

During the initial discussions of the adviser at the NESDB with government officials, it was requested that the adviser place the emphasis of his mission on the preparation of guidelines for a larger and more detailed study on the subject that will follow in near future, rather than on the resources endowment. This report was prepared with this request in mind.

The mission wishes to express its appreciation for the efficient support provided by the NESDB and other representatives of the Government, the banking system and industry. A list of the persons contacted is attached to the report (Appendix I).

^{1/} Assistant Professor of Chemical Engineering, McMaster University, Canada.

A series of interim reports with observations, among others, on the industrial restructuring in Thailand, on the plastics industry in Thailand, and on the country's export policy instruments and institutions have already been prepared by UNIDO and provide a description of the present general situation of the industry in Thailand and of the relation to the present global economic environment. As a result, the present report will not deal with this aspect. It should be noted, however, that Thailand must meet the objectives of the desired industrial restructuring when the external conditions are not as favourable. Many other developing countries face the same situation; Thailand will have to compete with them for factors that are important for the desired restructuring, as for example, new export markets, foreign investment and technological assistance, competitive wages, and productive domestic labour force available for employment by the foreign investors.

The last five-year plan (1982-1986) adopted by the Thai Government makes reference to several issues that relate to the development of the chemical industry in Thailand. The plan aims at promoting exports and stresses the adjustment of economic structure rather than improvements in the efficiency of natural resources utilization and the utilization and development of science and technology. The relation of these issues to the chemical industry restructuring is taken into consideration in the report.

Chapter II

CONCEPTUAL ASPECTS OF INDUSTRIAL RESTRUCTURING

IN THE CHEMICAL INDUSTRY

Two schools of thought exist, at present, in Thailand regarding the way in which industrial activity should evolve. The differences between the two schools are significant and each one dictates a different pathway for industrial restructuring in the chemical industry sector. The first emphasized world market integration, while the second stresses the creation of a diversified, domestically oriented structure. The option of a com-

bined world market integration with a nucleus of industries producing for the domestic market is also available and should be considered.

The last five-year plan emphasized the promotion of exports. In the chemical industry sector, export promotion signifies, most often, an integration into a very competitive world market where the use of a continuously improving technology and high product quality are primary characteristics. Based on import substitution policies, the basic chemicals sector in Thailand has shown growth in the recent years. The domestic market in Thailand, although large, is limited by a reduced purchasing power and a limited consumer education. As a result, productivity and quality control have not been very well attended to thus far. Any effort for integrating into international markets would require a departure from these practices and a significant change of attitude in the chemical industry sector. The economy of scale also becomes a very significant factor since product cost has to be low and quality has to be good for the Thai chemical industry to enter the world market. This is particularly true for the petrochemicals-plastics subsectors. It is felt that before any major industrialization investment programmes are planned or implemented, the issue of the intended market size be resolved first. Furthermore, the industrial structure that is desired to be developed should be flexible enough so that the sector will be able to respond dynamically to the rapidly changing technology, thus reducing cost, and also to respond to changing opportunities to sell abroad. The magnitude of the financial and technical requirements (including foreign capital) necessary for the desired restructuring of the chemical industry sector should not be underestimated. Chemical plants incorporating contemporary technology are costly and require a quite elaborate and efficient infrastructure on which they are built and operate. A petrochemical complex, for example, needs an elaborate transportation-communications-energy network, a secure and continuous supply of raw materials, and an appropriate institutional framework in order to function effectively. Difficulties in mobilizing both the required national and international sources of finance are not unlikely in view of the need for restructuring in other sectors of the economy at the same time.

Chapter III

POSSIBLE PATHWAY TO RESTRUCTURING

General model

On the assumption that properly trained manpower is available, three basic components are required for the development of chemical industries. These are the necessary resources, efficient technology that produces at low cost, and capital for the establishment and operation of the industrial plants.

Thailand faces serious limitations in the last two components. Consequently, industrial development efforts should at least, take advantage of the existing resources. It is the concept of "resource-based industrialization" that should be adopted for the restructuring of the chemical industry sector in Thailand. The proposed industrial development can be perceived as materializing around specific growth poles and along the links that connect these growth poles. A growth pole can be a national resource or a sector that can support significant chemical industries (subsequently called primary industries), as for example, natural gas. Once the growth poles have been identified, then secondary industries that feed intermediate products to or from the primary industries should develop, forming an integrated industrial network.

