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Promotional Approaches and Schemes
of Local Industry Co-operation
- with Special Reference to the
Engineering/Metalworking Field-

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1. Approaches and Schemes of Co-operation
Relating to Small and Medium Industry in General

a) General Remarks on the Importance of Local Small and
Medium Industry

A major general objective of development efforts is to increase the standard of living in non-metropolitan areas so that a contribution to reduce the income differential between metropolitan and provincial regions be achieved and the migration pressure to the capitals of developing countries be reduced. The major thrust of development efforts in this context is traditionally geared towards agricultural development in rural areas. When realizing that this approach for itself is many times insufficient to achieve the envisaged goals integrated regional development concepts were developed and put into practice. In various cases however, these concepts were only successful and feasible as long as supported through external funding for setting up infrastructural and service facilities. The reason for these shortcomings often relate to an insufficient recognition of the need to increase local value added, apart from activities in primary agricultural production. A considerable potential, often unsatisfactorily analyzed or promoted, lies in the field of local secondary production activities or production-related service establishments, such as elaboration of agricultural products in agro-industries, production of agricultural implements or fishing boats or service facilities for the primary production field (e.g. silos for grain storage, ice production for fish conservation, cold stores, maintenance and repair of machinery and equipment for primary production activities). In many cases there exist strong dependencies of small primary entrepreneurs for these services on external agents, generally those who also undertake the marketing of local production in consumer centers. As a result of such dependencies income concentration can be observed which counteracts the efforts

of development agencies to arrive at a more equal distribution of income through local value added.

The major constraint for such a situation normally can be identified as an atomistic production organization (i.e. in small family units) lacking associative or co-operative structures. An individualistic production organization for itself can be regarded as a socio-cultural and socio-economic sound and attractive form of organization if the external relations can be transferred from dependency to business partnership. This requires a strengthening of the associative and co-operative structures with self-help character of the local production sector.

b) Promotion and Expansion of Industrial Activities through Local Industry Co-operation

The increasing role of small-scale industries and the growing utilization of their dynamism is largely dependent on the degree of economic and - above all - inter-industry linkages in the country concerned. The development of industrial linkages in manufacturing in turn obviously presupposes a sizeable industrial production structure and an awareness in decision making of costs and benefits of a division of labour within the industrial sector. This implies that industrial linkages; in general and between small and large industries in particular are easier to achieve in developed economies than in developing economies. Competition in the industrialized countries has forced industries to purchase production inputs at lowest possible cost so that the competitiveness of the end product would not suffer. This has led to the establishment of supply industries which concentrate their efforts on specific products and improve their quality and performance above average through research and product development.

The following review of basic features required for establishing such linkages at the macro and micro economic level

may illustrate this point and at the same time pinpoint the policies required for achieving an increasing linkage in developing countries.

A fundamental prerequisite for establishing inter-industry linkages are well functioning physical infrastructural conditions, both in terms of telecommunications and transport facilities for the delivery of goods. The importance of close communications for subcontracting can be shown by the fact that according to a survey in the Federal Republic of Germany approximately 50 per cent of all engineering industry subcontracting activities were within 50 km distance from the purchasing companies.

While subcontracting linkages basically develop as a part of a market-induced development process, as can be observed in Europe, the establishment of linkages can be accelerated to a large extent through special governmental promotional measures. The experiences of several developing countries such as the Republic of Korea, Brazil, Venezuela and Mexico indicate that promotional policies can be of key importance to encouraging the establishment of linkages. Purchasing policy of government agencies and contributions to joint (small- and large-scale industry) research and development projects are common measures.

Besides such specific policies also the design of general macro economic policies such as customs, tax and industrial policies play an important role for establishment of inter-industrial linkages. Reduction of customs duties for raw material imports and increase of duties on parts and components are common policies. The abolition of cumulative sales taxes and introduction of value added tax is another example of incentives for domestic subcontracting.

