



**TOGETHER**  
*for a sustainable future*

## OCCASION

This publication has been made available to the public on the occasion of the 50<sup>th</sup> 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](mailto:publications@unido.org) for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at [www.unido.org](http://www.unido.org)

UNITED NATIONS  
INDUSTRIAL DEVELOPMENT ORGANIZATION

Distr.  
RESTRICTED

UNIDO/IS/R.19  
4 February 1986

ENGLISH

---

**THAILAND: A FRAMEWORK FOR  
TECHNICAL ASSISTANCE PROGRAMMING IN INDUSTRY\***

WORKING PAPER

Prepared by the

**Regional and Country Studies Branch**

**Division for Industrial Studies**

---

\* *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 concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Mention of company names and commercial products does not imply the endorsement of the United Nations Industrial Development Organization (UNIDO). This document has been reproduced without formal editing.*

## CONTENTS

	<u>Page</u>
Preface .....	i
Abbreviations used .....	ii
Executive summary .....	iii
I. Status and pattern of Thailand's industrial development sector .....	1
1. Basic characteristics and structure of the manufacturing .....	1
2. Economic outlook and envisaged future policies .....	3
II. Main overall constraints to industrial development .....	8
III. Important issues for industrial policy, research and technical co-operation .....	12
1. Industrial restructuring and investment promotion .....	12
2. Industrial development in the provinces and support for small- and medium-scale industries .....	16
3. Promotion of subcontracting between small-scale and large-scale industries .....	28
4. Linkages between agriculture and industry .....	30
5. Promotion of exports of manufactured products .....	32
6. Technology, research and development .....	41
Selected references .....	48

PREFACE

The working paper presented here is to serve as an analytical basis for programming technical assistance in respect of the industrial sector in Thailand. Its aim is not to formulate specific recommendations for detailed technical assistance projects but to provide the background information from which such projects subsequently can be identified. The paper first presents an overview of the level and pattern of industrial development as well as of some major constraints facing industry. In the following sections it is attempted to broadly identify development prospects and emerging bottlenecks and deficit areas in manufacturing. On this basis the various areas are outlined which may require external technical assistance in the future.

The paper is a companion document to the Industrial Development Review of Thailand,<sup>1/</sup> which provides more detailed information on the country's manufacturing sector and in particular on plans, priorities, strategies and policy measures.

---

<sup>1/</sup> UNIDO/IS.548, of 7 August 1985.

ABBREVIATIONS USED

AsDB	Asian Development Bank
ASEAN	Association of South East Asian Nations
ATI	Association of Thai Industries
BOI	Board of Investment
DIP	Department of Industrial Promotion, Ministry of Industry
DTEC	Departments of Technical and Economic Co-operation
EEC	European Economic Community
EPZ	Export Processing Zone
ESC	Export Services Centre
ESCAP	Economic and Social Commission for Asia and the Pacific
IEAT	Industrial Estate Authority of Thailand
IEPD	Industrial Economic and Planning Division, Ministry of Industry
IFCT	Industrial Finance Corporation of Thailand
IMC	Industrial Management Co. Ltd.
IPC	Industrial Policy Committee (formerly RESCOM)
JPPCC	Joint Public/Private Sector Consultative Committee
NESDB	National Economic and Social Development Board
NIDA	National Institute of Development Administration
OESB	Office of the Eastern Seaboard Development Committee
SICGF	Small Industry Credit Guarantee Fund
SIFO	Small Industries Finance Officer
TDRI	Thailand Development Research Institute
TISI	Thai Industrial Standards Institute
TISTR	Thailand Institute of Scientific and Technological Research
TMA	Thailand Management Association
TMDPC	Thailand Management Development and Productivity Centre, Department of Industrial Promotion, Ministry of Industry
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization

EXECUTIVE SUMMARY

1. Basic characteristics and structure

Thailand's industrial development has in the past thirty years gone through several distinct phases. From an initially small manufacturing capacity chiefly processing primary products, the sector moved into the production of consumer goods for the domestic market in the 1960s and - in the 1970s - an increasing production developed for exports of labour-intensive products (chiefly textiles and clothing, precious stones and electronics components). In the late 1970s, increased protection and incentives encouraged the establishment of relative capital-intensive industries with a high import content, a development which contributed to the country's growing external trade deficit. In a current phase, as laid down in the Fifth Five-Year Plan (1982 -1986), the emphasis shifted towards resource-based and decentralized development epitomized by the ambitious Eastern Seaboard Development Programme.

The present structure of the Thai industry shows a concentration on industries processing agro-products and on industries producing end-products for domestic consumption. The import content of these industries, in particular those in the latter category, is generally high, as capital goods and intermediate goods industries are not sufficiently developed and inter-industry linkages thus remain weak.

The expansion of Thai manufacturing has contributed significantly to employment creation. The rate of labour absorption in the manufacturing sector accelerated in the 1970s, coincident with the rapid expansion of manufacturing. Export industries played a leading role in this expansion, and are more labour-intensive than industries producing mainly for the domestic market.

Thailand's industry is predominantly operated by private enterprises. Recent developments (especially in connection with the Eastern Seaboard Development Programme) indicate, however, a slightly increasing selective Government participation in industrial development. This is done through the establishment of, so-called, 'national companies', i.e. public/private joint

ventures for large capital-intensive projects which are of special national significance and which, neither the Government nor the private sector would undertake alone.

## 2. Envisaged future policies

In the immediate term, and in the up-coming Sixth Plan period 1987-91 it can be expected that most policies formulated for the Fifth Plan period will be continued. Special attention is expected to be given to the following industrial development objectives:

- (a) Fostering the development of export industries that utilize domestic raw materials as the main source of production.
- (b) Fostering the development of small industries and rural industries by indicating and supporting the development of industries in each region to be in line with existing necessities of production. Financial resources and support measures should be made available to small-scale industries so as to promote new production techniques.
- (c) Promoting exports of manufactured products on the basis of industrial markets. Attention would be given to the development of an effective network of export market intelligence.
- (d) Proceeding with the programmes in the Eastern Seaboard area to develop agro-industries, and in particular industries with export and/or linkage potential.
- (e) Encouraging co-operation between the Government and the private sector; specifically supporting the work of the Joint Public/Private Sector Consultative Committee (JPPCC) and expanding its operation into the regional areas.
- (f) Enhancing Thai products' competitiveness through increased efficiency and quality in production and better marketing and in particular through:
  - improved quality of final products in line with domestic and/or export market demand requirements;
  - increased efficiency in the utilization of natural resources;
  - improved application of progressive agricultural and industrial technology, such as in the fields of genetic engineering, bio-materials and metallurgy.
- (g) Adjusting the use of energy by reducing the proportion of fuel use to 35 per cent of total energy use during the Sixth Plan period.

- (h) Improving and strengthening the management system of state enterprises; privatizing such industrial state enterprises that the private sector would be more capable of operating; using Government participation to initiate investment in new strategic industries.
- (i) Using Government as a stimulator rather more than as an interventionist or investor in production;

### 3. Constraints

In its industrial restructuring programmes and policies the Government has during recent years endeavoured to shift the structure of production from consumer goods to intermediate and capital goods and "strategic" production lines.

So far much manufacturing had been directed to final consumer goods, often in form of assembly with heavy import content. Little attention was given to materials research to foster the use of local raw materials or (semi-processed) intermediate materials for production. Local know-how has largely been limited to assembly of imported inputs. Technical capabilities have not been developed to meet the challenges of product development from scratch and to cater for vertically integrated product development sufficiently.

Without a domestic technological capability, an import-substitution strategy for industrialization imposes a heavy burden on the external trade balance, as local industries have to pay high costs of imported technologies, and remain dependent on these. Although production for exports generally would be relatively import-intensive, the development and adaptation of technology would be a key precondition for the Thai industry to become and remain competitive on the international markets. Technology is thus a major constraint for the long-term industrialization process in the country.

One further problem faced by the Thai policy-makers is the heavy concentration of industrial activities in the Bangkok metropolitan area. The need to decentralize industrial activities to the outlying regions is therefore seen as one major policy objective so as to improve and effect a more equitable distribution of incomes and provide employment opportunities also to agricultural labour, which has a large disguised unemployment.



The vital Government-sponsored assistance to entrepreneurs and investors in provincial areas is constrained by limited resources. Assistance to small industries, in the form of management training, marketing, common facility services etc. are still largely outside the scope of activities of the existing Government-sponsored institutions. These areas would warrant increased attention.

4. Key issues

(a) Industrial restructuring and investment promotion

After over two decades successful realization of an import substitution policy, the Thai industrial sector entered in the 1980's into a period of changing domestic and international challenges. As part of the Fifth-Plan 1982-86, the Government responded by launching a programme of industrial restructuring. This programme was to enable the Thai industry to adapt to the new trends in the international economy and emerging internal constraints and to identify subsectoral prospects and priorities. Under the guidance of the Industrial Restructuring Committee (RESCOM) subsector analyses were carried out on the auto industry, textile industry, chemical industry, machinery industry and iron and steel industry. UNIDO provided technical assistance to this analytical work with particular focus on the international perspective. Further assistance along these lines in support of the work of the Industrial Policy Committee (formerly RESCOM) have been indicated in relation to further analyses of specific subsector development to be carried out by the Industrial Economics and Planning Division of the Ministry of Industry. One immediate task would be to consolidate the results of the main sector studies which have already been carried out and on this basis prepare a consistent policy framework. For the textile sector, the possible establishment of a Textile Unit is being considered with corresponding UNIDO assistance project.

In addition to fulfilling tasks as the Industrial Policy Committee secretariat, the Industrial Economics and Planning Division is to extend its capacities so as to become the overall industry sector planning unit of the Ministry of Industry. Efforts are also under way to enable the Ministry to be

the main office for primary statistics on manufacturing industry and to supply key industrial data to Government services and private investors. Suggestions for the establishment of a Center for Industrial Statistics and Information within the Industrial Economics and Planning Division have also been put forward.

Concomitantly a strengthening of the planning and programming functions of the Board of Investment (BOI) has been voiced. BOI would then be able to provide better guidance on long-term trends and prospects of Thai industrial development. It has further been suggested that BOI should develop a 10-year "programme of action" in order to define the criteria for investment promotion. International assistance to this programme would be worth serious consideration.

(b) Industrial development in the provinces and support for small and medium-scale industries

The fact that industrial enterprises are heavily concentrated in Bangkok and nearby provinces, has prevented the Governemnt to take decisive steps for a dispersal of industrial activities from the Bangkok area to other parts of the country. Obviously, the development of large- and small-scale industries in provincial areas need to be promoted in accordance with their distinctly different characteristics:

- (i) Investments in large-scale industries can be promoted by facilitating acquisition of plan and equipment - e.g. through credits and other financial incentives. Government support in terms of infrastructure and energy supplies can also be of importance;
- (ii) For small-scale industries, external advice on the choice and operation of technology and production techniques could constitute essential incentives. Assistance in financing, management and marketing would be other forms of support.

Other specific measures to promote small-scale industries and to speed up industrial decentralization to provinces which could be considered are:

- (i) Establishment of industrial zones, suitable for the particular size and type of industries to be further developed in various provinces;

- (ii) Development and expansion of industrial estates and industrial areas along the Eastern Seaboard and in the various provinces, as well as special industrial zones possibly in other coastal areas;
- (iii) Expansion of promotional programmes for small-scale and provincial industries;
- (iv) Technical and financial assistance for the improvement and development of production technology and management techniques. Supporting measures to facilitate an expansion of the markets for existing small-scale industry;
- (v) Promotion of sub-contracting arrangements between small-scale and large-scale industries;
- (vi) Establishment of financing institutions and development of a credit extension system for small-scale industry and industries located in outlying areas;
- (vii) Support small industries' own local or sectoral associations .

The Government's most prominent effort towards spreading industrial development out of the Bangkok area is the Eastern Seaboard Development Programme. The Map Ta Phut port and industrial area is being developed with the establishment of basic, linkage industries, i.e. up-stream petrochemical and fertilizer industries. The Laeu Chabang sea port and industrial estate for light industries, and an export processing zone are to be developed during the next 2-3 years. The Eastern Seaboard Development Programme is operated and monitored by Office of the Eastern Seaboard Development Committee, while the Industrial Estates Authority of Thailand (IEAT) is responsible for the development of the industrial estates and the EPZ in the Eastern Seaboard area. UNDP/UNIDO assistance may be able to continue providing essential support to these programmes which would be particularly effective if consolidated under an 'umbrella project.' This could include investment follow-up and assessments of private sector requirements.

Investment promotion programmes, carried out in co-operation with the Board of Investment (BOI), could be supported by UNIDO. Such a project with BOI is presently under consideration. The purpose would be to identify industrial opportunities in the Laem Chabang area and to assist in preparing opportunity studies and priority projects for attention of potential private investors.

The Industrial Estates Authority of Thailand (IEAT) is active in promoting the dispersal of industries throughout the country. Estate investments in the provinces are being contemplated: Songkhla in the South, Nakhon Rakhasima in the Northeast and Samut Sakhorn Province southwest of Bangkok for water-intensive and polluting industries. IEAT is also involved in the development of industrial areas in the Upper South region.

Between IEAT which provides the 'hardware', or physical infrastructure and the Department of Industrial Promotion (DIP) of the Ministry of Industry which provides the 'software', like extension services (technical, marketing services, etc.) more direct co-ordination would be valuable for effectively promoting the development of small- and medium-scale industries in industrial estates in the provinces. Small-scale industry should indeed form the foundation for provincial industrial development. Accordingly IEAT has proposed that provincial "small-scale industry estates" be set up in every province. These estates would have the basic facilities, such as basic infrastructure and technological services (from DIP), and an established loan system for the small-scale industry.