Growth poles

The mission during the short visit in Thailand identified three major poles. These are: the available natural gas, the agricultural sector, and the mineral resources of the country.

Natural gas

Natural gas was discovered in the mid-1970s in the Gulf of Thailand. Current estimates indicate reserves of approximately 16 trillion cubic feet. A 625 km pipeline was constructed in 1981, transferring the natural gas to land. The throughput capacity of the pipeline is said to be 600-700

million cubic feet per day. A gas separation plant is under construction by the Petroleum Authority of Thailand. The plant is designed to produce approximately 350,000 metric tons per year (mtpy) of ethane and 217,000 mtpy of propane as basic feedstock to a petrochemical complex. Out of the same pipeline, gas is being supplied also to the Electricity Generating Authority of Thailand. An LPG and a fertilizer complex are also scheduled to draw on the natural gas supply.

Concern has been expressed over the present ability of the pipeline system to supply the required volume of natural gas. It is essential for the natural gas based industries to secure a cost structure and a steady supply of natural gas for their operations. Almost one million tons per year of ethylene capacity will be coming on stream from the Middle East petrochemical complexes alone, where plentiful supplies of inexpensive natural gas have been secured. Furthermore, on a somewhat theoretical basis, the petrochemical industry is on a trend where the value added on a per cent of unit value will be in the range of 30 to 40 per cent, with the exception of the speciality polymers. Raw material costs and the implementation of the appropriate technology have become very important factors for the efficient production of cost competitive products for the world market. Any problems relating to natural gas cost, supply by the pipeline, and subsequent separation must be resolved before the petrochemical complex will be able to go ahead efficiently. The Government must have a solid set of arguments in favour of the Eastern Seaboard industrial opportunities in order to convince prospective foreign investors to bring foreign capital into Thailand for the proposed complex.

Furthermore, the appropriate production technology is in the hands of the transnational corporations (TNCs). The Government must negotiate carefully with the technology proprietors (TNCs) in order to acquire usage rights. The Government should ascertain that the technology which will be implemented will be the most appropriate up to date and also that channels for a continuous active technology transfer be established so that, for example, thirty years from the starting day of the project, the potential for technology updating will be available and feasible. Training of Thai engineers and technicians on the new technologies will also be essential for Thailand. Furthermore, the new managerial-administrative skills that are required for

world market companies should be acquired via the same know-how transfer channels, which must be established as part of the TNCs licencing procedures in Thailand. The establishment of the new natural gas based industries must act, in the long run, as the catalyst for the qualitative and quantitative upgrading of the technical human potential of Thailand.

All the above concerns are very essential if the decision will be taken to establish an export-oriented petrochemical complex. This decision to establish an export-oriented (and consequently, competitive) petrochemical industry is also a good way for Thailand to proceed towards the desired industrialization, as it will be forced to follow the rest of the world in the international markets. In order to do so, Thailand would have to develop and maintain reasonably up-to-date industrial complexes. Alternatively, if the previous industrial practice of heavily protected and subsidized domestic market-oriented industries will be followed, the above concerns will not be as crucial for the survival of the industry, while at the same time, the objectives of the qualitative and quantitative change of the technical potential of the country will not materialize to the same extent as well.

In order to identify a first set of specific secondary chemical industries that are associated (backward and forward linkages) with the proposed petrochemical complex, it is proposed that a detailed analysis of the conceptual flow-sheets of the processes implemented by the primary industrial plants of the petrochemical project be analyzed by technical experts. An examination of the foreign trade statistics of Thailand can provide a quick indication of the additional demand that presently exists in the country for specific chemical products. Finally, the possibility of exporting products of the secondary industries should also be examined but separately for each one of the industries. Similarly, flow-sheet analysis of the most significant secondary industries (that are linked to the primary ones) may also suggest another set of secondary industries that can be established, leading to an integrated industrial network, formed around the growth pole of natural gas. It should be noted that the desire for the development of national basic-chemicals industries was also expressed by representatives of the Chemical Industries Club during the mission's visit to Bangkok.

