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UNITED NATIONS INDUSTRIAL
DEVELOPMENT ORGANIZATION

RESTRICTED
27 April 1989

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INDIA

NEEDS AND PRIORITIES OF TECHNICAL
COOPERATION IN THE INDUSTRIAL SECTOR

Report prepared by a UNIDO team

3a/50

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INTRODUCTION

This report was prepared by a UNIDO team in response to the request made by the Resident Representative in India, Mr. G. Handy, to the Director-General of UNIDO, Mr. Domingo L. Siazon. The report was expected to cover the following subjects:

1. General assessment of the industrial sector of India covering areas such as policy environment, export development, technology and research requirements, connection between R+D and production, industrial services and infrastructure, design and quality improvement, small and medium sector management/efficiency, private sector development, investment requirements/facilities and industrial manpower development.
2. Assessment of past and present UNDP/UNIDO technical cooperation in industrial development in India (based on a review of work already done).
3. Analysis of technical/external assistance being instrumental in accelerating industrial growth, employment and export development.
4. Identification/assessment of the needs and priorities of technical cooperation in the industrial sector based on an analysis of medium and long term potentials and constraints in the sector.
5. Analysis of priority sub-sectors and identification of appropriate areas and modalities for UNDP/UNIDO technical cooperation in the context of India's plan priorities, and technical assistance needs.

The team consisted of UNIDO staff members, Mr. B. Jamilla, Mr. A. Bromley and Ms. A. Melajarvi and Indian consultants Dr. I.Z. Bhatti, Director General

of the National Council of Applied Economic Research and Mr. M.C. Gupta, Adviser (Industry + Minerals), Planning Commission, Government of India. The SIDFA, Mr. M. Islam, actively supported and participated in the work of the Mission which took place from 6 to 24 February 1989.

The task of the mission has been facilitated by the work done by the Regional and Country Studies Branch of UNIDO in preparing the Industrial Development Review of India and, particularly, the ground work accomplished by Mr. N.N. Tandon, Director, Area Programmes Division, during his home-leave in India in the months immediately preceding the commencement of the Mission.

The warm reception accorded to the team in New Delhi, Bangalore, Mysore, Madras, Ahmedabad, Chandigarh, Jammu and Srinagar, Lucknow, Kanpur and Goa, and the active participation by government officials and representatives of the corporate sector, public and private, attest to the thoroughness of the preparations. The interaction with the private sector was particularly useful in revealing the relevance and the impact of projects assisted by UNDP/UNIDO. Likewise, in revealing what such projects can do, directly or indirectly, to assist the private sector, the interaction served to underline the opportunities that exist for technical cooperation at the enterprise level. A larger share than hitherto of multi-lateral assistance could be channelled through to the State level since it was here that most industrial activities were taking place. The response given to the team confirms the immensity and variety of needs which can be addressed by UNDP assistance.

The team also had very useful meetings with senior officials of the Government of India in the industry related Ministries and Departments. It greatly benefitted from the advice of Mr. Abid Hussain, Member, Planning Commission, and his colleague Mr. Hiten Bhaya. The lists of persons (senior officers of the Central and the State Governments and representatives of private and public sector industry) whom the members of the team met individually or collectively are annexed.

The report that follows is the result of the joint effort and shared perceptions of the members of the team and reflects its assessment of the felt needs of Indian industry in UNDP CP IV, viewed against the background of its present status and the likely growth impulses during India's Eighth Plan (April 1990 - March 1995).

1. THE INDIAN INDUSTRIAL SCENE

To understand the current industrial scene in India, it is helpful to step back in time and establish those links with past developments which are crucial in differentiating the present industrial environment from the past. This would provide insights into the dynamics of the change that is taking place and thereby lead one to those areas which are critical for sustaining the change. For picking up the links from the past we turn to the mid seventies which can be described as a watershed in the development of the Indian economy. Features that suggest this are:

- a) Growth in agriculture in the fifties came mainly from extension of cultivated area. The scope for this was, of course, limited which soon began to tell. Agricultural growth declined in the early sixties - a decline which if it had continued would have been a serious drag on the economy. Fortunately the bio-chemical technology, introduced during this time, took hold and spread fairly rapidly into areas where it could be applied. With the Green Revolution, as it has come to be known, crop yields began to rise and the barrier of land scarcity was overcome. Not only did growth in agriculture improve, but a fairly vast potential for sustained growth was opened up for exploitation. By mid seventies it was apparent that it would not be long before self-sufficiency in foodgrains is achieved. Instead of being a drag, agriculture would then fulfil a basic prerequisite for more rapid industrialization.
- b) Technological advance in agriculture enhanced the inter-relationship between agriculture and industry, the former generating a much wider range of demand for inputs and producing larger volumes of agricultural raw materials for industries. Agricultural growth was important for another reason. Adequate availability of wage goods (mainly foodgrains), which besides being of consequence in itself, turned the terms of trade against agriculture. Till the later sixties terms of trade had moved against industry, causing wages to

rise relative to product prices thereby inhibiting industrial growth. Thereafter the terms of trade moved in favour of industry for a few years and then against it. From 1975-76 the terms of trade have consistently been in favour of industry and, what is more important, largely on the basis of domestic production of foodgrains.

- c) Growing inter-relationship between industry and agriculture along with public investment in the development of services (education and health) accelerated the growth of non-farm incomes in the rural areas. Their share in average household income increased from 22% in 1971 to 33% in 1982. It was this feature as much as the developments in agriculture that caused the incidence of poverty to decline. Till 1967 the proportion of population below the poverty line consistently increased to reach a peak of 56%. Thereafter it began to decline, equally consistently, and was 46% in 1974 - a level it was at in the late 50's. The real decline in the incidence of poverty therefore commenced only after mid-seventies. By 1984, it had come down to 33%.
- d) Decline in the incidence of poverty eventually led to a change of considerable significance in the household consumption expenditure. Till the mid-seventies the share of household consumption expenditure devoted to cereals and food was rising steadily, but thereafter it began to decline and has continued to do so. To the growth of industry this change was of considerable significance as, besides adding a new dimension to the demand for industrial products, it presented the opportunity for attaining a better balance in the industrial structure. It was also a signal suggesting that it was time that the restrictive policy with regard to the expansion of consumer goods industries was reviewed.

- e) A substantial degree of import substitution had been achieved as revealed by imports to availability ratios in manufactures. As a result, industrial structure had acquired a fair degree of diversity and a substantial body of skilled and technical manpower had become accessible along with the emergence of growing class of competent professional managers.

- f) During the decade preceding 1975-76 there was a marked slackening in public investment in infrastructure particularly electricity, which resulted in the emergence of a fairly serious infrastructure constraint on the growth of industry. In 1975-76 there was a reversal in the trend and a substantial increase in public investment in infrastructure took place. Thereafter the share of total public investment allocated to infrastructure has been sustained, and infrastructure constraints on the growth of industry greatly reduced.

Thus, as the second half of the seventies progressed, there were several major factors favouring a marked upturn in the growth of industries. Agriculture and wage goods had ceased to be a drag, there was a substantial expansion in the demand for industrial products, particularly consumer goods - durables and expendables - industrial structure was inherently capable of responding to diverse demand and access to skilled, technical and managerial manpower had greatly increased. The response of industry to these changes was, however, somewhat tardy to begin with.

There were two reasons for it. Firstly the rate of import substitution had slowed down as indeed one might have expected. In other countries, such as Korea, where industrialization started with import substitution, the process after some time did slow down, but the growth of industry was sustained on the basis of a substantial increase in exports. In India this did not happen. However, unlike Korea, India is a large country with a vast domestic market which could have substituted for exports and sustained the

growth of industries when import substitution slowed down. This too did not occur because of Government's restrictive policy with regard to capacity expansion of a wide range of products, specially manufactured consumer goods. Second, on this account and that of the policy of import substitution a highly protected market for industrial products was fostered where competitive forces were held in abeyance and a sellers' market in most manufactures prevailed. This environment, though it enabled the nurture of a diversified industrial structure without concentration of economic power, was not conducive for keeping pace with technological developments taking place elsewhere or for any marked effort at cost reduction. The former implied relative indifference to improvement in quality of products and the latter, in the context of a protective regime and a fiscal policy which relied heavily on commodity taxation, led to a high cost industry.

As one came to the close of the seventies it was abundantly clear that, while India had learned to manufacture an extensive array of industrial products, it had to learn how to manufacture them well and cheaply. Towards this end it was necessary to diminish protective support and to make room for effective competition. For enabling this, (a) access to imported technology and capital goods had to be eased, (b) exports increased to restore external balance and (c) entry into industry made easier and more open. Adoption of policies in these directions is currently known as liberalisation. It should be apparent that the internal logic which led to the shift in policy is such that its direction cannot be reversed, though there may be peripheral aberrations or short-run adjustments which may appear in conflict with the overall policy. In fact, if growth is sustained, which is most likely, this policy would tend to be strengthened and made more effective.

There are two sets of policies which are related to liberalisation. The first concerns the area of international trade and has two components: One, which eases the way to imports for supporting the growth of industries and modernization in terms of technology, and the second that provides aids for increasing exports. On the import side the main components of policy are:

(a) extension of Open General Licences (OGL) for imports, (b) availability of selected raw materials at international prices, (c) duty exemption on selected imported capital goods, and (d) access to imports up to 30% of turnover for export-oriented industries. On the export side the policy includes, (a) liberalisation of Cash Compensatory Support (CCS) and duty drawbacks, (b) concessional interest rates for exports and (c) setting up of 100 per cent Export Oriented Units (EOU) and Free Trade Zones (FTZ).

