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UNIDO Programme Evaluation:

DEVELOPMENT AND TRANSFER OF TECHNOLOGY

Country report: Sri Lanka

Report of the evaluation mission*

Quality Assurance and Evaluation Branch

* This document has not been officially edited.

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Annex 3 List of UNIDO's Approved, Operational and Operationally Completed Technical Cooperation Projects in Sri Lanka

LIST OF ACRONYMS

ACCAT	Arthur Clarke Centre for Advanced Technologies
ADB	Asian Development Bank
BOI	Board of Investment
CARI	Central Agricultural Research Institute
CARP	Council for Agricultural Research Policy
CISIR	Ceylon Institute for Scientific and Industrial Research
CRDC	Ceramic Research and Development Centre
CSC	Ceylon Steel Corporation
DANIDA	Danish Industrial Development Agency
DFCC	Development Finance Corporation of Ceylon
EPZ	Export Promotion Zones
FDI	Foreign Direct Investment
FDSI	Foundry Development and Service Institute
IDB	Industrial Development Board
IFS	Institute of Fundamental Science, Kandy
ITMIN	Industrial Technology and Market Information Network
JICA	Japan International Cooperation Agency
KIST	Korean Institute for Science and Technology
NARESA	Natural Resources, Energy and Science Authority
NERD	National Engineering and Development Centre
NIBM	National Institute for Business Management
NPD	National Project Director
SGS	Superintendence of General Services
SLSI	Sri Lanka Standards Institution
TIPS	Technology Initiative for the Private Sector
TQM	Total Quality Management

1. INTRODUCTION

As part of the programme evaluation of UNIDO activities in the field of development and transfer of technology (DTT), evaluation missions to three countries (Kenya, Brazil, Sri Lanka) were carried out. This report summarizes the findings of the mission to Sri Lanka (22.1-2.2.1996). The mission was conducted by Mr. R.O.B. Wijesekera, consultant, and Mr. J. Navratil, UNIDO Quality Assurance and Evaluation Branch.

Selected institutions were visited (see Annex 1) and their objectives and constraints discussed as a basis for the assessment of the UNIDO activities. Eight UNIDO executed or implemented projects in the field of development and transfer of technology were reviewed and assessed in terms of relevance, efficiency, effectiveness, impact and sustainability (see Chapter 6). In addition, some information was collected on two other projects (DP/SRL/91/031: Micro-level industrial policy and DG/SRL/91/034: Investment Forum). An Objective-oriented Project Planning workshop was conducted to review and reformulate the Industrial Pollution Reduction Programme: DG/SRL/91/019. (A separate report was issued on the workshop.) Two participants at courses of the International Centre for Science (ICS), Trieste, were interviewed and inquiries were made in relation to the dissemination of some UNIDO publications (Technology Monitors).

Some visits could not be undertaken as planned because of the blast of a bomb at the Central Bank, Colombo. This affected the visit to Board of Investment (BOI) and the Tyre Corporation. Alternative arrangements were made but the effort to meet management of the Tyre Corporation failed.

At the end of the mission the main findings were conveyed to the Ministry of Industrial Development and UNDP. A number of immediate measures to be taken to support on-going projects were discussed with the relevant backstopping officers (BSOs) at UNIDO Headquarters.

2. ECONOMIC DEVELOPMENT

While development and transfer of technology are key factors of competitiveness and, thus, of economic growth, the extent and profile of development and transfer of technology are influenced by the demand for technology which in turn is determined by the size and overall performance of the economy and, in particular, by its ownership and sectoral structure, consumption/saving pattern, flow of foreign investment, etc. In Sri Lanka the development and transfer of technology have been influenced by the following factors:

- Economic performance in the decades after independence was rather modest. Emphasis on health and education resulted in relatively high standards in these areas (such as very high literacy rate, etc.) but growth of production sectors was slow for long periods. As a result the economy is still largely agricultural (20% of GDP, 36% of employment) with GDP per capita lagging behind Malaysia, Thailand, Myanmar, Philippines and Indonesia.
- The state played a significant role in the economy both as owner of capital assets (around 50% of industry) and through extensive policy control and institutional framework.
- Reforms introduced since 1977 and more rigorous liberalization programme introduced in 1989 (privatization, reduction of foreign exchange regulations and import control, promotion of foreign investment, etc.) were successful in accelerating growth, employment and investment. Real GDP averaged 5.5% in 1990-95. However, high unemployment remained a serious problem.
- Manufacturing has been growing fast since the mid - 1980s, accounting now for almost 20% of GDP (in real terms). The garment sector has recorded the fastest growth rates. Other important sectors are food and beverages, textile, footwear, electronic equipment, rubber products, ceramics. Diamond cutting is also growing fast.
- The clothing sector became the largest export earner. However, the garment sector has not been matched by the domestic textile industry so that much material must be imported. As a result the net export earnings represent only 60% of the gross export value. (Thus, in terms of net foreign exchange earnings the traditional agricultural products - tea, rubber and coconut - still retain the prime position).
- The growth in manufacturing has been associated with the growth of the private sector and with foreign investment, though its level was rather low (between 0.4 and 0.9 percent of GDP). A large part of foreign investment went into the service sector (property development, consultancy, Air Lanka). Much of foreign investment took place at the Export Promotion Zones (EPZ), primarily in the garment sector. The average scale of investment remained remarkably low (in most cases less than US\$ 0.5 million) with little linkages to the local economy in purchases of raw materials, intermediary goods or capital goods.
- EPZ played an important role in export (approximately 55% of visible export) and employment generation, primarily female. However, as almost 70% of the EPZ gross export earnings is produced

in the textile, garment and leather sector with most of the material inputs imported, the net contribution of EPZ to foreign exchange earnings is much lower.

- The ethnic conflict has had some impact on the Sri Lankan economy; the most significant seems to be the impact on increased defence budget, reduced foreign investment flows in some periods and emigration of qualified people. (The latter is, however, a more complex phenomenon caused primarily by other - mainly economic - factors.)

Conclusion: The small size of the economy does not make it possible to engage in significant indigenous programmes of technology development; more than 90% of technological changes occur through transfer of technology. Foreign investment and import of capital goods are the most significant channels for transfer of technology. The sectoral profile of manufacturing and foreign investment in manufacturing reveals their orientation primarily towards utilization of indigenous natural resources and cheap labour, with limited backward linkages, relatively simple technological processes applied and, thus, modest impact on the development of local technological capabilities.

3. POLICY AND INSTITUTIONAL FRAMEWORK FOR DTT

Industrial policy

For many years in the 1970s and partly in 1980s the industrial policy supported establishment and development of domestic industry through direct Government investment and management of industry and through protective foreign trade measures. Inward-looking policies aimed at import substitution under a regime of high protection and wide-spread controls. Sri Lanka concentrated on import substitution in agriculture and energy while laying the foundation for modern infrastructure. In 1987 new Industrial Policy was adopted by the Government, which was elaborated in more detail by the Ministry of Industry in 1989 in the document "*A Strategy for Industrialization in Sri Lanka*". The Strategy set the following objectives:

- a) to transform the primarily domestic market oriented industry to an export oriented one;
- b) to provide greater employment and income opportunity;
- c) to diversify the economy;
- d) to ensure a more equitable distribution of income.

The objectives were to be achieved through a set of policy measures adopting prudent macro-economic framework, rationalizing the tariff structure, granting special incentives for investment and exports, encouraging foreign investment, reforming public enterprises, promoting small-scale producers, removing administrative barriers and promoting more research and training of human resources. Specific measures were foreseen to support research and development, such as tax incentives (double deduction of expenditures on R&D, building allowances), grants for product development, technical assistance and financing schemes for SMEs, etc. The industrial policy recognized the key role of industrial technology for the export orientation and competitiveness on the world markets. The Strategy document contained several objectives related to technology development:

- assisting industries to identify, procure and absorb new technologies; establishing an effective technology information base;
- promoting foreign investment as a vehicle for transfer of technology;
- promoting closer linkages between R&D and industry;
- providing technology support to SMEs.

A more detailed action programme formulated specific recommendations in the field of human resource development (such as expanding higher education in engineering and management, revising university statutes in order to retain and attract experienced faculty in key technical areas such as electronics and computing, etc.), industrial consultancy (such as supporting domestic consulting industry in the field of information on technology and techno-economic advisory services, etc.), technology policy capability (such as establishing an inter-ministerial technology policy unit to guide resource allocations on science and technology projects, conducting studies on impact of tariff and tax codes and approval procedures on

transfer of technology, etc.), public sector industrial enterprises (introducing technology development plans) and R&D institutes (such as strengthening client orientation and marketing capability, etc.).

While the above objectives remained valid throughout most of the period covered by the evaluation, they were not pursued with the same intensity and only some of them were actually fulfilled. In 1989 "*New Industrialization Strategy for Sri Lanka*" was adopted, reiterating unemployment as one of the key problems to be addressed, confirming the trend to provide for an economic environment conducive to the growth of industry and designing a package of pro-active Government measures "*to foster many new industries which will be of lasting benefit to the country*". The industrial policy statement emphasised that the private sector would be regarded as the "*engine of industrial growth*". Attention to regional industrialization to tackle the problem of unemployment and achieve more equitable distribution of benefits is one of the new emphasis articulated by the Strategy. Another new issue addressed by the Strategy is industrial pollution. Special attention is paid to mineral development (including ceramics) and the textile and garment sectors.

The New Strategy recognizes that Sri Lanka has not developed sufficient competitiveness in the technologically sophisticated and higher intellectual value added products. To address the problem the Strategy foresees special incentives for investment that applies advanced technology as well as incentives to local industry to source and apply low cost high-tech solutions.

Science and technology (S&T) policy

In the 1980s an exhaustive analysis of the S&T situation was conducted under the direction of the then Science Adviser to the President. (Sessional Paper No V Volumes 1-9. Government Press 1986). Following this analysis a Presidential Task Force was appointed in 1991. The Presidential Task Force noted that policy statements on industry failed to allude to the need for investment by the private sector in the R&D in order to sustain a productive industrial sector. The task force report further noted: "*Industry in general appears not to concern itself much with the utilisation of scientific research for its own development*". An earlier report (1986) by the Asia and Pacific Centre for the Transfer of Technology also noted: "*R&D in the private sector is weak and in the most part confined to local subsidiaries or joint ventures with multinationals*" such as Lankem- Shell, Lever Bros-Unilever, Ceylon Tobacco Co-Imperial Tobacco.