Agriculture-related industries

Agriculture has been one of the most significant sectors of the Thai economy. During 1981-82 cropping year, the staple crops covered about 88 per cent of the country's total farmlands. About 53 per cent of the land is taken by rice, while another 8 per cent is taken by maize, 8 per cent by rubber, and 6 per cent by tapioca plantations. Of these crops, tapioca is facing quota in exports imposed by the European Economic Community. In rice cultivation, Thailand has achieved very low yields of rice compared to other countries. In 1979, for example, the Philippines showed a 10 per cent higher yield, China 100 per cent higher yield, and Japan almost 300 per cent yield. The main problem behind the low yield is the limited use of fertilizers and the absence of improved rice strains. Rubber is one of the country's cash crops. However, 95 per cent of the growers have very small lots, and almost 60 per cent of those planted contain older, low-yielding trees.

Agriculture can function as a growth pole for the chemical industries sector through the demand for fertilizers and agrochemicals, as for example, pesticides. Most of the fertilizers used in Thailand at present are imported. The value of fertilizer imports has risen at an average rate of 22.5 per cent over the 1972-81 period, resulting in a drain on the country's foreign exchange reserves. There is therefore a significant domestic market that needs to be supplied. The export potential needs to be examined carefully for each type of fertilizer separately. Small quantities of ammonium nitrate and urea are presently produced by the Chemical Fertilizer Company. A urea plant, using natural gas, is under negotiation as part of the Eastern Seaboard Development project. The comments raised in the natural gas section are pertinent for this urea plant as well. The exploitation of the extensive potash deposits for the manufacture of fertilizer ingredients can also contribute to the development of the chemical industries sector. These deposits will be discussed again in the minerals sector.

The protection of the agricultural crops from parasites and diseases is mainly effected through the use of improved strains and certain agrochemicals. These chemicals are highly toxic and are used in relatively

small quantities. At present, ICI, HOECHST and DUPONT are involved in the production of a few agrochemicals. If the decision is to be made for the expanded production of such agrochemicals in Thailand, it is recommended that the Government should secure appropriate environmental protection measures from the producing companies because of the high toxicity associated with these products. Furthermore, the use of some pesticides, herbicides and fungicides has been banned in most developed countries because of their high toxicity and very high chemical stability that results in their gradual accumulation in the environment. Taking advantage of the experience of the developed countries, the industrial activities in this area of agrochemicals should be examined from the environmental point of view as well.

The analysis of the flow-sheets of the planned primary fertilizer industries should identify, as in the case of natural gas, the subsequent generations of secondary industries that may grow as forward-backward linkages with the other growth poles. The usefulness of developing further the agrochemicals subsector should be examined very carefully in view of the small volume of the required production for Thailand and the potential adverse environmental effects.

Processing of natural latex is at present very limited in Thailand. Almost 90 per cent of the natural rubber is exported in raw form. Rubber processing can become a significant activity not only for import substitution, but for export as well. The efforts for processing most of the natural latex produced should also be coupled with efforts to increase the yield of the present rubber plantations by reorganizing production and planting younger, higher yield trees. The development of a rubber industry will assist the development of additional associated chemical industries.

The potential for the production of chemicals used by the food processing and preserving industries, such as fruit canning, may also be examined for their development potential. This can be advanced again by flow-sheet analysis of the respective industries.

Mineral resources

The Department of Mineral Resources has published detailed mineral statistics of Thailand. It has been realized that among the mineral resources available, the potash reserves, which are among the largest in the world, are very significant. Plans for their development are under active consideration at present. It is recommended that as much as possible of the potash produced be processed locally in Thailand rather than exported in raw form. It is also recommended that an analysis of the conceptual flow-sheets of the processed that will be implemented should be made so that the secondary industries will be identified. Furthermore, the mineral resources inventory of the country, as for example, limestone, phosphate rock, iron, fluorite, should be used in conjunction with the demands of specific basic chemicals industries in order to plan the expansion of the chemical industries sector.

A preliminary listing of some basic and certain subsequent generation chemicals, the production of which may be feasible in Thailand, is presented in the next section. They have been selected on the basis of their relatively simple manufacturing technology, their substantial level of imports during 1982, and their potential association to the mineral resources of the country. The import data were taken from the preliminary 1982 commodity classification of imports of the Department of Business Economics. It is realized that the imports statistics do not discern between imports for local consumption or imports for re-export. The proposed group of specific industries is only a preliminary and indicative one and by no means exhaustive. Before any decisions will be taken, a more detailed analysis of the subject must be undertaken, especially in relation to the existing resource base by a subsequent mission.