At the regional and provincial level the DIP is providing information on investment opportunities, industry profiles and pre-investment studies. This is particularly done through the Northern Industrial Promotion Centre in Chiang Mai and the other two regional centres presently being established in Khon Kaen in the Northeast and in Songkhla in the South. UNIDO provided assistance to such activities under project DP/THA/82/010, 'Pilot Project for Industrial Expansion in the Northeast', completed in June 1985.

It must be stressed that the key role for the promotion of small and medium industries is usually played by the active pursuance of Government policies in the form of investment incentives, small industry credit schemes, etc. Through its direct and regular contacts with the small-scale industrialists, the Ministry of Industry is in a good position to assess the effects of existing industrial policies and measures. Such assessment is essential for the future formulation of a consistent set of small and rural industrialization policies.

Of importance in this context is also the establishment of sub-committees, for the purpose of private sector support for regional development, in Songkhla, Chiang Mai, Nakorn Sawan and Khon Kaen, respectively. These sub-committees - emanating from the work of the Joint Public/Private Sector Consultative Committee (JPPCC) - have been formed by the private sector organs of JPPCC (the Association of Thai Industries, the Board of Trade and the Thai Banking Association). They would sponsor productivity seminars, exhibitions, etc. in close co-operation with the Ministry of Industry.

Another organ of the private sector is the Small Industries Association which has about 1,100 members, of which about 60 per cent are in the Bangkok area, essentially from industries with between 3 and 100 employed persons. The Association carries out a programme of seminars and workshops in Bangkok, and in the provinces in close co-operation with the Department of Industrial Promotion, Ministry of Industry.

(c) Promotion of subcontracting between small-scale and large-scale industries

The establishment of subcontracting relations between large and small industries presupposes the existence of large plants in particular industrial branches, such as metal working, and efficient and specialized small industries. The initiation and operation of such subcontracting requires a systematic search for supply/demand linkages and the existence of technical and managerial assistance facilities; legislation to protect small establishments; and a conducive tax system. It is obviously important to create an atmosphere of mutual confidence between the partners and a stable policy framework.

Due to a lack of trust in the small firm, and a desire to be in command of their own affairs rather than uncertain deliveries, large manufacturers tend frequently to rely on their own facilities as much as they can and to subcontract out work only when they have no other alternative. Government policies and promotional measures can play a role in changing th's attitude

and guide companies' subcontracting. In the long run, however, subcontracting can play fully the role in Thailand's industrial development that it deserves, only if small firms improve their standards and win over the confidence of the large manufacturers.

To promote subcontracting production of components and parts it may prove useful to provide assistance and guidance to the Small Industries Association. The Association could play a important role in co-ordinating and identifying capabilities of their small-scale industry members in response to expressed needs by the large industry sector.

(d) Linkages between agriculture and industry

One of the specific tasks of DIP's Regional Industrial Promotion Centres, when formulating an industrial development programme both at provincial and regional level, will be to co-ordinate with NESDB and other authorities concerned in the development of agro-industry projects. Knowledge of raw materials and processing techniques is very important. One specific aspect which should be subject of attention at DIP's regional centres as well as in R and D work, is agro-waste utilization.

Attention should also be given to the possibilities of making the Thai food processing industry more effective, in particular in overcoming the negative effects of the seasonal period of production of e.g. fruits and vegetables. The problem is being addressed by the Government through efforts to modernize techniques to process high quality goods from fruits and vegetables grown locally, and by setting standards for the growing (and storage) of good quality agro-products for local use and for export markets. The work of the Thai Industrial Standards Institute (TISI) in promoting the application of quality standards for food products is of great importance as complement to the work of DIP's extension services, as is that of the research institutions concerned, such as the Thailand Institute of Scientific and Technological Research (TISTR) and the Institute of Food Research and Product Development at Kasetsart University.

Consideration should be given to the development of machines and processing plant equipment, i.e. with the aim at utilizing energy efficiently. The R and D work of TISTR and others in this field should be given priority support. Also the Metalworking and Machinery Industry Development Institute (MIDI) at DIP, now being established with Japanese bilateral assistance and planned to be ready by the end of 1987, will be expected to play an important role regarding this matter.

(e) Promotion of exports of manufactured products

A major target area for policy support is export-oriented manufacturing with particular attention to enhancing the prospective comparative advantages of potential exports in respect of:

- processing of raw materials into finished products, such as processed food, jewellery, furniture and other wood products, rubber products and leather products;
- industries which have moved from only import-substitution to exports, such as construction materials, textiles;
- industries specifically set-up for exports, i.e. electronic components, garments, etc.

Measures for furthering exports of manufactures which may be accorded particular attention (including consideration of possible required technical assistance inputs) would seem to be in following areas.

It is very important that information and market data in respect of existing and potential export markets is being collected systematically. The basic strategy would be to produce what the market wants. The existing marketing should be strengthened, e.g. by building up a Thai marketing network with trading firms.

Attention should be given to enhancement of marketing abilities as well as market intelligence. Effective use should be made of Commercial Attachees and the Thai Trade Centres overseas. The private sector organizations, e.g. the Chambers of Commerce, should be directly involved in particular in connexion with visits of importers, exhibitions, etc. The Export Development

Committee would play a crucial role in initiating and co-ordinating various actions while the Export Development Fund would provide continuous support for such activities.

It is also very important to further pursue ways and means to disseminate the market information to producers more effectively. A major role would continue to be played by the Export Services Centre. The information on market potentials and requirements might be enlarged to include samples, where possible.

The bonded manufacturing factory system allows companies engaged exclusively in manufacturing items for exports to avoid the Customs procedures and duty payments (and refunds) when they import inputs needed to manufacture products for export. The same conditions apply for companies established in export processing zones (EPZ). There is at present only one such zone, in Lat Krabang (about 40 km northeast of Bangkok). Another EPZ is planned to be established at Laem Chabang (within the Eastern Seaboard Development Programme). Concern has been voiced as to the EPZs as means of promoting exports in view of the substantial investment in their establishment. Their further development merits a careful study as to their costs and benefits in terms of net foreign exchange earnings, employment, skill development, transfer of technology and market development and, if suitable, possibilities for integration with the local economy through partial sourcing of material inputs locally.

There is a need for technical support to small and medium manufacturers of export products. The Department of Industrial Promotion of Ministry of Industry would have a main role in directly assisting the small and medium producers and should in this co-operate with, among others, TISTR of the Ministry of Science, Technology and Energy, in particular in practical application of research results.

At the moment DIP is in a position to provide extension service support mainly to less specialized, often domestic market-oriented, industries. As complement, in particular for the export industries, the services of



university experts would be most useful. In practically all the universities, special units have recently been set up to handle the provision of such consultancies and R and D services and a special university/industry co-operation programme is being promoted by the Ministry of Science, Technology and Energy, with particular attention to the needs of the small-scale industry.

As far as the engineering industries are concerned the new Metalworking and Machinery Industry Development Institute at DIP will be well placed to serve export industries. A substantial strengthening of the Textile Industry Division of DIP and the planned Textile Unit would give that sector a similar base.

Of great potential importance in the context of both exports and rural employment is the further development of the Thai silk industry. Sericulture and silk production has been traditionally practised in the Northeast and North of Thailand. It provides direct employment to about one million farmers and indirect employment to another half a million people, including those self-employed in the silk weaving and connected processes. Following recommendations of a UNIDO mission report, "Silk industry development in Thailand", plans for the establishment of a silk industry development centre at DIP's Northeastern Industrial Promotion Centre at Khon Kaen are underway.

Packaging plays a prominent role for the end-products exported. The price obtained for the product may be crucially affected by absence of proper and efficient packaging. A strengthening of DIP's capabilities in providing advice and guidance in this field is envisaged. Active R and D work in packaging, in particular for the food processing industry, is carried out by TISTR.

A major issue regarding exports of manufactures concerns the matter of producing products of required quality and consistency. The Thai Industrial Standards Institute (TISI) of Ministry of Industry is giving high attention in both its standards preparation work and its certification work to the need of ensuring that the country's export industries are given the required support.

One area that needs to be improved is that of testing facilities. TISI is presently working on an amendment of its act so that the Minister of Industry can accredit private laboratories for certification testing. It is proposed that a feasibility study or programme be drawn up for the promotion of the establishment of such private laboratories. The study should not only be a 'market survey' but also cover the laboratory facilities needed (and the potential capability). The study should be comprehensive and provide the basis for a national testing network.

It has been pointed out that one of the important weaknesses of existing private sector institutions is the general absence of exporters' associations (with a few exceptions, like the Garment Manufacturers Association), that speak on the specific problems and interests of exporters of manufactures. In particular, small-scale producers/exporters find it difficult to build up such institutions, for lack of financial, legal and personnel resources. The Government may therefore take the lead in supporting such an institutional build up. Suggestions have been made also of the formation of technical advisory committees to work with the exporters associations in the respective branches. These technical advisory committees might help the Export Development Committee in examining the problems affecting their respective export areas.

(f) Technology, research and development

While Thailand now has relatively good manufacturing capacities, it is seriously lacking in technological capabilities. The development of technological capabilities must be built into the industrial growth process, if the country's industrial development is to become a self-sustained process. Hitherto, Thailand has invested very little in building up technology capacity; technology has only been bought. International assistance would be needed to bring in a new technology awareness or knowledge to Thailand in order to foster its technological build-up with fullest openness to international trends and impulses.

High level policy advice may also be sought in connexion with the tasks of the Ministry of Science, Technology and Energy in establishing a dynamic technology planning instrument.

It is envisaged that the Thailand Institute of Scientific and Technological Research (TISTR) should assume the role of a national R and D centre (not a 'research company'). It should contribute to increase the country's technical capabilities and technological self-reliance; it being conceived that these R and D activities would be directed towards the handling of technological problems concerning production. Accordingly, consideration may be given to three objectives for the country's R and D:

- to improve quality of existing products;
- to produce the products cheaper; and
- to make different products.

A key question is how to get R and D into the production, into industry. Possible international assistance to TISTR during the next 2-3 years might concern the overall R and D project management, the development stage, in (particular the development of some new products etc.) and, above all, the engineering stage.

One particular area which is expected to be subject of increased attention is that of the environmental factors in industrial development. The Industrial Environment Division of the Industrial Works Department of Ministry of Industry may initiate R and D towards non-polluting processes, effective waste utilization etc.

Within the Ministry of Science, Technology and Energy, the National Energy Administration (NEA) is responsible for energy planning and programming. The Fifth Plan 1982-86 listed a number of measures aimed at mitigating the constraints on the Thai economy of heavy reliance on imported energy. A series of investigative and other measures have been undertaken, inter alia, under a UNIDO assistance project with recommendations that included the establishment of a national energy management centre.

## I STATUS AND PATTERN OF THAILAND'S INDUSTRIAL DEVELOPMENT

### 1. Basic characteristics and structure of the manufacturing sector

In the past thirty years, Thailand has been transformed from a predominantly agrarian into a semi-industrialized economy, with the contribution of manufacturing to GDP on the verge of overtaking that of agriculture. Economic growth was well sustained through the 1970s, underpinned by rapid growth of exports - of mining products but also increasingly of labour-intensive manufactures. But the high rates of growth became during the late 1970s coupled with quickening inflation and a widening balance of trade deficit. Thus, Thailand was facing a difficult problem of adjustment to the second oil price adjustment which was followed by prolonged international recession. Indeed, Thailand's terms of trade have declined by nearly 50 per cent since 1973.<sup>1/</sup> The net effects were a marked slow-down of economic growth in the early 1980s but also reformulation of economic development strategy in favour of structural adjustment in all sectors of the economy with greater emphasis on efficiency in production and decentralization of productive activities throughout the country.

Thailand's industrial development has moved in the past thirty years through several phases, from an initially small manufacturing sector chiefly consisting of industries processing primary products, to production of consumer goods for the domestic market in the 1960s and emphasis on exports of labour-intensive products (chiefly textiles and clothing, precious stones and electronics components) in the 1970s. The late 1970s, however, also brought increased protection and incentives for rather capital-intensive industries with a high import content which contributed to the country's growing external deficit. In a current phase, as laid down in the Fifth Five-Year Plan (1982-1986), the emphasis shifted towards resource-based and decentralized development epitomized by the ambitious Eastern Seaboard Development Programme.

---

<sup>1/</sup> In fact, if Thailand could have maintained its 1973 terms of trade through 1983, the country would have achieved a significant trade surplus instead of the 90,000 million Baht deficit actually recorded.

The tendency in most developing countries for industrial development to be concentrated in and around the capital city is evident in Thailand in extreme form, with Bangkok and five adjoining provinces accounting for 75 per cent of value added in manufacturing. There is also evidence of increasing concentration in Bangkok of small-scale enterprises, but the statistical data are not entirely reliable.

Thailand's industry is predominantly operated by private enterprises. Recent developments, especially in connexion with the Eastern Seaboard Development Programme, indicate, however, increased Government participation selectively in industrial development. This may be done through the establishment of, so called, 'national companies' modelled after the National Fertilizer Corporation (NFC) or the National Petrochemical Corporation (NPC). These are public- and private-sector joint ventures set up for large capital-intensive projects of national significance that neither the Government nor the private sector would undertake alone. [In the case of NPC the public sector Petroleum Authority of Thailand holds 49 per cent of the shares, 2 per cent are held by the Crown Property, 9 per cent by IFC of the World Bank and the remaining 40 per cent by private sector down-stream investors. The latter's participation underlines the commitment to ensure that inputs to the downstream factories would be at a competitive price level.]

