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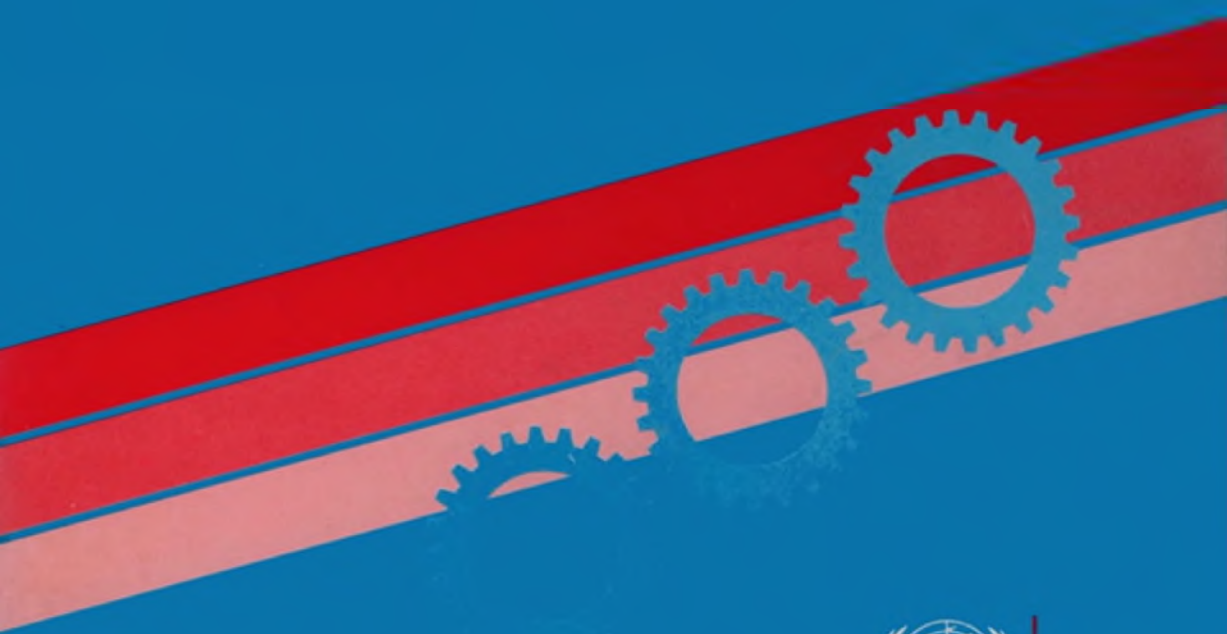

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I. Industrial Restructuring and Investment Promotion Measures in Developing Countries of the Asian and Pacific Region

The Asian and Pacific region has shown an impressive dynamism during the past few decades, whether looked at from the point of view of overall economic growth or that of performance in the industrial sector. Several developing countries of the region placed emphasis on the development of the industrial sector as a means of broadening the national production base and of further diversifying production patterns. These countries embarked on an extensive programme of industrialization, initially concentrating on the production of light consumer goods aimed at import-substitution. They were able to achieve significant results in the manufacture of textiles, rubber products, leather goods, tobacco products, sugar and plastic products and in food processing.

During the period 1965-1980, several developing countries and areas of the region experienced a rapid growth of their industrial sector. During the period 1980-1986, most of the countries and areas were able to maintain or improve their growth rates. This relatively good performance was accompanied by a structural transformation of their economies and the region was able to raise its share in world industrial production. The growth rate of the industrial sector was, on average, even higher than that of gross domestic product (GDP) in several developing countries of the region.

This industrial growth in Asian and Pacific developing countries was also accompanied by structural changes tending towards increased local processing and manufacturing of final products. This became evident in the growth of manufactured exports and the increased production of intermediate and capital goods.

This impressive regional growth of industrial production sometimes gives a misleading picture when compared with performances at the country level or even at the sub-regional level. This is because policies and industrial growth rates, especially for manufacturing, varied among the developing countries and subregions of Asia. Developing countries in East and South-East Asia, having achieved an exceptionally high growth rate during the 1960s and 1970s, were able to adjust somewhat during the difficult periods of the late 1970s and early 1980s; whereas the developing countries of South Asia experienced relatively weak industrial performances. The situation was even more difficult and serious for small least developed and island developing countries of the region. In other words, the region of Asia and the Pacific consists of a large number of countries with diverse resource endowments, levels of development and economic and political systems, leading to different economic and industrial policies and strategies. The newly industrializing economies, of Hong Kong, the Republic of Korea and Singapore, have taken advantage of comparatively well-established manufacturing sectors and have been able to overcome human and capital resource shortages. Their industrial structures, determined by their resource bases, size and policies, reflect not only comparative advantage but also quick and progressive movement towards export-oriented industries. On the other hand, a large number of developing countries pursued import-substitution strategies until recent years, emphasizing the production of a substantial quantity of consumer goods, construction materials and some capital goods, basically for local use. There are several countries in the region where manufacturing consists of a handful of factories producing construction materials, clothing, textiles, footwear, processed foods and some newly established assembly lines. These countries are still at an early stage of industrialization.

In recent years, several countries which had earlier adopted inward-looking strategies have now progressively moved towards outward-looking strategies with emphasis on export promotion of manufactured goods. Even low-income economies of the region which relied more on public sector participation in industrialization have now attempted greater private sector involvement and export promotion strategies through the liberal provision of incentives for increased industrial output and exports. They have enacted measures for improving the efficiency of public sector undertakings, including privatization of public sector manufacturing units. The newly industrializing economies and the middle-income countries, in particular, have strengthened their efforts in this respect. However, the continuing global recession, slow

recovery of economic growth in industrialized countries, stringent protectionist measures and decreasing international capital flows to developing countries have adversely affected various economic and industrial policies and programmes adopted by the developing countries. It is therefore desirable that those countries critically review their current economic and industrial policies and strategies and closely examine their manufacturing structure, taking into account the global economic environment and likely developments. This would help in assessing their role and strength in international and intraregional trade as well as in meeting domestic demands for manufacturing products through proper industrial restructuring.