It is the awareness of the benefits of specialization and of its cost-reducing effects among entrepreneurs coupled with possibilities of resources mobilization and of risk sharing in research and development, that has largely generated the

growth of the small industries as dynamic parts of a network of industrial companies.

In this connexion it can be mentioned that engineering creativity of employees in a large company has generally been an important source of the creation of new "spin-off" small-scale enterprises in the industrialized countries. In many cases these new companies remain in subcontracting business relations with the former employing company. In recent years this is especially the case for newly founded small enterprises in the electronics hardware and software area. Also in developing countries these tendencies are noticeable.

c) Support Efforts Required

Fostering the development of small and medium sized industry and specifically the development of inter-industrial linkages will require a spectrum of policy measures as the experience of a number of countries shows. These policy measures should include the following crucial areas:

- creation of appropriate business environment
- protection (yet, not over-protection) of small enterprises vis-à-vis financially stronger economic agents
- access to short, medium and long term credit schemes (in many countries, large industry has better and easier access to external bank financing)
- sales market enlargement, e.g. through government procurement policies and business potential surveys
- promotion of inter-industrial linkages, especially
 - fiscal incentives (instead of tax barriers) for subcontracting and complementation

- incentives to large industry to subcontract (tax incentives, deductability of subcontracting planning and technical assistance cost, financing schemes for subcontracting and complementation business etc.)
- investment incentives
- establishment of a legal framework for subcontracting and complementation
- industrial land and building facilities
- training facilities for key administrative and technical personnel.

The enlargement of policy measures to foster inter-industrial linkages will consequently lead to a more diversified industrial production structure. Each country will have to assess its own achievements in this respect and review its programmes and institutional framework. Once these foundations are laid the subsequent promotion of small industry in high technology areas will contribute to achieve the objectives of modernizing and restructuring industry.

Apart from a basic legal framework with the characteristics lined out an organizational framework of public support agencies, namely in the areas of business development, access to credit, access to technology and development of production know-how, should be set up jointly with privately operated business associations and co-operation organizations. In the era of rapid technological change the framework of support entities will have to concentrate in the future to a greater extent as so far on the development of human resources. Reference to this aspect is made in paragraph III a).

d) Support for such Efforts through Industry Associations and other Organizational Arrangements by the Industries Themselves

The promotion of associations and self-help organizations represents an important measure in the area of small and medium industry development. Support to the creation and operation

of such industry sector associations and self-help organizations is therefore recommended. Such institutions may be independent and supported by industry and/or by Government. Besides industry-oriented objectives they might also take up functions of interest as representatives of small industry or specific sectors vis-à-vis policy making and other economic agents. Examples of their active contributions to strengthen the position of small industry can be taken from various industrialized countries and, among the Asian developing countries, from the Republic of Korea. Measures to promote associations for small and medium industries may include the following topics:

- Government agencies responsible for small-scale enterprises trade and business co-operatives and associations in developing countries should review and consider the new forms of associations and their benefits.
- The forming of groups of companies, associations and/or co-operatives for mutual benefits should be promoted among private sector entities. In forming private groups, executive officers should be selected who have a great knowledge of the companies and persons in the industrial area, have good contact with local government and a broad knowledge of supplier services in the area.
- Forms of co-operation which strengthen the potential of small-scale industries to jointly participate in tender leading to subcontracting business.
- Establishment of government procedures which enable groups of small-scale industries to participate in public tenders.
- Assistance of associations to member small-scale industries to simplify bureaucratic procedures and obtain business advantages, e.g. in purchasing, banking, transport and services.