The second area of liberalisation relates to entry into industry. Essentially this includes, (a) delicensing (or free entry) into certain selected industries, (b) broadbanding (freedom to organize product-mix) in a number of other industries and (c) streamlining of procedures and thereby shortening the time required for securing clearance in those industries where governmental regulation is still applicable.

These policies at the broader level are supported by other policies, such as those relating to technology imports and direct foreign investment. In both cases the same liberal approach has been adopted to provide the desired encouragement. It is to be noted that India continues to prefer unpackaged technology transfer, retains the option of having majority share in equity and be responsible for management. However, exceptions are being made in regard to export-oriented and hi-tech industries. In regard to other terms there is considerable flexibility and greater receptivity as compared to the past. On the whole, the stance is to encourage collaborations with technology inputs in harmony with the objective of liberalisation and to offer terms which would be more acceptable to foreign collaborators and investors.

Quite obviously fiscal and monetary policies have relevance to the objectives of liberalisation and must be in harmony with it. This is evident from the approach adopted by the Ministry of Finance with respect to commodity taxation and has taken the form of the introduction of a moderated value added tax (MODVAT) and a series of other adjustments with regard to both excise and custom duties. Secondly, there is a concerted effort to increase revenues from direct taxes which has taken the form of a reduction in the marginal tax rate

to curb evasion where it is due to a high tax rate and the expansion of the tax base. Thirdly, a number of public sector enterprises have been asked to raise supplementary funds from the capital market. Finally the traditionally cautious approach to commercial borrowings from abroad has been somewhat relaxed in order to provide a backup for a rise in imports which at least in the initial stages was inevitable as a result of a liberalised import policy.

The Sixth Plan which ended in 1984-85, yielded an average GDP growth of 5.56% a year, which was a shade above the target. Industrial sector grew at an average rate of 6.36% which was below the target. In the first three years of the Seventh Plan growth of GDP at an average of 4.2% was short of target 5%, but the industrial sector maintained a higher rate - average of 8.4% - and exceeded the target. Manufacturing did even better by attaining an average growth rate of over 9%. Growth of GDP was held down by the exceptional concurrence of poor monsoons in three consecutive years ending with one of the worst droughts, so that the average growth of agriculture in the three years was actually negative. It is particularly noteworthy that, despite this, industry maintained a healthy growth rate. Equally significant is the fact that a particularly severe drought following two successive poor monsoons was taken, as it were, in the stride, with only a modest impact on prices, industrial growth and trade balance. The year 1988-89 had a good monsoon which gave a boost to agricultural production and GDP growth is expected to exceed 9.0% and industrial growth 8.5% (manufacturing approximating 10%). Wholesale prices which had risen by nearly 10% last drought year have settled back to a rise of 5%. The prognosis for the current year with average monsoon conditions would be a growth rate of GDP by about 5.5% and of manufacturing around 10%.

While taking a view on the growth of manufacturing over the past decade, it may be in order to draw attention to the oft repeated reference in literature to the inadequacy of the Index of Industrial Production (IIP) as a monitoring device for growth in manufacturing. It is now commonly held that not only is the estimate of manufacturing output understated, its rate of growth may also be under represented. While this suggests that it is

important to eliminate the shortcoming of IIP as a monitoring device, it is necessary to bear in mind that, in all probability the performance of the manufacturing sector has been even better than what appears from available statistics.

No comprehensive analysis has yet been made to related liberalisation policies with the upturn in industrial growth, but the observed empirical association is unmistakable. The lag between the initiation of liberalising policies and their impact should be understandable as an adjustment to a major shift in policy was bound to take time. It was also inevitable that it should cause a degree of uncertainty and give rise to resistance, particularly in the private sector accustomed to protection and reticent to enter an environment where competition was aimed to be encouraged. Indeed what was called for was a basic change in industrial culture and such changes do not occur quickly. In fact, these changes are still in the process of taking place. Finally, it is not yet possible to unscramble the effect on industrial growth of liberalised policies and factors which are not related to it and to which reference has earlier been made. However, irrespective of what analysis may ultimately show, both have worked in favour of raising industrial growth and would continue to exert their influence in the same direction. A confident affirmation of the efficacy and objectives of the new policy has come from the recent budget speech of the Finance Minister where he said "I have referred to the good performance of the industry and infrastructure sector. We believe that the changes with regard to industrial licensing, price and distribution controls and trade policy that we have made over the past few years have paid rich dividends. The underlying theme of these policy changes is to promote both growth and efficiency by stimulating domestic competition, technology acquisition and modernization".

Increase in productivity in any sector of economic activity is crucial to growth. In industry, two types of measures for productivity are used to assess overtime variations in it: labour productivity and total factor productivity. Available time series on changes in labour productivity while exhibiting a consistent though modestly rising trend (2.5% between 1960 and 1980) also reveal that this is attributable mainly to capital deepening. As

an index for measuring efficiency of factor use, total factor productivity is more appropriate. Here, due to methodological problems, there are varying estimates, but all either show no increase in total factor productivity since mid sixties to the end of the seventies or only a modest increase. The various reasons for relative stagnation in total factor productivity in the seventies have been discussed, but one of the major reasons has been the failure to keep up with technological developments due, in part, to easy access to a seller's market. Continuing low productivity has obvious implications for cost of production, which not only affects growth but also the prospects for expanding exports. The new accent on modernisation and promotion of competition arises out of these considerations, and while total factor productivity measures for the eighties are not available yet, it is quite probable that there has been an upward shift in the productivity trend along with the shift in the growth trend.

One of the objectives of liberalisation policy is to improve the environment for the growth of private enterprise. The response of the private sector has been positive as reflected in the rise in the rate of growth of manufacturing. In fact, if the small and informal sectors were more adequately represented, one would find evidence of a stronger response than observed from available data. It is also on the cards that as the implementation of the policy improves in efficiency there will be further improvement in the response of the private sector.

In the public sector too there is evidence of improvement. In the area of infrastructure both transportation and power sectors have significantly bettered their performance in the sense that shortages and bottlenecks are no longer experienced in the manner they were in the seventies. For the rest, however, the performance has been mixed. Whereas the appropriate criteria for assessing the performance of public sector remains a matter of debate, in a significant segment of the public sector inefficiencies, for reasons often explained, persist.

Basically, complementarity between public and private sectors is recognized and endorsed. This means that public sector needs to be

strengthened though not necessarily extended in terms of areas and may even relinquish its monopoly or near monopoly status in some. Strengthening of the public sector requires not only investment but measures for curbing the causes for inefficiencies and off-loading of units that can no longer be rehabilitated.

Investment in the Seventh Plan has kept up to target, both in the public and private sectors. Although there were annual fluctuations, gross capital formation in the economy in 1985-86, the last year for which data is available, was 29% higher in real terms than in 1980-81. Between the same years the corresponding increase in the private corporate sector was much higher at 48% and in the household (private) sector which includes unincorporated business was much lower (15%). In the public sector the increase was 35%. There is evidence also of some improvement in the incremental capital-output ratio, suggesting gains in the efficiency of capital use.

Domestic saving rate which had been consistently rising ceased to do so from the beginning of the eighties: in fact, it declined till 1984-85. It is not known yet whether the recovery in 1985-86 restored a rising trend again in subsequent years. The slackening in domestic saving has had the effect of a rise in dependence on foreign savings and is reflected in an increase in India's commercial borrowings abroad.

The capital market, on the other hand, is currently buoyant after nearly two years of somewhat depressed conditions which had followed a major extended boom. Over the past years new issues have attracted encouraging response from the investors. It is also significant that these issues have been dominated by equities and convertible debentures as against a wide spectrum of financial instruments issued in earlier years. Performance of the secondary market has been even better, as it was perhaps natural that the recovery of investors' confidence should reflect itself first in this market. Transactions in all the six major stock exchanges in the country showed that most scrips appreciated in value. These favourable trends in the capital market, which seem to be continuing, have definitely strengthened the longer term prospect of resource mobilization for the private and public corporate sectors.

While the general state of the economy exhibits signs of health and strength, two concerns have been voiced. The first, and the more serious, relates to the external balance. The second, which is essentially sectarian and highly controversial, pertains to what is being called the growth of "consumerism".

The balance of payments position has been difficult over the past few years. To begin with there was a deceleration in the growth of exports along with an acceleration in imports to which the slow down in domestic oil production contributed. Simultaneously there was an increase in repayment obligations. As a consequence the current balance rose from -1.3% of GDP in the Sixth Plan to around -2% in the first three years of the Seventh Plan. The situation in 1988-89, from partial data available so far, suggests a further deterioration. However, a significant pick up in exports is already visible. After a fall in exports in 1985-86, there was an increase of 15% in 1986-87 followed by an increase of 25% in 1987-88 - a rate of increase that was sustained in the first nine months of the financial year 1988-1989 also. This turn around in export performance is attributed to the various incentive measures for exports and the implicit devaluation of the rupee. It is expected therefore that this rate of growth will be sustained. Though in the current year 1988-89 there was a bunching of imports causing the increase to go way out of line, imports have risen in recent years at a somewhat higher rate. As it will be self defeating to resort to ad hoc restrictions in imports, it is all the more necessary that the current rate of growth in exports is sustained. In the meanwhile, repayments obligations to the IMF which peaked in 1988-89 will ease off. India has continued to receive current balance support from savings of Indian nationals residing abroad. Government is strengthening the incentive structure for attracting more of such savings. One can therefore expect an improvement in the balance of payments, but the pressure will remain unless growth in exports can keep the trade deficit within limits. To ease the pressure Government might opt for higher commercial borrowings abroad, or seek a loan from IMF. Given its traditionally cautious policy with regard to commercial borrowings, the latter is likely.