Specific chemical industries with growth potential

A preliminary listing of specific chemical industries with growth potential follows. The value of imports of the specific chemical for 1982 is given in million Bahts and the volume of imports in thousand tons, unless otherwise specified. The issue of the market size these plants should be producing for is not addressed at this preliminary stage.

Sulfuric acid	Value: 8.2 million Bahts; Volume: 62 thousand tons. Useful also for the production of subsequent generation simple chemicals, as for example, calcium sulfate. It is the most widely used mineral acid in the world, with numerous uses throughout the industry. Can be produced from many mineral sulfur resources.
Nitric acid	Value: 14.3 million Bahts; Volume: 16 thousand tons. Useful also for the production of subsequent generation simple chemicals, as for example, nitrate salts.
Hydrochloric acid	Value: 10 million Bahts; A very useful and simple inorganic acid. It is used extensively for the production of other simple inorganic chemicals and by industry as a mineral acid.
Phosphoric acid	Value: 21.4 million Bahts; Volume: 1.7 thousand tons. A family of inorganic acids based on the phosphate radical. Useful also for the production of subsequent generation chemicals. Produced from phosphate rock.
Carbon dioxide	Value: 1.4 million Bahts; Volume: 0.8 thousand tons. Very simple production technique. Useful also for the production of simple subsequent generation chemicals.
Silicon dioxide	Value: 34.1 million Bahts; Volume: 2.0 thousand tons. Could be produced from available quartz sand deposits.
Ammonia (anhydrous and in solution)	Value: 19.1 million Bahts; Volume: 2.5 thousand tons. A very useful chemical with many applications in subsequent generation chemicals, as for example, ammonium chloride and in the fertilizer industry.
Sodium hydroxide (caustic soda solid or in solution)	Value: 106.4 million Bahts; Volume: 13.6 thousand tons. One of the most significant basic inorganic chemicals with many applications. Consideration is being given, at present, in Thailand for expanding the existing production capacity. Starting chemical for the production of caustic soda is sodium chloride that can either be mined or extracted from the sea water in Thailand.
Potassium hydroxide (caustic potash)	Value: 6.4 million Bahts; Volume: 0.8 thousand tons. Can be produced from the available extensive deposits of potash.
Aluminum oxide-hydroxides	Value: 69.9 million Bahts; Volume: 11.9 thousand tons.

Aluminum oxide-hydroxides (continued)	Closely associated chemicals. Aluminum oxide is also known as alumina and is the basis for the production of aluminum metal. One production scheme (Bayer process) utilized bauxite or, possibly, high in aluminum clays and sodium hydroxide (caustic soda).
Iron oxides	Value: 31.7 million Bahts; Volume 1.7 thousand tons. Produced from iron ore they find use in the metallurgical production of iron and steel, as well as in the chemical industries, in smaller quantities.
Ammonium chloride	Value: 60.2 million Bahts; Volume: 22.8 thousand tons. Simple chemical produced from ammonia and hydrochloric acid.
Calcium chloride	Value: 5.4 million Bahts; Volume: 1.5 thousand tons. Simple chemical which can be produced from lime and hydrochloric acid.
Calcium hypochloride	Value: 17.8 million Bahts; Volume: 0.8 thousand tons. One of a family of simple chemicals used primarily as oxidants and for water disinfection. Chlorine is a raw material for the production of hypochlorides.
Sodium sulfides	Value: 12.7 million Bahts; Volume: 1.4 thousand tons. Simple chemicals.
Various sulfates	Value: 27.7 million Bahts; Volume: 1.3 thousand tons. Simple chemicals produced from sulfuric acid and a base with the respective cation. For example, sodium sulfate can be produced from caustic soda and sulfuric acid.
Nitrites-nitrates	Value: 72.8 million Bahts. Useful simple chemicals, the production of which is previously based on nitric acid. Useful also as a mineral nitrogen source in agriculture (e.g. ammonium nitrate).
Phosphates	Value: 434.9 million Bahts. A family of simple chemicals with many uses. They can be produced from the phosphoric acid group of mineral acids. Some can be used as mineral sources of phosphorus in fertilizers.
Poliphosphates	Value: 270 million Bahts. A group of polymeric phosphates useful in detergent manufacturing. They are also based on the phosphate radical.