The expansion of Thai manufacturing is important also for its contribution to employment creation. The rate of labour absorption in the manufacturing sector accelerated in the 1970s, coincident with the rapid expansion of manufacturing. There is some evidence that the export industries which played a leading role in the expansion, are more labour-using than those industries producing mainly for the domestic market. They are also more vulnerable of effects of international economic changes or stagnation trends.<sup>1/</sup> For the Sixth Plan period (1987-91) an annual economic growth rate of 6 per cent (minimum allowable 5 per cent) is assumed which is considered necessary to absorb the young labour force resulting out of the high population growth rate of 3.5 per cent 15 years ago.

---

<sup>1/</sup> A survey by the National Statistical Office released in September 1985 showed that during the first 8 months of 1985 more than 20,000 industrial workers had been laid off in Bangkok and surrounding provinces. Reportedly most affected were the textile, garment, furniture, auto-assembly and electrical appliances industries.

An analysis of the composition of the manufacturing sector shows that the bulk of production is still closely related to the primary producing sectors. The manufacturing sector is broadly divided into those industries processing primary products for either export or domestic consumption and those transforming imported raw materials and intermediate goods into final goods for domestic consumption (and more recently for export). The capital and intermediate goods industries are still little developed and the inter-industry linkages are weak. It has been pointed out that such a structure, common among developing countries, has in the case of Thailand been the result of the combination of an active agricultural sector and cascading protection favouring consumer end-products for the domestic market. More uniform tariff rates would help develop intermediate and capital goods industries.

Major changes in the industrial development strategy were introduced during the Fifth Plan period 1982-86 in so far as export-oriented industrial development and rationalization of domestic industries were to constitute basic elements for efficient long-term growth of the industrial sector. A programme of industrial restructuring was adopted. The inter-ministerial Industrial Restructuring Committee (RESCOM)<sup>1/</sup> was established and a systematic review of the pattern of industrial development was initiated in 1983. It was well recognized that new elements in the international economy as well as international constraints would require the formulation and implementation of new strategies, giving special emphasis on sub-sectoral priorities.

## 2. Economic outlook and envisaged future policies

The Thai Government is currently grappling with the country's serious economic situation, above all manifested in the long-standing problem of trade deficit, for the immediate future and for the up-coming Sixth Plan period, 1987-91. As for the outlook for 1986, recent authoritative statements indicate an expected expansion of the economy by 4.0 per cent while the inflation is projected at 4 per cent. Like other countries the Thai economy has during the last years been greatly affected by many unfavourable external

---

1/ Now the Industrial Policy Committee.

factors, such as the world economic recession and the related decline of commodity prices in the world market. Of particular significance (for the present industrial sector analysis) is the fact that although production and export earnings of the industrial sector have increased during the last years the gain could not compensate for the lower earnings of the agricultural sector, due to the fact that a large part of the industry sector's income had to be spent on imported inputs and raw materials.

In a recent major economic policy statement<sup>1/</sup> modifications of the economic development strategy were announced, which would focus on implementing the following two principal sets of policies simultaneously.

The first set would involve a reduction of national spending that is neither necessary nor urgent which would lead to a reduction of imports. It was suggested in the policy statement that this might be done through cancellation or postponement of major capital-intensive projects (such as some of the envisaged Eastern Seaboard projects) which require large investments and high import contents and are not urgent for the country. It could also be done through retrenchment of projects now under implementation which do not prove to have beneficial returns and by diverting remaining fund to those with immediate returns.

The second set of measures would be aimed at relieving recession and create more jobs as well as generate income. These measures, to be urgently implemented, include the following relating directly to the industrial sector development:

- To carry out a restructuring of the tax system<sup>2/</sup> to promote greater fairness and eliminate fiscal obstacles to national development and export and to improve the preferential system for promoted industries;
- To undertake both monetary and other measures to generate more productive exports;
- To accelerate rural development as most important means to alleviate rural poverty and seasonal unemployment;

---

<sup>1/</sup> Made by the Prime Minister, H.E. General Prem Tinsulanonda on 23 September 1985.

<sup>2/</sup> A package of tax measures was approved by the Cabinet on 22 January 1986, involving i.a. a reduction of the corporate tax rate from 40 per cent to 35 per cent (and from 35 per cent to 30 per cent for companies registered on the Securities Exchange of Thailand) and a reduction of taxes on imported raw materials used by export processors.

- To promote in the provincial areas small- and medium-scale industries which rely less on machinery and energy. This is to be done through careful planning in the areas of funding, marketing, technology and systematic implementation management.

In the immediate term, as well as for the up-coming Sixth Plan period (1987-91) it can be expected that a continuation (with increased focusing) of many policies formulated in the Fifth Plan will take place. As regards the industrial sector development specific attention to the following has been indicated to be called for:

- (a) Development of export industries that utilize domestic raw materials as the main source of production. This is done by
  - expanding the industrial base;
  - adjusting import-substituting industries to be able to export; and
  - promoting new types of export industries.
- (b) Development of small industries and rural industries by indicating and supporting the development of industries in each region being in line with existing necessities of production. This would be expected to imply i.a. that the Government should provide support to small-scale industries and industries in the provinces<sup>1/</sup> more or equal to large-scale industries. There should be enough financial resources available to small-scale industries and support measures aimed at bringing in new production techniques.
- (c) Promotion of exports of manufactured products following an approach of producing what has a market (rather than first produce and then look for markets). In this context priority attention should be given to the development of an effective network of market intelligence, e.g. on the demand of goods, quality of goods and prices in the world market, in respect of items of interest to Thai producers.
- (d) Phased continuation<sup>2/</sup> of the programmes in the Eastern Seaboard area to develop agro-industries, export industries and linkage

---

<sup>1/</sup> It has been suggested regarding basic services that the prices of such services in the urban areas be adjusted so that they will become self-reliant and that the Government will support basic services network in the rural areas only. (Still, payment for the basic services may not necessarily be at the same rate for the whole country. The price would to certain extent have to relate to the initial investment in each area, for example, in rural water supply.)

<sup>2/</sup> A Cabinet decision was made on 24 December 1985 to the effect that, in principle, the Eastern Seaboard Programme should go ahead with a timing in accordance with decisions to be made in each case by the Eastern Seaboard Development Committee (under the Chairmanship of the Prime Minister). Initially, the fertilizer project was to be implemented immediately upon conclusion of required financial arrangements. The construction of the Map Ta Phut Port would start once the fertilizer project was going. The petrochemical complex would be developed in synchronization with the port.



industries (including support of the management system according to the Eastern Seaboard Development Programme).<sup>1/</sup>

- (e) Encouragement of co-operation between the Government and the private sector and specifically support the work of the Joint Public/Private Sector Consultative Committee (JPPCC) and expansion of its operation into the regional areas.

One concrete example of co-operation between the Government and the private sector might concern the setting up of an organization to co-ordinate programmes for export promotion projects.

Another example might be to develop a system and mechanism to co-ordinate the Government and private sector efforts in the development of science and technology. Particular attention may be given to the transfer of technology from foreign countries. This co-ordination would cover areas such as research and development, and testing and standards measures, and the development of human resources in science and technology.

Mention may also be made that the NESDB has established a special Government-Private Sector Co-operation Division focusing on development in the private sector within the context of the country's planning efforts.

- (f) To increase efficiency and quality in production and marketing to enhance Thai products' competitiveness i.a. through:
- improvement of quality of final products to be in line with the (domestic and/or export) market demand;
  - increased efficiency in the use of existing natural resources;
  - improvement of agricultural and industrial technology in order to apply progressive technologies, for example, in the fields of genetic engineering, bio-materials and metallurgy, as appropriate.
- (g) To proceed to adjust and balance the energy framework (introduced in the Fifth Plan) by setting the target to reduce the proportion of fuel use down to 35 per cent of total energy use during the Sixth Plan period. Natural gas will be increasingly used to substitute for petroleum and close attention should be given to effectively develop the demand of natural gas as well as the supply of natural gas both in the Gulf of Thailand and on land.
- (h) To continue efforts to improve and strengthen the management system of state enterprises, including measures to privatize, to the extent practicable, such industrial state enterprises that the private

---

<sup>1/</sup> Under the, so called, '12th Yen Loan', announced in September 1985, 16,000 million yen are provided to IEAT for construction of the Map Ta Phut Port in support of the activities of the heavy and chemical industries (such as fertilizer plant and petrochemical complex) which will be established in the Map Ta Phut Industrial Estate. An additional 3,200 million yen will be provided to the Industrial Estate itself.

sector is considered to be more capable of operating. This could be done by allowing the private sector to join in joint capital investment, to rent under contract or to accept partial or total transfer.<sup>1/</sup>

At the same time it is well recognized that in the case of new major industries that require Government participation in the initial stage (usually concerning activities which need high capital investment and technology) state enterprises would join in the investment of such industries.

- (i) To adjust and focus the role of the Government to consolidate and provide guidance for every sector in the development process in so far as:
- Government must act as a stimulator or a catalyst more than an interventionist or investing in production and marketing by itself;
  - The country-wide development burden be divided between the Government, regional administration, state enterprises and the private sector at the appropriate proportion.

As an overall comment it may be stated that, while the Fifth Development Plan laid much stress on Government measures to develop industry (e.g. modifications in the tariff and tax systems, simplified procedures and other related measures), the Sixth Development Plan will be oriented towards direct actions, such as the carrying out of specific programmes and effectuating institutional support to industry. Attention may be given to the need for separation of policy formulation on the one hand and implementation of measures or programmes on the other. There seems also to have been some disappointment as far as the time used in the implementation process of the Government measures of the Fifth Plan is concerned, and thus special attention can be expected to be given in the Sixth Plan to quick implementation of measures and actions.

---

<sup>1/</sup> Thus, several public enterprises under the Ministry of Industry have been privatized. Only three state enterprises - the Petroleum Authority of Thailand, the Offshore Mining Organization and the Industrial Estate Authority of Thailand - remain with the Ministry of Industry.

## II. MAIN OVERALL CONSTRAINTS TO INDUSTRIAL DEVELOPMENT

The industrial sector of Thailand has remarkably grown during the last two decades although the resulting structure reveals serious shortcomings. This could be attributed to the rather indiscriminate promotional policies of the Government, the impact of the growth of the other sectors, mainly agricultural, and the development of the world economy.

Up to the mid-70's emphasis was placed on capital formation and heavy investments on infra-structures. The industrial investments, promoted by attractive incentives, were concentrated on industries serving domestic requirements. By the early 1970's Thailand's import bills had become very large as result of heavy imports of capital goods, intermediate products and energy. The import bills were covered essentially by foreign exchange earnings from agricultural exports supplemented by the inflows of foreign capital funds. As the growth rates of the export incomes did not keep pace with the import growth rates, the country's trade deficits, as well as the foreign debts became larger, thus adversely affecting both internal and external equilibrium.

The present structure of the Thai industry reflects this concentration on either industries processing agro-products or industries producing end-products for domestic consumption. The import content of these industries, in particular those in the latter category, is very high, as capital goods and intermediate goods industries are still little developed and inter-industry linkages weak.

The manufacturing industry sector has become a significant net user of foreign exchange earnings and, in general, the situation of the sector has, as result of past policies, tended to be characterized by:

- a general inefficiency of production.
- inadequate utilization of current comparative advantages, viz. labour intensive processes and domestic raw material processing.
- import-dependent production processes.
- a bias against exports.
- lack of technological innovation.

Main attention has been given in the industrial restructuring work to ways and means to diversify the industrial structure to effect a shift from consumer goods oriented industries to those producing more basic and strategic, intermediate and capital goods.

The fact that so much manufacturing has remained at the end-product (often assembly) stage with heavy import contents has had the effect that little attention has been paid to materials research to foster the use of local raw materials or/(semi-processed) intermediate materials. Little consideration has also been given to vertically integrated product development; main attention being paid to the task of manufacturing existing (import-substituting) end-products. The local know-how has thus often been limited to assembly of imported inputs and the technical capabilities have not been developed to meet the challenges of product development from scratch.

It can be argued that science and technology have been somewhat neglected by the Thai policy-makers and economic planners.<sup>1/</sup> Before the second half of the 1970s, the negligence was evidently due to lack of strong pressures on trade balances and international payments and perhaps also to the busy engagement in building the physical infrastructure. The concept of investment in technology and technological capability was not given much attention as being of a national concern; technological investment was essentially left to the private industrial sector with the general assumption that technology transfer would automatically accompany imported capital. The Government, in promoting foreign investment promotion schemes therefore concentrated on the objectives of employment creation and exports. Not until the Fifth Plan (1982-86) was major attention given to the role of science and technology. Policies and measures in this field are expected to continue in the Sixth Plan period within programmes to develop production systems and technology, e.g. in improving agricultural and industrial technological capabilities in order to apply progressive technologies in, for example, genetic engineering, bio-materials, metallurgy and metal-working industries.

---

1/ Ref. e.g. Vichitvong N. Pombhejara, 'Science Policy in Thailand', paper presented at US-Thai Relations Bilateral Forum, Berkely, 26 April 1985.

Without a domestic technological capability, an import-substitution strategy for industrialization imposes a heavy burden on the trade and payment balances, as local industries have to spend excessive amounts of scarce foreign exchange resources on imported technologies, both hardware and software, just to get goods manufactured in the country. This situation would also prevail in the case of (imported technology-based) production of manufactures for exports. As long as the country still cannot to large extent rely on its own technology, the industrialization process can in the long-term hardly be expected to result in satisfactory economic growth and stability.