The concern with consumer goods arises essentially out of the growth in

the production of consumer durables, because consumer goods as a whole continue to grow at a rate significantly less than the growth of basic and capital goods. Acceleration in the growth of consumer durables has occurred as a result of rising household incomes and the more liberal policy for entry into industry. But still consumer durables have a weight in the manufacturing sector which does not exceed 3%. Also, durables which can be described by any objective criterion as "luxuries" would not account for more than 2% of the aggregate household consumption expenditure. Surveys reveal that over 60% of consumer durables are consumed by households who are in or below the lower middle class category. It is universally true that as incomes rise, people in their consumption behaviour exhibit an upward movement along the hierarchy of consumer goods. To describe the modest movement that is observed in India today as "consumerism", would require the meaning of the term to be stretched beyond recognition. Meanwhile, there is no evidence to show that on account of the so-called "consumerism", household savings have been adversely affected. It is also well known that substantial quantities of durables are still smuggled into the country causing an unnecessary drain on foreign exchange resources and suggesting not only that there is excess demand for a number of durables, but that this demand will be met, if not from domestic production, from illicit imports. The more sensible approach to this situation therefore clearly is to harness this demand for growth, particularly since the country's economy is ready for it.

2. INDIA'S SEVENTH PLAN PRIORITIES

India's Seventh Plan (1985-90) laid considerable emphasis on accelerating the pace of growth by easing infrastructural constraints, liberalisation of industrial licensing policy and other regulations, provision of incentives for rapid growth of new areas like electronics and a new fiscal policy. A number of policy initiatives have been adopted since the commencement of the Plan. As mentioned in the previous chapter, the industrial licensing policy has been liberalised, controls on large houses somewhat relaxed and a more pragmatic policy in regard to imports and exports is being pursued.

The Seventh Plan had projected an annual growth rate of 8% for the gross value of output in the manufacturing sector. As against that the growth rate of the industrial sector i.e. including mining and the energy sub-sectors, has been 8.7% in 1985-86, 9.1% in 1986-87, 7.5% in 1987-88 and 9.4% during April - December 1988. The manufacturing industry has grown by 9.7%, 9.1%, 8.5% and 10% respectively during the same period. In these years industry has not only achieved a high growth rate but also acquired a wider base as evidenced by a large variety of goods manufactured/processed by the different industrial sectors in the country.

In the field of metallurgical and mineral industries the Seventh Plan priorities were set on efficient use of inputs, optimal exploitation and use of minerals, scientific and technological research for utilization of low-grade and multi-metal ores, recovery of by-products, environmental protection, improving productivity, efficiency, cost reduction and energy conservation. Specific priorities for development of iron and steel were increase in capacity utilization of public sector steel plants, continuation of modernization process, improvement of maintenance and inventory management practices, quality of raw materials and optimization of use of scarce resources. In the field of aluminium emphasis was given to the role of R + D in the upgrading of technology and modernization of the industry.

Problems to be tackled on priority basis in the field of engineering included high cost of production of capital goods. The adaptation and

absorption of new technologies was to be facilitated and the range of products widened. To promote export of engineering goods various measures for upgradation of technology, quality, product design and cost competitiveness were proposed to be taken. The leading public sector manufacturers and research organizations were to carry out research programmes in the fields of coal gasification, welding techniques, pollution control, NC/CNC machine tools, new techniques in metal forming, horology etc.

The thrust areas of the Seventh Plan in the field of electronics were:

- (i) General liberalisation of the licensing policy with emphasis on creating an appropriate environment for rapid growth of electronics.
- (ii) As a general rule, the pattern of growth would be influenced by fiscal motivation, rather than by physical controls.
- (iii) Volume production at the most economic level with contemporary technology would be the guiding principle of the policy for development of this industry.
- (iv) Indians abroad, entrepreneurs as also the experts who had contributed to the electronics industry overseas would be expected to play an important role in the development of the domestic industry.
- (v) Vigorous efforts would be made in the direction of standardisation, through which alone economically viable production of components can be achieved.
- (vi) Effective steps would be taken to ensure quality and reliability of the electronic components and products.

The Seventh Plan envisaged rapid introduction of electronics in almost all sectors of economy. Technological developments in most of the industrial and

services sectors were to require much greater application of electronics. The development of electronic components and materials industry was given a special emphasis, as was development of computer software industry. Concerted efforts towards technology absorption, upgradation and development were to be made through national projects.

In the chemical sector the fertilizer industry was to concentrate on better utilization of existing capacities including improvement of process efficiencies, energy conservation, utilization of waste heat and by-product recoveries. The Projects and Development of India Ltd. (PDIL) was to carry out various R + D activities to assist existing industries and in setting up new plants. In the field of pesticides stress was on keeping up with the latest technological developments in the world so that better indigenous pesticides could be provided to the Indian market. Pollution control and safety were also to receive attention. The drugs and pharmaceuticals industry suffered from low capacity utilization and high-production cost. Large petrochemical corporations, such as Indian Petrochemical Corp. Ltd. (IPCL) were to have an R + D programme to keep up with developments. In the field of plastics stress was to be on skill development and use in new areas.

Agro-based industries are of great importance to the Indian economy. The sugar industry was said to act as a catalyst in the process of rural transformation. Here additional capacity needed to be created and modernisation and/or rehabilitation of uneconomic sick units were to be tackled on priority basis. As for edible oils the Seventh Plan foresaw a need for efforts to augment indigenous production. In the field of leather the Plan saw a need for technological improvement in the methods of tanning and finishing of leather with a view to upgrading quality and strengthening India's position in the export markets. Effluent treatment in leather industry was to be taken up as a priority. R + D in leather products was also regarded important. The thrust of the technology development programmes in the field of paper industry was to be the use of non-conventional raw materials, conservation of raw materials and energy.

In the field of textile industry the main problem had been the increasing number of sick production units. The textile research associations were given a role in the Seventh Plan to assist in the process of modernisation of viable units. Concerted scientific efforts were to be directed towards improvement in the quality of indigenous cotton, conservation of energy and scarce raw materials, application of microprocessors for improvement in efficiency and quality of products, utilization of agrowaste and man-made fibre waste etc. In the jute sector activities were to be directed toward change in product mix, diversification of product range, quality improvement, reduction in cost and development of new products.

The industrial growth has been broadly consistent with the Seventh Plan priorities and has been positively heartening for the following reasons:

- i) While linkage between industry and agriculture continues to be strong, industry has shown remarkable resilience and has even insulated itself from agriculture to some extent:
- ii) there has been no shortage of consumer goods: whether consumer durables or expendables; and
- iii) because of the competition generated through policy initiatives the price increase of some manufactured goods has been restricted e.g. two wheelers, textiles, etc.

On the debit side one notices factors like continued heavy imports of capital equipment and components for engineering industry, recourse to screw driver technology, in some areas, particularly electronics, and demand constraint in some sectors, particularly textiles, for lack of adequate purchasing power.

While expressing satisfaction over the performance of the industrial sector in the first two years of the Plan, the Mid-term Appraisal Document of the Seventh Plan made special reference to modernisation of industries and rehabilitation of sick units. It noted, however, that taking into account the

employment characteristics of modern industry, the pace of industrial growth would need to be substantially accelerated if a significant impact was to be made on the occupational pattern.

The document further noted that in certain sectors like electronics, automobiles and others, more systematic attention needed to be paid to indigenisation. They are high growth sectors and their input demands can be a major driving force for growth in the related component industries. In regard to the public sector, it noted that important changes had been made to increase both its autonomy and accountability, but more needed to be done in this direction and to reduce the burden of losses. The document espouses the cause of an open capital market and its role in mobilizing and channelling resources into the industrial sector.

As a measure of mid-course correction of policies and priorities the document observed that there was a two-fold task, namely (i) restructuring and consolidation of enterprises to maximise the productivity on resource use (fixed assets, labour, energy and materials) for the attainment of Plan targets, and (ii) accelerating modernization, based on futuristic technologies so as to position industry for more rapid development in the 90s. The latter task could be pursued through three strategic initiatives: (a) highly focussed technological education programmes: (b) expeditious acquisition and development of technologies appropriate to India, (c) pursuing mission-oriented technology programmes for building up capabilities and self-reliance in critical areas.