Small-scale industry in most countries are confronted with the same set of problems, i.e. acquiring access to growing and changing markets, keeping pace with technology development and handling increasingly complex accounting and financing systems and managerial tasks. The key issues for small-scale industry co-operation, therefore, can be listed as follows:

- promotion of contracts with large industries (subcontracting exchanges; small-scale industries with supplementary production entering in joint contracts with large industry etc.)
- marketing activities (including the collection and dissemination of marketing information, participation in trade fairs, export marketing, etc.)
- R and D
- administrative services (accounting, tax administration, auditing, etc.)
- co-operation with financial institutes in the context of special small-scale industry credit schemes
- operation of small-scale industry technical service institutes (testing, quality control certification) or guidance to and co-operation with public or semi-public technical service institutes
- up-grading management and technical skills.

e) Small-scale industry co-operation in a developed economy - an example from Sweden

The experience of the Fosieby Group of Entrepreneurs in Malmö, Sweden, as a "self-help" organization created by small- and

medium industries in a specific geographical area, may prove useful for those involved in small-scale industries in developing countries - even if the Group operates in a highly industrialized country. The Fosieby Group does not rely on Government funds (members pay a modest subscription fee) and its activities require only a minimum of staff and overhead costs; this by itself is an interesting point for entrepreneurs in developing countries where finance and skilled staff are generally in short supply.

The board governing the Group is elected by all members, and consists of high-level executives of various member companies who have a good overview of developments within the member companies and also have built up close contacts with government officials, outside enterprises, etc. Staff requirements are kept at a minimum by organizing working groups composed of company representatives to deal with specific tasks. Administrative support is hired or provided by the companies, whenever the need arises. For special problems (e.g. computerization of the production process) consultants are hired; support from the local government and research establishment is available for such activities.

The Fosieby Group has served as an example for other entrepreneurs in Sweden. Small- and medium-scale industry co-operation in specific locational areas has become common, and is stimulated by a national federation which also co-ordinates information exchange between members.

The experience of these local small and medium industry co-operation "groups" in Sweden shows that:

- close physical proximity is essential if entrepreneurs are to co-operate intensively. Even in a country like Sweden, with its extensive (tele)communication systems, over 90 per cent of industries belonging to a co-operation "group" are located in the same town; (the Fosieby Group, for instance, includes in its membership only

companies located in that particular industrial areas which is part of the "greater Malmö" town area)

- there is an upper limit to the number of companies in a "group" (in Sweden, the great majority of "groups" have less than 100 members)
- "groups", when formed, should focus attention on specific purposes. Successful activities of the Fosieby Group include services sharing (and providing services to local residents, many of whom work for member companies), bulk buying of supplies, training and information, marketing and co-operation in joint subcontracting arrangements with large enterprises, and joint actions to ensure government support in various instance. Other fields could be e.g. co-operation in organizing the sharing of service personnel for specific tasks, such as tax accounting and data storing, etc.

f) Co-operation among small-scale industry - an example of a UNIDO-project in Peru

In Peru UNIDO applies a new scheme of local small-scale industry development in the city of Villa El Salvador, a "young township" in the Lima metropolitan area where migrants from all over Peru have settled in the last two decades. Today, Villa El Salvador is a well organized township of approx. 300.000 people.

In this township exist approx. 700 cottage and small-scale production and repair enterprises. Major branches are garment manufacturing (approx. 150 enterprises), wood working (approx. 90), auto and truck repair (approx. 40), handicrafts (approx. 50), food production (approx. 30), shoe making (approx. 20) and foundries (approx. 15). Their major acute bottlenecks are availability of industrial land (the enterprises operate in the residential area) and electricity

supply (in the residential area only monophasic electricity supply exists).