Another characteristic of the country's industrial sector is its heavy concentration in the Bangkok metropolitan area and the need to decentralize industrial activities to the outlying regions to improve and effect a more equitable distribution of incomes and provide employment opportunities to the disguised unemployed agricultural labour.

The Government and the Government-sponsored institutions/organizations are the single biggest source of help and assistance to entrepreneurs and investors in the provincial areas. This assistance, although constrained by limited resources, is largely directed to two major areas: technical and financial. Some other vital areas of assistance, particularly for small industries, like management training, marketing and common facility services are still largely outside the scope of activities of the existing institutions.

Experience in other countries, including some newly industrializing countries, shows that an active participation of the private sector in the advisory or supervisory boards of the institutions assisting industry is essential to their orientation towards the needs of the industries. At the same time considerable financial support to the budgets of the institutions (in the order of 50 per cent) by the private sector is often experienced in these countries.

It is suggested that a comprehensive in-depth analysis be made of the institutional framework for the country's industrial development giving specific attention to a separation of the functions of policy formulation (and supervision and control) on the one hand and implementation of measures on the other hand. Particular consideration should be given to the institutional

requirements for effective implementation of objectives and policies in the small industry sector for the provincial industrial development.<sup>1/</sup> Above all, ways and means of strengthened co-operation between the Government institutions and the private sector institutions and associations should be looked at, including technical assistance inputs for possible joint programmes.

---

<sup>1/</sup> See also "The Needs of Small-scale Industries for Managerial and Technological Services in Thailand" prepared by the Research Institute for Management Science (RVB), Delft, for the Department of Industrial Promotion, Ministry of Industry (report dated May 1985).

III. IMPORTANT ISSUES FOR INDUSTRIAL POLICY, RESEARCH AND  
TECHNICAL CO-OPERATION

1. Industrial restructuring and investment promotion

After over two decades of promoted industrial development primarily on basis of a policy of import substitution, the Thai industrial sector entered in the 1980's into a period of changing domestic and international trends and developments. In order to effectively enhance the competitiveness of the country's industry, the Government launched the major programme of industrial restructuring during the Fifth-Plan 1982-86, as new elements in the international economy and internal constraints called for the formulation and implementation of new strategies, giving special emphasis to subsectoral priorities. Under the guidance of the Industrial Restructuring Committee (RESCOM)<sup>1/</sup> a series of subsector analyses were carried out in respect of auto industry, textile industry, chemical industry, machinery industry and iron and steel industry. The assistance that in this context has been provided to the RESCOM Secretariat by UNIDO<sup>2/</sup> has been particularly focusing on the international perspective in the selected industries, and thus contributed to a widening of the scope of analysis and an increase of the policy options to be considered by the RESCOM and further Thai authorities.

Needs for further assistance connected with the work of the Industrial Policy Committee (formerly RESCOM) have been indicated in connexion with the follow-up work on RESCOM recommendations regarding further analyses of specific subsector development to be carried out by the Industrial Economics and Planning Division of the Ministry of Industry, e.g. on mineral-based, forest-based and agro-based industries. The Division is expected to become [in co-operation with local research bodies, like the Industrial Management Co. Ltd] the research arm of the Industrial Policy Committee concerning such subsectoral analytical study work as well as required research and monitoring connected with implementation of the Committee's recommendations [while the NESDB will continue to provide support as secretariat in the overall planning

---

1/ Now the Industrial Policy Committee.

2/ Under projects DP/THA/82/011 and SI/THA/82/804.

area]. One immediate task in early 1986 would be to consolidate the results of the main sector studies which have already been carried out.

As to engineering industries, a stepwise development policy is being followed towards high technology and more capital-intensive industries. It is starting out from assembly operations and production of parts - which is largely characteristic for the present stage of the Thai engineering industry - into engines manufacture, machining operations and forging industry. In this context, the R and D work at TISTR is being drawn upon, e.g. to prepare for production of special alloys for the building of engines within, say, the next 4-5 years. Ultimately, within perhaps a 20 years time horizon an integrated steel industry will be recommendable even though new materials (e.g. carbon fibres) will possibly replace steel raw materials.

Electronics are expected to be pursued in three fields during the Sixth Plan period. Firstly, support should be extended to small and medium industries so that they can export products with consistent quality. The industries would need some electronics equipment for this. TISTR or universities might provide advice in this connexion. Secondly, electronics components production should be pursued on basis of market assessment, and focus be given to specific areas, like ceramic capacitors, electronic crystals or certain telecommunications items. Owing to technological changes (i.e. continuous integration of functions into automatically produced chips) the growth potential lies mainly in the area of systems applications. Thirdly, production of electronic appliances, like microwave ovens, which could be produced cheaply and reliably. There should be a distinct own design; no copies. But from technology and access to export-markets point of view such production might best be carried out on joint venture basis with foreign partners.

As to the establishment of a CAD/CAM entity, this will be of particular importance when entering into production of specific parts for the automotive industry (engine parts etc.) and for other industries. It is also to be noted that the new Metalworking and Machinery Industry Development Institute to be established, with Japanese assistance, within the Department of Industrial Promotion, the Ministry of Industry, will have CAM facilities.

In the case of the textile sector, particular attention is given to the possible establishment of a Textile Unit.<sup>1/</sup> The Ministry of Industry, in due recognition of the importance of the textile sector, as being the largest manufacturing sector in Thailand with more than 350,000 people directly employed, as well as a leading foreign exchange earner among the manufacturing industry, wants to set up, jointly with the private sector, a small unit which will observe and watch international developments and trends, and assist in planning and in problem-solving. International trends in automation of textile and garment production will require close monitoring to assure competitiveness of the country's industries and to control the employment impact.

---

<sup>1/</sup> SI/THA/85/50/Rev.1. For a sector assessment see also the research paper 'Scope and outline for ASEAN regional co-operation in the textiles and textiles products industry' prepared by IS/REG, 24 June 1985 (UNIDO/IS/R.17).



In addition to fulfilling the above indicated tasks as the Industrial Policy Committee secretariat, the Industrial Economics and Planning Division is aiming at strengthening of its capacities towards becoming an effective overall industry sector planning unit of the Ministry of Industry. Indeed, it is understood that the Ministry of Industry is currently undergoing an organizational review and in this context such a strengthening of the Industrial Economics and Planning Division as well as the Office of Basic Industry Development<sup>1/</sup> which are both within the Office of the Permanent Secretary for Industry, is being considered. Within this framework the possible establishment of an industrial project assessment unit to work closely with the [private sector] industry (and technical assistance in that context) has been discussed.<sup>2/</sup>

Note should also be taken of a study made in early 1985 by a team of Belgian experts (under a bilateral assistance project) on the deficiencies in the existing system of industrial data in Thailand and proposals put forward for a programme towards increasing the efficiency of industrial data compilation and presentation.<sup>3/</sup> The objective of the study was to improve the ability of the Ministry of Industry to supply industrial data to Government services and to private investors so that the Ministry of Industry will be recognized as the supplier of primary statistics on manufacturing industry (on basis i.a. of the Factory Act) to the public and private sectors. Suggestions for the establishment of a Center for Industrial Statistics and Information within the Industrial Economics and Planning Division were also to

- 
- 1/ It might be noted that short-term advisory services are currently provided to the Office of Basic Industry Development by the UNIDO Regional Adviser on Industrial Development attached to the ESCAP/UNIDO Industry Division in the preparation of terms of reference and bid documents for certain project studies.
- 2/ A proposal is currently under consideration for preparatory assistance by UNIDO to the Industrial Economics and Planning Division with the aim, inter alia, to advise the Division in determining the ways and means of strengthening the technical, institutional and functional capability of the Division for undertaking on a regular basis the tasks of industrial planning and programming both at overall industry sector level and subsector levels, and co-ordinating and monitoring the implementation, within the sphere of its competence.
- 3/ "Development of Industrial Statistics in Thailand", working paper dated 29 May 1985 prepared for the Industrial Economics and Planning Division.

be put forward. It is envisaged that technical assistance, possibly from Belgium, be requested for this purpose.

An important role in ensuring that the establishment of industrial activities throughout the country is fully conducive to set strategies and desired development patterns, rests with the Board of Investment (BOI). Not the least as result of the work of the BOI, the quite substantial large- and medium-scale industrial sector in Thailand has been established during the last decades but, as noted above, it is characterized by large import content, both in the case of production for the domestic market and for exports. In the future much more emphasis will have to be given to promotion of supporting industries in fields, such as chemicals, engineering, electronics, etc. It is in this vein that BOI has requested the Asian Development Bank to carry out a comprehensive study on chemical industries, capital goods and intermediate products industries. The study which will cost about US \$350,000 is to start in early 1986. The objectives of the study are, firstly, to identify areas for upgrading already existing industries, secondly, to identify where industry could be expanded with a view to exports, and thirdly, to identify new products; that is, where the market has expanded enough to justify production of new products, both domestic and exports. Thus, the study will aim at making the present industry more competitive and to reduce the import content of the present industries. The results of the AsDB study will be expected to provide important guidance to the future work of BOI as well as the Ministry of Industry and, of course, to the industry itself. In the area of agro-industries the BOI has engaged consultants provided through the US Business Council in the case of specific subsectors.

The need for a strengthening of the planning and programming functions of BOI has been voiced. In earlier days, BOI relied mainly on a flow of ad hoc proposals coming from investors, attracted by the incentives system. BOI had been relatively weak in providing effective guidance as to long-term trends and expectations for a desired Thai industrial development. It has been suggested that BOI should develop - in close consultation with private sector associations - a sort of "programme of action" with a 10-year perspective which should provide the necessary back-up for BOI's developing criteria for promotion; where to focus, where main activities of the industry sector should be directed to, etc. It is felt that international assistance in these endeavours would be highly useful.

2. Industrial development in the provinces and support for small and medium-scale industries

Industrial enterprises are concentrated in Bangkok and nearby provinces, reflecting basically Bangkok's primate city position in the country. It is estimated that only about 25 per cent of total manufactured value added is generated by industrial enterprises not located in Bangkok and five nearby provinces and that 30-40 per cent of the total industrial labour force of about 2 million workers is employed by these industrial enterprises. Large- and medium-scale plants (employing 50 or more people) constitute only 7 per cent of all industrial plants found in provincial areas. Small-scale industries (with between 10 to 49 employees) account for 30 per cent of the total number of provincial factories, while, so called, cottage industries (employing fewer than 10 people) account for 65 per cent. The reason why large- and medium-scale industrial enterprises are located in provincial areas is mainly the need to be near sources of supplies of important raw materials, such as agricultural crops or mineral resources. Examples of large- or medium-scale agro-industries located in provincial areas include pineapple plants in Petchburi and Prachuab Khirikhan, sugar refineries in the cane growing provinces of Kanchanaburi and Suphanburi and tapioca flour and pilot factories in Nakhon Rakhasima. There are also several cement factories in provincial locations. Small-scale factories tend to be situated near the markets for their products.

In general, it can be said that large- and small-scale industries in the provinces play different roles in national development. The former play a greater role in earning foreign exchange and increasing the value added of agricultural products while the latter tend to generate more benefits in terms of employment and increased local demand. These two groups of industries in provincial areas should be promoted in different ways:

- (i) Technologically advanced resource-oriented large-scale industries tend to require investments in machinery and equipment and Government support above all in supplying some infrastructure such as communications and electricity;
- (ii) For small-scale industries, investment incentives are not the most important requirements. One way to promote these types of industries is to provide advice on technology, production techniques and management. Some of the small industries also need assistance in financing and the marketing of their products. In this context support of the work of the small industries' own local associations might be of vital importance.

The large majority of Thailand's small industries is owner-managed. These industries also mostly design and develop their own technology based on past experience in their line of activity, with little help from outside. Various independent surveys of the small industry have brought attention to following problem areas:

- Shortcomings in managerial capabilities e.g. in planning and management of cash, inventories and the production process;
- Problems concerning availability, reliability and price stability of raw materials. Those who rely on imported raw materials and semi-finished products also have to bear heavy transportation costs and generally do not benefit from duty exemptions;
- Lack of skills in marketing, technology, product development and diversification, quality control, etc.;
- Scarcity of skilled manpower. Skilled workers who have been trained in small industries, tend to leave in order to start their own business or migrate to Bangkok to join larger firms;
- Shortage of capital and lack of access to financial institutions for investment funds. Lack of guarantee capability is also a common obstacle.
- Lack of transparency of the economic environment to the small industries.

Areas of action or specific measures to promote small-scale industries and speed up industrial decentralization to provinces include:

- (i) Establishment of industrial zones, suitable for the size and type of industries in various provinces;
- (ii) Further development of industrial estates and industrial areas along the Eastern Seaboard and industrial estates in provinces. Possible development in other coastal areas of basic or specific industrial zones;
- (iii) Expansion of promotion work on small-scale and provincial industries;
- (iv) Improvement and development of production technology and management techniques. Expansion of the markets for small-scale industry;
- (v) Promotion of sub-contracting between small-scale and large-scale industry;
- (vi) Development of a credit extension system and financing institutions for small-scale industry and industries in outlying areas.
- (vii) Support towards a strengthening of the small industries' own local associations or other groups (provincial or sectoral).

In the above the Department of Industrial Promotion (DIP) of the Ministry of Industry will be expected to play a major role, providing following range of services (often in direct collaboration with the local industry associations concerned):

- technological training (e.g. in furniture-making, metal-working, textile manufacturing);
- management training;
- consultancy and trouble-shooting services;
- product testing and certification service, particularly for the metal-working and textile industries;
- vocational training for the rural people and the urban slum areas in cottage industry and handicrafts;
- technology and product development, including product design and packaging, with emphasis appropriate technology for small and cottage type industries;
- exhibitions, information services to promote better craftsmanship.