Based on the Task Force report the then Government proposed a Science and Technology Development Bill which was passed by the Parliament in 1994. The Act aims at promoting the use of science and technology, fostering scientific and technological activities and ensuring allocation of a reasonable proportion of the GNP for S&T activities. The Act provides for the establishment of a national science and technology commission, a national science foundation and a council for information technology. It also merged some existing institutes into the Industrial Technology Institute.

However, the present minister decided against the implementation of the Act. Instead the Minister appointed a committee to study it, retain its salient features, and also to propose an action plan for implementation. The proposed plan of action has five major thrusts which are central to the development of a national S&T structure:

- Strengthening & modernising existing S&T institutions;
- Identifying strategic areas for technology development and preparing the institutions accordingly;
- Developing the human resources for the above;
- Providing the leadership and the mechanisms for the coordination and integration of S&T activities;
- Building a scientific culture and promoting private and public sector participation.

At the time of evaluation the action plan was under consideration by the President.

Institutional framework for research and development

The Government R&D system in Sri Lanka is spread among its various ministries. The President has directly under her the Institute of Fundamental Science (IFS) situated in Kandy, the Institute of Policy Studies and the Sri Lanka Foundation Institute.

Major research thrust in Sri Lanka is in the areas of agriculture and the plantation industries. The Central Agricultural Research Institute (CARI) and its many regional stations handle mainly rice and other grains. It reports to the Ministry of Agriculture & Forestry and is guided by the Council for Agricultural Research Policy (CARP). The Ministry of Plantation Industries is responsible for the Tea Research Institute in Talawakelle, the Rubber Research Institute in Agalawatte, and the Coconut Research Institute in Lunuwila. These three institutes were established in colonial times. Besides these major agronomy oriented R&D institutions there are other smaller product related research stations for sugar, cashew, spices, etc. The Medical Research Institute, which falls within the Ministry of Health, also has longer history having been established in the early twentieth century.

Industry-related R&D in the government sector is under the responsibility of the Ministry of Science, Technology and Human Resource Development (MSTHRD) and the Ministry of Industrial Development. The former one is supervising a number of R&D institutes such as the Ceylon Institute for Scientific and Industrial Research (CISIR), the Arthur Clarke Centre for Advanced Technologies (ACCAT), the National Engineering and Development Centre (NERD) and the Natural Resources, Energy and Science Authority (NARESA). This is a policy making organ (formerly the National Science Council) which sponsors research on a project by project basis at the universities and R&D Institutions, and promotes research within the country.

The Ministry of Industrial Development is responsible, inter alia, for the Industrial Development Board (IDB) and the National Textile Training Centre.

The NERD Centre is the major centre for engineering research. It has areas of expertise in new forms of energy, in designing and fabrication of simple mechanical utilities (such as small baking ovens, wind-related power units) and measuring instruments for industry. Its services are not enough utilised by industry mainly for the reason of the want of risk capital. NERD also provides consultancy services to industry in engineering .

The ACCAT operates in the field of electronics and communications.

The main component of industry-related research is carried out by the multi-disciplinary research institute - the CISIR. Established in 1955, the CISIR receives a grant from the government and earns around 30-35% of its annual operational budget, which is around Rs. 40 million. Government also grants it a capital budget which varies between Rs. 20-30 million each year. The institute carries out research on a supply - oriented as well as demand -oriented basis. Industry contracts it to do customised research and other services. The institute attempts to transfer to industry the technology developed on the basis of research conducted by its staff. Special emphasis is directed towards the improvement of industries that utilise and add value to the indigenous raw materials, with good results produced in the area of agro-industrial products such as grain-based foods, spices, essential oils and medicinal plants. Contract work carried out by the CISIR for industry during the past years included the following categories:

- Product development & improvement
- Process improvement
- Design & fabrication of process equipment
- Energy audit, trouble shooting
- Environmental factors, waste disposal
- Repair & maintenance of equipment
- Services related to quality assurance/quality control
- Information

The CISIR also functions as the national centre for pesticide research and assists the Sri Lanka Standards Institution (SLSI) in testing services which demand an investigative component.

Some industry-related research is conducted at the universities but their linkage with industry is rather weak.

Sri Lanka Standard Institution (SLSI)

SLSI undertakes and promotes standardization, measurement and related activities in order to facilitate trade and enhance competitiveness of products. It develops and formulates requisite national standards and promotes their application. In recent years, with greater demand for quality assurance of imports and exports, SLSI has been engaged in promoting quality management systems at company level and introducing product and quality system certification schemes. It has promoted the ISO 9000 concepts.

The SLSI has over a hundred qualified staff but a high staff turnover reduces the performance of the Institution.

Industrial Development Board (IDB)

IDB was established in 1969 as the prime state organization responsible for the development of the industrial sector. It is a sizable organization with a number of provincial offices and industrial estates. It is entrusted with a number of services to industry, such as technical and engineering advisory services, rubber products development, entrepreneurship training, marketing services, etc. It also operates the Centre for Industrial Technology Information Services (CITIS). However, the IDB serves mainly to adapt existing technologies in the regional setting, and to familiarise users of technology with the methodologies and current trends. The work of the IDB cannot be strictly categorised as research, although its dissemination of industrial technological know-how is an important component of work in training the indigenous industrial work-force, particularly within the private entrepreneurship.

Information on technology

Industrial Technology and Market Information Network (ITMIN) has been conceived as a private company offering, on commercial basis, a speedy access to high-quality technology and market information. (Effectiveness of the UNIDO project supporting the establishment of ITMIN is described in Chapter 6.) There are other information systems and data banks in the country, such as the one operated by the IDB. Information systems at the universities at Colombo and Moratuwa pertain to specific S&T subjects. The Export Development Board (EDB) also has information base on export-related products and international market information. NARESA is preparing a network link with the S&T libraries in the country so that S&T personnel can access information directly.

There is a certain proliferation of the databases, which may be difficult to avoid, particularly in the situation where some of the information services are subsidized. On the other hand, monitoring significant and relevant scientific and technological developments worldwide ("Technology Watch" generating timely signals for initiatives in industrial, technology and HRD development) is not considered adequate by some parties involved.

Financing and venture capital

Although the work of local institutions, such as the NERD Centre and the CISIR results in a number of "technology packages" ready for industry, the industrialists are unable to make use of them due to the lack of risk or venture capital. Current bank rates make commercial borrowing impractical. Originally the DFCC (Development Finance Corporation of Ceylon) was set up to serve precisely this purpose, that is to provide venture capital to industrialists at attractive terms. This arrangement has not served the original purpose and the objectives of the DFCC have acquired other directions in the last decades. The lack of venture capital is a problem as severe as the under-investment in R&D.

Board of Investment (BOI)

BOI is a large parastatal organization (approximately 1000 staff) in charge of foreign investment promotion, approval and monitoring. It was constituted in 1991 on the basis of the former Greater Colombo Economic Commission (GCEC). GCEC was also entrusted with investment promotion but its primary concern was the establishment and operation of EPZs and its competence was confined to the Colombo Metropolitan Area. Under the expanded role of BOI new activities were introduced. In 1992 a one-stop service was established for non-zone investors. In 1991, an investment forum was organized with the support of UNIDO. Another one followed in 1995. In both cases the meetings met with modest response on the part of investors and achieved very limited impact in terms of projects actually implemented.

In 1995, the incentives scheme was amended to grant a package of additional incentives for new and existing industries using higher technology. Higher technology is defined as technology which introduces a new design, formula or process which results in higher productivity, improved product quality, upgrading of technical skills, etc. or technology "hitherto not applied in Sri Lanka", in particular technology for the local processing of raw materials. In view of the short time of the new incentives being in effect, their impact on the structure of investment could not be assessed.

Intellectual property rights and patent protection

The Sri Lanka Patent Office (The Registry of Patents and Trade Marks) undertakes patent rights locally. The problem they are confronted with is the fact that there are only a few people in their respective areas who are capable of reviewing any application for patents. Therefore, the issue of patents is accompanied by inordinate delays.

(Furthermore, any invention if patented locally is often insufficient, given the universal nature of science. International level patenting is beyond the financial reach of the country and protection of patent rights would not be possible.)

Conclusion: Nominally Sri Lanka has a well designed policy framework and institutional infrastructure to support development and transfer of technology. In terms of size (number of institutions, staffing) the institutional infrastructure is considerable. However, the efficiency and effectiveness of policies and institutional infrastructure in supporting and/or carrying out the development and transfer of technology are significantly reduced by several factors, such as lack of financial and human resources, in particular

qualified technical personnel; profusion of institutions competing for the scarce resources; dispersal of policy implementation among several bodies necessitating intensive coordination; inflexible administration, in particular deficient personnel management with inadequate motivational systems, etc. Competition on the foreign investment market has been constrained by the adverse image of a country with occasional ethnic conflicts.

4. TRENDS IN DTT IN SRL

Limited scope of R&D

As mentioned above, small size of the economy does not make it possible to engage in significant indigenous programmes of technology development. Even in relative terms Sri Lanka stands very low in comparison to other countries of the region. Expenditures on R&D in Sri Lanka represent 0.15-0.18% of GNP, and a large part of it is for agricultural and plantations research. In comparison India spends 0.9% and Malaysia nearly 1% of GNP on R&D, Korea and Taiwan are in the range of 1-2%. Sri Lanka can point to only around 120 scientists and engineers engaged in R&D per million of inhabitants, Korea to 800, industrialised countries to 3-6 thousands.

There is no private sector research of any significance in the country. (In Korea, the share of the private sector in R&D is 84%, in industrialized countries about 70%.) The only exceptions to this are small R&D units at some of the leading companies and multinational organisations and the recently privatised Ceramics Research and Development Centre (CRDC). In all these cases the work carried out is more developmental than research oriented. CRDC, the beneficiary of UNIDO assistance from its inception, now functions as a branch of a private company but it continues to service the whole industrial sub-sector.