3. ASSESSMENT OF UNDP PROGRAMME DURING CP-III IN INDUSTRY SECTOR

The industry sector programme in CP-III was formulated within the framework of the objectives and priorities of the Seventh Five Year Plan where the emphasis was on better utilization and low cost expansion of existing capacity, on the modernization and upgrading of Indian industrial technology and the interaction of new technologies to raise output. In its mid-term review of the 7th Plan the Planning Commission reiterating this position stressed that the industrial sector strategy should rely on its potentially most valuable input - scientific and technical knowledge. Knowledge based industries like software production, communication equipment, computers and integrated circuits presented certain critical advantages in the Indian context. In certain sectors like electronics, automobiles and others, it was felt that systematic attention needed to be paid to indigenisation. They are high growth sectors and could be a major driving force for growth in the related component industries. Accordingly, the UNDP programme strategy in the industry and related sectors in India has been to develop local R+D, establish institutional infrastructure for facilitating technology transfer, expand employment opportunities and optimize input utilization.

The share of the industry and allied sectors in the estimated UNDP outlay of \$ 146 million during the programming cycle 1985-90 is around 35%. About 30% of all projects under implementation during CP-III have been implemented by UNIDO.

The UNDP programme includes such hi-tech projects as research and development on instrumentation for micro-electronics, amorphous silicon photo-voltaic cells, novel-shape zeolite catalysts, fibre-optics technology and encompasses application-oriented R+D in low-technology areas where the immediate beneficiaries include the small- and medium-scale enterprises. Whereas the UNDP assistance has been extended to such large public sector enterprises as SAIL, BALCO, IPCL, EIL in the specific areas of their needs in the steel, aluminium, petrochemical, fertilizer and oil sectors, the organizational and financial strength of some of the other public sector

enterprises like HMT/BHEL/HIL and the product-oriented research establishments have been used to create R+D facilities and to help R+D activities to cater to the needs of the industry as a whole, both public and private.

UNDP has, on the one hand, played a strong supportive role in assisting the industry sector in India in the acquisition and upgradation of technology covering a wide range of industrial processes and products, including development of human resources to adopt and assimilate technology, and on the other hand, has taken advantage of the sophisticated research establishment under CSIR and the technical universities to promote the application of micro-processor, automation, computer and electronics technology. Assistance to the automotive sector, textile and jute industry has been extended through industry associations.

A number of the existing national R+D centres have been used for channelling UNDP input for assisting specific branches of industry in the large-, medium- and small-scale sectors in upgrading technology and in the introduction of new technologies. The UNDP assistance has focussed on specific issues to resolve identified problems. The Central Machine Tool Institute was first given assistance in the development of computerized numerically controlled (CNC) machine tools and later received UNDP assistance to develop CAD/CAM capability for dissemination to the machine tools industry. The Central Pulp and Paper Research Institute with strong linkage with the small, medium and large pulp and paper industry in the private and the public sectors is working closely with UNDP in tackling specific problem areas of chemical recovery, pollution control and energy savings. To enhance productivity in the cement industry, the National Council of Cement and Building Materials and for research and development in packaging technology, the Indian Institute of Packaging have been the national counterparts of UNDP to upgrade technology in industries active in these sectors.

In India, large public-sector enterprises and industry play a significant role in developing and acquiring new technologies and disseminating them to the industry at large. The Government of India, as a matter of policy, uses the resources and the facilities of these public-sector industrial enterprises in developing and acquiring new technology through setting up of R+D centres

in specific areas. A good example of such a centre is the Welding Research Institute of BHEL, which has been developed through UNDP assistance and is now rendering valuable assistance to the industry in the area of welding technology. During CP-III, BHEL has sponsored R+D programmes in advanced ceramics, metal-forming technology and pollution control, whereas HMT has initiated testing and training programmes in micro-precision engineering and horology. HIL and ILK have undertaken R+D in the respective areas of pesticide and fluid control.

A substantial amount of the UNDP resources has been allocated to the small-scale sector in creating Product + Process Development Centres (PPDCs) to assist the small- and medium-scale enterprises clustering around such centres. In setting up these PPDCs, a three-way partnership has developed between the UNDP and the Central and the State Governments - UNDP providing the international expertise, training and equipment and the Central and the local Governments providing the land, buildings, staff and other local inputs. Examples of assisted PPDCs include those for bicycles (DP/IND/79/028 and 88/070), sewing machines (DP/IND/79/027 and 87/012), hand tools (DP/IND/82/032), sports goods (DP/IND/84/009), metal handicrafts (DP/IND/85/026), small-scale casting and forging (DP/IND/83/031) and hosiery knitwear (DP/IND/82/006). These centres apart from being the providers of common facility for testing and finishing also give advice and information to the industry on such matters as improved design, product upgradation and new product development. For a number of these products, there is export demand and further growth potential. PPDC's role in advancing the cause of higher exports has been pivotal.

Use of the PPDC concept for assisting the SMIs has proved to be a useful instrument for UNDP to reach the private-sector enterprises. There is further scope for UNDP assistance in setting up of PPDCs for other new products and in upgrading the existing PPDCs. The establishment of new PPDCs in the field of glass, essential oils, pumps and engines are being considered for future UNDP support. However, the triangular partnership among UNDP, the Central and the State Governments, each sharing a part of the cost, can sometimes cause problems of co-ordination and timely implementation. Specially, delays in

acquisition of land and construction of buildings, which are essential elements of creating new PPDCs, have sometimes hampered the smooth execution of projects. Advance planning and close cooperation among the partners are needed to minimize these delays.

UNDP has been actively concerned with energy conservation in industrial establishments in India. Several UNIDO-implemented sectoral projects have contributed by introducing energy conservation measures. Such projects include DP/IND/84/005 (Demonstration unit of alumina calciner for energy conservation at BALCO, Korba) and DP/IND/85/064 (Measures for energy saving and conservation in SAIL's steel plants). Most of the projects aiming at the upgradation of technology or supporting industrial automation will have an impact on energy conservation and, thus, on the reduction of production costs as well. Various projects have been developed with the aim to find more effective uses for indigenous energy sources and for the development of new sources of energy. UNIDO has assisted in studying the feasibility of the conversion of indigenous coal into gaseous fuels and synthetic oil. The refinery and petrochemical industries are expected to benefit from the results of the experimental project on development of novel-shape selective zeolite catalysts (DP/IND/87/007) being implemented in NCL. The project on the development of amorphous silicon solar cells at IACS (DP/IND/87/003) has already achieved some initial results; its impact on the electrification of rural and remote areas could be very important.

A major project in the field of environmental protection is the establishment of the Pollution Control Research Institute (PCRI) (DP/IND/83/008), which, due to problems of delivery of inputs, such as equipment and national staff, is not yet fully functioning. A second phase will be required to get a good research and development programme going and to extend the contacts with industry. PCRI is expected eventually to become a regional centre. The project setting up an emission laboratory at ARAI (DP/IND/85/070), implemented by the Government on the basis of preparatory assistance provided by UNIDO, has a long-term objective of reducing vehicle pollution. Control of pollution and environmental hazards caused by industries being an area of concern to the Government, many projects aiming at

modernization and introduction of new technologies, completed or under implementation, also include activities aiming at minimizing pollution. Examples of such projects are: Performance optimization of petro-chemical complex at IPCL (DP/IND/84/001), where, for instance, an air-pollution monitoring system was established, and the PPDC for small-scale casting and forging industries at Agra, one objective of which is the improvement of design of cupolas to reduce pollution caused by foundry industry. Due to various delays, only a technical report on the project has so far been prepared on pollution from foundries in Agra.

Under CP III, UNDP assistance was requested in several industrial engineering sectors. The automation industry and the vehicle industry in a wider sense have been supported by several UNDP/UNIDO projects starting with assistance in the establishment of a testing centre for automobile ancillary industry in Pune and followed more recently by DP/IND/79/044 (Fatigue Laboratory) and the above mentioned Emission Laboratory. These projects have established testing facilities to secure safety of cars and to control pollution caused by cars. The project DP/IND/85/015 (Semiconductor devices and electronic sub-systems for transportation) at the Central Electronics Engineering Research Institute has experienced some problems with inputs. However, on the other hand, some of its outputs, aiming at operational efficiency of electric vehicles and energy conservation, are already being used by BHEL and the Department of Space, among others.

The recently approved project DP/IND/88/003 (Centre for Electric Transportation Technology) has started the development of advanced mass transportation systems and technologies for energy conservation. A further project in a related field is DP/IND/85/060 (Strengthening of design and development of construction and earth moving machinery) being implemented by Bharat Earth Movers Limited (BEML). As a result of the project, Indian mining, irrigation, road- and house-construction sectors are expected to benefit from the improved design and manufacturing processes of indigenously manufactured equipment.

A series of projects bringing automation and computer aids to industry

have been under implementation during CP III. These include: Assistance to metal working industry in India - computer aids at GMTI (DP/IND/82/019) and Development of Microprocessor Based Agro Dairy Instruments (DP/IND/81/025). The main purposes of these projects have been the development of capabilities in software or hardware development, training of manpower and/or providing services to industry. CAD/CAM systems have been introduced to several other projects as well, as their use is expected to have an important impact on product quality.

A further project of the above type, DP/IND/82/034 (Appropriate Automation Promotion Programme), has aimed to promote the appropriate integration of electronics in industry with other tools of control and to evolve a multidisciplinary approach to industrial electronics.