With these objectives in mind, this article reviews the current structure of the manufacturing sector in developing economies of the ESCAP region. It examines industrial structural changes in those economies, the technological implications of such structural changes, and the linkage between investment promotion and technology transfer. The paper attempts to draw attention to major issues related to industrial restructuring in Asian and Pacific developing economies with a view to identifying a policy framework and modalities for accelerating diversified industrial growth, both to meet domestic demand and to promote manufacturing exports.

GROWTH AND STRUCTURAL TRANSFORMATION IN ECONOMIES OF THE ESCAP REGION

In situations where economic development is progressing slowly, the structure of the economy as a whole remains in the traditional pattern, in which the agricultural sector is predominant and contributes the highest share to gross domestic product (GDP). The industrial sector's share is the smallest. In several developing countries of the region, especially least developed and island developing countries the sectoral structure of production has remained this way. However, in many of the other developing countries of Asia and the Pacific, the structure is being transformed, with the services sector coming to the front but industry still lagging behind.

However, during the past two decades, technological progress, though slow and uneven, has gradually taken place in the developing economies of the region and has been reflected in satisfactory economic growth (6 per cent annually during the period 1965-1980). Except in the case of Bangladesh, Indonesia, Nepal and the Philippines, the growth of GDP during the period 1980-1986 was about 5 to 8 per cent per annum, while China had a growth rate of 10.5 per cent. So far as the type of structural growth was concerned, most developing countries of the ESCAP region experienced a typical pattern of industrialization, involving accelerated growth of industry, slower growth of the service sector and relatively sluggish growth of agriculture. Table 1 provides the average annual growth rates of production by major sectors in selected countries of the ESCAP region during the period 1965-1986. The structure of production is given in Table 2, showing the increased contribution of the industrial and service sectors and the decline of the agricultural sector. Thus, there was a dramatic shift away from agriculture, mainly to industry and services. From this rapid increase in the share of industry in total production, it is clear that the drive towards industrialization during the past 20 years has been the principal characteristic of the process of growth and structural change in the developing countries of the ESCAP region.

Manufacturing output increased between 9.5 and 18.7 per cent per annum in China, Indonesia, the Republic of Korea, Singapore and Thailand during the period 1965-1980. However, the average growth rates of manufacturing output in those countries was lower during the period 1980-1986, with the exception of China, with 12.6 per cent growth. In other developing countries, the performance in manufacturing was reasonable during the period 1980-1986, except in the case of the Philippines, which recorded a negative annual growth rate of 1.7 per cent.

When the structure of employment in the developing part of the ESCAP region is examined, it can be seen that, during the 1980s, employment was highest in agriculture, with the industrial and service sectors lagging behind. This traditional structure did not change, although the share of agriculture in total employment decreased between 1960 and 1980 in almost all the developing countries of the ESCAP region, while the shares of the industrial and service sectors increased (Table 3).

For developing countries, the patterns of structural change in production and employment have important implications for employment strategies and policies. As compared with the earlier industrialization of the developed world, there appear to be two distinct factors exerting a strong influence on

Table 1. Growth of production

(Percentage)

	GDP		*Agriculture*		*Industry*		*Manufacturing*		*Services*	
	1965-80	*1980-86*	*1965-80*	*1980-86*	*1965-80*	*1980-86*	*1965-80*	*1980-86*	*1965-80*	*1980-86*
Low-income economies	4.8	7.5	2.7	4.9	7.6	9.3	7.8	10.8	5.0	6.3
Middle-income economies	6.6	2.3	3.4	2.3	7.6	1.2	. .	. .	6.7	1.9
Industrial market economies	3.6	2.5	0.9	2.5	3.6	2.5	4.0	3.0	3.9	2.0
Australia	4.0	3.1	2.6	6.1	2.9	2.0	1.2	. .	5.4	3.5
Bangladesh	2.4	3.7	1.5	2.7	3.8	4.6	6.8	2.1	3.4	4.7
Burma	3.9	4.9	3.7	4.7	4.4	6.3	3.9	5.8	4.0	4.8
China	6.4	10.5	3.0	7.9	10.0	12.5	9.5	12.6	7.0	9.4
Hong Kong	8.5	6.0	. .	.	. .	. .	. .	. .	. .	. .
India	3.7	4.9	2.8	1.9	4.0	7.1	4.3	8.2	4.6	6.0
Indonesia	7.9	3.4	4.3	3.0	11.9	1.8	12.0	7.7	7.3	5.6
Islamic Republic of Iran	6.2	. .	4.5	. .	2.4	. .	10.0	. .	13.6	. .
Japan	6.3	3.7	0.8	1.0	8.5	5.0	9.4	7.8	5.2	2.9
Malaysia	7.4	4.8	. .	3.0	. .	6.0	.	5.8	.	4.5
Nepal	2.4	3.5	1.1	4.8	. .	. .	. .	. .	. .	. .
New Zealand	3.1	2.6	. .	2 1	. .	. .	. .	. .	. .	.
Pakistan	5.1	6.7	3.3	3.3	6.4	9.3	5.7	9.3	5.9	7.2
Philippines	5.9	−1.0	4.6	2.0	8.0	−3.5	7.5	−1.7	5.2	−0.6
Republic of Korea	9.5	8.2	3.0	5.6	16.5	10.2	18.7	9.8	9.3	7.2
Singapore	10.4	5.3	3.1	−3.5	12.2	4.4	13.3	2.2	9.7	6.1
Sri Lanka	4.0	4.9	2.7	3.9	5.1	4.5	3.2	5.6	4.3	5.7
Thailand	7.4	4.8	4.9	2.9	9.5	5.0	10.9	5.2	8.0	5.6

Source: World Bank, World Development Report 1988 (New York, Oxford University Press, 1988) table 2, p. 224.