Constraints to R&D and its application

Some of the constraints for industrial R&D were spelled out above. To sum up the following main constraints can be highlighted:

- The country produces very high quality basic graduates but post-graduate training facilities are sub-standard and insufficient in relation to the needs.
- The high cost of living and the low remuneration for scientific and engineering personnel, particularly in research and development, mitigates against the human resources build up. The migration of qualified personnel is serious, there are no incentives for retaining them. As a result, the institutions lack the critical mass of qualified staff.
- Whatever is developed locally is not sufficiently commercialized; marketing of the R&D results by the R&D institutes themselves is not determined enough. On the other hand official publications advising potential entrepreneurs ("How to Start an Industry", published by IDB) refer them for information on investment opportunities to various ministries, but not to R&D centres.
- Lack of technology financing schemes, in particular for SMEs.

Transfer of technology

As mentioned above, technological changes occur predominantly through transfer of technology from abroad. Foreign investment and import of capital goods are the most significant channels for transfer of technology. With trade liberalization, import of capital goods is becoming a more significant channel of technology transfer than implementation of turn-key projects.

While the transfer of technology from abroad still occurs primarily in simple production processes, there are numerous examples of more advanced technology being transferred. However, such transfers of technology usually need complementary training and adaptation of local organization patterns at company level. More complex use of technology highlights importance of intangible investment in training, organization and information over physical investment.

As the policy statement by the Government gives preference to FDI bringing higher levels of technology, it is necessary to create conditions enabling the absorption of more complex technologies. This makes it imperative to identify "trust areas" for supporting measures, such as human resource development. The Ministry of ST & HRD embarked on a study to assess the requirements for highly skilled manpower development. (The study was funded by the Asian Development Bank.) It identified the following "thrust areas" for HRD to help accelerate the absorption of new technologies and the process of industrialisation in the country:

- Agro-industries and food processing
- Light engineering and metal working
- Industrial infrastructure
- Tourism infrastructure
- Mining, mineral exploration and processing; ceramics
- Textile fabrics and the garment industry
- Rubber-based industries and footwear
- Gems and jewellery

The study proposed an action plan for HRD with a set of measures totalling US\$ 59 million. The strategic areas will be electronics & communication, computer & information science, energy & environment, agroindustry and biotechnology.

Technological changes at company level

Industrial companies in the country can be categorized in the following general types:

- A) Branches or joint ventures of transnational companies or other industries set up with a parent industrial concern overseas.
- B) Industries that are part of a local cluster of companies with assorted activities.
- C) Companies utilising primarily traditional natural resources, e.g. tea, rubber, coconut, spices etc.

D) Small and medium scale enterprises.

All these types, and some of them may be classified in more of these categories simultaneously, are introducing technological changes but the scale and speed differs considerably. In doing so the companies derive some benefit from the local R&D effort, though in very different ways. Category A would generally be inclined to get their technology from the parent company even if the locally available technology or service is adequate. They would, however, make use of some technical services provided by local institutions, such as testing of materials and product certification. However, these companies do not engage in large contractual arrangements or sponsorship of research.

Most of the imported technologies are project specific and do little to enlarge backward linkage. As an example, the petroleum refinery based on an Italian technology runs its own research and technical laboratories purely for its own needs.

Category B depends more on local R&D and makes use of the local institutions for testing as well as for trouble-shooting and upgrading product quality. In a number of companies quality circles are established and quality management principles are introduced, with the support of local institutions. Some of these companies would sponsor customised research on their specific problem areas. They expect the R&D work to be Government subsidised, and complain of the high costs and the lack of facilities for their own R&D work.

Categories C as well as D cannot afford the costs of R&D. They have to receive subsidized R&D and other, in particular, quality-related support services to be competitive in the international arena. Agro and food industries fall into this category.

Joint (collaborative) programmes between R&D institutes/universities and industrial companies are rather rare. Recently a joint initiative of the CISIR and a private company resulted in improvement of the production of mosquito coils, and a new company was initiated with the CISIR sharing in equity for its contribution in the form of technology. Networking among industrial companies and sharing experience is also rather exceptional.

5. UNIDO TECHNICAL COOPERATION IN DTT IN SRI LANKA

Scope of UNIDO technical cooperation

Total official development assistance (ODA) in recent years amounted to approximately US\$ 550 million annually, of which almost 30% was in the form of grants and more than 70% in the form of soft loans. Not much grant money has been targeted at industry. The most extensive support to industry under the grant component has been provided by the bilateral USA programme "The Technology Initiative for the Private Sector" (TIPS); its budget for 1991-1996 is approximately US\$ 12 million. As regards loans, they have been used quite extensively to support industrial development. There have been a number of loans by the International Development Association and the Asian Development Bank to facilitate credits for investment in manufacturing, in particular in private SMEs. The World Bank provided some funds to finance environmental projects including technological improvements in industry. Considerable loans have also been provided by Japan to upgrade the energy and telecommunications sectors.

In the period 1982-94 annual delivery of UNIDO technical cooperation amounted to US\$ 1.1 million on average (since 1989 the average was US\$ 1.2 million). Compared with total ODA targeted at industry UNIDO technical cooperation delivery is rather modest and its investment promotion activities cannot compete with the effects of the soft loans provided to industry, but its share in the grant segment of ODA to industry is not negligible. Except for the above-mentioned TIPS, the other donors' technical cooperation activities with industry were smaller in size. (At present this may be changing due to a sharp increase of Japan International Cooperation Agency (JICA) support to SLSI and other industry-related institutions, such as the Textile Centre.)

Structure of the UNIDO technical cooperation

In the above -specified period more than 90% of the UNIDO technical cooperation programme was financed by UNDP. Almost 50% was spent on experts and consultants and almost 20% on training. A review of study tours and fellowships in the period 1990-95 revealed that:

- in total 42 professionals were sent on fellowships, of which 33 were DTT-related, with an average duration of 55 days;
- in total 123 professionals were sent on study tours, of which 71 were DTT-related, with an average duration of 11 days.

One can conclude that the training component in the UNIDO programme was considerable, that it was primarily DTT-related and that - with a few exceptions - all the fellowships and study tours were an integral part of larger projects and had, therefore, capability and institution building objectives. This, however, does not exclude inefficiency in the training component, as explained in the assessments of some projects visited by the evaluation mission (Chapter 6).

Not included in the above figures are stand -alone fellowships at the International Centre for Science, Trieste. In the period 1990-1995, 25 Sri Lankans worked as research fellows or participated at training

courses of the Centre. From the title of the workshops, it is apparent that many of them dealt with natural sciences at a level rather remote from application in industry. Interviews with two former participants confirmed the relevance of the fellowships for their work but only in one case (Dr. Herath from CISIR) was the subject (Industrial Composites Design and Application) related to industry and the newly acquired knowledge was applied in a project of CISIR on composite building materials.

While in the case of fellowships and study tours the relation to DTT can be identified, in the case of larger and more complex projects the distinction between DTT-related and other projects cannot be defined clearly. For example, investment promotion projects are normally not classified as DTT projects but in fact they may result in considerable transfer of technology. Advice on industrial and trade policy, if implemented, may have a considerable impact on trade in capital goods and, thus on the transfer of embodied technology. No effort has, therefore, been made to structure the projects by backstopping divisions/sections or related programme element codes. The issue is compounded by several organizational changes at UNIDO and the subsequent amendment of the coding system, as can be observed from the list of completed and operational UNIDO projects in Sri Lanka (Annex 3).

Dissemination of technological information

UNIDO technology monitors (Genetic Engineering and Biotechnology, Microelectronics, High Technology Spin-Offs, Advances in New Materials and Marine Industrial Monitor) were sent to more than 50 addresses in Sri Lanka. Inquiries in the field showed that a significant number of addresses were no longer valid because the addressees had moved, changed jobs, migrated or died. The updated information - as far as it was possible to get it - was conveyed to the responsible person at UNIDO Headquarters after the mission.

However, the system of dissemination of information products requires reconsideration. Particularly in a country like Sri Lanka, where UNIDO supports ITMIN, the dissemination of UNIDO information products should be channelled through such a facility. As the technology monitors are considered useful by those who were contacted, it is conceivable to charge a reasonable price. In the view of some subscribers a price of US\$ 5 per monitor might be acceptable but the actual "retail" pricing should be delegated to ITMIN.

The UNIDO office should also be on the mailing list of UNIDO information products.

Overall assessment of UNIDO technical cooperation activities

The opening consultation of the evaluation mission with the Ministry of Industrial Development revealed a rather critical assessment of the UNIDO technical cooperation by the Government body primarily responsible for most of the projects (see Annex 2). The key observations can be summarized as follows:

- Focus on institution building in the public sector;
- Focus on utilization of local natural resources;
- Limited success in introducing new technologies (information technology, new materials, CAD/CAM);
- Limited success in commercialization of R&D results;
- Absence of cost-sharing by target beneficiaries;
- Focus on equipment and training components with inadequate attention to organizational innovations and information ;
- Hardly any impact on the "technology climate: industry continues to be operation intensive and not skill intensive".

In two cases specific implementation problems were highlighted (for which UNIDO has had the primary responsibility): purchase of inappropriate equipment for the Foundry Development and Service Institute (FDSI) project and termination of a consultant at the ITMIN project.

The evaluation mission concurs with most of the observations. One could add that technical cooperation activities were aimed primarily at strengthening the supply side of DTT services and underestimated the need to promote measures strengthening the demand for such services. However, it is necessary to assess the projects, for the design of which both UNIDO, UNDP and the Government bodies were responsible, in the context of Government policies and objectives valid at the time when they were designed and consider the possibilities and constraints of technical cooperation interventions given by the overall performance of the economy and its institutions. From this point of view the package of UNIDO (in most cases UNDP-financed) projects has been remarkably well balanced and followed - in time - the changing priorities of the country. In the second half of the 1980s UNIDO projects still continued to support building up of the key elements of technological infrastructure: the SLSI as well as R&D institutes in important industrial sectors, such as textiles, ceramics and agro-based industries. A concentrated effort to build up a training capability for the rubber-processing sector at the Tyre Corporation was launched. In parallel to strengthening existing R&D institutes in important sectors, an effort was made to develop a capability in the country to introduce and support the application by industry of CAD/CAM processes. After the changes in investment promotion in 1991, BOI was supported in organizing investment fora and reorganizing its office. In the 1990s extensive policy advice was provided to the Ministry of Industrial Development on the implementation of the new industrial and trade policy. With the reorientation of the policy towards the private sector, new modalities in project ownership and implementation were introduced: the private sector became the owner of two large projects - FDSI in the foundry sector and ITMIN in the field of industrial and market information. ITMIN, together with the CAD/CAM Centre and the Industrial Pollution Reduction Programme reflect the new trend aiming at more sophisticated technological capabilities.