The immediate objective of the project DP/IND/84/030 (Microprocessor Application Engineering Programme) is to establish capabilities for the application of microprocessors in five regional centres within India. The centres are being equipped to train engineers and scientists in microprocessor application in their specific fields and to guide industries in the development of application hardware and software. The project is expected to lead to increased production through quality control, process optimization, energy conservation and optimal utilization of raw materials and manpower and, thus, to lower production costs. Fertilizer, jute, cement, tea, sugar, textiles, petrochemicals and steel industries, among others, have benefitted from the above-mentioned two projects.

The project DP/IND/82/033 (Computer Aided Design Programme) has assisted in creating facilities at four CAD centres to provide plant/industry-oriented training programmes, to establish CAD R+D facilities and to set up on-line, real-time computer process control for demonstration in training and in testing the efficiency of micro- and mini-computers. There is a major, ongoing project in the field of development of knowledge-based computer systems which is expected to have an impact on industrial production among other fields. Projects expected to be started still during CP III include DP/IND/88/021 (Development of a special facility for electronic packaging

technology and ergonomic design at the Centre for Electromagnetics, Madras) and DP/IND/88/022 (Establishment of a Centre for electronic design and technology on process control and instrumentation).

The technological capabilities of the Indian pulp and paper industry have been strengthened by UNDP and UNIDO assistance since the early 1970s. For most of the projects, the Central Pulp and Paper Research Institute (CPPRI) has acted as the counterpart institution. One of the most interesting projects, which has been financed by UNIDO, is US/IND/79/206 (Desilification plant for the Ashok Paper Mills Limited). The purpose of this project is to develop a technology for the desilification of bamboo and bagasse black liquors in paper making. This project could have implications on paper production in all bamboo-growing countries. Another ongoing project, DP/IND/85/048 (Chemical recovery for small pulp mills using non-woody materials), is expected to lead to more cost-effective pulp production and decrease use of forest resources. A few new projects to strengthen CPPRI's capabilities to serve industry are expected to be approved still under CP III. Also, the village-level handmade paper production will be upgraded with UNDP assistance.

In the field of fertilizer and pesticides production the main emphasis has been on the development of indigenous capabilities. DP/IND/81/018 (Investigations to produce sulphur and sulphuric acid from Anjhore pyrite deposits) has produced successful results, which have already led to investment considerations for setting up a commercial plant. Furthermore, the capabilities of Projects and Development of India Limited (PDIL) services to the fertilizer industry are being strengthened through the following projects: DP/IND/85/007 (Demonstration and training in predictive maintenance), DP/IND/88/011 (Strengthening of NDT facilities) and DP/IND/88/012 (Development of improved corrosion detection technologies).

Regarding pesticides, the project DP/IND/80/037 (Pesticides Development Programme), has established a centre where success has been achieved particularly in developing formulations, which will contribute to the further indigenization of Indian pesticides industry.

With the increasing interest of Indian textile and garment industry to upgrade technologies and designs for export purposes, the Government decided to establish the National Institute of Fashion Technology. Some support has been requested from UNDP. Various existing textile industry R+D institutes are also receiving UNDP assistance. ATIRA has been supported in the application of research results in easy-care cotton fabrics. The technology has been fully developed but has not yet been taken up by industry. BTRA is being supported in instituting computerized woven or printed textile design with the added advantage of shade matching. SITRA is developing uses of unconventional fibres for the manufacture of fabrics under the project DP/IND/86/038 and some promising experiments with the mixing of pineapple fibre with other fibres has been undertaken. The jute industry needs modernization and diversified end uses for jute are being developed under the project DP/IND/86/037 to sustain the industry as a major employer. SASMIRA has had some preliminary assistance to strengthen its capacity to serve industry.

Modernization of the steel industry is currently being assisted by two major projects, which also aim at the reduction of production costs. Both projects are active at SAIL plants. The first project, DP/IND/85/002 (Introduction of computer system in SAIL plants), is expected to assist in improving maintenance management, effectiveness, capacity utilization and productivity by establishing an integrated computer-managed maintenance system (CMMS). The other project is DP/IND/85/064 (Measures for energy saving and conservation in SAIL's steel plants). Both projects are expected to contribute to bringing down the cost of steel. Assistance to the mini-steel mills to cut energy consumption has also been initiated.

With its extensive bauxite reserves, India has interest in developing her aluminium industry. A number of smaller projects to modernize facilities and to introduce new processing technologies have been carried out with UNDP and UNIDO assistance. These include DP/IND/84/004 (Techno-economic study for industrial utilization of red-mud waste from bauxite processing in Korba), DP/IND/84/005 (Demonstration unit of alumina calciner for energy

conservation), UC/UD/IND/87/083 (Techno-economic study for upgrading the technology of Korba Alumina Plant of BALCO) and DP/IND/84/007 (Assistance to super purity aluminium). UNDP inputs worth over US\$ 4 million will support the establishment of the Jawaharlal Nehru Aluminium Research Development and Design Centre (DP/IND/88/015). The activities of the Centre should lead to greater self-reliance in alumina and aluminium production and to faster growth of the industry in India. New interesting processing technologies such as bioleaching have been introduced to copper (SI/IND/87/803).

The comparison of the Seventh Plan priorities with the UNDP assistance during CP III shows that the UNDP programme in the field of industry has effectively supported India's industrialization efforts.

Nevertheless, as noted, for instance in the documentation prepared for the Mid-term Review of the UNDP/India Country Programme, the UNDP programme implementation has experienced various problems which may have influenced the efficiency of the assistance rendered. Deficiencies in project design and implementation has been mentioned. In many cases the problems in implementation emanate from poor and unrealistic project design. The complexity and the technological level of the industrial projects in India require special effort in formulation with close cooperation of all partners, i.e. UNDP, the Government and the executing agency. It seems that PA or PDF should have been used in more cases of CP III projects. In quite a few instances UNIDO has financed preparatory projects or project formulation missions from its own resources to design IPF-funded projects. Furthermore, in 1987 UNIDO established a project appraisal unit which has contributed to improved project design.

In project implementation there have been some cases where the Government implementing agency has not delivered inputs in time and others, where the executing agency has caused the delays. In UNIDO's experience a useful tool for minimizing these delays has been the visit of the National Project Director or Coordinator, who in India mostly are the managers of the projects, to the UNIDO headquarters at the start of the project to prepare a detailed work plan, agree on the training programme and to discuss in detail the

equipment requirements. Further necessary means to secure timeliness of inputs, and smooth implementation in other respects as well, are monitoring visits of substantive officers to the project site and their attendance at tripartite review meetings.

Criticism has been expressed from the UNDP and Government sides on selection of experts and equipment. UNIDO's expert roster has been said to be of low standard. In the selection of experts UNIDO does not however depend on the roster only. The substantive officers maintain personal contacts with institutions, individuals and companies from whom recommendations for experts can be obtained. Many similar channels are used for acquiring up-to-date information on equipment. UNIDO encourages this type of contacts and attendance of fairs and conferences is promoted for establishing and maintaining them.

Placement of trainees from the high-tech projects has often been difficult and costlier than expected. These factors have to be taken into consideration at the time of project formulation. In a few recent cases UNIDO recommended raising the budgetary provision originally proposed for the training component of projects as the training fees have been known to be high.

4. POSSIBLE AREAS FOR FUTURE EMPHASIS
IN INDIA'S INDUSTRIAL DEVELOPMENT

Eighth Plan

For the Eighth Plan (April 1990 - March 1995), the national leadership has decided on a GDP growth target of 6% per annum. This would entail a massive investment in the economy and a public sector investment of approximately 30 trillion rupees. The growth in industry will have to be between 9 and 10% both in terms of value addition and in gross output terms.

While targetting for a 6% GDP growth rate within the given resource parameters, the Planning Commission of India is aiming at a reduction in the Incremental Capital Output Ratio: from the existing 4.6 to 4.3. The assumption of growth based on the new ICOR expostulates greater efficiency, improvement in productivity and a wiser management of resources etc. Therefore, as India looks ahead in the Eighth Plan period and beyond, greater efficiency of investment in different sectors, particularly in the industrial sector, becomes imperative. It would necessarily have to come from improvement in productivity, reduction in investment costs and operational costs, more efficient management techniques and better industrial relations.

Slowly, but steadily there is increasing realization among the planners, the manufacturers and the consumers of the importance of standardization. It is also being realized that quality control will, in fact, increase productivity and production in the long run and not reduce it. The need for them is being felt increasingly across the board i.e. in capital goods, intermediates, and consumer goods - durables and expendables alike and more so in the context of growing export orientation of the economy and the increasing competition inside the country caused by imports. Coupled with it improvement of testing facilities and institutionalized arrangements for consumer protection, would also be necessary.

The third area where the national leadership, and the planners are laying more and more stress is pollution control and environmental protection. Industry is being viewed both as a sinner as also the instrument for

environmental protection and for providing the wherewithal for pollution control.

Yet another emerging area of concern is conservation of raw materials and strategic inputs like water and energy. While the need for energy conservation in sectors like steel, aluminium, cement, etc. has been considered important for many years, in other areas also the demand for more energy efficient equipment and processes is gaining strength. Increasingly, there is a feeling that the volumes of water used in industrial processing should be drastically curtailed if the available resources of this critical material are to sustain a larger industrial growth. Norms for energy and water conservation will have to be fixed and where they exist, will require being made more stringent.