Table 2. Structure of production

	Distribution of gross domestic product (Percentage)							
	Agriculture		*Industry*		*Manufacturing*		*Services*	
	1965	*1986*	*1965*	*1986*	*1965*	*1986*	*1965*	*1986*
Low-income economies	42	32	28	35	21	24	30	32
Middle-income economies	22	15	33	36	19	22	45	48
Industrial market economies	5	3	40	35	29	. .	54	61
Australia	9	5	39	34	26	17	51	62
Bangladesh	53	47	11	14	5	8	36	39
Bhutan	. .	. .	. .	. .	. .	. .	. .	. .
Burma	35	48	13	13	9	10	52	39
China	39	31	38	46	30	34	23	23
India	47	32	22	29	15	19	31	39
Indonesia	56	26	13	32	8	14	31	42
Islamic Republic of Iran	26	. .	36	. .	12	. .	38	. .
Japan	9	3	43	41	32	30	48	56
Malaysia	28	21.3[a]	25	18.4[a]	9	. .	47	55.4[a]
Nepal	65	. .	11	. .	3	. .	23	. .
New Zealand	. .	11	. .	33	. .	. .	. .	56
Pakistan	40	24	20	28	14	17	40	47
Republic of Korea	39	12	25	41	18	30	37	45
Singapore	3	1	24	38	15	27	73	62
Sri Lanka	28	26	21	27	17	15	51	47

Source: World Bank, *World Development Report 1988* (New York, Oxford University Press, 1988) table 3, p. 226.

[a] Estimate (source: UNIDO, Industrial Development Review Series, "Malaysia" (UNIDO/IS.545). Figures for 1985.

Table 3. Structure of employment

	Percentage of labour force in						*Average annual growth rate of labour force (Percentage)*		
	Agriculture		*Industry*		*Services*				
	1965	*1985*	*1965*	*1985*	*1965*	*1985*	*1965-1980*	*1980-1985*	*1985-2000*
Afghanistan	69	..	11	..	20	..	1.7	..	..
Australia	10	7	38	32	52	61	2.4	1.8	1.3
Bangladesh	84	75	5	6	11	19	1.9	2.8	3.0
Burma	64	53	14	19	23	28	2.2	1.9	1.8
China	81	74	8	14	11	12	2.4	2.5	1.4
Hong Kong	6	2	53	51	41	47	3.9	2.5	1.4
India	73	70	12	13	15	17	1.7	2.0	1.8
Indonesia	71	57	9	13	21	30	2.1	2.4	2.2
Islamic Republic of Iran	49	36	26	33	25	31	3.2	3.3	3.2
Japan	26	11	32	34	42	55	1.0	0.9	0.5
Lao People's Democratic Republic	81	76	5	7	15	17	1.6	1.8	2.2
Malaysia	59	42	13	19	29	39	3.4	2.9	2.6
Nepal	94	93	2	1	4	7	1.6	2.3	2.3
New Zealand	13	11	36	33	51	56	1.9	1.8	1.2
Pakistan	60	55	18	16	22	30	2.6	3.2	2.8
Philippines	58	52	16	16	26	33	2.5	2.5	2.4
Republic of Korea	55	36	15	27	30	37	2.8	2.7	1.9
Singapore	6	2	27	38	68	61	4.2	1.9	0.8
Sri Lanka	56	53	14	14	30	33	2.2	1.6	1.6
Thailand	82	71	5	10	13	19	2.8	2.5	1.7
Viet Nam	79	68	6	12	15	21	1.8	..	..

Source: World Bank, *World Development Report 1988* (New York, Oxford University Press, 1988) table 31, p. 282.

industrialization in most developing countries in recent times. The first is technological progress, which has reached a new stage of scientific and technological revolution. The other is population growth.

Technological progress is closely associated with industrial development. Modern technologies introduced in industrial production are mainly supplied by developed countries. Such technologies are essentially capital-intensive and labour-saving. Their introduction produces a stronger effect on production than on employment and increases labour productivity. This is the major reason why the share of industry in GDP in the developing part of the ESCAP region is estimated to have increased, while the share of industry in total employment has registered a slower increase.

STRUCTURAL TRANSFORMATION IN MANUFACTURING IN ECONOMIES OF THE ESCAP REGION

Rapid growth of the economy as a whole and the industrial sector, in particular, remain the most important development objectives of all ESCAP members. In this process, structural change that transforms a traditional agrarian economy into a modern industrial one has been attempted for sustained growth in the economy and the industrial sector. Sometimes it is considered that structural change within industry and, especially, in manufacturing may not necessarily lead to rapid economic growth in the short run, but is needed to develop productive capacity and to expand industrial output, employment and increase the welfare of the countries in

the long run. Recent development experience in resource-rich developing countries and, particularly, capital-surplus oil economies illustrates this point. They attained unprecedentedly rapid growth rates, mainly relying on a few primary commodity exports, but delayed the structural transformation essential for creating and diversifying productive capacity to sustain rapid growth and reduce vulnerability to the ups and downs of the world economy. On the other hand, some of the resource-poor economies of Asia and the Pacific, such as Hong Kong, the Republic of Korea and Singapore, underwent structural change at fairly early stages of development, with a relatively low per capita income initially and, after two decades of restructuring their economies and manufacturing on the basis of an export oriented growth strategy, have now been heralded as success stories among developing countries and have been able to establish a diversified structure. Furthermore, a comparison among the countries of per capita income during the period 1965-1985, and of the growth rates of per capita incomes even during the partly recessionary 1983-1984 period, suggests that, over the long run, openness and the market mechanism tend to promote more rapid growth than inward-looking options.[1]

Several developing countries of Asia and the Pacific, in response to the increasing internationalization of trade, production and finance, have attempted industrial restructuring through the expansion of their intermediate and capital goods sectors. This is evident from the share of these sectors relative to other manufacturing value added substantiate this phenomenon. This section examines the contribution of different manufacturing outputs in total manufacturing value added and presents a broad picture of structural change in manufacturing in developing economies of the ESCAP region.

As shown in Table 4, the share of the developing part of the Asian and Pacific region in world manufacturing value added increased from 2.57 per cent in 1965 to some 3.75 per cent in 1980 and 4.79 per cent in 1985. This advance found its expression in the rising share of manufacturing in GDP in almost all the developing countries of the region.