The major part of the enterprises has formed an association with the major objective to obtain access to a nearby and almost completely developed industrial zone which had been planned for settlement of large scale industry. Through UNIDO assistance programme jointly to government agencies and to the association of entrepreneurs a revision of use of the industrial zone has been agreed upon, and UNIDO will support the small-scale enterprises in relocating on the industrial zone. The entrepreneurs have decided to form within their association sub-structures by branches of activities and to undertake common investment in specific machinery and equipment so that greater use can be made of the required investment. For this purpose, they are at present in the process of forming joint ventures per branch to realize the investment and to operate common production facilities. These are for example, an electric furnace and a moulding machine for the foundry branch, motor testing and wheel balancing equipment as well as paint cabin for the auto and truck repair, modern machine-tools for metal working, specialized machines for shoe making, water treatment plant, process steam generation and cold store for food industry etc. In other cases, joint purchasing (e.g. garment manufacturers) or marketing (e.g. handicrafts) are planned to be established. For the use of the production service facilities specific charge out rates will be fixed which will be billed to the participating enterprises on a monthly basis. Furthermore, common training facilities and technology information centres as well as a central drafting and construction unit are planned.

The entrepreneurs remain independent in the operation of their own enterprises receiving management support and financial analysis (bankable documents) from an agency to be set up with government assistance.

The approach has developed so promising that a similar program is to be planned by UNIDO in Colombia.

2. Approaches and Schemes of Co-operation in Support of Activities in the Engineering /Metalworking Industry Field

a) Forms of Inter-industrial Linkages

Among the various linkages between small- and large-scale engineering industries, subcontracting is by far the most important form of co-operation. Complementation, maintenance and repair services for equipment and sales dealerships with partial assembly or repair services are also relatively common types of co-operation. Franchising should also be mentioned even though it plays a reduced role for the engineering industries.

(i) Subcontracting

The term subcontracting usually encompasses two distinct forms: industrial and commercial subcontracting. Industrial subcontracting is a contractual arrangement between a primary company (purchasing company) and a secondary company (subcontracted company) for

- the supply by the subcontracted company on order from the purchasing company, of parts, components, sub-assembly and assemblies that are then incorporated in a product sold by the primary company; or
- the processing of materials for the primary company - whether the materials are provided by it or not - and the processing or finishing of parts provided by and returned to the primary company.

Commercial subcontracting relates to the production of finished products for a company which is not engaged in manufacturing but in sales (e.g. department store chains, dealers). Both forms of subcontracting exist both on the na-

tional and the international level. International subcontracting is mostly made in the form of commercial subcontracting.

A further distinction can be made between purchasing-, supply- und task-oriented subcontracting. Purchasing-oriented subcontracting entails the manufacturing of specialized parts and components produced according to an order by the purchaser; usually these parts or components are not generally tradeable as they are to be subject to further processing or assembly operations. The subcontracted company thus depends strongly on the purchasing company.

Supply-oriented subcontracting refers to the manufacturing of parts or components which were identified as market opportunities by the producer or are usually sold to several clients as they can be used in various end products. This type of subcontracting is relatively common in the automotive, electrical and electronics industry.

Task-oriented subcontracting means that the subcontracted and the purchasing company jointly develop and produce new parts, components and end products. This form implies a high research and development capability of the subcontracted company offering an attraction for the purchasing company.

(ii) Complementation

Complementation implies that the products manufactured in one (small specialized) company are complementary to the production in another company. Typical complementation is the production of standardized products such as bolts, screws or electronics passive and active components. These products are all marketable by themselves which is the major distinction to subcontracting. However, in specific cases a distinction between complementation and subcontracting can be difficult, e.g. in the case of development and production of special bolts, fastening devices or electronic components which were

originally conceived for one purchaser but which in the course of production become generally marketable items, eventually with own standards. A subcontracting scheme thus can develop into a complementation scheme, and the product can change from a non-tradeable to a generally tradeable item.

(iii) Maintenance and repair services

In industrialized countries the number of small-scale enterprises specialized in equipment maintenance and repair under service agreements is expanding. The service agreements are either concluded with the equipment producer or with the equipment user. In the first case regionally exclusive service rights are normally granted to the service company which most likely specializes on a certain type of equipment regardless of the producer.