Efficiency of implementation of the above projects and their effectiveness, impact and sustainability are analyzed in Chapter 6. Implementation problems - apart from delays - were noted in a few cases only, the most notorious one being the spectrometer at the FDSI Centre. This was in fact the only project which failed to develop the planned advisory and testing capabilities, even though, on the other hand, it achieved some impact through direct interventions of project consultants at the plant level. It is, however, a common feature for many institution building projects that attention to their organizational dimension, in particular the establishment of working procedures, methodologies, standards and/or practices lags behind attention given to the installation of equipment and training.

Effectiveness - use of the project outputs, of the capabilities developed by the projects - varied from project to project. In the case of R&D institutes the use of testing and certification services prevails over the use of consulting services and R&D work proper. This is well reflected in the structure of income generated from the sale of services. Training services are also used even though below the level of the capacities developed, in particular in the case of the Textile Centre and the CAD/CAM Centre. The reasons are related both to the operations of the institutes (lack of intensive marketing) and to a complex set of factors on the demand side (hardly any motivation of staff for upgrading their qualifications; management in SMEs does not encourage training either). Use of information services on a commercial basis, as conceived by ITMIN, is yet to be tested in practice: quite optimistic assumptions are contradicted by long term experience of free access to or low price of information and other business services in the country.

Sustainability of the institution building projects proved to be satisfactory as regards the essential functions of the institutions. As mentioned above, upgrading has been very slow and at least in one case a capability already established deteriorated and was finally dissolved (consultancy services at the Textile Centre). These problems (slow take off, sometimes even losing critical mass) are caused to some extent by high staff turnover in some institutes which in turn is caused by remuneration regulations and external factors referred to above. Commercialization of services proceeds slowly. Usually the institutions established or strengthened by UNIDO projects generate income at a level of about 30% of their operational budgets. The only exception is CRDC which in real terms is recovering fully its operating costs.

Impact of the projects - actual changes in industry - was not achieved at scope which would make it immediately apparent. There has been hardly any direct impact on export (foreign exchange savings/earnings generated directly by R&D work such as at CISIR and CRDC are rather small), on the mass introduction of advanced technologies or methods (CAD/CAM dissemination in industry is very limited), on the inflow of FDI and technology (investment fora had very modest attendance and hardly any contracts to follow). Support to the Textile Centre has not had any significant impact on strengthening the backward linkages of the garment sector. On the other hand at least some projects (SLSI, CISIR, CRDC, the Textile Centre) contributed to the consolidation and satisfactory functioning of basic elements of the technological infrastructure such as testing and standardization which are already at this stage important for the facilitation of foreign trade. Some R&D work is contributing to better use of local materials and increased value added in their processing (ceramics, essential oils). The projects also laid foundations for a more significant role to be played in industry by quality management, human resource development, advisory services and applied research in order both to increase competitiveness and to comply with environmental standards.

It should be noted that impact of direct support projects (interventions of external consultants at the level of target beneficiaries) may be more visible and easier to demonstrate than impact of projects building up local capabilities to provide such interventions or services. This was the case of a small direct support by a consultant providing advice to the Steel Corporation (advice was implemented, quality of the products improved and waste was reduced) as well as of the direct support component under the FDSI project (blast cupola was installed at least in one foundry, etc.). Direct policy advice provided to the Ministry of Industrial Development might have contributed to the amendment of some policy measures which have an impact on trade and transfer of technology. However, it is a principle established by most development cooperation agencies that development cooperation should target primarily the development of local capabilities.

It is to be recognized that technical cooperation alone can hardly change the "technological climate" in a country. Such changes usually emerge as a result of concerted domestic efforts (policies, education and training, development of supporting institutions) and - in case of a small country - a large-scale transfer of technology from abroad, with foreign direct investment being the main platform for the transfer of technology.

Lessons learned

The following main lessons can be learned:

Policy level

1. Technological development requires policy support. Advice provided to high-level policy making bodies by a consultant may be effective and achieve a significant impact. In order to create a critical mass of knowledge capable of continuously amending the policy measures it is advisable to complement such direct advice by training of larger number of senior staff at the policy making bodies and exchange of experience with other countries.
2. DTT-related projects targeted at any level should provide feedback to policy level on constraints to technological development and propose corrective measures. Periodic review meetings may be mechanism for channelling the feedback to the policy making bodies.
3. As the new technologies applied in industry are more sophisticated and requires higher skills to operate and maintain it, it is necessary to stimulate management of the companies by policy measures to train the staff and make use of the available training facilities. Making the cost of training a deductible tax item is one policy option. Another one can be exemplified by the Australian regulation. (A certain percentage of the turnover has to be allocated for training purposes; if not used by the company itself, the company has to transfer the funds to a training institution.)
4. Restructuring of industry may raise the following question: Is it relevant to support an industrial sector the survival of which is threatened by the restructuring process? Resolution of this issue requires consideration of the indirect effects (employment, utilization of local resources, diversification of industry, retaining of skills, etc.) and the weight assigned to them by the policy bodies. In principle the solution is a policy decision and should be made by the authorities.

Infrastructure level

5. The establishment of a R&D Centre at a large industrial company ensures close links with the industrial company which facilitates efficient feedback for the Centre's work. If operating on a commercial basis, the Centre is motivated to offer the services to a broad range of companies. However, the experience seems to indicate that this applies primarily to testing and training services. The product development function serves primarily the "parent company".
6. To promote intensive use of the product development and other R&D services by potential users, a more determined marketing is required. Personal contacts with demonstrations of samples and similar techniques are likely to be more effective in establishing confidence than dissemination of printed promotional materials. Advice on marketing strategies for diffusion of technology should be built in any DTT-related project document.
7. Involvement of economically strong private companies as owners of a project is a factor of sustainability and image building. Implementation of the project by a contracted competent local private company can contribute to the efficiency of implementation. However, any involvement of private sector in a project is not necessarily a guarantee for relevance and sustainability. Private sector, which is in a difficult financial situation and faces serious restructuring problems, may need a subsidy to organize and sustain common services as much as the public sector would need.
8. Unless there is a clear indication that the private sector can guarantee self-sustainability of the project demonstrated by, for example, direct financial contribution to cover the capital and operational costs, there is hardly any justification for creating new structures in the private sector in parallel to those existing in the public sector. Instead, a single consolidated technological infrastructure should be built to service the whole industry.
9. In some cases projects attempting to introduce advanced methods and technologies do not apply adequate strategy: they include significant equipment component while underestimating the need for training, elaboration of working methods and standards and extensive awareness raising among potential users of the services.
10. Developed technological capabilities should include skills needed to carry out investment analysis and market investigations or, at least, skills to communicate and cooperate with such bodies.
11. Using local professionals for advisory services is not only more efficient but it increases their experience and upgrades further their professional capabilities.
12. Motivational salary schemes are important for staff performance and sustainability of the developed technological capabilities. Privatization facilitates introduction of such schemes.

Plant level

13. Focusing assistance on downstream technological development implies support of institutions/capabilities directly associated with a specific enterprise. This company may monopolize the results. To avoid that conditions should be made to share results either through exchange of information or through a commercial transfer contract.

14. Small projects at the plant level may have immediate, visible and significant impact for the beneficiary. Low efficiency for UNIDO (high actual support costs, far exceeding the 13% flat rate) could be reduced by applying a rate recovering fully the support costs. This is, however, conceivable only in case of self-financed trust fund projects.

Project cycle management in general

15. It is still not generally recognized that UNIDO-supported projects are not owned by UNIDO, but by a governmental or private body ("the client") in the country which should feel primarily responsible for the final results.

16. Conceptually - for the sake of synergy - it is preferable to provide UNIDO services as a package or programme supporting a number of related programmes and/or projects in the country. Well elaborated industrial policy objectives in Sri Lanka may facilitate this approach. However, programmes supporting a number of national projects with different parties responsible for them are running an increased risk of inadequate cooperation and coordination in the course of programme implementation. To reduce the risk a good participation analysis is required at the beginning of the programme. Workshop techniques can facilitate such an analysis and establish better understanding of participants' expectations and define their roles and responsibilities.

17. There is a need for courageous initiative to redesign the project when external factors change and the previous assumptions do not hold any longer. In this context the periodic review meeting should be made use of to agree on the changes.

18. Personality frictions accompanied by differences in conceptual approaches to project implementation need to be addressed as soon as possible. With the accent on national ownership and execution of projects this may be a sensitive task. An in-depth evaluation by an external consultant may help in finding and implementing a solution.

19. Accidental failures in the delivery of inputs and provision of services might become cases of protracted debate. The longer the issue lasts, the higher are the management and administration levels into which it penetrates, damaging the image of the Organization. To minimize the negative impact of such a case it is imperative to address it promptly and, if necessary, even at the cost of additional expenditures for the Organization.

6. TECHNOLOGY-RELATED PROJECTS ANALYZED BY THE MISSION

6.1 Ceramic Research and Development Centre (CRDC)

Supported by:

- US/SRL/78/207 US\$ 1,005,800 of which equipment US\$ 608,216
- DP/SRL/86/005 US\$ 56,477

In-depth evaluation report available

Relevance

The project was addressing the needs of the national ceramic industry for testing, advisory and product development services. The needs were well identified, the demand for services of the Centre is well established; time has confirmed the continuing relevance of the project.