Coupled with the above, need is also being felt for recycling of industrial wastes and effluents. The availability of large quantities of agricultural waste, particularly of paddy, calls for immediate strategies for their economic utilization. The discussions with the States in north India particularly Haryana and Punjab confirmed the impression that there is an urgent need for providing technologies and mechanisms for pollution free use of agricultural residuals and for recycling industrial wastes and effluents.

No development plans for India would be meaningful without a major thrust on manpower development and upgrading of skills. Stress was laid on these two aspects in the Mid Term Appraisal Document of the Seventh Plan. While some efforts have been made, much more needs to be done. Need is also being felt for improvement in maintenance management of industrial enterprises and for installation of modern information systems.

Modernization of the capital intensive sectors of industry particularly steel industry both in the primary and the secondary sectors is likely to be an important area of concern. At the same time, growth of downstream industries will have to be supported. Greater emphasis on expansion of village and the traditional small industries is also likely as these sub-sectors are seen as a major source of employment without being capital intensive or being hazardous to environment.

The march towards liberalization of industry which was started a few years ago is likely to continue and the industrial enterprises will have to stand greater competition both within the country and outside.

As industry registers higher growth and consolidates its gains, it will be expected to record a better performance in terms of value addition. Greater sophistication in industry would be warranted in the next Plan period. This may also require restructuring of industry and re-training of workers, technicians, experts and specialists.

The Government of India is likely to contain public sector investment in the industrial sector. Consequently, the large and medium industry will have to look increasingly to the capital market and, consequently, enterprises will have to improve their appeal to the common shareholder. Technology support to Indian industry should, therefore, be directed towards equipping the country's industry in the above mentioned directions.

Role and Integration of new technologies

The introduction of new technology on which special emphasis has been laid by the Government requires an integrated multidisciplinary approach that can exploit the potential of these technologies by creating synergies among them and linking from the beginning capability building and research and development with industry. Indian industry enters the 1990's in an increasingly competitive environment both at home and abroad. The new technologies will be the key to revitalise existing industries and promote new ones.

A process of restructuring of existing industries and rehabilitation of enterprises in the public and private sector has been initiated. This is an opportune moment to combine with it the introduction of information technology. Surveys have already been made of the scope for such introduction in several industrial sectors such as sugar, textiles, cement, etc. Institutional mechanisms, incentives and a holistic approach to restructuring and rehabilitation would be necessary. The small scale sector cannot be

excluded in this context both in view of the need to upgrade technology within the constraints of economies of scale and also to enable these small units to compete, where they must, with the medium and large enterprises and in international markets. Handlooms, clothing and shoes, all with export potential, fall in this category. These sectors may require informatics applications not only in the production process but in design and distribution. Applications of CAD and FMS may have to be adopted. Pilot informatics applications in small scale industries in general, built around specific products or in industrial estates, could improve efficiency without harming employment. It follows that further momentum needs to be imparted to software for local applications.

Technologies are increasingly available for exploitation of, and adding value to marine and bio-resources. Marine resources exploitation includes sea-bed mining where India's task as a pioneer investor requires a mobilization of her industrial and technological capacities. The need for linking biotechnology research to production gathers added emphasis, as the biotechnology programmes of the Government envisage many products to come up for pilot plant production in 1990-95. In this context, bioprocessing skills including fermentation, purification and separation need to be upgraded substantially in a planned way.

Industry-academia interaction may need examination and new types of institutions such as the Engineering Research Centres in the United States may require to be created, as also further emphasis on tools such as science parks, venture capital, etc. Stand-alone R+D institutions may have to be re-oriented as innovation institutions with full involvement of industry. Pre-competitive research among enterprises could be encouraged, both, in the public and private sector.

The materials field is very important for India. This includes new materials, adding knowledge content and value to existing materials and production of appropriate composites based on local materials. Conservation of materials, prevention of corrosion, recovery of materials (e.g. by bacterial leaching of copper) and new design concepts are tasks to be pursued.

Engineering and capital goods industries will bear the brunt of the impact of information technology and new materials. To remain competitive internationally and supply state of the art products, the capital goods industries will have to incorporate features of CIM and FMS.

Technology monitoring and forecasting already introduced in India, will need further extension to enterprises.

The building up of information systems, such as the one introduced for biotechnology, needs to continue in the fields of new technologies in general, complemented by investment-oriented information with the cooperation of development-financing institutions.

5. AREAS OF INTEREST FOR INDIAN INDUSTRY DURING UNDP CP-IV

All the Eighth Plan priorities known at the time of writing this report are intersectoral ones. They include standardization, quality control, pollution control, conservation of raw materials, recycling and manpower development. This may mean that the UNDP programme also needs to take a more intersectoral approach than in the present country programme. Many of the ideas brought to the attention of the team are linked to the above listed priorities.

Standardization and quality control are two closely related concepts which have particular importance to a country which wishes to promote exports of manufactured goods or has opened markets for imported goods. Many of the institutions to be established during CP IV have the objective of enhancing standardization of products and securing their quality to meet the requirements of the importing countries. This applies particularly to the small scale enterprises which may not be able to afford the instruments and the information required for testing and standard setting and would therefore use the services of an institute.

Leather products and textiles including garments are areas where India has certain comparative advantages and where quality particularly could boost export possibilities. External assistance to such industries to upgrade quality could have a strong and positive impact.

In addition to the possible extension of the project establishing the Pollution Control Research Institute several UNDP projects will assist in reducing pollution caused by particular industries. Projects to assist in treatment of tannery effluents and in introduction of clean coal technologies are being formulated. The sectoral presentation of needs for UNDP support, which follows, mentions requirements for assistance in controlling pollution in such fields as non-ferrous metals, pesticides, fertilizers and pulp and paper. It is, however, expected that in most future projects greater attention will have to be focussed on the environmental impact.

The Eighth Plan will require strong measures to conserve energy and, as the sectoral presentation will show, assistance is required to introduce and develop new and more efficient energy saving and conservation measures in numerous industries. Water is also becoming a critical commodity the use of which has to be controlled. This was expressed to the team in several meetings in different parts of the country. Water management, for instance in fertilizer, pulp and paper and leather industries, could need external support. In some industries, such as leather goods, introduction of CAD can assist in using raw materials in the most optimal manner. This tool should be exploited by all industries needing conservation of raw materials. To reduce deforestation alternatives for wood as raw material for packaging, pulp and paper industry or handicrafts will have to be found in India.

Recycling is closely connected to pollution control and to conservation of raw materials. Technologies now exist in which UNIDO has considerable experience and could assist in their transfer to India. In this connection one could also mention profitable utilization of industrial wastes. Assistance would be needed for instance in promoting industries based on blue dust and fly ash.

Another important cross-sectoral field where assistance could be provided is training and skill development. In addition to helping in introducing new training methodologies support for entrepreneurial development in small-scale industries was recognized as an important need.

For CP-IV, the felt needs in the electronics sector are in further development of fifth generation/knowledge based computer systems; computer networking applications in industrial service and social sectors; fibre optics systems application promotion programme; continuation of the computer aided management (CAM) programme, the computer aided design (CAD) programme; the appropriate automation programme and the microprocessor application engineering programme. New ideas include application promotion of surface mount technology (SMT) in Indian electronics equipment industry; productivity

improvement of component industry; computer integrated manufacturing; and development of capital equipment and tools for electronics industry, including moulding technology.

Need is also felt for developing capabilities for manufacture of all types of components, for institutional support in development of semiconductor materials, and design and batch fabrication of RF + microwave systems. There is also need for upgrading and expanding the facilities of the printed circuit board project at Gurgaon.

The team also noted the common desire of the Government and of the electronics industry that its heavy dependence on imports should be substantially reduced. On the contrary, they consider consumer electronics, electronic components and electronic software as items of great export potential in the 1990s. Assistance for attaining the quality of the products at international level will therefore continue to be required.

Though the steel industry in India is about a hundred years old, the major thrust to development of the industry came in the 1960s and thereafter. Unfortunately, the capacity utilization of public sector integrated steel plants has been low. Recently plans for their modernization and debottlenecking have been pushed through. Steel being a highly capital and energy intensive industry, the thrust has to be on modernization of industry, better management of integrated plants, better productivity, and greater energy efficiency both in the primary and the secondary steel manufacturing units.

The needs and priorities of technical improvement in the steel sector have been felt in the areas of software development, system engineering for process control, standardization of hardware and software across steel plants, training, particularly for automation and computer control process, and training simulators. Major areas for technical cooperation include continuation of assistance to SAIL in setting up the computer managed maintenance system and in energy conservation, support to software development for various processes and development of improved refractories for iron and

steel making. Application of advanced ceramics in SAIL plants needs to be studied. Sponge iron production will be enhanced with assistance to SAIL. Uses of blue dust, a by-product of iron ore mining will be studied.

India has reached the stage of self-sufficiency in the production of alumina and aluminium. There have been only marginal imports during 1988-89, but no imports may be warranted during 1989-90. The installed capacity for aluminium at the end of the Sixth Plan i.e. in 1984-85 was 362,000 tonnes. During the Seventh Plan the prestigious national aluminium projects in the public sector were commissioned with French technology having a capacity of producing 800,000 tonnes of alumina and 210,000 tonnes of aluminium. The objective was to export surplus alumina/aluminium. In spite of the aluminium producing process being energy intensive and India being in short supply of energy, the cost of production of aluminium in India has been economic and today indigenous aluminium is selling around 25% cheaper than the cost of imported aluminium. The situation is likely to improve in the Eighth Plan when some expansion of capacities may be effected.