- Carbonates Value: 26.0 million Bahts.
A group of simple chemicals among which well-known is soda ash. Some are available in mineral form, as for example, limestone or dolomite (respectively, calcium and calcium-magnesium carbonate).
- Toluene Value: 160.1 million Bahts; Volume: 14.6 thousand tons.
Organic chemical solvent. One of a group of cyclic organic compounds. Production technology is more complicated than for many of the inorganic compounds. Many other organic cyclic hydrocarbons, such as xylene, are also members of this extended family of chemicals. They are oilbased. The total volume of their imports in 1982 reached 678 million Bahts.
- Alcohols A large family of organic chemicals comprising both linear and cyclic members. The lower number c the series, as for example methyl or ethyl alcohol, can also be produced by fermentation. Consideration should be given in this direction in view of the large agricultural production of Thailand and the favourable climate that allows the production of crops such as sugar cane, which can be the raw material for the biochemical manufacturing of simple alcohols. The total values of import for various alcohols reached 587 million Bahts in 1982. The lower members of the series can also function as basic chemicals for the synthesis of other organic molecules.
- Acetone Value: 37.8 million Bahts; Volume: 3.1 thousand tons.
The first member of a family of chemicals known as ketones. They are useful in the synthesis of higher chemicals. Acetone and other members of the ketone family are also widely used as industrial solvents.
- Terphalic acid Value: 678 million Bahts; Volume: 41.5 thousand tons.
High carbon, industrial organic acid. Useful for ester production.
- Terphalic ester Value: 252 million Bahts; Volume: 16 thousand tons.
Ester of the terphalic acid.

A very large number of other organic compounds could also be considered, such as amines, amides or heterocyclic compounds. However, the production technologies for many become progressively more complicated and is beyond the terms of reference of the present work to enter in detail in this area.

It is recommended, however, that this issue should be examined in a more detailed study on the restructuring of the chemical industry in Thailand. The integration of the specific industrial units should be looked at as an important constraint in such a study. Furthermore, the resource base of the country should also be looked at very carefully in association with the proposed industries. The possibility of importing certain basic raw materials for the production of the proposed chemicals should also be examined on the assumption that a considerable per cent of the final product value will be value added during processing in Thailand (say, 25 per cent or more). Finally, the market size should also be taken into consideration, very carefully, along with the economy of scale which is very important for some of those industries.

The subsector of oil refining should also be addressed carefully, especially if the organic chemicals subsector will be developed further. Substantial savings in foreign exchange can also be effected by importing crude and then refining locally due to the value added on refined products.

The choice of the specific industries for development should also take into consideration the terms for the availability of the appropriate technology and the environmental effects that each technology may have. A typical example of such differences among technologies is the case of chlorine production. The older technology, using mercury cells, for production has been abandoned because of the adverse environmental effects (principal cause of Minamata disease). Alternative effective and safe technology already exists and is used in practice. The environment should be considered as a national resource that must be used very effectively and cautiously.

During the visit of the mission in Thailand, it was perceived that the pharmaceuticals and biotechnology are seen by some as subsectors that could also function as potential growth poles for the chemical industry. Most of the pharmaceutical operations in Thailand, at present, are not in the drug manufacturing area. Manufacturing of pharmaceuticals often requires advanced technology as well as other supporting industries it is possible that the pharmaceuticals subsector may develop further, following the establishment of a wider and more elaborate chemical industries base. Biotech-

technology is another new area that is experiencing rapid growth worldwide. It is a high-technology area, with the exception of the conventional fermentation operations that are not as elaborate in their technology. Biotechnology has been targeted as a primary growth area by a number of developed countries such as Canada, France and Switzerland. It is an area that requires a very extensive know-how and an elaborate support network in order to function efficiently. If biotechnology were to be considered as a growth area for Thailand, then it must be made certain that Thailand will be in a position to compete in a world market with the above countries. In addition, both the facts that the technologies involved are very recent and also very dynamic, results in very rapid changes and improvements in cost efficiency of production, as well as a continuous improvement of the type and range of products. It is felt that unless a country, is in the position of producing or improving the required technology, through research and development, it is better that biotechnology or to a certain extent other high technology areas not be targeted as an immediate growth subsector.