Originally the Centre (then Laboratory) was owned by the Ceylon Ceramic Corporation. After privatization in 1991, the Centre was privatized as well. It is to be noted with satisfaction that the Centre continues to serve not only the newly privatized Lanka Ceramic Ltd. but the ceramic sector (approximately 50% of the income is generated from sales of services to customers outside the Lanka Ceramics group).

Effectiveness

The outputs were produced as planned; the developed technological capability provides not only testing services, but also research work on raw materials, product development, consulting services and training. The Centre received a presidential award for "high temperature furnace for heat treatment of geuda and similar varieties". The Centre developed (from local materials) heat work measuring rings and replaced imported hydrocyclones with their own products, etc.

As mentioned above, the capabilities are used by Lanka Ceramic Ltd. as well as by other companies in the sector. Testing services are used primarily by the outside clients. Product development and manufacturing services are used primarily by the Lanka Ceramic Ltd. The Centre has started cooperation with the Industrial Development Board in conducting training workshops in the provinces. Joint R&D projects are conducted with the Open University (utilization of rice husk ash) and the Geological Survey.

Sustainability

Nominally, the Centre is recovering approximately 80% of recurrent expenditures from income received for its services. In real terms the economic benefits generated by the Centre are larger but they are partly retained by the Lanka Ceramic Ltd. (see Impact).

Compared to the situation at the end of the project, the number of staff has decreased (from 12 to 9 professionals, with two vacancies to be filled). Out of 14 staff trained under the project, 5 have left the Centre (the former General Manager of the Ceylon Ceramic Corporation, who received most of the training abroad, is now in a managerial position in another private ceramic company). In spite of these setbacks the current staffing seems consolidated. This is also thanks to the incentive salary scheme for the scientists introduced after privatization (the professional staff at CRDC is better paid than equivalent staff at CISIR).

The equipment delivered under the project is still operating and in use (except for one piece). The maintenance has not posed unsurmountable problems; the cooling system, when it broke, was repaired.

The Centre has a Board of Directors, out of 11 members of the Board 2 are from the Lanka Ceramic Ltd.

Thus there seem to be good prospects for sustainability of the Centre and continuous interest in providing services to the whole sector, since a considerable part of the income comes from clients other than Lanka Ceramic Ltd. However, there is a potential to expand and further upgrade the services of the Centre. It has the capacity to develop and produce small batches of different ceramic products which are currently imported. To achieve this the Centre needs to increase its visibility outside the sector. In the past years it has organized several sector-wide conferences (approximately 150 participants, several foreign guests/lecturers) complemented by small exhibitions of the ceramic products produced in Sri Lanka, but for its own penetration of the market a more active marketing is desirable (probably personal visits with demonstration of product samples).

Impact

The primary impact of the Centre's supporting activities to industry is in better use of local raw materials and improved quality of products. CRDC also supports the export of ceramic products by product testing; the certificates are recognized by the customers (Lanka Ceramic Ltd. exports approximately 4% of its production, the whole sector approximately 30%). Advice has also been provided (and implemented) on how to alleviate quality problems of products for export (example: Dankoduwa Co.).

In economic terms the main impact is apparently in import substitution, both directly, through manufacturing of products substituting imports (such as the above-mentioned hydrocyclones) and indirectly, through supporting the local industry (better use of local materials, improved quality of products, lower costs) to hold the lion's share of the local market.

The direct impact is noteworthy in specific cases (one hydrocyclone was imported for US\$ 1,600, the production costs of its substitute produced by CRDC are less than US\$ 150), but in view of small size of production batches (approximately 120 per year) the overall direct impact on import substitution (in this particular case US\$ 170,000) is probably less important than the indirect one (testing and problem solving for the exporters).

Lessons learned

1. The establishment of the Centre at a large industrial company ensures close links with the industrial company with efficient feedback for the Centre's work. If operating on a commercial basis, the Centre is motivated to offer the services to a broad range of companies. However, experience seems to indicate that this applies primarily to testing and training services. The product development function serves primarily the "parent company". To promote use of the product development services by other potential users determined marketing is required. Personal contacts with demonstrations of samples and similar techniques are likely to be more effective in establishing confidence than dissemination of printed materials.
2. Motivational salary schemes are important for staff performance and sustainability of the developed capabilities. Privatization facilitates introduction of such schemes in Sri Lanka.

6.2 Sri Lanka Standards Institution (SLSI)

Supported by:

DP/SRL/86/007 US\$ 575,000 of which equipment US\$ 192,600

In-depth evaluation report available

Relevance

The mission of SLSI is to undertake and promote standardization, measurement and quality assurance in order to facilitate internal and external trade, increase productivity and international competitiveness and safeguard the interests of consumers. In general terms the relevance of a project supporting a standards institute can be derived from the relevance of this institution as one of the unquestionable components of the institutional framework of the country.

However, in view of the new concepts developed in the field of quality management, one of the original project outputs ("Company Standardization") has become obsolete and lost its relevance (which it might have had at the beginning of the project). On the other hand, the relevance of Output No. 1 ("Laboratory Accreditation Scheme") has considerably increased in view of the Government's decision to introduce compulsory accreditation for all laboratories conducting or planning to carry out environmental analysis (10-15 laboratories should be assessed for accreditation purposes by June 1996). It is expected that the compulsory scheme will be extended to other professional fields.

Effectiveness

SLSI has approximately 100 professionals (of which 95 have a scientific background), 50 middle-level technical staff and approximately 200 general service staff. Through massive training abroad (over 130

fellowships and study tours) and a considerable input of equipment (approximately US\$ 600,000), the project aimed at producing five distinct outputs. However, the relation between the inputs and outputs is rather blurred as the inputs seem to have been used for strengthening SLSI in general, not necessarily only the outputs/functions specified in the project document. For example, the Materials Section of the laboratory was strengthened by several pieces of equipment, but it is not clear which specific output was supported by this equipment. (It should be noted in this context that this Section faced several problems in installing a universal tensile testing machine worth almost US\$ 100,000. First, when the machine arrived, the foundation base was not prepared and the machine remained stored in a horizontal position for a long time. Once erected it did not operate properly, but the supplier was no longer obliged by the terms of the contract to commission it.)

Three of the Outputs were produced fully, one of them had to be revised (Company Standardization - see above) and one was not produced fully ("Engineering Industry Standardization") because a job with SLSI is not counted for in the career development of those who want to become chartered engineers. As a result, the staff in the Engineering Section of SLSI are not stabilized and their performance in preparing and issuing standards is below the planned targets.

Use of the capabilities developed under the Outputs is satisfactory. Laboratory accreditation activities (Output 1) are on-going, information and educational bulletin (Output 2) are distributed quarterly to 800 libraries, 10-15 standards are issued annually by the Engineering Division (Output 3), 50 group training workshops on Total Quality Management (TQM) are conducted annually (revised Output 4), import inspection procedures are well established (currently there are 56 items on the list) and 5 agreements on inspection procedures have been concluded with foreign laboratories (Output 5). The activities of SLSI are, of course, much wider and the training provided under the project in the past is no doubt contributing to them as well.

Sustainability

In financial terms, SLSI manages to recover approximately 30% of their recurrent expenditures from income generated by their services. The most significant revenue items represent testing and calibration fees (30%), training (17%), certification marking (12%), import inspection charges (11%) and sales of standards (5%).

Most of the beneficiaries of approximately 130 fellowships and study tours have stayed with the institute; however, about 45 left the country for economic and social reasons. In spite of this, the training contributed to the sustainability not only of the outputs produced with the support of the project, but of the institution as a whole. Now, as SLSI has embarked on the implementation of the laboratory accreditation scheme and has shifted the emphasis from product standards to certification of quality management systems (ISO 9000, TQM), the training obtained in the past, is found to be particularly beneficial.

Upgrading of staff qualifications continues with the support of a consultant on accreditation (funded by the World Bank) and training on TQM financed by Swedish Development Agency. However, staff turnover caused by a low salary level continues to be a lasting problem for SLSI.

Except for the serious and still unresolved problem with the universal tensile testing machine and a few instruments which are out of order, most of the equipment and instruments provided under the project are operating. The frequency of their use depends primarily on the demand for testing, calibration and inspection services because these services represent approximately 80% of the laboratory' activities, whereas the standardization work proper (development of standards, testing methods, etc.) accounts for approximately 20% only. At some periods SLSI may be overloaded with testing orders - in that case an order may be passed on to another laboratory outside SLSI, such as CISIR.

The equipment/instruments out of order had been lying idle in some cases for several years. In one case the producer had gone out of business and, thus, there was no chance of receiving technical support from him. In other cases (such as Honeywell chart recorder) the producer insisted on sending the piece to Singapore, which would be technically easy but, allegedly, very cumbersome administratively, owing to customs clearance requirements.

The SLSI laboratories continue to be heavily supported by provision of additional equipment from JICA; at the time of the mission's visit to the laboratories a consignment of equipment and instruments worth US\$ 5 million was under way and partly unloaded.

Thus SLSI tries to continuously upgrade its human and instrumentation resources both to develop standards, perform the accreditation function and provide testing and inspection services. For the future the strategic plan expects greater demand for quality assurance of exports and imports, for quality system certification and for the expansion of the product certification schemes. There do not seem to be any threat to the sustainability of the institution even if the testing services are gradually taken over by other laboratories. (In view of a rather comprehensive endowment of SLSI with equipment and qualified staff, this is unlikely in the near future.) There is, however, a risk of deterioration of the activities and services of SLSI if the heavy staff turnover is not reduced. This can be considered a demonstration of an asymmetry between highly developed hardware and an inadequate organizational framework.

Impact

The impact of the capabilities developed under the project and their use can hardly be separated from the impact of the activities of SLSI as a whole: facilitation of trade, protection of health and safety, and increased awareness of the need for quality management in order to increase competitiveness. Implementation of the quality management system in industry depends, however, primarily on the industrial companies themselves.

Lessons learned

1. Training of staff needs to be accompanied by organizational measures (salary, fringe benefits, career development) to increase the probability that the trainees will stay with the institution.
2. Current administrative procedures regulating shipment of a piece of equipment (purchased tax-free under a project) for repair abroad seem to represent a hurdle discouraging staff to take action.