The situation in regard to copper is not so good. India is able to meet indigenously just about 35% of her requirements. The quality of copper ore is poor, though the reserves in the Malanjkhand area in Madhya Pradesh are more promising. The demand for copper in 1987-88 was 130,000 tonnes while the indigenous production was only 50,000 tonnes. The tentative projection at the end of the Eighth Plan is that India should meet 50% of its demand indigenously.

Similar is the position in regard to zinc where against the estimated demand of approximately 150,000 tonnes in 1987-88 only 60,000 tonnes was produced indigenously. Apart from the existing facilities in Rajasthan, a new project based on the ore reserves in the Rampura Agucha zinc-lead deposits is being implemented. The preliminary demand projection for zinc at the end of the Eighth Plan is a little over 200,000 tonnes of which 60-70% would be met indigenously. The capacity of the new unit will be 70,000 tonnes of zinc and 35,000 tonnes of lead.

The non-ferrous industry sector will continue to be a major area of interest to the Indian economy. UNDP assistance in that field is proposed to be used for introduction of bio-metallurgical processes in India. To start with they are being considered for application in copper mining. Pollution control and energy efficiency in non-ferrous metals processing will need support. Processing of manganese, gallium, zinc and ilmenite are also areas for further assistance. The Korba Aluminium complex will require some technical assistance, as will the introduction of electro-smelting of sillimanate to aluminium-silicon alloys.

Chemicals and petro-chemicals is another area which will acquire greater significance in the industrial growth of India in the 1990s. Additional capacity of ethylene crackers is likely to come up during the Eighth Plan period. So also larger production of downstream basic materials like HDPE, LDPE, LLDPE, PVC, etc. The availability of industrial plastics will also be much higher. A few aromatic complexes are also planned which will provide xylene and other chemicals. The Indian industry and Government are keen to exploit these new opportunities.

With the number of industries growing requiring handling of increased amounts of toxic materials interest was expressed in assistance being given in the field of safety in chemical industry.

In the field of plastics possible areas of assistance include development of speciality plastics, plastics for agricultural production in such areas as canal lining, irrigation and mulching, as well as in setting up modern information systems for polymers and petrochemicals. Related to this is introduction of know-how for production of chemically modified rubber.

The drugs and pharmaceuticals sector is another sector of major interest to India, both in terms of volume and efficacy of drugs, pharmaceuticals and vaccines etc. For UNDP CP-IV, the areas of interest in this sector would be upgrading and modernization of fermentation technology for antibiotics and industrial utilization of medicinal plants.

Nitrogenous and phosphatic fertilizers have received increasing attention in the last two decades or so with continued emphasis on raising agricultural production steadily. Looking to the criticality of the fertilizer industry and its crucial role in Indian economy, it has been felt that the emphasis has to be on raising the nutrient unit efficiency of fertilizers, on tackling problems of packaging, retention and transportation and on research and development for the new varieties of fertilizers and micro-nutrients. The major areas of possible assistance include production of new types of fertilizers, production of 100% water soluble phosphates and partially acidulated rock phosphates, introduction of new energy and cost effective production processes, energy conservation, pollution control and water management in plants, development of new types of catalysts (low temperature ammonia synthesis, super methanation, low pressure methanol) and a molecular sieve, and introduction of computer-based process optimization and advanced analytical techniques. In addition to these areas some thought has been given in India to the idea of setting up of an Institute for Fertilizer Science and Technology.

The Cement industry has expanded rapidly in the last few years because of the stimulus provided through certain policy initiatives taken by the Government of India in the eighties. Incentives have also been provided for the shift towards dry process technology which saves as much as 35% energy compared to the wet process. The cement industry, being one of the key industries in the Indian economy, needs to keep up with developments. Assistance could be considered in modernizing VSK technology and bulk handling of cement and other building materials, introducing improved training methodologies for skill upgradation and developing utilization of fly ash in cement production.

The main problems of the paper industry in the Indian context are, (i) heavy dependence on wood; (ii) high energy consumption; (iii) high consumption of water; and (iv) discharge of highly toxic effluents. The Indian Pulp and Paper Research Institute should continue to receive support to strengthen its capabilities in finding solutions. Assistance may be required in building up

institutional support for the development of wood-based industries in the Northern parts of the country. External assistance would also be needed in the field of production of furniture from rubber wood.

Agro-food processing industry has acquired a new emphasis and possesses tremendous potential in India. The major requirements are in the improvement of the network of collection, storage and preservation facilities, processing technology, and packaging. The industry also suffers from the non-availability of adequate varieties of fruits suitable for processing. Fruits and vegetables ideally suited for processing are mango, guava, banana, pineapple, garlic, onion, potatoes, ginger, peas, cauliflower and leafy vegetables. Cereals, like maize and barley, and spices are also well suited for processing. Various fruits and berries particular to India are not utilized for lack of processing know-how and therefore work in this area needs to be carried out. The specific needs in this sector for technical cooperation could include better processing, preservation and packaging technologies, manpower development and economic use of by-products.

In regard to marine products, it has been noted that the bulk of the marine catch is thrown away for lack of preservation facilities and proper marketing techniques. Efforts have to be made towards optimal utilization of the catch either for table purposes or for processing it for nutritional food supplements or as an ingredient for drugs and pharmaceuticals. Therefore in addition to building up its fishing harbours, equipment and other infrastructure, there is need of better packaging of the marine catch and setting up of 'cold chains'. In regard to meat, the need for modern slaughter houses has been felt as also for meat packaging units.

In the field of edible oils a "technology mission" has been set up by the Government of India for the production of oilseeds. However, on the processing side, need for external assistance is felt for improved technologies, extraction of edible oil from non-traditional items like rice bran and forest based oilseeds, and production of soyabean oil. Great urgency is being felt for more efficient preservation and storage of edible oils, and energy conservation in the edible oil industry. The need for setting up some

demonstration units for extraction of new varieties of edible oils and for demonstrating newer process technologies of extraction cannot be overemphasized.

The sugar industry has been growing at a fast pace since the 1970s and in fact, India is now the largest producing country in the world. It is generally self-sufficient in sugar production. The number of sugar factories went up from 214 in 1970-71 to a total of 386 in December 1988 of which 330 are in private and cooperative sectors. The recovery percentage of sugar has tended to improve while the crushing seasons have become longer. However, in certain varieties of sugarcane and in some parts of the country the sucrose content continues to be low. Worldwide there have been considerable developments covering such areas as mill extraction, juice clarification, evaporation and crystalizing and energy conservation which need adoption by the Indian sugar industry. Similarly, the instrumentation and control mechanisms also need updating. There could also be better utilization of by-products such as bagasse and molasses for newsprint and alcohol.

Footwear and other finished leather goods have become major export earners for India. As stated above, the country has a comparative strength in this area, but the quality of the products needs to be continuously upgraded for them to be competitive. Assistance could be used for introduction of latest technologies for leather processing and component and accessories manufacture. The Central Leather Research Institute (CLRI), Madras, should be supported in the field of design and development of footwear and leather products. Production of leather garments is an area where assistance may be required for development of quality products. Quality control and testing facilities are needed in various parts of the country. Effluent treatment, recovery of some processing agents as well as water management are areas where the leather industry may also require assistance.

The textile industry is one of the main pillars of the Indian economy apart from being one of her oldest industries. The weightage assigned to IIP to the textile industry including cotton textiles, jute and textile products is a little over 15%. The industry is presently going through a major

transformation. While a large number of composite units are facing hardship, the powerloom industry is doing rather well. In the composite mills, the spinning sector is doing better. Export of handlooms and readymade garments is looking up.

The Central Government announced a new Textile Policy in 1985 which has yielded dividends. The total volume of cloth production has increased over the years. The quality also is improving. There is a perceptible shift towards production of blended yarn.

The readymade garment industry has been looking up. The export of textiles including fabrics and readymade garments has been going up sharply. Their export exceeded Rs. 20,000 million in 1987-88 and is likely to be around 22,000 million in 1988-89. The target for 1989-90 has been fixed at Rs. 25,000 million.

Textile mills have faced closure essentially because of lack of modernization and inability to remain competitive in an open system.

The main thrust in the textile industry has, therefore, to be on modernization and restructuring, which would include re-training and re-deployment of the large workforce.

Assistance aimed at meeting these requirements will be of great importance. The other felt needs of the textile industry include energy conservation, pollution control, improvement and diversification of blending of fabrics, including use of jute in menswear etc. In the garment sector, the main areas of interest are fashion designing and strengthening of export capabilities. Need has also been felt for setting up centres for wool development and testing. Induction of the latest dehairing technologies will greatly help the woollen industry particularly the pashmina shawl manufacturing industry in Kashmir and Himachel Pradesh.

The energy sector is a critical area for the Indian economy. Acute electric power shortages have been experienced in different parts of the country at different times. The present installed capacity of 58738.96 MW falls short of India's requirements. The targetted installed capacity at the

end of the Seventh Plan i.e. 31 March 1990 is 64371.37 MW and 102559 MW as at the end of the Eighth Plan.