In developing countries maintenance and repair services under contractual agreements are generally still in their initial stage. Their future potential will depend on the awareness of the equipment user of the advantages and cost reductions resulting out of well maintained production and auxiliary equipment through specialized services. Such awareness is usually directly related to the level of technology of the equipment; the more advanced the equipment, the greater is the awareness of the prospective benefits of preventive maintenance.

b) Plant Modernization, Capacity Utilization and Technical Service Schemes

In an era of rapid technological change the necessary new investment leading generally to lower production cost of newly installed machinery and equipment the modernization of production equipment and machinery poses severe problems to small scale industry: on the one hand, the production cost reduction through new invest:

ments is a fundamental requirement to the small business for survival in a more and more competitive market. On the other hand, very often the restraints encountered by the small entrepreneurs make an investment difficult and risky. The difficulty lies mainly in access to external financing, while the risks are concentrated in judgement of technological choices and appropriateness of technology.

The generally poor access to technological information of small entrepreneurs is one of the basic factors for them to be unable to determine which type of equipment is the most appropriate for their investment and modernization plan. Furthermore, in many cases new equipment has a much higher production capacity than their requirements. A possible solution in these cases can be a jointed investment undertaking by a group of entrepreneurs of the same branch (cf. the example of Peru in para If) in form of a new jointly owned company operating as a production support facility to each one of them or the installation of a new production line by one entrepreneur catering for subcontracting business from other entrepreneurs. In both cases adequate charge-out rates for the use of the equipment will have to be established.

Apart from co-operation in the production level itself it might be advantageous for small-scale enterprises to co-operate in production-related areas. These can be joint raw material supply to achieve better prices due to higher volume of purchases and better terms of payments, joint marketing efforts or co-operation in quality control and setting of own standards allowing for a better access to markets, reduction of production losses and customer rejections and in many cases higher sales prices.

An additional possibility is an international co-operation of enterprises in industrialized and developing countries. UNIDO recently has set up a special support programme for small- and medium-scale enterprises in developing countries with the purpose of upgrading their technological capabilities by means of a plant level co-operation with enterprises in industria-

lized countries. The mechanism employed in these efforts is that of promoting co-operation partnerships between complementary enterprises. As the focus is on the creation of longer-term industrial co-operation for mutual benefit, proposals which are purely for sale of equipment or other forms of embodied technology are not promoted within the project framework. Co-operation approaches that would, however, fit well into the framework are e.g.: joint ventures, sub-contracting, licensing with marketing or buy-back arrangements etc.

Once the technological requirements of each potential recipient enterprise have been articulated, the search begins for a partner (for each) which has the expertise in the particular field for supplying the required technological know-how. However, only those requirements which can not be met by national resources are considered. After the technology supplying partner has presented his specific proposal, a co-operation agreement can subsequently be negotiated with the assistance of UNIDO.

This approach obviously has much in common with the Swedish sister-industry approach described above. On the other hand, there is a stronger emphasis on strengthening the negotiating capacity of developing country enterprises as well as on the adaptation of the technologies transferred. A considerable part of the project budget has actually been spent on technology adaptation, be it for the purpose of scaling down certain production processes or of adapting them to the use of specific local raw materials. As this often requires highly cost-intensive modifications, they would in many cases not be undertaken on a purely commercial basis.

Plant level co-operation agreements have up to now been negotiated between enterprises in the Netherlands and in China, Mexico, Sudan and Thailand as well as between enterprises in Sweden and Egypt, India, Kenya and Sri Lanka. A third round of projects is envisaged between Italian enterprises and

counterparts in Cameroon, Columbia, Peru and Tunisia, concentrating on engineering industries.

c) Human Resources Requirements in an Era of Rapid Technological Change

Small-scale industrial enterprises comprise diversely organized activities: household production, handicraft, small maintenance and repair, etc. Major differences exist between traditional, handicraft-oriented small-scale industry and small-scale industry using modern technologies; the latter are often capital-intensive. Traditional small-scale industries are frequently located in the countryside, modern small-scale industries tend to concentrate in or near major urbanized areas where subcontracting arrangements with large industries are more easily made, know-how is more easily available and good physical and service infrastructure exist. One of the major challenges to development policy is the upgrading of traditional small-scale industries and/or the development of modern small-scale industries outside urban centres.