Many Asian countries enjoyed satisfactory growth of the manufacturing sector. Overall, the manufacturing sector in developing Asia grew by annual average rates of 6 and 5 per cent, respectively, during the periods 1965-1980 and 1980-1985. Table 5 provides detailed figures on the growth performance of the manufacturing sector in individual countries during the periods 1965-1980, 1980-1985 and for 1986 and 1987. In many countries the performance of manufacturing has been higher than the overall economic performance, thus raising substantially the share of manufacturing value added in total GDP.

It is in these regional and national contexts that the growth and structural change of manufacturing in the Asian and Pacific region should be considered. First, the period 1970-1980 is reviewed; then the contribution of manufacturing value added is examined in four broad subsectors of manufacturing – agro-based, engineering, metallurgical and chemical industries – for the years 1975, 1980 and 1985.

The structural change in the ESCAP region in a period of just one decade (1970-1980) was remarkable. In the developing part of the ESCAP region, the

Table 4. Share of developing regions[a] in world manufacturing value added at constant (1975) prices, selected years

(Percentage)

Year	*Africa*	*Asia*	*Latin America*
1965	0.80	2.57	4.47
1970	0.84	2.71	4.81
1975	0.87	3.21	5.49
1980	0.99	3.75	5.92
1985[b]	1.00	4.79	5.28

Source "World industry: a statistical review – 1985", *Industry and Development, No. 18* (UNIDO publication, Sales No. E.86.II.B.2), table, p. 102.

[a] Excluding China.

[b] Estimate.

[1] B.O. Campbell, "Asian and Pacific developing countries: performance and issues", *Asian Development Review*, Vol. 5, No. 1, 1987, (Asian Development Bank, Manila), p. 6.

Table 5. Average annual growth rates of manufacturing production in selected developing economies, 1965-1987

(Percentage)

Economies	*1965-80*	*1980-85*	*1986*[a]	*1987*[b]
1. Bangladesh	6.8	2.0	−4.0	8.5
2. Burma	3.9	6.0	3.3	3.1
3. China	9.5	12.4	9.3[c]	9.3[c]
4. India	4.4	5.6	8.3	4.6
5. Indonesia	12.0	6.4	6.2	7.4
6. Malaysia	11.8[d]	6.1	−1.7	1.1
7. Pakistan	5.3	10.1	8.2	6.2
8. Philippines	7.5	−1.2	−0.8	1.7
9. Republic of Korea	18.8	9.0	16.8	14.6
10. Singapore	13.3	2.1	−1.6	−1.0
11. Sri Lanka	3.2	5.5	6.1	0.4
12. Thailand	10.9	5.3	5.3	5.3

Source: World Bank, *World Development Report 1987* (New York, Oxford University Press, 1987), table 2, pp. 204-205.

[a] Estimates and [b] projections made by the UNIDO secretariat. See *Industry and Development: Global Report 1987* (UNIDO publication, Sales No. E.87.II.B.2), table 26, p. 53, and table 27, p. 56.

[c] The estimates for China are from *Industry and Development: Global Report 1986* (UNIDO publication, Sales No. E.86.II.B.5), table 1.6, p. 31.

[d] For 1970-1980, from World Bank, *World Development Report 1982*, (New York, Oxford University Press, 1982), table 2, p. 113.

expansion in the manufacture of metal products, machinery and equipment was especially vigorous. This group's share in total manufacturing value added has increased significantly, catching up with the largest, the food industry. If these two tendencies continue, which is very likely, it can safely be forecast that metal products, machinery and equipment will become the largest manufacturing subsector in the developing economies of Asia. The chemical industry (excluding petroleum refineries and products) also increased its contribution to manufacturing value added, absolutely as well as relatively. The increase in the other fast-growing manufacturing divisions (non-metallic mineral products and basic metals), although noticeable, was less pronounced.

Thus, in the course of the 1970s, a substantial shift away from the traditional structure of manufacturing production to a modern one could be observed in the developing part of the ESCAP region. Food and textiles showed a definite, and wood processing and paper a slight, downward trend. Metal products, machinery and equipment, and the chemical industry (excluding petroleum refineries and products), in particular, along with non-metallic mineral products and basic metals, registered a considerable increase in their respective shares of total manufacturing value added. As is shown in Table 6, while their relative contribution to total industrial output increased from 35 per cent in 1970 to 42.5 per cent in 1980, the share of the two traditional industires (food and textiles) declined from 42 to 38 per cent in the same period.

However, several developing economies of the ESCAP region reveal some variations as compared with the regional trends (Table 7). In India, for instance, the share of wood processing in manufacturing production increased, while that of basic metals remained essentially unchanged. In Hong Kong, Malaysia and Singapore, the share of the chemical industry, excluding petroleum, decreased.

The share of the textile industry in the regional average declined because of the structural shift from light to heavy industries in serveral countries such as Bangladesh, India and Pakistan in South Asia, and Singapore in South-East Asia. In the South Asian countries, the textile industry traditionally occupied the strongest position in the composition of manufacturing production and its relative decline reflected the process of gradual transformation from the predominantly traditional to a more modern manufacturing structure. By contrast, the relative portion of the textile industry in Singapore has never been as large as in India or Pakistan. However, it grew stronger in the course of the first phase of industrialization in Singapore (1960s). When Singapore had achieved practically full employment and internal as well as external conditions changed (in the 1970s), the textile industry, predominantly labour-intensive, began losing ground, while other

Table 6. Growth and structural change in manufacturing in the ESCAP region (1963, 1970 and 1980)

(Percentage)