6.3 CAD/CAM Centre (University of Moratuwa)

Supported by:

DP/SRL/86/014 US\$ 835,841 of which equipment US\$ 394,684

In-depth evaluation report available

Relevance

Originally the intention was to upgrade and fully equip with CAD/CAM a workshop of the Industrial Development Board (IDB). Later a decision was taken to locate the CAD/CAM Centre at the Mechanical Department of the University of Moratuwa. Though the industry did not participate directly in the formulation of the project, a survey of needs for CAD/CAM services had been conducted before the project was formulated. The survey confirmed the needs for CAD/CAM and supported the considerations about project relevance.

However, the survey could have brought different results had the inquiry about the interest of the industry been accompanied by information about the price for the services. As it has turned out, there is sufficient demand for the introductory training in CAD (primarily drafting), whereas the demand for CAD/CAM-supported small-scale production of spare parts or prototypes is very limited. To a great extent this is due to the price charged by the Centre (which, anyway, is far from covering all costs). It can be concluded that the relevance of the CAM component in the project located at a university is highly doubtful, at least under the present conditions.

On the other hand, application of CAD/CAM requires a longer gestation period and there is a chance that full relevance will be achieved at a later date, once the engineering sector further develops and the demand for CAD/CAM increases.

Effectiveness

Basic capabilities as defined in the project document were developed, most of the staff trained by the project are still at the Centre (though not full time, as all of them are lecturers), equipment is operating and new equipment procured, though on a moderate scale (University funds, Danish Industrial Development Agency [DANIDA]). However, the three technicians operating the machines in the CAM section of the Centre are still employed on a short-term basis only which does not ensure stability of the staff and its performance. The sabbatical leaves taken occasionally by some of the staff (presently two staff are on sabbatical leave, including the Head) also reduce the capacity of the Centre.

There appears to be a disproportion between the sophisticated equipment and the capabilities of the Centre's staff (who can hardly make full use of the capacity of the NC centre). However, through the challenges of tasks carried out for the clients, the capabilities of the staff are being gradually upgraded to meet very diversified and practical needs.

Quite inadequate is the informational support, such as documentation for clients on the Centre's potential, capabilities, guidelines for CAD/CAM application, etc. The library is also rather modest and is used primarily by the teachers.

The developed capabilities in CAD are used primarily for training students. In addition to this, the Centre conducts Saturday courses for outside professionals (mainly from public utilities and industry) in drafting (twelve weeks, 72 hours each, 60 participants annually) and in final elements analysis (the same duration, but only 12 participants annually). It also conducts awareness seminars.

The use of the capabilities in CAM is rather limited, primarily due to the limited effective demand for these services (10-15 paid jobs per year). What is most frequently used is the EDM machine (for tasks required by the aluminum industry and the Ceylon Steel Corporation).

To sum up: while the capabilities were developed to a great extent, their use by industry is limited.

Sustainability

The CAD/CAM Centre earns very little (on average approximately US\$ 20,000 annually). In view of the large capital investment which will be required for continuous upgrading of the hardware it is evident that the current Centre can hardly be operated on commercial principles even if the quantity and price of services for industry are increased considerably. (The possibilities for increasing prices are, however, very limited.) Unless there is a strong industrial organization ready to take over the Centre with the commitment of a long-term subsidy, its present location at the University provides at least some pre-requisites for its continuity. However, in order to stabilize the staff, strengthen linkages with industry and increase income from training, advisory and other services, it is necessary - as an immediate measure - to strengthen marketing, nominate a full-time director and change the legal status of the Centre, allowing for more autonomy in staff recruitment, remuneration, etc.

In the longer term, further upgrading of the Centre, its transformation into an independent Centre with full-time staff, a governing board etc. should be considered, as recommended already in the in-depth evaluation report in 1993.

Impact

It is difficult to assess the impact of the project as the Centre does not keep summary records of its own activities, let alone of their impact. Tangible results in industry, however, seem to be very modest. After the exposure to training several companies have allegedly introduced CAD. One can expect that the 60 mechanical engineering graduates each year (with courses in CAD/CAM) will in the long term contribute to the application of CAD/CAM in industry.

Lessons learned

1. In conducting a survey of the demand for services, a distinction should be made between needs and effective demand. This distinction makes it possible to arrive at a realistic conclusion about commercial viability of an institution or the scope of long-term subsidy required to support the institution and its services.
2. Development of an advanced capability (such as CAD/CAM) at a university has a distinct advantage in terms of availability of qualified staff to operate it, sustainability and impact on the educational process. To facilitate direct impact on industry it is necessary to provide the team with an autonomous status in terms of recruitment, salary levels and financial management.
3. More advanced services for SMEs (such as CAD/CAM) can hardly be cost-recovering in a small country with a historical memory of extensive and cheap public services.

6.4 Ceylon Institute for Scientific and Industrial Research (CISIR)

Supported by

DP/SRL/86/016 US\$ 812,208 of which equipment US\$ 426,000

Relevance

The project aimed at developing technological capability to develop/improve products based on two distinct local raw materials: rice and leguminous seeds, and essential oils. In both cases the needs were identified by the R&D staff at CISIR, but extensive contacts with industry had been established to confirm its interest before launching the project. In both cases the motivation relates to the utilization of local resources.

As regards rice, its production increased considerably in the 1980s as the Mahaweli scheme was gradually put into operation. At the same time imports of cheap wheat and convenience of preparing meals from wheat products resulted in increasing substitution of rice by wheat products. New products to be developed from rice were expected to offer the same convenience to consumers and compete in terms of cost. The relevance of this project component remains valid, as confirmed by frequent requests of the Ministry of Agriculture to promote the products developed by the Institute. On the other hand, the current policy of cheap wheat counteracts this effort; the current higher price of rice hampers a wider introduction of the new products in the market.

As regards essential oils, the origin of distilling local plants goes back to several centuries. Traditional distilling is still applied. In the 1970s, at the time of curtailed imports, the Government policy demanded that maximum use be made of local materials. With the liberalization of imports, local products could not compete (in quality or price) with those imported from India. Hence, the requirement to upgrade the technology and improve the quality of products. The relevance of this project component was jeopardized after the civil riots in 1989 when a large area of fields was destroyed (except cinnamon).

Effectiveness

In both cases most of the planned outputs have been produced. The technological capability of the CISIR to service industry in respect of the two areas viz: food technology, and the technology of essential oils, has been enhanced. The most important equipment (the multipurpose pilot plant, the fractionation unit and the general purpose versatile extruder) is still operational, though maintenance problems occur. Some equipment such as the belt drier is not capacity matched, causing problems of wastage of raw materials.

The fractionation unit is used for the R&D work connected with the separation of some of the flavour constituents of locally produced essential oils. This is for the use of the fragrance formulation unit at the CISIR as well as for contract research for industry. The separation of Eugenol from the leaf oil of cinnamon oil is conducted on contract for industry. Similarly the UNIDO-designed polyvalent pilot plant is used for the development of industrial methods for the production of spice oleoresins, a value-added product now in demand on export and local markets. The polyvalent pilot plant is also used for contract research to produce extracts of medicinal plants for the herbal pharmaceutical industry.

The training has been adequate and well balanced as regards exposure to technology in Western and Eastern Europe, as well as relevant technology in the Asian region, notably in India and Thailand. A case of wrong placement of a fellow was however recorded, where an experienced fellow was placed in a University laboratory.

CISIR has been able to develop the technology for a variety of new products. These include rice-incorporated cereal products, and a formulation for bread with 25% rice which is now being used by bakers in the Kandy region and is expected to be made available in Colombo as well. "Hopper" is a popular local rice-flour pan-cake-like product. An "Instant hopper mix" has been developed and transferred to industry. Several extruded rice and other flour-based products have also been produced and the technology transferred to industry. There are also good prospects for the wider use of other products developed by the project such as weaning food mixes from local materials and granola bars. Textured vegetable proteins were not developed but local style herbal soup instant mixes have been produced and the technology transferred.

Standard specifications for a variety of products within the food and the essential oils industry have also been developed through a collaborative effort with the SLSI.

The project also gave rise to a facility for the local formulation of fragrances, and a joint venture has already been set up which will be serviced by the CISIR as a result of the technology transfer effected through the project.

Neither the rice nor the essential oils component produced brochures or other documentation for the industry on the processes, product formulas, production costs, etc. This is explained by the arrangement made with those who buy the technology, protecting them for some time against competition. Generic information about the available technologies on offer by the Institute is published and disseminated through the CISIR Bulletins (the two most recent Bulletins carry information on technology offers in the essential oils field). A complete list of technology offers is also available.

Sustainability

CISIR covers approximately 30% of its operating costs income from the sale of services and technologies. In order to promote local industry and not to fend off clients from the SME segment the fees are kept low.

From the 15 staff trained under the project only 2 have left CISIR. In particular the "rice component" is distinguished by high staff stability. The most detrimental impact has been from the departure of an experienced expert in essential oils.

Since the completion of the project the activities continued and new R&D projects started, some of them in cooperation with other institutes (such as CARI - Central Agricultural Research Institute). Some companies have become recurrent clients of the Institute (Harischandra Mills, Reckitt and Colman, Hettigoda Group, etc.). Sustainability at the current level of activities can thus be expected with sufficient justification. However, more dynamic and intense R&D work, which is desired to achieve a more visible impact, requires a system of motivation which would spur present staff and attract additional qualified scientific staff to the institute.

Impact

The economic impact of the project on the industry has been rather modest so far because the clients are primarily SMEs or their number is limited. Some impact on the substitution of wheat by rice can be expected in the Kandy region where 4 large bakeries are applying the technology and use composite flour. The essential oils industry has received an impetus due to greater prospects for export. The same applies to the fragrance industry. However, data on quantities are not available.

Lessons learned

1. Diffusion of technology embodied in new products depends to a great extent on the price structure. R&D needs to consider this context when deciding on a product development project. If desirable, the R&D institution should provide a feedback to the policy-making bodies about the implications of Government policy(ies) on domestic development and commercialization of technology.
2. In order to improve the value of training, fellows should be informed in advance about the activities conducted at the institution to be visited.

In general, very good training results are observed when the training is arranged by an expert working with the project staff.