An essential, common characteristic of small (and medium-scale) enterprises is the way they are managed and operated usually, the owner/manager assumes the full responsibility for all long-term (strategic) and short-term (tactical) decisions. Still, small-scale industry is a relative concept, being dependent above all on a country's industrialization level so that criteria will lead to different threshold values in different countries. This is certainly true for the developing countries in Asia and the Pacific region which find themselves at various levels of the industrialization process.

The sectoral distribution of small-scale industry seems to follow a fairly stable pattern across various countries. In the case of ASEAN countries, empirical evidence has shown that irrespective of the relative size of the small and medium

industry sector, the small and medium industries tend to be concentrated in the same industrial activities. These include industrial activities using relatively simple, labour-intensive production techniques such as: leather, footwear, furniture and metal production; industries processing spatially dispersed raw materials such as: food processing and wood processing; and industries particularly dependent on proximity to the market such as: printing and publishing. Where sub-contracting plays a role, there is a wider branch range of activities. Small-scale suppliers of components, for instance, are particularly found in the engineering (transportation and communication, metal products, machinery) industries.

These comparisons between industrialized and developing countries indicate that a major effort to develop small-scale engineering industry will require investment in technology, which can be synonymously used for human resources development. The technology changes to be expected in the near future will affect the small-scale industry in developing countries in two aspects: First, they will require a flexible response by the entrepreneur to the changing production environment so that his business profits remain unaffected (this aspect will have more importance in industrialized countries with well developed small engineering industries and might have less effect on the majority of cottage and small-scale industry in developing countries with traditional low price and relatively low quality products); second, they will represent additional business opportunities for cottage and small-scale enterprises, yet of a different type than commonly known up to now in the developing countries.

The growth potential for the value added of the engineering industry can rise considerably, yet the effect on employment will be limited, even though it is extremely positive for highly educated young professionals (university or collage graduates).

3. Key Issues and Conclusions on the Basis of Comparative Analysis of International Experiences in the above Areas

a) Trends in Technology in the Engineering Industry Sector

Production characteristics are, since approx. 20 years, undergoing considerable changes. The application of numerical control machine tools brought about the mass production of machined products reducing the labor force required on the shop floor and the potential of human failure in machining. Following came the automation of plant operations around the production process, especially in automated quality inspection and raw materials, intermediate products and finished products warehousing. More or less parallel to that a reshifting in machining operations started by introducing multifunctional machining centres with automatic changes of tools and three dimensional working capacity. Their introduction reduced the minimum lot sizes and increased the flexibility of production besides also reducing the labor force required. During the introduction of these machining centers the automated materials handling or industrial robots were introduced in the automotive and other industries, again reducing labor requirements on the shop floor.

Technological changes which are about to be massively applied after they went through several years of development and testing are Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM). Similar as the previous technological changes they indicate the growing importance for the economic viability of the engineering industry, small, medium or large scale, of results of planning efforts resulting in improved machinery, equipment and operations and reducing human intervention in the production process. These efforts belong to what sometimes is called "intangibles".

Intangibles in this context can be described as investment in planning, organization and human resources which cannot be quantified until activated at a later stage of business ope-

ration. In other words, intangibles represent investment in technology and require human resources development.

The group of intangibles of major importance to the development of engineering industries are:

- operational planning
- engineering design
- product design
- manufacturing software.