Manufacturing division	*Year*	*Developing economies*		*Developed economies*	
		Structure	*Growth rate*	*Structure*	*Growth rate*
Food, beverages and tobacco	1963	20.8		14.1	
	1970	21.6	6.4	10.4	5.9
	1980	20.0	5.7	8.4	1.9
Textiles, wearing apparel and leather	1963	23.1		9.8	
	1970	20.2	3.8	8.0	7.6
	1980	18.0	5.2	5.7	0.6
Wood and wood products, including furniture	1963	3.4		7.5	
	1970	3.7	7.0	5.1	4.7
	1980	3.5	5.9	3.5	0.1
Paper and paper products, printing and publishing	1963	3.9		10.5	
	1970	3.9	5.7	7.6	5.5
	1980	3.7	6.0	6.9	3.1
Chemicals and chemical products, petroleum, coal, rubber, plastic products	1963	22.4 (7.6)[a]		8.9	
	1970	23.4 (10.5)[a]	6.5[a]	11.6	14.9
	1980	22.5 (12.5)[a]	6.1[a]	13.6	5.8
Non-metallic mineral products, except petroleum and coal	1963	4.0		6.9	
	1970	4.6	8.0	4.9	5.4
	1980	5.4	8.2	4.2	2.5
Basic metals	1963	5.3		8.3	
	1970	5.1	5.3	10.5	14.4
	1980	5.2	6.7	9.6	3.2
Metal products, machinery and equipment	1963	12.8		28.4	
	1970	14.8	8.0	38.2	15.4
	1980	19.4	9.4	45.1	5.8
Other manufacturing	1963	4.2		5.6	
	1970	2.7	−0.5	3.6	3.9
	1980	2.4	5.2	2.9	1.9

Source: Calculated by ESCAP on the basis on UNIDO data.

[a] Relative figures in parentheses relate to the chemical industry excluding petroleum refineries and petroleum products.

industries continued to grow rapidly.

A number of developing countries of the region with redundant and cheap labour either began, or continued, to industrialize, relying *inter alia*, on rapid growth of the textile industry. Some countries and areas such as export-led Hong Kong and the Republic of Korea, export-oriented Malaysia, Sri Lanka and Thailand, and even Burma and the Islamic Republic of Iran, recorded high rates of growth in the textile industry. Accordingly, the share of the textile industry in the overall structure of manufacturing increased in all these countries.

An examination of structural change among 28 manufacturing branches permits the identification of several trends which substantiate the main findings of the foregoing analysis of growth and structural change among the broad manufacturing divisions. Three leading industries, electrical machinery, transport equipment, and professional and photographic goods, were responsible for the expansion of metal products, machinery and equipment.

Analysis of changes in the composition of manufacturing production, in terms of 28 major manufacturing groups, reflects an

Table 7. Change in structure of manufacturing production in ESCAP countries and economies

(Percentage)

Country or area	Year	Food, beverages and tobacco	Textiles, wearing apparel and leather	Wood and wood products, including furniture	Paper and paper products, printing and publishing	Chemicals and chemical products, petroleum and coal	Non-metallic minerals, except petroleum and coal	Basic metals	Metal products, machinery and equipment	Other manufacturing	Chemicals and chemical products, excluding petroleum	Petroleum and coal products
Developing												
Bangladesh	1970	28.9	49.8	–	2.0	12.2	0.7	3.8	2.2	0.4	12.2	. . .
	1980	26.6	40.6	0.6	2.2	16.4	2.0	5.5	5.8	0.2	16.3	0.1
Burma	1963	37.1	9.1	24.8	1.0	7.2	5.8	10.4	3.1	1.6	6.2	1.0
	1970	34.2	8.9	22.8	2.1	7.6	4.6	15.6	4.2	1.3	5.9	1.7
	1980	33.5	12.3	13.5	3.2	8.0	7.7	17.8	3.2	0.9	6.6	1.4
Fiji	1963	93.6	0	4.2	0	0	2.2	0	0	0	0	0
	1970	54.7	5.8	26.7	1.2	1.2	3.5	0	7.0	. . .	1.2	0
	1980	56.8	7.2	20.7	3.6	1.8	3.6	0	6.3	. . .	1.8	0
Hong Kong	1963	5.4	47.1	4.6	5.2	1.8	0.4	1.8	25.6	8.1	0	0
	1970	4.7	43.6	2.4	5.4	12.7	0.9	1.3	24.6	4.4	12.7	0
	1976	6.4	43.8	1.8	4.4	9.7	1.1	1.2	27.3	4.3	9.7	0
India	1963	11.7	32.1	2.5	3.1	11.0	4.5	8.8	18.4	7.8	10.1	0.9
	1970	13.6	25.4	3.6	4.2	13.4	4.5	8.2	21.9	5.1	11.8	1.6
	1980	12.6	18.6	4.6	3.9	16.8	4.9	8.1	24.9	5.7	15.0	1.8
Indonesia	1963	32.0	5.8	2.6	1.1	50.5	2.8	–	5.3	0.3	6.8	43.7
	1970	29.7	8.4	3.0	1.4	49.4	2.4	0	5.5	0.2	10.1	39.3
	1980	29.8	8.0	5.1	1.8	39.5	6.6	0.9	8.2	0.1	13.6	25.9
Islamic Republic of Iran	1963	17.2	9.2	0.5	3.2	60.7	2.7	3.5	2.7	0.1	2.3	58.4
	1970	18.0	11.7	0.9	1.9	50.3	5.2	5.8	6.0	0.4	5.7	44.6
	1980	13.5	14.0	1.0	2.8	43.7	9.6	5.2	9.6	0.6	8.3	35.4
Malaysia	1963	30.3	6.6	16.3	5.9	23.4	3.6	3.2	10.6	0.1	21.1	2.3
	1970	26.1	5.1	15.8	6.9	22.0	5.2	2.6	16.1	0.1	19.4	2.6
	1980	22.4	8.1	13.0	5.5	18.8	6.0	2.9	22.8	0.5	17.0	1.8
Pakistan	1963	28.8	45.6	0.3	2.4	11.8	3.1	2.1	5.1	0.5	8.8	3.0
	1970	39.7	31.4	0.2	2.4	15.4	3.4	1.5	5.8	0.3	10.7	4.7
	1979	44.4	14.3	3.0	3.8	19.3	3.8	2.1	8.8	0.4	14.9	4.4