Regarding the promotion activities for small-scale and provincial industries, the establishment of industrial zones in the provinces and the programmes of industrial estates and industrial area development in the Eastern Seaboard and elsewhere technical co-operation activities supporting the various measures being pursued, might be considered against the following background.

(i) The Eastern Seaboard development

The Office of the Eastern Seaboard Development Committee will continue to play a crucial role in the development of that area, in proceeding with the programmes to develop agro-industries, export industries and linkage industries. The Map Ta Phut port and industrial area is being developed with basic linkage industries - up-stream petrochemical and fertilizer.<sup>1/</sup> Also

---

<sup>1/</sup> As mentioned earlier (footnote 2 on page 5), the immediate implementation of these two industries is currently being under consideration while other large-scale investment proposals, such as that for an integrated steel mill (with feasibility study prepared by Estel of Holland), have been postponed in view of current economic situation. [In order to continue the development of Thailand's steel industry, a coil rolling mill is envisaged for the time being, and assistance is sought for the preparation of a pre-feasibility study for a 700,000 tons/year plant with an estimated investment cost of US \$50 million plus US \$50 million infrastructure investment.]

the Laem Chabang industrial estate (for non-polluting light industries) and export processing zone are expected to be developed during the next few years when also final decision on the development of the Laem Chabang port as Thailand's major port for containerized cargo, will be made. The Eastern Seaboard Office has the responsibility of managing the Eastern Seaboard Development Programme, and to monitor the development, while the Industrial Estates Authority of Thailand (IEAT) is carrying out the actual development of the industrial estates and the EPZ in the Eastern Seaboard area.<sup>1/</sup>

Assistance is provided by UNDP/UNIDO (Financial Planning Adviser, Advisor on Environmental Pollution Control, Municipal Engineer to Map Ta Phut attached to IEAT).<sup>2/</sup> In addition, under the SIS programme,<sup>3/</sup> the services for 2 months of a consultant in computer system and computerization will be provided, with the tasks of assessing the data processing requirements of the Eastern Seaboard Office; making recommendations for appropriate computer (hard and software) system; and advising on training requirements for the utilization of the computer system for the Eastern Seaboard industrial development programme.

It might be desirable that possible future UNDP/UNIDO assistance be consolidated under an 'umbrella project' with an overall co-ordinating role of the UNIDO input to the Eastern Seaboard development, which would include e.g. investment follow up and assessments of private sector requirements (in addition to the monitoring of the large-scale public investment). It should in this connexion also be noted that two French bilateral advisers have been engaged in 1985/86 to assist the Eastern Seaboard Office in the promotion of Eastern Seaboard industries. The investment promotion is carried out in co-operation with the Board of Investment (BOI). A possible UNIDO technical co-operation project with BOI in this context is under consideration. The purpose of the project would be to conduct a survey to identify industrial projects in the Laem Chabang area [through a more in-depth assessment than

---

<sup>1/</sup> Under the, so called, "12th Yen Loan" announced in September 1985, 2,900 million yen will be used for the Laem Chabang Industrial Estate (including the EPZ) and 12,300 million yen for the (second part of) the Laem Chabang Port construction.

<sup>2/</sup> Under projects DP/THA/83/009, DP/THA/84/009 and DP/THA/83/006, respectively.

<sup>3/</sup> Project SI/THA/85/141.

what is contained in the 1982 Coopers and Lybrand 'Eastern Seaboard: Industrial Opportunities Identification Study' and the 1985 JICA 'Study on the Development Project of Laem Chabang Coastal Area'], and to assist in preparing opportunity studies and priority projects for attention of potential private sector investors.

(ii) Regional dispersal of industrial development

Of particular importance for the dispersal of industrial development throughout the country (not only the Eastern Seaboard) is the work of the Industrial Estates Authority of Thailand (IEAT).<sup>1/</sup> Lessons are being drawn from the establishment of the first industrial estate in provincial location, in Lamphun in the North and great concern is being voiced regarding its too large size and investment cost. Having been burnt on the Lamphun project, other less ambitious estate investments in the provinces are being contemplated for early implementation: Songkhla in the South (in connexion with area development around the Songkhla Lake), Nakhon Rakhasima (Korat) in the Northeast and Samut Sakhorn Province southwest of Bangkok for water-using and polluting industries<sup>2/</sup>.

In addition, IEAT is also to be involved in development of industrial areas in the Upper South region. Under the long-term industrial development scenario for the Upper South region two industrial estates are proposed to be developed: one on the Gulf of Siam side in Surat Thani province directly linked with the port at Khanom and another in Phuket on the Indian Ocean

---

1/ Following industrial estates are in operation:

In Bangkok area:

Lat Krabang (incl. EPZ) managed by IEAT.  
Bang Poo jointly managed by IEAT and private sector (planned to have EPZ added)  
Ban Chang initially private, now managed by IEAT  
Nava Nakorn private  
Bang Plee housing estate/industrial estate managed jointly by IEAT and private sector.

In the North:

Lamphun managed by IEAT.

2/ Expert assistance has been provided to the Industrial Works Department of the Ministry of Industry by UNIDO (DP/THA/34/008) for the establishment of an industrial water supply system in the industrial area (southeast of Bangkok) of Samut Prakarn Province, (including the Bang-Poo Industrial Estate). The Metropolitan Water Works Authority proposed a special water supply project for industries in that area in order to reduce the critical problem of groundwater in the Bangkok area.

side. Other specific areas, such as areas to support port activities, fishing activities and agricultural processing are proposed to be designated around existing ports i.a. Phuket, Tha Thong and Kantang.<sup>1/</sup>

In particular as regards the development of small- and medium-scale industries in industrial estates in the provinces, the link is to be fostered between IEAT and the Department of Industrial Promotion (DIP) of the Ministry of Industry in so far as IEAT provides the 'hardware', or physical infrastructure, and DIP provides the 'software', like extension services (technical, marketing, etc.).

Indeed, it has been suggested that each of the major provincial cities in the country (that is, provincial cities with between 50,000 and 100,000 people) should allocate an industrial location area under the Ministry of Industry supervision for small and medium industries. The planning capacity of DIP, in particular, should be called upon for this purpose, as would the close co-operation with local industry associations concerned. For implementation of the industrial development in these areas IEAT could play a major role. The small-scale industry should be the foundation for the provincial industrial development and from the side of IEAT it has been proposed that provincial "small-scale industry estates" be set up in every province.<sup>2/</sup> These estates would have needed basic facilities - limited to basic infrastructure and availability of technological services (from DIP) - and an established loan system for the small-scale industry investors. It could also be envisaged that standard building facilities (for renting) be set up, perhaps as joint venture between IEAT and the National Housing Authority.

At the regional and provincial level the DIP is providing information and study reports on investment opportunities, industry profiles and pre-investment

- 
- 1/ Another long-term perspective study [similar to the one completed a year ago for the Upper South region] might be called for by NESDB to assess the future development of agro-processing and other industries and services in the 'Southeast' region, or the 'hinterland' to the Eastern Seaboard.
  - 2/ In this connexion attention may be given to the fact that the privileges and benefits offered by the Board of Investment to industries to be promoted within special investment promotion zones are restricted to some specific locations and types of industries only, as specified by the BOI. The bulk of the small industries, sole proprietorship or partnership establishments, may fall beyond its scope. This constitutes a serious handicap for promotion of small- and medium-scale entrepreneurship within these areas.



studies,<sup>1/</sup> particularly through the Northern Industrial Promotion Centre in Chiang Mai and the other two regional centres presently being established - in Khon Kaen<sup>2/</sup> in the Northeast and in Songkhla in the South. A basis for this work has been provided through the UNIDO- assistance project DP/THA/82/010, 'Pilot Project for Industrial Expansion in the Northeast' which was completed in June 1985. The success of the efforts of DIP's regional industrial promotion centres in supporting existing and promotion of new small and medium industries is in the first hand, however, dependent upon the active pursuance by the Government of policies fully conducive to such development, that is, investment incentives, small industry credit schemes etc., as outlined in the evaluation report of the Pilot Project.<sup>3/</sup>

In addition, as stressed in a recent study,<sup>4/</sup> the staff of DIP's regional centres should (on top of basic activities of consultancy and training) be in a position to:

- interpret the macro economic and industrial policy guidelines of NESDB, the Ministry of Industry and Labour properly in order to implement them well;
- monitor the regional industrial development process, by province;
- analyse the potentials and bottlenecks of regional industrial development in their areas; and
- give feedback and recommend measures to improve the industrial policy within the overall Five-Year Plan policy.

From the above follows that special attention has to be given to the selection and training of the cadre of industrial extension officers at the Ministry of Industry in order for them to play a crucial role for the industrial development in the provinces, both those attached to DIP's regional

- 
- 1/ The provision by DIP of such information and studies should be closely monitored as to results, in order to assess the optimum scope of work for DIP in this context.
  - 2/ The establishment of the buildings and facilities for the Khon Kaen Centre is assisted through Japanese aid. A proposal for UNIDO assistance in strengthening the Centre is under consideration.
  - 3/ DP/ID/SER.A/589 of 20 May 1985.
  - 4/ "The Needs of Small-scale Industries for Managerial and Technological Services in Thailand" prepared by the Research Institute for Management Science (RVS), Delft for DIP (report dated May 1985).

industrial promotion centres (in Chiang Mai, Khon Kaen and Songkhla) and the Ministry of Industry's Provincial Industrial Offices in main provincial towns.<sup>1/</sup> These officers are the only important direct and regular link between the small-scale industry community in the provinces and the Government institutions in charge of small industry development. The officers are involved in

- the improvement and rationalizing of the existing small industries;
- the expansion of operation scale of the existing industries; and
- the promotion of new industries.

Thus, a large part of their activities is related to pre-investment work (including such work aimed at expansion of existing investments), market assessment and identification of industrial manufacturing or processing opportunities. The other main activity relates to improvement of operations in existing plants.

Furthermore, it may be noted that the Industrial Services Division of DIP has since 1980 an active Entrepreneurship Development Programme which provides a 'package' of services (project opportunity survey, entrepreneur training seminar, follow up assistance). Programmes have been carried out in Songkhla, Khon Kaen, Chunburi, Korat, Udon, Nakhon Sawan, Chiang Mai, Surat Thani and Phitsanulok. Possible technical assistance in support of these programmes should be considered. (Certain assistance is provided through Technonet Asia.)

Through these direct and regular contacts with the small-scale industrialists, the Ministry of Industry will be in a good position to make assessments of the effects of existing industrial policies and measures, essential for the preparation of consistent small and rural industrialization policies and programming in the future, and thereby also provide the sectoral inputs and support to the work of the National Rural Development Committee, in particular that of the regional and/or provincial rural development sub-committees.

Of importance in this context is also the fact that, as extension of the work of the Joint Public/Private Sector Consultative Committee (JPPCC) at

---

<sup>1/</sup> It is understood that a programme of joint training courses for officers of DIP's three regional centres and the Provincial Industrial Offices, will be organized under a Dutch assistance scheme.

national level, the private sector organs - the Association of Thai Industries, the Board of Trade and the Thai Banking Association - are now establishing sub-committees for the purpose of private sector support for regional development, in Songkhla, Chiang Mai, Nakorn Sawan and Khon Kaen, respectively. These sub-committees would sponsor productivity seminars, exhibitions, etc. In these efforts close co-operation is maintained with the Ministry of Industry. In designing and elaborating on the various above-mentioned UNIDO technical co-operation proposals, the Thai policy-makers have indicated the wish that the needs to support JPPCC initiatives and other efforts of co-operation with the private sector, should be given prominent attention.

Reference should also be given to the efforts (although at present somewhat limited) of the Small Industries Association. The Association membership covers essentially industries with between 3 and 100 persons employed. The Association, as such, is a member of the Thai Chamber of Commerce. The Association has about 1,100 members, of which about 60 per cent are in the Bangkok area. The Association has a programme of seminars and workshops in Bangkok, as well as in the provinces which is carried out in close co-operation with the Department of Industrial Promotion, the Ministry of Industry.

(iii) Small- and medium-scale industry in the Bangkok area

Note might be taken of various efforts to support and up-grade the small- and medium-scale industry also in the Bangkok area. The Ministry of Industry through the Department of Industrial Promotion and, specifically, its Industrial Services Division (formerly Industrial Services Institute - ISI) and Thailand Management Development and Productivity Centre - TMDPC - is providing support in respect of various technical as well as management matters. Co-operation by way of joint sponsorship of seminars, training workshops etc., is maintained between the Management Development and Productivity Centre and the private sector's Association of Thai Industries (ATI) and Thai Management Association (TMA). External assistance in this context is provided i.a. through the US Business Council.

In co-operation with the ATI 'industry clubs' a survey was recently made regarding areas where the industry would be interested in obtaining technology advice and upgrading, of which the following may be listed as indicative of the needs of Bangkok's small- and medium-scale industry:

- Plastic industries - Precision moulds and dies<sup>1/</sup>
- Rubber-based industries - Precision moulds and dies for rubber
- Automotive industries - Heat treatment
- Leather - Finishing, leather furniture, leather garments
- Electrical - Lead-less components
- Precision plating technology
- TV tube technology
- Glass - Furnace design
- Fuel conservation
- Quality control
- Industrial machinery - Instrumentation technology.