For each of the cases computerized operations are characteristic. Operational planning refers to the sequence of overall functions of the enterprise, i.e. timing of production input, purchases, production planning, stock control, dispatching etc. In engineering design of complete processing plants computerized systems find already widespread applications. These aids might in the future facilitate the setting up of specialized engineering companies with or without production capacity for specific products, e.g. in food processing, chemicals or heavy equipment manufacturing.

Product design and manufacturing software will most certainly be of great importance toward the end of the decade for the small-scale industry in general. Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) will, together with the change to machining centers presently taking place in industrialized countries and already starting in Thailand (two cases are reported, one foundry and machining company and one company making components for transmission gears), alter the production potential of small industry completely:

- CAD will reduce the drafting time and cost for parts and components (in the American automotive industry reductions in time required from 2 years to 6 weeks have been reported)

- the installation of machining centers and CAM will reduce the minimum lot size per unit output so that small market sizes are less of an obstacle to take up production
- CAD and CAM reduce the potential of human failure to a minimum, especially failures due to false machine operation are eliminated
- CAD and CAM will allow developing countries to produce products of international quality standards
- CAD and CAM will reduce the implementation time for taking up new products or product lines in manufacturing, start-up losses are also reduced
- CAD and CAM will have negative effect on employment of unskilled or low skilled workers but will create a strong demand of highly educated personnel in informatics and engineering.

The described group of intangibles, especially CAD and CAM, will have a major impact on the development of the engineering industries in the developing countries. Besides the traditional cottage and small-scale engineering industries with technologically relatively simple products a new type of cottage and small-scale production industry will emerge: highly automated flexibly operating enterprises opening new manufacturing potential of technologically complex products at international standards of quality.

Apart from new production enterprises other new types of cottage and small-scale industries will also have good market potentials:

- engineering companies for planning and commissioning of process plants and

- companies producing the software required by the production enterprises and other users of computers.

b) Emerging Technologies and the Songkhla Lake Basin Area

At the first glance there seems to be hardly any relation between the international trends in technology described above and the small scale metalworking industry in the Songkhla Lake Basin Area. The metalworking sector of the region represents approximately 10 per cent of the number of registered industrial establishments, and almost exclusively consists of small enterprises (i.e. 10 to 49 employees) servicing the regional market with products and repair works. Besides the registered enterprises there is a great but unknown number of non-registered cottage industries with less than 10 employees, their major assets are the skills of the entrepreneurs and his (family) workers. These enterprises belong to what above has been called the "traditional" metalworking enterprises. In most cases of metalworking industries, the technological complexity of the manufactured products is relatively low, the same holds for the degree of specialization in the production process, and subcontracting or complementation is practically inexistant. However, there seems to exist a good and creative entrepreneurial base taking advantage of business opportunities in the region, especially among the young company owners.

The access to information on technology and new products or production processes is quite limited for the entrepreneurs. Many of them are not aware of the international trends in technology, and some of them might in the future be confronted with national or international competition offering the same products at by far lower prices due to lower production costs resulting ^{out} and of application of modern production technology. These ^{outside} enterprises might also capture additional regional market segments which the regional enterprises cannot service owing to their lack of engineering capacity, i.e. in drafting and engineering design.

The Manufacturing sector of the Songkhla Lake Basin Area is basically resource oriented, i.e. based on resources available in the region as main production inputs such as agricultural (rice, rubber, palm oil among others), forestry (for the wood working industry) or aquatic (fish processing) resources. Their major market outlets are with the exception of the wood industry, the export markets (the metalworking industry is, however, demand oriented servicing mainly the regional market). A recent comprehensive and fundamental analysis on the small scale industries of the region indicates that¹⁾ the industrial potential of the regional industry lies mainly in the resource base. Relating this premise to the metal working industry and international trends in technology one could add ²⁾ an additional resource to the physical ones, that is the human resource which has been hardly developed so far with respect to modern engineering industry technologies and entrepreneurial activities. The basis³⁾ for human resource development in this area can be considered favorably resulting out of entrepreneurial spirit, academic potential and creativity of the people. The new investments in⁴⁾ infrastructure, especially⁵⁾ the sea port facility, would also contribute to a possible favorable entry in the production of goods of higher technology for markets outside the region. An entry into new technological areas would increase the growth potential of existing industries and open up investment possibilities for new industries. This would require, however, a revised approach in support schemes and facilities and an associative or co-operation approach among the entrepreneurs themselves. These changes would contribute to enlarge the industrial base in the engineering industry sector and capture new business opportunities instead of being faced with the dangers of stagnation or probably even decline in business volume.