Table 7. *(Continued)*

Country or area	*Year*	*Food, beverages and tobacco*	*Textiles, wearing apparel and leather*	*Wood and wood products, including furniture*	*Paper and paper products, printing and publishing*	*Chemicals and chemical products, petroleum and coal*	*Non-metallic minerals, except petroleum and coal*	*Basic metals*	*Metal products, machinery and equipment*	*Other manufacturing*	*Chemicals and chemical products, excluding petroleum*	*Petroleum and coal products*
Developing *(Continued)*												
Philippines	1963	36.1	12.3	5.3	9.2	15.2	5.3	4.5	11.4	0.6	9.5	5.7
	1970	36.3	10.1	5.2	5.8	19.1	5.0	4.2	12.4	0.9	11.0	8.1
	1980	39.9	10.9	3.8	5.6	17.0	4.0	4.7	13.4	0.7	10.9	6.1
Republic of Korea	1963	32.2	13.4	4.5	7.8	15.0	8.4	3.9	10.2	4.2	13.1	1.9
	1970	23.5	18.0	4.7	6.1	24.4	8.7	3.3	8.4	2.7	17.3	7.1
	1980	16.6	22.2	1.7	4.1	19.7	5.3	7.6	21.5	1.3	16.0	3.7
Singapore	1963	14.2	4.1	6.2	8.4	31.6	6.8	1.3	25.9	1.3	6.9	24.7
	1970	10.9	5.0	3.8	6.1	34.1	4.1	2.5	32.4	1.1	6.1	28.0
	1980	5.5	3.6	1.6	4.7	20.6	2.4	1.8	58.8	1.0	6.5	14.1
Sri Lanka	1963	54.0	8.0	8.8	3.1	4.8	7.3	1.3	9.8	3.0	4.7	0.1
	1970	41.1	10.7	5.1	2.7	8.8	8.8	2.1	14.7	6.1	3.4	5.4
	1979	46.0	10.8	2.5	2.3	7.8	11.4	1.0	9.8	8.4	4.6	3.2
Thailand	1963	53.7	14.3	7.5	2.9	3.5	2.9	0.1	11.3	3.7	0	0
	1970	47.5	14.3	5.3	3.0	12.5	4.7	2.1	8.3	2.3	4.9	7.6
	1980	38.2	24.7	3.7	2.6	13.4	4.0	2.2	10.2	1.2	5.2	8.2
Developed												
Australia	1963	18.0	9.1	6.4	6.3	7.6	6.3	9.1	35.9	0.9	6.9	0.7
	1970	17.5	7.9	5.8	8.2	10.4	5.2	8.9	35.0	1.0	9.6	0.8
	1980	15.5	7.2	5.1	8.3	11.6	4.8	9.2	27.7	0.7	20.8	0.8
Japan	1963	12.7	9.9	7.7	11.9	9.0	7.4	8.3	26.5	6.7	18.2	0.8
	1970	9.1	8.0	5.0	7.4	11.8	4.9	10.9	38.9	4.0	10.7	1.1
	1980	7.3	5.4	3.2	6.6	12.8	4.2	9.8	47.5	3.2	11.9	0.9
New Zealand	1963	30.8	10.3	9.6	11.0	8.8	5.2	1.8	21.3	1.2	8.0	0.8
	1970	28.0	10.9	7.3	11.9	10.3	4.3	2.0	23.5	1.8	9.4	0.9
	1979	26.3	11.3	8.0	12.2	9.3	4.6	3.0	24.0	1.2	8.4	0.9

Source: Calculated by ESCAP on the basis of UNIDO data.

immense variety of conditions in the Asian and Pacific countries. Though valid generally, this observation relates primarily to the situation in the developing countries. In fact, not a single change in the structure of manufacturing production common to all the developing countries of the region could be identified. In spite of this, a broad picture of four categories of industries and their contributions to total manufacturing value added is presented in Table 8. In almost all the developing countries, the contribution of agro-based industries to total manufacturing value added declined during the period 1975-1985. Nevertheless, in countries like Bangladesh, Pakistan, the Philippines, Sri Lanka and Thailand, their contribution still amounted to more than 50 per cent. There has been a significant increase in the contribution of engineering industries to total manufacturing value added in India and the newly industrializing economies of the region. The contribution of metallurgical industries in total manufacturing value added was higher in the case of newly industrializing economies, whereas in others it was somewhat stagnant. The contribution of the chemical industries group in total manufacturing value added declined in the newly industrializing group but increased in other developing countries.

In the above analysis of structural changes in manufacturing, China was not included owing to a paucity of data in disaggregated form. However, a brief review of manufacturing in China is presented to highlight some of the major trends. The share of China in world manufacturing value added was estimated to be 4.2 per cent in 1982. International comparisons show that China is the world's largest producer of industrial goods among developing countries and possesses one of

Table 8. Total manufacturing value added and share of selected manufacturing subsector in total manufacturing value added

(Percentage)

	Agro-based industries			*Engineering industries*			*Metallurgical industries*			*Chemical industries*		
	1975	*1980*	*1985*	*1985*	*1980*	*1985*	*1975*	*1980*	*1985*	*1975*	*1980*	*1985*
Newly industrializing economies												
Hong Kong	56.46	49.11	45.97	17.15	23.33	24.53	8.51	9.56	9.63	15.17	14.42	16.44
Republic of Korea	44.97	40.11	36.04	14.22	18.57	23.58	8.86	11.04	12.43	29.51	28.49	25.88
Singapore	16.83	14.64	14.08	42.75	46.42	47.93	6.77	6.75	8.55	32.54	30.40	28.36
South-East Asia												
Indonesia	52.09	42.41	38.58	7.85	10.30	7.31	3.78	5.31	12.16	35.83	42.12	42.14
Malaysia	NA	40.50	NA	NA	21.31	NA	NA	7.30	NA	NA	30.74	NA
Philippines	62.18	53.73	57.14	8.40	11.74	9.82	7.82	6.33	5.09	23.01	27.54	27.16
Thailand	63.80	55.07	51.74	9.56	12.39	15.24	5.71	7.28	4.26	18.30	18.71	20.11
South Asia												
Bangladesh	71.91	69.67	58.04	3.55	3.24	7.17	7.40	6.24	10.23	16.79	22.31	24.53
India	34.02	33.40	27.70	23.97	25.75	28.26	16.29	15.22	15.08	25.96	25.05	28.51
Nepal												
Pakistan	62.89	55.07	56.66	9.18	10.32	8.01	4.38	6.94	5.29	22.04	27.24	29.62
Sri Lanka	54.62	50.54	53.64	9.27	6.17	4.71	5.11	3.91	3.37	30.04	39.72	37.91
Developed economies												
Australia	33.13	32.61	34.26	24.73	22.49	22.19	18.82	20.09	18.07	22.45	23.89	25.31
Japan	25.59	22.72	19.30	32.76	34.18	42.37	15.24	16.61	12.44	24.71	24.97	23.97
New Zealand	50.18	49.54	49.58	17.25	16.98	16.45	11.46	12.03	12.35	19.77	20.04	20.60