3. Female trainees are more likely to stay for a longer period with the same project/institution than men.

6.5 Textile Training and Service Centre

Supported by

- DP/SRL/79/054 US\$ 2,917,346 of which equipment US\$ 1,228,966
- DP/SRL/87/012 US\$ 1,043,197 of which equipment US\$ 72,300

In-depth evaluation reports for both projects are available

Relevance

The Centre was established to provide training, testing and consultancy services to the textile sector. The need to upgrade the textile sector was apparent and still exists as this sector lags behind the requirements of the garment sector for local inputs. In view of the fast growth of exports by the garment sector, the need for upgrading the textile sector is even greater now than it was at the time the project was formulated. (While 90-95% of the textile inputs for the garment sector are imported, the garment sector is interested in getting supplies locally because local supply can increase reliability and flexibility of inputs procurement, provided the supplies meet the required quality and are delivered on time.) As long as training, testing and consultancy services can support this development, the relevance of the Centre is real.

However, the demand for consultancy services decreased after most of the large textile mills had been privatized and some of them established various forms of cooperation with foreign partners who have become the main source of know-how and technology transfer. Thus the Centre's main relevance seems to be in training and testing services, the need for which will continue to exist even if some textile mills do not survive the restructuring process.

Effectiveness

The training and testing facilities have been well established. Currently the Centre carries out one long-term course with a certificate (one year duration) for 15 participants. The participants are eligible for complementary training (10 weeks duration) at the Melbourne College of Textiles, on a self-financing basis (four applicants this year). There are a number of short-term modular training programmes in technical aspects, both for operators as well as for management staff.

Testing is conducted for both the textile and garment sectors. Superintendence of General Services (SGS), BOI and Government tenders are among the users of their testing services. In terms of income, testing represents the main growth area. The Centre is taking steps to acquire international accreditation.

The production machinery installed by the project is used for training and for producing small batches of specialized products for outside clients. This activity is, however, kept at a level not affecting the training activities, so that the level of utilization of the machines varies considerably.

The sizing machine provided by the project turned out to be too large for the needs of the Centre and the Centre plans to sell it.

Sustainability

The Centre recovers approximately 40% of its operating costs through income generated by services. The most significant contributor to income generation are testing services and training. The importance of consultancy has decreased and does not represent more than 20% of the total income. As explained above, the fall in consultancy services was caused partly by the decrease of demand (privatization; fewer market studies due to very limited investment). However, it was also caused by the difficulty of reaching and maintaining high standard of consultancy services. As a result, the Management Services Division, created by Phase II of the project, was dismantled. Thus, Phase II of the project did not prove sustainable.

As regards the staff, the Centre manages to maintain the number of professionals (number of general service staff has decreased slightly), but there is a considerable staff turnover. From the 16 staff trained under the project, only 5 are still with the Centre, the others have left (most of them stay in the country). The Centre, however, follows a very sound approach to its own staff career development: newly recruited graduates are exposed to jobs in all sections of the Centre and they are also sent for on-the-job training and exposure to shop-floor conditions for several months to a textile mill.

As regards the equipment provided under the project, it is in good operational condition; however, to have advanced technology for training purposes, some replacement is already needed. JICA agreed to provide a significant support to the Centre both in terms of equipment (approximately US\$ 2 million), long-term (5 years) experts (dyeing and finishing, weaving, environmental pollution, maintenance of equipment, quality assurance) and training in Japan (45 man/month in total, 3 months duration each).

The Centre is supervised by a Board of Governors (9) which meets monthly. The new Director has very good qualifications and extensive experience in industry and is an important factor for the sustainability of the Centre and its upgrading. The plans include training in engineering (to repair and maintain equipment), CAD, and a small electronics laboratory.

Impact

There has been hardly any visible impact by the Centre on upgrading textile production to meet the requirements of the garment sector. Apart from the fact that qualitative changes in the textile sector require considerable investment in new technology (which can not be influenced by the Centre), the impact of the training itself is marginal as well. With a few trainees from one large mill it has not been possible to reach a critical mass to induce any changes by the trainees in the mill. With the forthcoming shift of focus on the SMEs the chances to make an impact might increase. In 1996 two SME companies are selected, on an experimental basis, for concerted support through training, testing and consultancy in order to improve productivity.

Lessons learned

The demand for training often results from personal motivation of the trainees and less from the interest of the company management. Sometimes the trainees do not want that the management be informed about the training because the training is viewed by some of the managers as a factor in staff separation from the company. There is much more willingness to invest heavily in hardware than to invest more modest amounts in the training required to operate the machines properly.

On the other hand, new technology in the sector is more sophisticated and requires higher skills to operate and maintain it, and a more sophisticated organization. To stimulate management of the textile companies to train the staff a policy measure is needed to make use of the available training facilities. Legislating the cost of training a deductible tax item is one option. Another one can be exemplified by an Australian regulation: 2,5% of the turnover had to be allocated to training purposes; if not used by the company itself, the company had to transfer the funds to a training institution.

6.6 Ceylon Steel Corporation (CSC)

Supported by:

SF/SRL/93/001 US\$ 23,451 no equipment

Relevance

The rolling mill of the CSC was facing problems of low capacity utilization and a high reject rate. At a UNIDO training workshop in the Ukraine a CSC participant initiated contacts with UNIDO. The company agreed to cover the full costs of a consultant's mission.

Effectiveness

Management of the rolling mill is fully satisfied with the advice provided. Five out of six recommendations have been implemented.

Sustainability

Direct support, therefore not applicable.

Impact

There are considerable savings generated by the application of the recommendations. The mill management is convinced that the savings "have exceeded by far the price" they paid for the service. In view of the good results they are negotiating terms with UNDP for hiring another consultant. They wrongly assumed that it would again be a UNIDO consultant. (UNDP started making arrangements with UNISTAR.)

Lessons learned

1. Small projects may have immediate, visible and significant impact for the beneficiary and support image building of UNIDO. Low efficiency for UNIDO (high actual support costs, far exceeding the 13% flat rate) could be reduced by applying a rate recovering fully the support costs. (However, this approach can be justified only in the case of self-financed trust fund projects.)

Note: The visit was also used to test the Client Feedback Questionnaire. It was confirmed that it is relatively easy to fill in and the questions are comprehensible (only two amendments were needed to avoid misunderstanding). Required time for completion: approximately 15 minutes.

6.7 Industrial Technology and Market Information Network (ITMIN)

Supported by

DG/SRL/93/010 IPF US\$ 1,287,000 of which equipment US\$ 675,000
 consortium Rs. 20,000,000

Allotted to UNIDO : US\$ 382,000

Relevance

The relevance of the project was based on the assumption that industry needs information on products, technologies and markets and that it is ready to pay enough for the services to make the project sustainable. The preparatory assistance, however, did not verify this assumption through a market research. The Country Technical Adviser (CTA) did not consider the structure of services outlined in the original project document as sustainable and proposed to complement the information services with follow-up (value-added) services. In particular matchmaking and other services to support transfer of technology as well as any form of industrial cooperation were included.

The relevance of some of the services to be offered seems to be beyond doubt (such as the training and advisory services on the application of information technology) whereas the existence of sufficient

effective demand for other services is yet to be proven, particularly in view of the fact that a number of institutions are also trying to operate in this field. The project team is, however, fully aware of this situation and tries to address the problem by aiming at high quality of information and its speedy delivery.

Effectiveness

The outputs have been produced to a considerable degree and there is a good chance that they will be produced to the level allowing operation of the network at the time of planned project completion. Hardware is installed, offices are equipped, staff (15) have been recruited and trained. A busy working climate can be observed. However, several important activities are still to be performed. Application software is not yet finalized, a methodological toolkit for the staff is prepared only partly and nothing has so far been prepared for the users. Except for two databases on technologies and data on approximately 1,500 local companies the other databases are not yet established and periodicals and publications have not yet been delivered. The project seems to share the frequent feature of projects when primary attention is paid to hardware and training while guidelines, procedures and documentation are viewed as components of complementary importance.

Capabilities to provide support to technology transfer until the conclusion of a contract will be most difficult to develop; this can hardly be expected at the end of the project.

In addition to various administrative hurdles, the delay was also influenced by the withdrawal of one of the UNIDO consultants whose attitude and performance were considered by project management as unsatisfactory.

In addition to the backstopping section, contacts and linkages with other UNIDO substantive sections have been established but not developed. ITMIN can benefit from various UNIDO activities, such as training courses on technology transfer, the network of the Investment Promotion Service, dissemination of UNIDO periodicals and publications, etc. On the other hand UNIDO can use ITMIN as its window in Sri Lanka, use its services for distribution of periodicals such as Monitors on Technology, etc. Not much has been done in this field so far.

Sustainability

Given the current status and the quality of staff it is probable that ITMIN will develop most of the capabilities to provide services as planned. Sustainability will thus depend primarily on the existence of a sufficiently significant demand for such services. In recent months a demand survey was conducted on the basis of which the project staff are cautiously optimistic about the possibility of running ITMIN - after several years - as a self-supporting entity. The project staff have the experience that at least some companies in Sri Lanka are ready to pay for high quality and user-friendly information.

Impact

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Lessons learned

1. Whatever the demand-derived relevance and sustainability of the project will prove to be, the involvement of economically strong private companies among the shareholders of the network is a factor of positive image building.
2. Implementation of the project by a contracted competent local private company can significantly contribute to the efficiency of its implementation.

6.8 Foundry Development and Service Institute (FDSI)

Supported by

DP/SRL//89/014 US\$ 698,750 of which equipment US\$ 275,402

Relevance

While the manufacturing sector (and in particular the garment industry) has recorded the highest growth rates among all sectors of economy, the foundry sub-sector is facing serious problems which threaten the survival of many SMEs owing to the effects of trade liberalization. The project was designed to help the industry overcome the problems of low competitiveness (due in particular to low product quality caused by obsolete technological processes, low skill levels, heavy reliance on scrap with small inputs of pig iron, etc.) The problems were well identified together with the industry. The industry itself (48 companies, of which 4 in the category of 20-30 tons of output per months, the rest being SMEs) became the owner of the project with the understanding that after initial support from IDB and UNDP/UNIDO the developed testing, analytical, training and advisory capabilities (in FDSI and in some member companies themselves) will become self-sustainable.