(iv) Financial support for small industries

Capital shortage appears to be a problem affecting all categories of industrial enterprises in Thailand. This affects plant expansion and diversification as well as efficient operation. The existing credit system is considered to be rather inflexible, relying to a greater extent on the availability of securities and guarantees than on the potential economic viability of the investment. The small scale industries (SSIs) have in average a relatively low debt ratio which would seem to indicate great difficulties for small enterprises in acquiring sufficient credits from institutional sources. There is no doubt that limited availability of financial resources poses real constraints on the acquisition of fixed assets and enterprise operation. From the viewpoint of commercial banks, which are

---

<sup>1/</sup> This specific problem has been given priority attention by the Department of Industrial Promotion, the Ministry of Industry, and a request for urgent UNIDO assistance in the development and improvement of the country's tool and die industry has been made. A survey recently conducted by the Industrial Services Division of DIP revealed that a significant portion of the firms are small-scale, equipped with relatively modern machinery and would be able with some guidance to produce satisfactory dies for plastic injection machines (to replace the traditionally imported ones). If further equipment would be needed it is understood that the companies would be prepared to invest.

the most important source of SSI credit, inadequate collaterals, poor record keeping and the risk of business failure, particularly among new enterprises, constitute greater lending risks (than in the case of larger enterprises).

The DIP provides financial assistance, through the Small Industries Finance Office (SIFO), in the form of low-interest loans of up to one million baht for small industrial projects, and has also a revolving fund scheme for cottage and handicraft industries. Efforts are being made to reactivate the SIFO loan activities and, among others, consideration is being given to increase the ceiling for loans from 1 million to 5 million baht, which has been proposed by DIP. In particular in the provinces, co-operation between the Regional Industrial Promotion Centres and the Provincial Industrial Officers on the one hand and the lending operations of SIFO on the other is to be strengthened so that integration between the technical extension services and the financial assistance is achieved. This is all the more important as the financial problems of SSIs are (as indicated above) to a large extent symptoms of results of managerial/technical weaknesses.

At IFCT a special loan unit for small-scale projects was created in 1984 to implement IFCT's strategy to strengthen its promotion of small industry and regional development. In this endeavour IFCT has been building up its branch network and regional offices for the North, Northeast and South regions, in Lampang, Khon Kaen and Haadyai, respectively, have been established.<sup>1/</sup> Under the special IFCT small industry lending programme the average loan per client is about \$100,000; the clients being mainly engaged in food processing, construction materials, wood products and furniture making and commercial farming activities. Another major aspect of the lending programme involves the provision of technical assistance through the IFCT consulting subsidiary, the Industrial Management Co. Ltd.

IFCT is presently about to start a further financing scheme - the Export Industry Modernization Programme - for small and medium enterprises which differs from the above small industry lending activities in three major respects:

---

<sup>1/</sup> The intention has been expressed by the Ministry of Industry that very close co-operation be established between the Ministry's regional centres and provincial offices and the IFCT branches (possibly by the posting of an officer of the Ministry at each of the IFCT branches).

Firstly, the programme has a more specific objective as it is intended to enhance the competitiveness of export-oriented manufacturing through modernization of production facilities, improvement in product quality, work and management systems.

Secondly, the programme will link the provision of technical assistance with the provision of financing, not just in the project implementation phase, but throughout the project cycle, that is, from the project concept phase to the operation phase.

Thirdly, since only relatively limited resources in foreign and local currencies will be available for lending and technical assistance, it is envisaged that the programme concentrates in selected priority export sectors. A narrowing down the target groups to a few sectors will not put too extensive requirements on the provision of technical assistance, in view of the resource limit, while the local currency financing requirement will be met by IFCT, a two-step loan of approximately US \$17 million, on concessional terms will be provided through Japanese aid (OECP) with about US \$1 million earmarked for technical assistance expenses.

The nature of the technical assistance services under this programme to the export-oriented small- and medium-size enterprises may be categorized as follows:

- (i) Basic market research to identify business/product opportunities.
- (ii) The preparation of project studies to comply with the requirements of IFCT, and government agencies if necessary.
- (iii) Production management assistance, including product design, quality control.
- (iv) Operational management assistance, such as financial management and marketing of products.

The services will be provided for two years from the commencement of the programme.

Mention should also be made of the Small Industrial Credit Guarantee Fund (SICGF) being another mechanism for promoting the development of small-scale industries, by enabling such businesses to obtain more credit from financial institutions. Agreement on this mechanism was reached with the Joint Public/Private Sector Consultative Committee (JPPCC) after IFCT had in 1984 prepared a feasibility report on it. The IFCT has been put in charge of SICGF's operations in the initial Five-Year period. Its start-up capital is 200 million baht where of 100 million from the Government, 20 million from the (public sector) Krung Thai Bank, 20 million from IFCT and 60 million from 15

commercial banks. After the initial period it is foreseen that SICGF will become a statutory credit guarantee corporation to be established under a special act of Parliament. An agreement has been concluded with the Asian Development Bank (AsDB) for a technical assistance grant to assist IFCT in setting up the new credit facility.<sup>1/</sup>

3. Promotion of subcontracting between small-scale and large-scale industries

The subcontracting system which is common in rural Thailand may be referred to as a 'putting-out' system, whereby a producer undertakes to have certain steps in the production process done by individuals working in their own homes. The producer in the parent firm provides the raw materials and sometimes the necessary tools and equipment, paying on a per-piece basis for work completed. Such subcontracting arrangements are extensively found in the production of ready-made garments, silk, wood carving, furniture, fish net, knitting, laquer ware and metal bowls. Apart from these craft-oriented products, there is very little subcontracting activities in the country; only a few larger firms, like bicycle assembly factories and electrical appliances factories, employ commercial subcontracting as it is commonly known. According to a recent study,<sup>2/</sup> this is not very surprising because generally the conditions for carrying out subcontracting are not well fulfilled at the present stage of industrialization in Thailand.

The establishment of subcontracting relations between large and small industries presupposes the existence of large plants, in particular in industrial branches such as metal working, and efficient and usually highly

---

<sup>1/</sup> The AsDB technical assistance will involve advisory services to IFCT by a foreign consultant for developing appropriate policies, guidelines and operational procedures for the SICGF scheme; intensive training programmes in Bangkok and in a selected overseas institution for staff selected by IFCT who will be assigned to SICGF; seminars and short courses to provide basic information on policies, guidelines and procedures of SICGF to participating financial institutions and their potential clients. The technical assistance also provides for advisory services to IFCT by a foreign consultant to assist in establishing small-scale industry extension services within SICGF.

<sup>2/</sup> "The Needs of Small-scale Industries for Managerial and Technological Services in Thailand" prepared by the Research Institute for Management Science (RVB), Delft, for the Department of Industrial Promotion, the Ministry of Industry (report dated May 1985).

specialized small industries. The initiation and operation of such subcontracting requires a systematic search for supply and demand linkages; technical and managerial assistance facilities, legislation to protect small establishments and the existence of a conducive tax system (e.g. with taxation on value added, thus avoiding cumulative tax payments). It is obviously important to create an atmosphere of mutual confidence between the partners as well as a stable policy framework. Lack of mutual confidence is much influenced by the absence of accepted standards in respect of such vital factors as quality, delivery dates, financial transactions, etc. It is unlikely that any subcontracting exchange, or clearing-house, that puts two firms in contact and leaves them to negotiate contracts between themselves, would play a significant role unless the large firm or some public institutions are ready to take the long-term view and are prepared to offer guidance and technical assistance. It is probably true that in the final analysis such a development depends both on the large firm and on the small ones. A feeling of insecurity, a lack of trust in the small firm, and a desire to be in command of their own affairs often lead large manufacturers to rely on their own facilities as much as they can and to subcontract out work only when they have no other alternative. Government policies and promotional measures may play a role in changing this attitude. In the long run, however, it is only if small firms improve their standards and win over the confidence of the large manufacturers that subcontracting will play fully the role in Thailand's industrial development that it deserves.

A key role in the above may be played by the Association of Thai Industries (ATI) and, possibly also by the Small Industries Association. Consideration might be given to the possibility of providing assistance and guidance to the Small Industries Association in efforts to promote subcontracting production of components and parts. The Association could play an important role in co-ordinating and identifying capabilities of their small-scale industry members in response to expressed needs by the large industry sector.

A study, financed by the World Bank, is presently being carried out by Professor Somchob Chaiyavej, Vice Rector, King Mongkut's Institute of Technology on the areas in the engineering industries sector which should first be selected for promotion. One aspect of the engineering industry sector's development is its suitability for subcontracting work. For



instance, a new diesel engine project is being promoted and four companies have submitted proposals. While the presently operating manufacturers of small diesel engines have a total number of about 50 subcontractors it is expected that the new project - diesel engines up to 2500 cc - will co-operate with approximately 100 subcontractors. A similar situation is envisaged in the case of a planned project for production of motorcycle engines. This development points to the necessity of availability of technical services for small industries (potential subcontractors) in the engineering sector, including services covering i.a. materials testing and utilization, quality control, plating and finishing, etc.

#### 4. Linkages between agriculture and industry

One of the specific tasks of DIP's Regional Industrial Promotion Centres, when formulating an industrial development programme both at provincial and regional level, will be to co-ordinate with NESDB and other authorities concerned in the development of agro-industry projects. Knowledge of raw materials and processing techniques is very important. One specific aspect which should be subject of attention at DIP's regional centres as well as in R and D work, is agro-waste utilization.

Thailand has demonstrated comparative advantage and international competitiveness in respect to a wide range of agro-industry products. In the future particular attention will continue to be given to possibilities of further processing of agricultural raw materials into higher value added products. Some examples are given in following paragraphs.

Tapioca is transformed into pellets and used for production of starch and as input for production of animal feed which in turn is exported. Among other potential areas for further processing of tapioca attention has focused on the production of ethanol (or ethyl alcohol).

Maize is at present exported in its crude form. Further processing would be for the production of starch and of maize oil. Only a small plant with a production capacity of 18,000 tons/year of starch has recently been set up in Thailand. The production of maize in the country is too small at present to permit any large-scale production of maize oil. If in a longer perspective

there should be established several maize starch plants in Thailand a raw material basis for large-scale maize oil production might eventually develop.

Another export crop which is planned to be introduced in the Northeast is cashew-nuts (as substitute to cassava). World demand of cashew-nuts is reported to be about 600,00 tons/year with currently only 300,000 tons available.

One specific area where technical assistance has been proposed by UNIDO is in the economic use of sugar industry waste by-products. The immediate objectives of the proposed assistance would be to review present practice and experience of sugar waste and by-products utilization and advise on further development with a view to saving energy, increasing employment and somewhat improving the very difficult economic situation of the sugar industry. A comprehensive report would be prepared containing recommendations, inter alia, on (i) technology issues concerning utilization of the cane sugar by-products viable in the country; (ii) specifically, marketing aspects of molasses-based products; and (iii) laboratory and pilot plant facilities for testing and carrying out R and D functions regarding molasses utilization.

An interesting example of R and D for agro-industrial and rural development is the work on agricultural and industrial utilization of peat soil. IISTR has been assigned the task of investigating the use of peat soils particularly in industry, as follow up on basic analytical work carried out by an EEC consultant to the Faculty of Environment and Resource Studies, Mahidol University, in December 1984. IISTR has indicated the need for short-term expert assistance from UNIDO in this connexion.

Attention should also be given to the possibilities of making the Thai food processing industry more effective, in particular in overcoming the negative effects of the seasonal period of production of e.g. fruits and vegetables. As this period is very short, the production of fruits and vegetables frequently very much exceeds the demand for fresh fruits and vegetables with the result that excess production often goes to waste in the absence of other markets or processing facilities. The problem is being addressed by the Government through efforts to modernize techniques to process high quality goods from fruits and vegetables grown locally, and by setting standards for the growing (and storage) of good quality agro-products for

local use and for export markets.<sup>1/</sup> The work of the Thai Industrial Standards Institute (TISI) in promoting the application of quality standards for food products is of great importance as complement to the work of DIP's extension services, as is that of the research institutions concerned, such as the Thailand Institute of Scientific and Technological Research (TISTR) and the Institute of Food Research and Product Development at Kasetsart University. It should be noted, for example, that one priority area for TISTR's R and D work is the development of small industry and rural/agro-industry technology.

Consideration should be given to the development of machines and processing plant equipment, i.e. with the aim at utilizing energy efficiently. The R and D work of TISTR and others in this field should be given priority support. Also the Metalworking and Machinery Industry Development Institute (MIDI) at DIP, now being established with Japanese bilateral assistance and planned to be ready by the end of 1987, will be expected to play an important role regarding this matter.<sup>2/</sup>

Attention should also be drawn to the possibilities of pesticides production, as outlined in the report<sup>3/</sup> of a UNIDO expert in pesticides manufacture technology provided under project UC/THA/83/116.

##### 5. Promotion of exports of manufactured products

A major target area for policy support is export-oriented manufacturing with particular attention to enhancing the prospective comparative advantages of potential exports in respect of:

---

<sup>1/</sup> A proposal is being prepared by DIP for UNIDO assistance in establishing training and demonstration programmes to be carried out in villages near food processing factories on improvement of food processing methods and quality standards and initiating of applied R and D activities, as follow up of recommendations by a food processing expert whose services were provided in May-July 1985 under project DP/THA/82/010 'Pilot Project for Industrial Expansion in the Northeast'.

<sup>2/</sup> Note also be taken of the work at the Agricultural Engineering Division of the Department of Agriculture, Ministry of Agriculture and Co-operatives, in the development and use of agricultural machinery (for which purpose UNDP/FAO assistance has been provided since 1980).

<sup>3/</sup> UNIDO/IO/R.141 of 17 December 1984.