c) Recommendations for future actions

The above mentioned industrial analysis elaborated by Industrial Management Co., Ltd. proposes four programmes for small and medium industry development, of which two programmes are of special importance for the engineering industry sector:

- industrial facilities programme
- industrial support programme

1) Promotion of small and medium scale industrial development in the Songkhla Lake Basin, prepared by Industrial Management Co., Ltd. under UNIDO contract.

The recommendation of a coordinated approach of the support agencies as mentioned in the study, is strongly supported. It is proposed that these programmes are executed, as relates to the engineering industries, under consideration of five special factors:

- international trends in technology
- international region-to-region cooperation potential
- human resource potential
- demand of facilities and support of existing and new industrial establishments
- potential and requirements of associative and co-operative forms of organization of the private sector

The international trends in technology have been described above. For the region is suggested to analyze in which way access to modern technology and how its utilization in industrial establishment can best be achieved. This holds, at the time of entry in modern technology, especially for a CAD facilities serving interested entrepreneurs.

The second factor, international region-to-region cooperation, enlarges the scope of industrial growth potential especially in industrially less developed regions of developing countries. This approach is successfully pursued by UNIDO in Yucatan, Mexico, where an international cooperation between small and medium business from Malmö in Sweden with local entrepreneurs is undertaken. The new joint ventures envisage both the Mexican and the international markets and are expected to be beneficial to both participants. For the Songkhla Lake Basin a co-operation with a sea port city with industrial base in an industrialized country could be envisaged.

The development of human resources potential calls for an active role of the academic institution of the region, i.e. Prince of Songkhla University, and support of other institutions in follow up actions, that is mainly in establishing "nursery factory schemes" which originated in Europe for supporting talented young entrepreneurs. The concept is to make available to young enterprises "traditional" business functions such as ^{office and factory space} accounting, general office services, raw material purchasing, as well as risk financing (sometimes over several years) so that the enterprise in the

start-up phase could concentrate on the product development ^{and market entry} in high technology areas.

The suggested new approach should basically have a demand analysis of the existing and potentially new enterprises. The demand analysis approach has been extremely successful in the UNIDO project supporting the industries of Villa El Salvador in Peru (cf. paragraph 1f), and it can be said that only a thorough analysis of the problems and growth bottlenecks of the industries in this city allowed for a programme concept which is actively supported by the entrepreneurs, which led to the strengthening of their association and laid the base for joint branchwise investment in production support facilities of formerly heavily competing small scale industries. Importance should also be given to determine the type of support facilities (e.g. as regards industrial land, location in relation to customers and lot sizes required for types of industry) and schemes (e.g. type of services to be rendered by support agencies)•

In the future good inter-industrial linkages and cooperation specialized industries in form of subcontracting or complementation will be a basic access to assure continued growth. These forms of co-operation will require institutional support and promotion, but will basically originate out of readiness of the entrepreneurs to enter such ventures. Therefore, importance should be given to the determination of one ^{of} more common denominators for associative and cooperative forms of organization of the private sector, e.g. small business association or joint investment in production support facilities. In this context it is recommended to analyze the possibility of an active participation of the entrepreneurship in the administration of the proposed CAD facility.

The suggested approach of joint pursuence by the public and private sector agents will strongly contribute towards the achievement of common industrial development goals in the Songkhla Lake Basin Area.