With the direct involvement of the private sector the relevance of the project seems to have been well established. It seemed more relevant to establish a new facility owned by the private sector than to support the IDB which, at that time, was not considered to be a business-oriented institution. However, the long-lasting dispute with IDB (after the change of the IDB Chairman) about the ownership of the project raises doubts about the relevance of establishing a facility parallel to IDB. The doubt is further nourished by a major support currently provided to the IDB foundry by JICA (5 experts for 5 years, equipment worth US\$ 2,5 million during the first two years, including an emission spectrometer and a tensiometer, and some training in Japan). These doubts are also nurtured by the fact that the National Project Director could not be paid by the private sector and had to be financed from the UNDP funds.

The understanding of the type of services to be provided by the FDSI at the end of the project has not been updated and clearly specified. The analysis of the situation in the sector by the Chairman of the Board points to the necessity to develop sub-contracting for foreign partners. Hence the primary requirement is for services upgrading the quality of products. This understanding, however, has not been clearly articulated and translated in the specification of services to be developed/made available in any management document. (The specification in the project document turned out to be too broad and too ambitious.)

Effectiveness

Capability building has so far been very limited. The chemical laboratory is not functioning because a re-conditioned emission spectrometer has not been put into operation in spite of four visits by a supplier's technician. (The spectrometer was purchased from Applied Research Laboratories Ltd. The electronic components are obsolete. Complete service documentation is not available.) For more than one year after delivery it was not installed because conditions for its installation had not been known. The carbon equivalent determinator is also out of order. Some equipment for metallurgical testing is available.

Only one chemist is serving in the laboratory. Until 31 December 1995 the National Project Director (NPD) also worked in the laboratory; his contract, however, was discontinued upon request of UNIDO due to long-lasting differences in conceptual approaches to project implementation with the CTA/BSO.

Demand for the rather elementary services which are available is very limited. Some tests are carried out free of charge for IDB, hardly any member of FDSI comes with a request for testing.

The effectiveness of the project was affected by the above mentioned conceptual differences. For example, while the BSO advised the NPD to engage in trade operations to generate income for the Institute, the NPD was not willing to start activities which he believed were outside the mandate of FDSI. According to the Chairman of the Board, the CTA was advocating application of technologies/methods which in some cases were too advanced for local conditions. As the former NPD has full support of the Board, the friction has affected the effectiveness of the project.

Sustainability

FDSI is not and can hardly become sustainable, even if the spectrometer is repaired (which is generally doubted) or replaced. At present the annual membership fee is US\$ 40 and in view of the financial situation of the members it can not be increased. Payment for advisory services has not been part of the industrial culture so far so that fees need to be kept at a low level. It will be hardly possible to operate FDSI on cost-recovery principles. The only solution at hand is to pool resources with IDB. The offer of JICA to provide IDB with a spectrometer may support this solution.

Impact

The project has a considerable direct support component as a large part of the project budget has been spent on consultants who visited and directly advised several companies. The impact of this direct support can be noted particularly in two areas: introduction of divided blast cupola (working in one foundry, under preparation in another one) and extensive training in pattern making. The study tour of 12 industrialists to India, which was highly praised for allowing exposure to technologies adequate to Sri Lankan conditions, supported introduction of new methods by some companies (sand testing, teapot ladle) with impact on product quality.

Lesson learned

- 1) The involvement of private sector in a project is not necessarily a guarantee of relevance and sustainability. A private sector which is in a difficult financial situation and faces serious restructuring problems may need subsidies to organize and sustain common services.
- 2) Personality frictions accompanied by differences in conceptual approaches to project implementation need to be addressed as soon as possible. With the accent on national ownership and execution of projects this may be a sensitive task. An in-depth evaluation by an external consultant may help in finding and implementing a solution.
- 3) There remains the question regarding the relevance of providing support to a sector from which only a few companies are likely to survive the restructuring process. It is a policy question whether it is in the interest of the country to support a particular sector which is affected by the liberalization policy and the only competitive advantage of which is cheap labour and less strict environmental regulations. The evaluation team believes that for several reasons - employment, utilization of local scrap, retaining existing technical skills and industry diversification, etc. - the answer should be positive, but an answer can only be given by Government authorities.

6.9 The Ceylon National Chamber of Industries

Supported by:

US/SRL/93/021	Pilot Project for Enterprise Restructuring	US\$ 298,000
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Relevance

Support in restructuring has been provided to 10 companies (80-150 employees each) in five sectors (wood, electro, light engineering, rubber, printing). The companies pay a nominal fee (US\$ 300) for the advisory services. This can be considered an indicator of interest in the project and of the project's relevance.

Effectiveness

Diagnostic studies have been completed. The companies are reported to be satisfied and to have started implementing some non-investment recommendations (changing plant layout, better housekeeping, sending staff to technical training, etc.)

The studies were conducted by local professionals (National Institute for Business Management [NIBM]; University) under the tutorship of a CTA (6 months). NIBM is reported to have a well established Engineering Department. The National Project Coordinator is a qualified engineer with a dynamic personality.

Sustainability

Experience acquired by the two consulting groups in the course of project implementation can be used should the project be extended, probably with reduced involvement of a foreign consultant. It will also be used in other consulting activities of the two institutions.

Impact

Implementation of recommendations has only started. The Chamber plans to monitor the progress of implementation of recommendations, and their impact.

Lessons learned

With some guidance from a consultant, Sri Lanka has the local capability to conduct diagnostic studies and advise SMEs on productivity improvement. Using local professionals for such tasks is not only more efficient; it also increases experience and further upgrades existing professional capabilities in the country.

LIST OF INSTITUTIONS VISITED/ PERSONS MET**MINISTRY OF INDUSTRIAL DEVELOPMENT**

Mr. Perera, Austin K., Secretary

Mr. Dheerasekera, W.C., Director

MINISTRY OF SCIENCE, TECHNOLOGY AND HUMAN RESOURCES DEVELOPMENT

Mr. Wimalagunawardhane, H.A., Secretary

MINISTRY OF FINANCE

Ms. Madanyake, N., Director, External Resources Department

THE CEYLON NATIONAL CHAMBER OF INDUSTRIES

Mr. Abeysekera, N., Former President, Member of ExCom

Mr. Weerakoon, W.T., National Project Coordinator, Enterprise Restructuring

INDUSTRIAL DEVELOPMENT BOARD OF CEYLON (IDB)

Mr. Jayasinghe, V., Chairman

Mr. Peiris, H.C.S., Director, Technical Services

CENTRAL ENVIRONMENTAL AUTHORITY

Mr. Amaratunga, G.K., Chairman

Mr. Wijegunasekera, J.K.A.B., National Project Coordinator

Mr. Milsted, A., Chief Technical Advisor

Mr. Pham, Tien N. , Associate Expert

CEYLON INSTITUTE OF SCIENTIFIC & INDUSTRIAL RESEARCH (CISIR)

Mr. Jayatissa, P.M., Director (Former National Project Director)

Ms. Jayasinghe, S., Manager - Services, Agro & Food Technology Division

Mr. Senanayake, U.M., Senior Research Officer, Essential Oil Group

Mr. Dayananda, K.R., Senior Research Officer, Essential Oil Group

Ms. De Costa, S.L., Trainee, Essential Oil Group

Ms. Amerasinghe, N., Engineer, Pilot Plant

Ms. Rajapakse, D., Baking section

Mr. Herat, M.M., Timber specialist, Participant at a ICS workshop

SRI LANKA STANDARDS INSTITUTION (SLSI)

Mr. Jayawardene, C.D.R.A., Director General

Mr. De Silva, N.R., Chairman

Mr. Liyanaarachchi, D.S.D, Assistant Director, Laboratory Services Division

Mr. Fernando, M.C., Assistant Director, Electrical & Electronics, Laboratory Services Division

CERAMIC RESEARCH AND DEVELOPMENT CENTRE (CRDC)

Mr. Silva, Sarath R., Deputy General Manager of LANKA CERAMIC LTD.,
Director of the Centre

Mr. Soysa, E.S.K., Senior Research Officer

Mr. Harischandra, W.K.D., X-ray Laboratory (Trainee)

Ms. Wickramaratne, D.D.M.R., Laboratory (Trainee)

Ms. Talwatte, D.P.K.T., Administration (Trainee)

UNIVERSITY OF MORATUWA

Mr. de Silva, P.A., Head, Department of Mechanical Engineering & CAD/CAM Centre

Mr. Tittagala, S.R.

Mr. Karunaratne, G.

FOUNDRY DEVELOPMENT AND SERVICES INSTITUTE (FDSI)

Mr. Jinasena, T.N., Chairman

Mr. Rodrigo, R., Former National Project Director

TEXTILE TRAINING AND SERVICES CENTRE

Mr. Tennakoon, R.H., Director

INDUSTRIAL TECHNOLOGY MARKET INFORMATION NETWORK (ITMIN LTD.)

Mr. Jayaweera, T., Chairman

Mr. Ratnarajah, V., Senior Manager

Mr. Perera, K., Director (Member of the Ceylinco Group)

Mr. Vajda, E., CTA

CEYLON STEEL CORPORATION (CSC)

Mr. Wijenayake, K.D.K., Manager, Rolling Mill

Mr. Padmasiri Costa, Foundry Manager

OPEN UNIVERSITY

Mr. Sumathipala, W.L., Fellow at ICS

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

Mr. Nakamura, Y., Resident Representative

Ms. Inami, J., Assistant Resident Representative

TECHNOLOGY INITIATIVE FOR THE PRIVATE SECTOR (TIPS)

Mr. King, S.T., Chief Executive Officer

Mr. De Alwis, S., Director, Project Development

UNITED NATIONS DEVELOPMENT PROGRAMME (UNDP)

Mr. Ofstad, A., Resident Representative

Mr. Conroy, R., Deputy Resident Representative

Mr. Gunawardena, T., Assistant Resident Representative

Ms. Jayamanne, M.

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION (UNIDO)

Mr. Seneviratne, W. B., Administrative Assistant/Secretary