Source: Calculated by ESCAP on the basic of UNIDO data.

the most diversified industrial structures in the world. It is the world's largest producer of cotton yarn and textiles, the third largest producer of cement and sulphuric acid, and ranks among the top six in the production of steel.

China has been passing through a period of restructuring and modernization of the economy. Since 1979, industrial development in China has been promoted through a strategy of industrial decentralization. The basic objective of economic readjustment and reforms is to overcome imbalances and to ensure a fairly steady tempo of advance aiming at quadrupling gross industrial and agricultural output by the year 2000. Furthermore, with the adoption of a more open policy and flexible measures, new avenues opened up for the inflow of foreign capital and technology into China. Manufacturing activities in two selected provinces, four Special Economic Zones and 14 open coastal areas are enjoying special rights and privileges regarding foreign trade and investments.[2]

TECHNOLOGICAL CONSIDERATIONS IN THE INDUSTRIAL RESTRUCTURING PROCESS

Levels of technology and the quality of the human resources of a country are two important, critical factors in industrial development, in general, and industrial structural change, in particular. Industrial performance in Asian and Pacific developing, as well as developed, countries has clearly shown that the pace at which industrialization proceeds depends on the marked acceleration of science and technology. Advances in science and technology give rise to new knowledge, new products and new processes, which will have important implications for the international competitiveness of industrial products. In the post-War period, several new manufacturing technologies were invented, including synthetic fibres and products, television and computers based on electronic and new materials technologies. These new technologies brought important changes in the structure of industry. In recent times, further technological innovations in micro-electronics, informatics, bio-technology, genetic engineering, new materials, laser technology and optic fibres are creating new means of competing in the national and international markets. The developing countries of Asia and the Pacific, unless they develop the capability to acquire, adjust and adopt these technologies, will lose ground in international competitiveness in a period of greater integration and interdependence of global and regional economies.

Though several developing countries of the ESCAP region have advanced significantly in industrial development, their progress in science and technology and technological innovations, as well as effective adoption of imported technologies, have been limited. The distinctive characteristic of any modern industrial structure is the mass production system made possible by a combination of large-scale capital investment and highly developed technology. In this context, the importance of technological capability is absolute in modern industry. Furthermore, technological innovation and adaptation are also very crucial for small and medium-scale industries, which

Table 9. Changing composition of exports and imports in selected Asian economies (1965, 1985)

(Percentage)

	Share of primary goods exports		*Share of imports of machinery*	
	1965	*1985*	*1965*	*1985*
Hong Kong	13	8	13	24
India	51	51	37	25
Indonesia	96	89	39	36
Japan	9	2	9	9
Malaysia	94	73	22	46
Pakistan	64	37	38	27
Philippines	95	49	33	21
Republic of Korea	40	9	13	34
Singapore	65	41	14	31
Sri Lanka	99	73	12	24
Thailand	95	65	31	29

Source: World Bank, *World Development Report 1987,* (New York, Oxford University Press, 1987), tables 11 and 12, pp. 222-225.

[2] UNIDO, Industrial Development Review Series, "The People's Republic of China" (UNIDO/IS. 582), p. 16.

occupy a prominent place in Asian countries. In this respect, the developing countries of Asia and the Pacific have to strengthen further their research and development activities, especially for the successful adoption of available technologies. This is highly essential to increase the profitability of manufacturing enterprises and to stimulate a country's industrial capacity and diversification for achieving international competitiveness. At present, the majority of Asian and Pacific countries are constrained because of insufficient investment in science and technological activities, a shortage of scientific and technical manpower, inadequate scientific and technological infrastructures, including policy measures, and social and cultural attitudes towards science and technology.[3] These prevailing constraints have limited the potential of developing countries to achieve effective structural change in industry.

INVESTMENT PROMOTION AND ITS LINKAGE WITH TECHNOLOGY FOR STRUCTURAL CHANGE

Overall manufacturing growth within a country depends not only on, among other things, the availability of efficient technologies, but, to a large extent, on the provision of adequate investment funds. The availability of investment funds alone is not sufficient, unless the climate for industrial investment is suitable and positive. This climate has to be created through appropriate policies and incentive measures. Such incentives should be directed at raising the general level of investment in the country. They should aim to raise the rate of domestic savings and investment. Most incentive measures try to direct resources into certain priority areas. Once the decision is made to use incentives for the promotion of industrial investment, a wide choice of instruments is available. The more direct the instrument, the less likely it is to create costly side effects. For example, tariffs used to encourage local production by restricting imports raise the price of the protected product, thus discouraging consumption. A direct production subsidy would cause fewer distortions in the economy. If the goal is employment creation, a direct subsidy for labour usage could be used. Instead, one of the incentives most frequently used to attract capital tends to encourage its use in relatively capital-intensive activities. Similarly, some methods used to promote import substitution, save foreign exchange and improve the balance of payments tend to promote an industrial structure heavily dependent on imports and unable to export. It is therefore necessary for investment promotion measures aimed at industrial restructuring to be carefully designed, so that the distorting effects are minimized. Furthermore, the investment promotion measures should be carefully examined in the context of technological development and acquisition.