During the consideration for developing and restructuring the chemical industries sector, special attention should be given to assess the possibility of exporting selected products to ASEAN member countries.

APPENDIX I

List of persons contacted in Thailand

Mr. Staporn Kavitanon	Assistant to the Secretary General, NESDB
Mr. Narong Nitayaporn	Director, Economic Projects Division, NESDB
Mr. Charkamon Phasukranich	Chief, Industrial Planning Sector, NESDB
Dr. Narongchai Akrasanee	Managing Director, Industrial Manage- ment Co.
Mr. Pisit Samahito	Research and Planning Division, Bank of Thailand
Dr. Sathit Uthaisri	Vice-President, Business Promotion Department, Bangkok Bank Ltd.
Dr. Ponchai Tulyadhan	Director, Project Development Division, Board of Investment
Mr. Rachane Pjanasuthorn	Senior Trade Officer, Export Service Center
Mr. Terajitt Sathirojtamawong	President of Chemical Industry Club, Association of Thai Industries
Mr. Mana Sethatutra	Secretary, Plastics Industry Club, Association of Thai Industries
Dr. Arporn Sripipat	President, Food Industry Club, Association of Thai Industries
Mr. Chatchai Bunyarat	Vice-President, Food Industry Club, Association of Thai Industries
Mr. Rungsarid Vithayanonth	Marketing Executive, Thai Nam Plastics Co.
Mr. Banchong Somboonpakorn	General Manager, The Chemical Corporation
Mr. William Millager	UNIDO Senior Industrial Development Adviser, c/o UNDP

APPENDIX II

References consulted

1. "1981 Directory. The Association of Thai Industries", Business Information and Research Co. Bangkok, Thailand.
2. "Thailand's Petrochemical Complex". The Eastern Sea Board Development Committee, December 1982.
3. Eastern Seaboard Study. Seminar On Development Policies and Strategies. Industrial Development Pattaya, 5-6 August 1982.
4. Eastern Seaboard. Industrial Opportunities Identification Study (3 volumes). Cooper and Lybrand Associated, June 1982. For the National Economic and Social Development Board.
5. "1982 Thailand Investment Handbook and Directory of Promoted Companies". Prime Minister's Office, Office of the Board of Investment.
6. Bank of Thailand Imports-Exports Statistics, 1975-82.
7. Ministry of Commerce. Export of Polymers Statistics, 1980-82.
8. Industrial Restructuring in Thailand. Some Observations on Export Policy Instruments and Institutions. UNIDO.IS/R7 March 1983. V.83-54012.
9. Comparative Advantage of Manufacturing Industries in Thailand, volumes I and II. Industrial Finance Corporation of Thailand, Bangkok, 1982.
10. Industrial Restructuring in Thailand. Some Observations by a UNIDO Mission. 28 October - 4 November 1982. UNIDO IS/R5/Rev 1. V.83-51102, February 1983.
11. Thailand Petrochemical Complex. The Eastern Seaboard Development Committee, December 1982.
12. Thailand Industrial Sector. Background Report. Industrial Development and Finance Division. East Asia and Pacific Regional Office. UNIDO, August 1982.
13. Country Industrial Development Profiles of Kingdom of Thailand. UNIDO ICIS124. October 1979.
14. Industrial Restructuring in Thailand. Some Observations on the Plastic Industry. UNIDO IS/R.8. V.83-54440. April 1983.
15. Industrial Restructuring in Thailand. Some Observations on Policy Issues Concerning the Automotive Industry. UNIDO/IS/R.6. V.83-50359. January 1983.

16. Kingdom of Thailand. Development Plan, 1982-86.
17. Annual Report for Thailand 1981-82. UNIDO/THA/J/8206/1Y1.
18. Commodity Classification of Imports for 1981 and 1982. Department of Business Economics. Thailand.
19. Plastics Directory 1983. Plastic Industry Club, Association of Thai Industries.
20. Mineral Statistics of Thailand, 1977-81. Department of Mineral Resources. Thailand.
21. Chemical Engineering Progress, January 1983 issue. Publication of the American Institute of Chemical Engineers.
22. Chemical Engineering Progress, February 1983 issue. Publication of the American Institute of Chemical Engineers.
23. "Energy and Petrochemical Feedstocks. A view of the Future", K.L. Mai. Shell Development Co., Houston, TX.