This major area of concern in the energy sector lies in the need to improve the generation, transmission and distribution systems aiming at reduction in T+D losses, reduction in consumption of furnace oil and coal and reduction in auxillary consumption. Improvements in power generation, transmission and distribution equipment as well as in the domestic appliances are urgently needed. Another area of concern is the harnessing of renewable sources of energy. Solar powered pumping sets for agricultural purposes have been developed but the prototypes do not have sufficient capacity equivalent to 5 to 7.5 H.P. and their cost is prohibitive. Therefore assistance is needed for the development and eventual manufacture of adequately powered agricultural pumping sets at competitive prices.

Areas of further possible assistance include support to development of hydrogen energy and a rural power programme based on renewable sources of energy.

The modern small scale industry has played a very significant role in India's economic development in the last three decades or so. It is likely to play a more crucial role in the years to come. Unfortunately, it suffers from a few serious handicaps, e.g. low productivity, poor quality, cost of production and a very large percentage of industrial sickness.

The need, obviously, is to provide sustenance which will improve the overall competitiveness of the small scale industry, its quality and reliability as also its export capability. This will enable the small scale industry to modernize and will also reduce the risk of such units falling sick. With these objectives, several projects have been formulated and some of them have already been submitted to the Government and UNDP.

Specific areas addressed by the projects are: entrepreneurial development, quality control and standardization of products, creation/upgrading of common facilities like heat treatment centres, quality marking and testing

facilities, tool rooms and training centres for designs, die making and mouldings, and exposure to the world market with a view to boost exports. It would be worthwhile to support institutions to build up expertise and capabilities in industrial management and industrial economics specifically for the small and medium scale sectors.

The traditional industries of India, namely, handlooms, handicrafts, village industries and agriculture have been the mainstay of Indian society and economy for centuries. Their importance lies in the large scale local employment they provide, the fact that these industries have been the flag bearers of India's cultural heritage, and that they are low capital intensive and high employment intensive sectors. One of the main areas of concern for the Eighth Plan is the greater efficiency of every rupee which is invested and the effort needed for raising productivity for greater value addition in these sectors. Consequently, the emphasis on these sectors of industry may be heightened in the Eighth Plan.

Unlike the sectors of modern industry, there is very little in terms of craftsmanship or the quality of human skills that the Indian artisan could seek to import from abroad. The human skills for handlooms and handicrafts and khadi and village industry are available aplenty in the country. However, appropriate inputs for modernization of these activities would be needed which would also lead to greater value addition. These sectors seem to require institutional support for design development including CAD, quality control, standardization, testing, R+D for development of new materials for handicrafts and handlooms and development of ceramics for domestic use and clay roofing tiles. Improvement is needed in packaging technology for handicrafts and dyeing, finishing and moth-proofing of carpets and handloom products. Energy conservation measures need to be introduced to rural industries.

Gems and jewellery have become a major export earner for India. The value of their exports may have exceeded Rs. 40,000 million in 1988-89 and may

touch Rs. 50,000 million in 1989-90. (The net value addition is around 20%). The industry is essentially in the private sector though the Government of India and the State Governments are providing back-up support at different points. The sector, and particularly its export capability could be improved with assistance to artisans in the field of training in jewellery product development and manufacturing technologies.

6. LESSONS LEARNT: NEW MODALITIES

The industrial growth achieved by India in the 1980s has been impressive. The team also noted the general appreciation in India for the inputs provided by UNDP in industrial development. The team, therefore, feels justified in suggesting that the importance given to the industrial and industry related sectors by UNDP be maintained, and even increased during CP-IV. While making this recommendation, the team would like to reiterate that these activities should aim at technology related institution building, human resources development and making a solid and perceptible contribution to the Indian economy. Fragmentation of the limited available resources must be avoided.

The policy initiatives that have led to the acceleration of industrial growth have per force generated the need for speedy provision of up-to-date technological, marketing and related information. While the large enterprises in the public and private sectors have inherent advantages in anticipating new developments, the small and medium scale industry is highly dependent on external information delivery systems. Increasing emphasis on export orientation and the growth of competition from imports underlines the need for SMEs to be constantly on the look-out for technological innovative and marketing trends.

Technology transfer being an essential aspect of UNDP/UNIDO assistance, the mid-term review of CP-III pointed to the need for a more active sharing within the country of technologies being developed with UNDP funding. To prevent projects from becoming solely in-house R+D units of the assisted agency, the suggestion was made that, wherever appropriate, projects should consider setting up pilot facilities to tackle technology transfer problems. Wider dissemination of information on successful projects was underlined, but this could be done best when government policy was clear to ensure that firm linkages are established with industry and other end-users to facilitate the use of methods and technologies developed.

The industrial research and service institutions that have been assisted by UNDP/UNIDO, such as those dealing with leather, textiles, machine tools,

electrical measuring instruments, bicycles, etc. have been active in providing information to industry but appear to have largely confined their work to their immediate vicinity. Given the size of the country, there have been requests for assistance in the establishment or strengthening of similar institutions in other states. Perhaps, with some budgetary help and a modicum of external assistance, a more effective networking system could be devised in the existing structures, at least in the area of information.

The team also noted an intense desire on the part of the Indian industry and the Government for a regular dissemination of information from UNDP/UNIDO in the following areas: i) technological developments taking place in industry and the industry related sectors outside India, ii) the nature and quality of the industry related projects of UNDP executed in other countries, and iii) the achievements and the benefits of the industry related projects of UNDP executed in India.

In this context the team recommends that the UNIDO Headquarters play a role in discharging the responsibilities at (i) + (ii) above and transmit information to India in the Ministry of Industry and the Industry + Minerals Division of the Planning Commission. As regards (iii) above, it is noted that the project profiles of UNDP/UNIDO projects even now require sharing of such information. The Government of India, UNDP and UNIDO have a role to play in ensuring its flow and dissemination

Since the adoption of economic liberalization measures, there has been a keen and wide interest in how the pattern of interaction and coordination between private and public sector industry are developing. This is to be expected since the manufacturing sector in India is one of the largest in the world. These patterns could affect the role UNDP/UNIDO could play in the promotion of private sector growth in industry.

Private sector participation in UNDP/UNIDO assistance in India has been more of an end-user and beneficiary than of an initiator and implementor. This is particularly true of projects targetted at small and medium-scale industries. For instance, bicycle manufacturers have benefitted from

technological improvements resulting from the project in Ludhiana. Similarly, the small scale electronics and scientific instruments industries have gained tremendously from the assistance given to the Instruments Design Development and facilities Centre at Ambala Cantt; so has the plastic industry in Madras from the Plastic Testing Centre, whose success had led to the setting up of similar centres in Lucknow, Bhubaneswar, Hyderabad and Bhopal. Progressively, the private sector should take initiatives through their associations to seek UNDP/UNIDO cooperation. In the meantime, new projects dealing with the establishment of institutions to serve industry would do well to learn from the success of the above mentioned projects, whose main accomplishment has been their close association and working partnerships with industry. With the private sector being given a greater role in industrial development, it is important that projects are designed to ensure their participation not only as end-users or beneficiaries but also as actual agents of development and change. Increasingly, projects could be directed towards working directly with and for private industry through the use of industrial associations, consultancy groups, NGO's. Any efforts towards 'privatization' of projects would, however, be misplaced.

During the discussions with the State Governments, the team noted their strong desire for greater involvement with the UNDP/UNIDO programmes. The team's interaction with them has generated many fresh ideas. Worthwhile proposals for CP IV could be expected from them. The State Governments also laid stress on sharing of information by UNDP/UNIDO and the Government of India with them. The team noted that the State Governments generally have large and strong industry departments.

The team also noted the suggestion that for a successful implementation of industry related UNDP projects in India, the appointment of full-time experts and managers is warranted. Short-term appointees or part-time workers find it difficult to devote the kind of serious and sustained attention which is needed to execute these projects in time and effectively. The team also noted the suggestion that the local Project Director may be given greater flexibility in making appropriate adjustments in the inputs needed for executing the project. Reference has also been made to the need for greater cost effectiveness of these projects.

Due to the complexity and sophistication of many of India's industrial requirements, it is recommended that more measures be given to project identification and formulation activities. Greater use of preparatory assistance (PA) and project development facility (PDF) mechanisms should be encouraged along with the participation of executing agencies in such missions. They provide the opportunity for early acquaintance with local project authorities and potential users and beneficiaries of the project, which could facilitate understanding of future procedural and substantive requirements. During this pre-project execution stage sufficient time should be given to ensure that a project will have met its pre-requisites before its approval. If necessary, PA funds could be used to provide expert assistance in determining the kind of land and buildings that will be required to house the project. This is to underline the now increasingly accepted fact that it is project preparation that has the greatest influence on project success.

In India project monitoring appears to have been given more importance than evaluation. The tripartite review being the formal part of the monitoring system, where important decisions can be made on the design, progress and future of the project, the participation of agency technical backstopping officer should be the norm and such participation should be covered from project funds. Regarding evaluations, the timing is important as it provides the opportunity for improvement in performance and impact. Mid-term evaluations should therefore be favoured.

The mid-term appraisal of CP-III has been very useful in pointing out lessons to ensure improved efficiency and effectiveness of future programmes.

The Indian industry has a large pool of technically trained manpower endowed with long and rich experience in various fields. Many sectors of industry have acquired a strong and wide base. The team, therefore, feels encouraged to recommend that more regional and inter-regional projects be hosted in India.

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