- processing of raw materials into finished products, such as processed food, jewellery, furniture and other wood products, rubber products and leather products;
- industries which have moved from only import-substitution to exports, such as construction materials, textiles;
- industries specifically set-up for exports, i.e. electronic components, garments, etc.

Measures for furthering exports of manufactures which may be accorded particular attention (including consideration of possible required technical assistance inputs) would seem to be in the following areas.

(i) Market information

It is very important that information and market data in respect of existing and potential export markets is being collected systematically. The basic strategy would be to produce what the market wants. The existing marketing should be strengthened, e.g. by building up a Thai marketing network with trading firms. (Trading firms are getting BOI promotional privileges.) Marketing knowledge or intelligence would also be provided by buying agents.

(ii) Institutional mechanism

It will be of highest importance that a medium-term strategy is developed that mobilizes fully the potential of the manufactured goods export sector by fully utilizing the potentials, of both the indirect exporters (mostly small enterprises) the direct or final exporters (final-stage manufacturers or trading houses). The country must develop a complementary institutional mechanism for promoting exports. A set of strong, effective and efficient marketing support services and institutional arrangements is of great importance.

Thus, attention should be given to enhancement of marketing abilities as well as market intelligence. Effective use should be made of Commercial Attachees and the Thai Trade Centres overseas. The private sector organizations, e.g. the Chambers of Commerce, should be directly involved in particular in connexion with visits of importers, exhibitions, etc. The Export Development Committee would play a crucial role in initiating and co-ordinating various actions, while the Export Development Fund, with its

resources of about 40 million Baht per year, would provide continuous support for such activities.

One initiative worth mentioning is the close co-operation established between the Export Services Centre (ESC) of the Ministry of Commerce and the Small Industries Association, for instance, in connexion with trade exhibitions. A major exhibition of small industry export products, "Export Industry '85", was held in Bangkok in early November 1985. The Small Industries Association has, furthermore, a permanent showroom opposite of the ESC-building.

It is also very important to further pursue ways and means to disseminate the market information to producers more effectively. A major role would continue to be played by the Export Services Centre. The information on market potentials and requirements might be enlarged to include samples, where possible.

(iii) Incentives

Various export incentives and administrative arrangements have been introduced to facilitate the exporters' tasks (e.g. in terms of packing credits, letters of credit, simplified procedures, etc.) and some further instruments may still be called for such as an export credit insurance system.

Now, attention should be given to the needs of the producers of export items. In this the first priority would be to develop measures that will enable all producers (and traders) who generate export value added to compete with foreign competitors on an equal footing. The two critical elements in achieving that objective are (i) equal access to imported and locally produced intermediate inputs at internationally competitive prices and (ii) equal and speedy access to working capital for export financing.

The provision of basic export incentives for input-supplying indirect exporters are critical for achieving backward linkages from exporters. The establishment of special incentives for indirect exporters is a first step in achieving such linkages, e.g. through the domestic letter of credit system now being introduced by the Bank of Thailand.

Thailand has at present two systems for tax-free imports for exporters, namely, (i) a prior exemption system for duties, that exempts exporters from paying duties and indirect taxes on imports used in the production of exports on a case-by-case basis (by Customs Department) at the time of importation; and (ii) a duty drawback system that allows exporters to obtain refunds for the duties and indirect taxes they pay on imported inputs (either on case-by-case basis by Customs Department or according to a pre-set schedule by the Fiscal Policy Office. In addition, BOI also manages a prior exemption systems for firms it promotes with procedures much simpler and more convenient than those of the Customs Department. In principle, however, the privilege of using this system is granted only in the first year.

(iv) The bonded manufacturing factory system and export processing zones

The bonded manufacturing factory system allows companies engaged exclusively in manufacturing items for exports to avoid the Customs procedures and duty payments (and refunds) when they import inputs needed to manufacture products for export. As of October 1984, 36 companies had been granted bonded manufacturing factory status. The same conditions apply for companies established in export processing zones (EPZ). There is at present only one such zone, in Lat Krabang (about 40 km northeast of Bangkok) with at present seven factories operating (when fully utilized it will accommodate about 25 factories). Another EPZ is planned to be established at Laem Chabang (within the Eastern Seaboard Development Programme). Concern has been voiced as to the EPZs as means of promoting exports in view of the substantial investment in their establishment. Their further development merits a careful study as to their costs and benefits in terms of net foreign exchange earnings, employment, skill development, transfer of technology and market development and, if suitable, possibilities for integration with the local economy through partial sourcing of material inputs locally.

It has been indicated that during the Sixth Plan priority attention might be given to the development of the New Economic Zones within the Eastern Seaboard area and the Upper South region to become the doors towards international trade and contribute to an increase in the competitive status of exports - agricultural as well as manufactured.

(v) Technical support

There is a need for technical support to small and medium manufacturers of export products. A survey of small- and medium-scale export manufacturers in 1975 found that not only was the total export value of smaller firms high, but it exceeded that of the large-scale firms. The fact that small- and medium-scale manufacturers have been very active in exports is not, however, necessarily a reflection of a conducive environment. Rather, it demonstrates the existence of comparative advantages among small- and medium-scale producers that are strong enough to have outweighed the disadvantages they have faced in terms of basic incentives.

The prospective comparative advantages of these firms are often closely linked with the utilization of local materials or related process adaptation. Support in these endeavours might be of equal importance, in particular through the activities of research and development institutions (see below).

Within the context of ASEAN co-operation, a number of advisers have been or are being provided by the EEC, Australia and Japan to provide guidance regarding export potentials. On the Thai side, these advisory services are handled by the Department of Commercial Relations of the Ministry of Commerce working closely with the two ASEAN Trade Centres in Tokyo and Rotterdam. The product areas of attention include furniture, leather goods, jewellery and garments. In these advisory services special attention is being paid to improving quality control, design, packaging and marketing. It may also be mentioned that a major survey of Thai small and medium industry with export interest has recently been made by JETRO for the Department of Commercial Relations.

The Department of Industrial Promotion of Ministry of Industry would - often together with the industry's own associations - have a major role in providing technical assistance to producers and should in this co-operate with, among others, TISTR of the Ministry of Science, Technology and Energy, in particular in practical application of research results.

At the moment DIP is in a position to provide extension service support mainly to less specialized, often domestic market-oriented, industries. As

complement, in particular for the export industries, the services of university experts would be most useful. In practically all the universities special units have recently been set up to handle the provision of such consultancies and R and D services and a special university/industry co-operation programme is being promoted by the Ministry of Science, Technology and Energy, with particular attention to the needs of the small-scale industry.<sup>1/</sup>

As far as the engineering industries are concerned the new Metalworking and Machinery Industries Development Institute at DIP will be well placed to serve export industries. A substantial strengthening of the Textile Industry Division of DIP and the planned Textile Unit would give that sector a similar base.

Of great potential importance in the context of both exports and rural employment is the further development of the Thai silk industry. Sericulture and silk production has been traditionally practised in the Northeast and North of Thailand. It provides direct employment to about one million farmers and indirect employment to another half a million people, including those self-employed in the silk weaving and connected processes. Following recommendations of a UNIDO mission report, "Silk industry development in Thailand" (SI/THA/78/801), plans for the establishment of a silk industry development centre at DIP's Northeastern Industrial Promotion Centre at Khon Kaen are underway and UNIDO assistance is being sought by DIP for the elaboration of a concrete institutional proposal with the aim at

- (i) developing the integrated Thai silk industry in every sector from sericulture, silk reeling and silk weaving to meet the export demand,
- (ii) increasing the villagers' income in the rural area,
- (iii) improving the standards and quality of Thai silk products and
- (iv) strengthening the existing silk promotion organizational set up.

---

<sup>1/</sup> Ref. discussion paper presented by Narong Kattana, Director, Technology Transfer Centre, MOSTE, at the UNIDO Workshop on Technological Services Delivery System, Vienna, December 1985.



Specialized extension service and development centres for food, plastics<sup>1/</sup> and chemicals industry might also be called for. [In other areas the DIP work, through in particular the Industrial Services Division in Bangkok and the Chiang Mai Centre, has provided a significant base for the extension service and development work, e.g. in the case of the wood working<sup>2/</sup> and ceramics industries.] For instance, there is a lack of links between R and D on the one side and commercial exports on the other in the food area in the, so called, health food sector, including fruit juices etc.

Packaging plays a prominent role for the end-products exported. The price obtained for the product may be crucially affected by absence of proper and efficient packaging. A strengthening of DIP's capabilities in providing advice and guidance in this field is envisaged. Active R and D work in packaging, in particular for the food processing industry, is carried out by TISTR.<sup>3/</sup>

(vi) Testing and quality standards

A major issue regarding exports of manufactures concerns the matter of producing products of required quality and consistency. The Thai Industrial Standards Institute (TISI) of Ministry of Industry is giving high attention in both its standards preparation work and its certification work to the need of ensuring that the country's export industries are given the required support.

- 
- 1/ Consideration has been given (especially in connexion with envisaged down-stream petrochemical industry development) to the establishment, possibly as Government/private sector entity, of a 'Plastics Industries Development Centre' with the tasks of collecting and disseminating technical information to the industry, setting up quality control, promoting standardization and identifying new applications and markets (recognizing that in the immediate future the main potentials are still at the domestic market, such as applications of plastics in agriculture, in the construction industry, in the packaging of foodstuffs, etc.) Ref. "Industrial restructuring in Thailand - Some observations on the plastics industry", UNIDO/IS/R.8.
  - 2/ Extension and technical services to the wood-working industry are also provided by the Forest Industry Organization under the Ministry of Agriculture and Co-operation, i.a. on matters concerning kiln drying, wood preservation, plywood and veneer manufacturing.
  - 3/ An example of assistance in this area is a current study and research project at TISTR and Kasetsart University under Australian aid, on fruit packaging, preservation and marketing.

One area that needs to be improved is that of testing facilities. TISI does not have any testing facilities of their own (except for mobile testing units) but relies on some 46 testing laboratories in public institutions (like TISTR) throughout Bangkok. Major problems and bottlenecks are being met with in this connexion often resulting in very long delays in the certifications system. One way to alleviate this situation which has been suggested i.e. by RESCOM, is the establishment of private testing laboratories. TISI is presently working on an amendment of its act so that the Minister of Industry can accredit private laboratories for certification testing.<sup>1/</sup> It is proposed that a feasibility study or programme be drawn up for the promotion of the establishment of such private laboratories. The study should not only be a 'market survey' but also cover the laboratory facilities needed (and the potential capability). The study should be comprehensive and provide the basis for a national testing network.

One area where standards testing will be much required is in the automotive industry in a further development towards more and more parts and components manufacturing (in particular if it is a question of fulfilling stringent local content conditions). TISI, in co-operation with TISTR has suggested to the Automotive Assemblers Association and the Automotive Parts Manufacturers Association that they co-operate on this matter, firstly by making an inventory of existing testing facilities, secondly by advising on what facilities are lacking, thirdly, if possible, by going together in a pool and establish a testing network of existing facilities and, fourthly, by setting up those which were lacking. TISI would then be able to provide required guidance for the testing work. In the meantime, TISI would speed up the setting of standards for automotive components parts. There is in the auto industry in all a need for about 165 standards relevant for Thailand [whereof 16 are already published by TISI, 40 are now in TISI committees, another 40 are in TISI's plan for next 3 years, while the remaining 60-70 are, so called, company standards].

Expert assistance is required by TISI for the standards preparation, i.e. specialists in agricultural machinery, electronics and electrical products and

---

<sup>1/</sup> The Certification Committee of TISI has drafted guidelines on this and wished urgently expert advise on them. It was suggested the matter might be pursued under SIS.

automotive products. Also equipment for electrical laboratory is sought through technical co-operation.

Of crucial importance to the possibilities of building up a strong food industry export sector would be the building up of the quality and hygienic standards of production by the many small and medium industries (e.g. fruit and vegetable processing, rice noodles, oils and fats, fish and fish meal, milk products). The certification offices for food industry of TISI are paying particular attention to the sanitary conditions when inspecting food factories. Canned pineapples have compulsory export standards. Other products have voluntary standards, e.g. vinegar sauce, fish sauce, vegetable oil, chilli sauce, instant noodles, sardines and honey. Assistance is needed in the surveying of factories and analysis of data on basis of which seminars may be held to inform the factories.

(vii) Private sector support activities

It has been pointed out that one of the important weaknesses of existing private sector institutions is the general absence of exporters' associations (with a few exceptions, like the Thai Garment Manufacturers Association), that speak on the specific problems and interests of exporters of manufactures. In particular, small-scale producers/exporters find it difficult to build up such institutions, for lack of financial, legal and personnel resources. The Government may therefore take the lead in supporting such an institutional build up. Suggestions have been made also of the formation of technical advisory committees to work with the exporters associations in the respective branches. These technical advisory committees might help the Export Development Committee in examining the problems affecting their respective export areas.

It might also be noted that, at a high level public/private sector seminar held on 12 January 1986, it was proposed that a "Board of Export" be established with authority similar to the BOI and chaired by the Prime Minister. It would replace the Export Development Committee which had been found to lack the necessary authority to co-ordinate the work of agencies and promote exports.

6. Technology, research and development

While Thailand now has relatively good manufacturing capacities, it is seriously lacking in technological capabilities. The development of technological capabilities must be built into the industrial growth process, if the country's industrial development is to become a self-sustained process. Hitherto, Thailand has invested very little in building up technology capacity; technology has only been bought. International assistance would be needed to bring in a new technology awareness or knowledge to Thailand in order to foster its technological build-up with fullest openness to international trends and impulses.

High level policy advice may also be sought in connexion with the tasks of the Ministry of Science, Technology and Energy in establishing a dynamic technology planning instrument. A UNESCO-executed project, THA/81/T01, "Improved Planning and Delivery Capabilities in the Ministry of Science, Technology and Energy" has addressed this matter mainly from the point of view of a legal framework.

The Human Resources Institute of Thammasat University, in co-operation with the Ministry of Science, Technology and Energy, is presently carrying out a manpower planning study which includes analysis of the present structure and the number of scientists and technicians who are working in various fields in the public sector as well as the potential future demand - based on simple trend estimates - and the adoption of a structure conducive to the national economic development. A point in case are Thailand's projects in the energy intensive industries, such as petro-chemicals, fertilizers, gas separation plants especially in the Eastern Seaboard, which relate to concrete developments since only some 3-4 years. The shortage of specific skills for such projects is very self-evident. The advanced technology is imported but human resources must increasingly be found domestically.<sup>1/</sup>

There is at the same time a need to create an environment conducive to technical innovation by young people with degrees. There are lots of highly

---

<sup>1/</sup> Chira Hongladarom, Executive Director, Human Resources Institute, Thammasat University, in "Human Resources Development - Its Technological Dimension" (mimeo), October 1985.

trained people in many areas, but they are often not being used well. Graduate engineers are in great demand, but too many of them, hired on good pay by the foreign companies, are used for jobs which would really only need mechanical instructors or the like.

(i) Research and development

An effective catching up on the technology scene towards competitive international levels can, however, only be done selectively and the matter is currently under intensive discussion on that basis. A systematic approach to it was initiated in April 1985 when the Minister of Industry issued an announcement requiring all manufacturing projects with investment exceeding 100 million baht, or BOI-promoted firms, to set up R and D centres and inform the Ministry of Industry by January 1986 of the progress made. A conference to discuss the matter was organized by the Industrial Works Department of Ministry of Industry and the Chulalongkorn University in October 1985.<sup>1/</sup> The conference discussed sets of guidelines for the manufacturing companies to follow when establishing R and D programmes with the aim to boost local industries' capacity to further develop use of local raw materials, processes and products. The R and D centres will also enhance the firms' decision-making capability in purchasing foreign technologies. In particular, attention was paid to the creation of a widened awareness of the potentials of new technologies now emerging.

It is envisaged that the Thailand Institute of Scientific and Technological Research (TISTR) should assume the role of a national R and D centre (not a 'research company'). It should contribute to increase the country's technical capabilities and technological self-reliance; it being conceived that these R and D activities would be directed towards the handling of technological problems concerning production. Accordingly, consideration may be given to three objectives for the country's R and D:

- to improve quality of existing products;
- to produce the products cheaper; and
- to make different products or widen the product range.

---

<sup>1/</sup> An earlier conference was organized in March 1985 on the subject of bio-technology.

A key question is how to get R and D into the production, into industry.

TISTR's R and D projects involve a full circle of activities:

- Identification of market prospects for the R and D project and its contribution to closing the technology gap as well as its potential for achieving specific economic objectives;
- Once the R and D project is identified, some searching research or a 'state-of-the-art' study is carried out, coupled with investigation of some new aspects to adjust to Thailand's conditions;
- Next step comprises the real development work with the objective(s) to ensure top quality of existing products, and the cheapest possible way to produce them and/or the development of new products;
- Then comes the engineering portion of the R and D project circle. This is considered the weak link in TISTR. The engineering capabilities to develop and design plant equipment are not good. Success in laboratory is one thing, success in industry is something else. The concept of the pilot plant is important. At this stage TISTR would be trying, if possible, to get together with an interested industry;
- The last step is the transfer of the R and D to the industry: "This is the product and this is the required plant". Now, (if not before) the investors are to be convinced.

Possible international assistance to TISTR's R and D work during the next 2-3 years might concern its overall R and D project management, the development stage, in particular the development of some new products etc. and, above all, the engineering stage. A creation of a core of engineers, design engineers, etc. is needed at TISTR. As a stop gap measure, reliance could be given to a network of the universities' engineering resource persons until TISTR got enough volume. Requirements of possible UNIDO technical assistance have in this connexion been indicated in the first hand for the purpose of:

- a strengthening of the R and D capabilities of TISTR through active project management, including project design, project implementation, project control and monitoring system; and
- a strengthening of TISTR's engineering design capabilities (a team of 3-5 engineering experts is required to work with TISTR staff and to help transfer or implement R and D projects to industrial application).

Closely linked with TISTR, which may be considered as the main arm for implementing a policy of strengthening of the research and development activities as means of building up the country's technological capability, the Ministry of Science, Technology and Energy is also developing a special

institutional framework for R and D in some selected strategic areas, namely, biotechnology - with the National Centre for Genetic Engineering and Biotechnology established in September 1983<sup>1/</sup> -, electronics - the establishment of an Applied Electronics Centre is being planned<sup>2/</sup> - and metallurgy - the establishment of a National Centre for Metal and Material Technology as expansion of the present TISTR facilities is being planned.<sup>3/</sup> The possible provision of external assistance in these endeavours will be of crucial importance.

Some fields where Thailand may have comparative advantages, which have been discussed, as calling for R and D by TISTR (or any other suitable institutions) include:

---

1/ In the field of biotechnology the programme of action for the next 5-years of the National Centre for Genetic Engineering and Biotechnology covers R and D in specific areas, such as industrial applications (production of selected enzymes and pharmaceutical applications; biotransformation of starch; production of selected nutritional biochemicals) agricultural applications (incl. development of natural rubber products for selected industrial use) and energy and environmental applications (including production of ethanol and other biofuels from agricultural products; production of biogas from agro-industrial waste; and feasibility study for pollution control through ultrafiltration techniques and utilization of waste concentrates). Special emphasis will be placed on building up a national infrastructure of genetic engineering and biotechnology capabilities in both public and private institutions (including TISTR).

A proposal for UNIDO assistance in fermentation ethanol production for use as fuel has been prepared by TISTR (October 1985), against following background: In order to realise the technical feasibility of the fuel ethanol programme TISTR has successfully carried out pilot plant research to develop the technology of producing fuel ethanol from starch material, in co-operation with the Japanese Association of Industrial Fermentation. The proposed UNIDO assistance would involve the provision of short-term consultancy on the economics of the fuel ethanol programme including the potentials for an industrial scale anhydrous ethanol plant to be set up in Thailand.

2/ In close collaboration with universities, i.e. the King Mongkut Institute of Technology.

3/ Furthermore, an initiative of the Office of Basic Industry Development of Ministry of Industry for the establishment of a Metal Research and Development Centre has recently been taken. This Centre would focus on the application of steel (current production in Thailand: 1 million tons/year) to widen the product range and types of steel.

It might also be noted that the Faculty of Engineering at Chulalongkorn University carries out metal research for industry in semi-finished metals, welding metals etc. and provides a quality control service.

- rubber technology, especially in the context of special rubber products
- identification of tin-linked alloys and uses for them (in domestic industry and for exports)
- hard ceramics for auto-parts or electrical components; also crockery or tableware
- use of the very good Thai glass sand for cut crystal glass industry
- instrumentation (combined with glass blowing)
- development of prefabricated light weight building components and of insulating materials, for instance, from rice-husk (e.g. on basis of Japanese and Federal Republic of Germany research experience).<sup>1/</sup>
- Carbon fibres and other plastic materials.

With the objective to promote the utilization of Thailand's resources of medicinal and aromatic plants, thereby enhancing self-reliance in the field of pharmaceuticals while at the same time providing income to agriculture producers of the plant material, assistance has been provided by UNIDO (DP/THA/82/006) to TISTR in the production of pharmaceuticals from the Thai traditional pharmacopoeia, including the development of production technology at pilot scale of selected products.<sup>2/</sup>

One particular area which is expected to be subject of increased attention is that of the environmental factors in industrial development. The Industrial Environment Division of the Industrial Works Department of the Ministry of Industry may initiate R and D towards non-polluting processes, effective waste utilization etc.<sup>3/</sup>

---

<sup>1/</sup> A proposal for UNIDO assistance in the establishment of a prefabricated component pilot plant has been prepared by the Building Technology Department of TISTR.

<sup>2/</sup> Within another technical co-operation project (DP/THA/84/005) UNIDO is providing short-term assistance to the Government Pharmaceutical Organization (GPO) of the Ministry of Public Health in the development of a maintenance programme for existing pharmaceutical equipment.

<sup>3/</sup> A proposal for UNIDO assistance in the conservation of natural water resources and industrial waste waters by biological method has been prepared by TISTR (October 1985).



It should in this connexion also be noted that advisory services for environmental pollution control for the Eastern Seaboard Development Programme are being provided by UNIDO (under project DP/THA/84/009), with the objective of assisting IEAT in organizing, directing and monitoring the preparation of a comprehensive environmental pollution control masterplan and first phase detailed engineering designs for the industrial complexes and port areas of Map Ta Phut and Laem Chabang. In developing the programme IEAT is collaborating with the Eastern Seaboard Office and the National Environment Board.

Within the Ministry of Science, Technology and Energy the National Energy Administration (NEA) is responsible for energy planning and programming. The Fifth Plan 1982-86 listed a number of measures aimed at mitigating the constraints on the Thai economy of heavy reliance on imported energy. A series of investigative and other measures have been undertaken, inter alia, under the UNIDO assistance project DP/THA/80/016, Energy Saving Scheme which was completed in March 1982. The recommendations emanating from the project included the establishment of a national energy management centre<sup>1/</sup> as well as providing basic linkages to the outputs of three major projects now under executions with AsDB,<sup>2/</sup> World Bank and JICA assistance. Assistance through the Canadian CIDA is also under consideration.

(ii) Transfer of technology

During the Sixth Plan period special attention is expected to be given to the development of a system and mechanism to improve the negotiating capabilities of the Government and private sector in the acquisition of technology which may involve the introduction of a specific legislation on this matter and the creation of a technology transfer regulatory body.

Intra-ASEAN co-operation is taking place for the establishment of an ASEAN Technology Transfer Information System, on the basis of a network of

---

<sup>1/</sup> A proposal for UNIDO assistance to NEA in the establishment of an Energy Conservation Centre is presently under consideration.

<sup>2/</sup> An energy conservation credit line of AsDB with IFCT of US \$50 million is under consideration for the purpose of making subloans to industrial enterprises for productive and energy conservation purposes.

information centres aimed principally at strengthening the service capacity in the selection and acquisition of the technology. ASEAN/COIME is receiving assistance from UNDP/UNIDO in the establishment of a basic infrastructure for such an ASEAN System (DP/RAS/85/024). The Ministry of Industry (Office of the Permanent Secretary) has been designated the focal point for Thailand, in order to co-ordinate between all Thai entities concerned the collection of available information required for this exchange mechanism.

The Ministry of Science, Technology and Energy established in 1983 a Centre for Transfer of Technology. This Centre has as yet been concentrating on obtaining and analysing information regarding transfer of technology opportunities, and is closely co-ordinating with the Ministry of Industry for the ASEAN exchange mechanism. One task of the Centre will be to provide organizational support for the university/industry co-operation programme referred to earlier.

The results of a survey covering some 80 Board of Investment-promoted joint ventures between OECD-country companies and local investors, presented at a seminar in Bangkok in late September 1985, disclosed many aspects which gave reason to concern. For example, often joint venture firms were not permitted to adjust product designs and no R and D was allowed. They were often not permitted to export or were restricted in their exports to certain areas. The results of this survey underline the importance of a more active government role in assisting local investors in technology transfer, in particular when it concerns joint ventures.

SELECTED REFERENCES

- Industrial Development Review Series - Thailand, UNIDO/IS.548, 7 August 1985.
- Annual Economic Report 1984, Bank of Thailand.
- Monthly Bulletin, latest issue, Bank of Thailand.
- Overview - Eastern Seaboard Development Programme, Office of the Eastern Seaboard Development Committee, NESDB, November 1985.
- The Needs of Small-scale Industries for Managerial and Technological Services in Thailand, prepared by the Research Institute for Management Science (RVB), Delft, for Department of Industrial Promotion, Ministry of Industry, May 1985.
- Study on the Development Project of Laem Chabang Coastal Area, prepared by Japan International Co-operation Agency for IEAT, February 1985.
- Sub-regional Development Study of the Upper-southern Part of Thailand, prepared by Japan International Co-operation Agency for NESDB, December 1984.
- Study on Large Scale Industrial Investments in Thailand, prepared by the Consultants for Trade and Industry AB, Asian Engineering Consultants Corp. Ltd., NIDA and Louis Berger International Inc. for NESDB, October 1984.
- Thailand's Manufactured Exports: Key Issues and Policy Options, World Bank, 1985.
- Thailand - Managing Public Resources for Structural Adjustment, World Bank, June 1984.
- Rural Off-farm Employment in Thailand, by Narongchai Akrasanee and Associates, September 1983.
- Eastern Seaboard: Industrial Opportunities Identification Study, prepared by Coopers and Lybrand Associates for NESDB, June 1982.
- Engineering Industries in Thailand - Seminar on Industrial Restructuring by the RESCOM Secretariat and UNIDO, 5-6 November 1984, UNIDO/IS/R.14.
- Industrial Restructuring in Thailand - Seminar organized by the RESCOM Secretariat and UNIDO, 22-23 October 1983, UNIDO/IS/R.13.
- The Fifth National Economic and Social Development Plan (1982-86), NESDB, October 1981.
- 21st Compendium of Development Assistance to Thailand 1984, prepared by UNDP, Bangkok.
- IFCT Annual Report 1984.
- TISTR Research News 1983-84.
- Industrial Directory 1982/83, The Association of Thai Industries.