There is no question that, in most of the developing countries of the ESCAP region, the public sector has taken the lead in creating policies for technology development and transfer. This was necessary to overcome severe constraints in attempting to telescope a country's industrial and technological development, in contrast to the considerable time it took industrialized nations to achieve such development. At present, in developing countries of the ESCAP region, there is growing awareness of the need for policies to encourage in-house research and development of enterprises and strengthen linkages with investment decisions of the industrial sector. Over their history, all countries, even those which have exported a considerable quantity of technologies, remain net importers of technology. For all forms of investment, developing countries will continue to rely heavily on imported technologies for some time to come, whether it is for bringing out new products, modernizing existing plant and equipment, introducing new techniques of design, management or marketing, establishing ancillary industry or improving productivity.

In fact, some countries have been very effective at creating policies, institutions and linkages related to the promotion of investment and transfer of technology. The Republic of Korea is probably the most outstanding example of recent years. Only 20 years ago, the Republic of Korea had a per capita GDP around the same as that of the least developed countries today, characterized by a low savings ratio and capital accumulation. The inflow of foreign technology and investment helped the Republic of Korea to achieve rapid industrial development. It was secured by a policy of favouring investment and technology inflow, funded by loans and provided mostly on a "packaged", turn-key basis. In addition, foreign funds were used to finance purchase of equipment and technical training. More than half of the foreign licensing agreements were considered as simple knowhow transfer. The

[3] For further details in these respects, see (1) ESCAP, Technology for Development (Bangkok, 1984), and (2) ESCAP, *Human Resources Development: Its Technological Dimensions* (Bangkok, 1986).

Republic of Korea stands as a good example of a Government promoting technological transfer rather than innovation. Initiatives such as the establishment of research and training institutes and the promotion of standardization have been accompanied by specific tailored incentives established by various laws. Under these laws, for example, a set of tax and financial incentives is offered to private industries engaged in technology development activities. The Republic of Korea had deemed it advisable to impose conditions on foreign licensing or investment agreements, such as export requirements and the purchase of locally supplied components or materials. However, these restrictions on licensing were steadily eased and replaced by incentives to encourage technological and market linkages. Later on, the conservative position on foreign investment was also changed by substantially liberalized guidelines, which have resulted in an increased number of industries.

Developing countries of Asia and the Pacific have recognized the need for a systematic approach to attract domestic as well as foreign private investment in order to accelerate their pace of industrial and economic development. The creation of an appropriate institutional framework along with the availability of appropriately skilled staff was thought to be essential. Many countries have now established organizations charged with "investment promotion" activities. These organizations have to be well-organized, well-equipped and performance-oriented. They should have technical, technological, managerial and financial capabilities. These promotional agencies act as a focus in respect of rules and regulations governing the establishment of industries, infrastructural facilities, fiscal incentives and tax concessions, preparation of project profiles, technological capabilities, labour legislation, availability of skilled manpower and contacts with industry associations. In order to realize their action-oriented potential, they should be in direct contact with industrial finance and banking organizations. Such organizations should be in a position to give information promptly, and should also be in close liaison with all relevant authorities.

In short, such promotional centres should be "live-wire" organizations linked with all aspects of industrial investment. A major constraint of many of these bodies is the lack of liaison with governmental bodies concerned with science and technology. Such liaisons would improve the government's capability to assist industry in assessing alternative technologies and in improving overall productivity. A second shortcoming is that activities are generally confined to industries or projects that are granted special privileges, that is to say, medium- or larger-scale enterprises, and small-scale industries are relatively neglected.

A number of countries, when importing technology, prefer technical collaboration, whereas the supplier of technology often prefers to have equity investment and participation in a joint venture. A debate has been going on for some time in international forums as to which form of collaboration, technical or joint venture by equity participation, is better. The general consensus which has emerged is that a joint venture has a number of advantages over mere technical collaboration, for example:

(a) The equity capital provided by the foreign partner reduces capital and operating costs and risk;

(b) The supplier of technology has an abiding long-term interest in efficient operations and would like a share in the profits generated;

(c) There could be future advantages from research and development in technology being carried on by the supplier without extra direct cost to the local partner;

(d) The local partner has the benefit of the managerial and marketing skills of the foreign partner and sometimes has a buy-back arrangement;

(e) Economic co-operation of this nature between two partners from two countries may lead to further economic co-operation in the form of expansion and diversification of existing projects or the establishment of new projects.

The joint venture concept is becoming more acceptable to many developing countries desirous of quick industrial development. As far as public sector projects are concerned, technical collaboration is generally on a Government-to-Government basis with mutually-agreed terms of payment. However, in several developing countries, there is now a trend towards privatization which will tend to expand the proportion of joint ventures.

Therefore, encouraging the joint venture concept and supplying the developing countries with the necessary inputs and expertise for the promotion and negotiation of joint ventures could be a concrete way of strengthening the linkages between investment promotion and transfer of technology in developing countries of Asia and the Pacific.

CONCLUSIONS AND ISSUES FOR CONSIDERATION

The developing countries of Asia and the Pacific, whether developing relatively fast or least developed, have realized that a rapid expansion of industrial production would result not only in a more rapid rate of economic growth but also in diversification of the economy. They have therefore strengthened their policies and programmes for further industrialization in recent decades. The developing countries of the region, because of diversities in resource endowments and economic systems, have pursued different strategies and policies towards industrial development. But, over time, strategies and policies have been modified as a result of altering conditions in technology, international trade and domestic demand. East and South-East Asian countries have generally adopted open-economy policies, have tried to promote exports and have reduced trade barriers as much as possible. In recent times, China adopted open-door policies, and India has begun to liberalize its international trade and foreign investment policies.

Hong Kong, the Republic of Korea and Singapore clearly show export growth rates far exceeding the growth rates of value added in the manufacturing industry, but this export-led growth does not seem to have spread to the other Association of South-East Asian Nations (ASEAN) and South Asian countries. In these countries, primary goods such as agricultural, fishery, forestry, petroleum, and mining products are still the major export goods. Asian newly-industrializing countries are advancing towards higher levels of industrialization, which is reflected in the increasing importance of machinery imports and the declining significance of other manufacturing imports. (Table 10).

Although some of the developing countries of the ESCAP region have been able to perform well in industrial growth and exports, the majority possess an industrial structure which is highly import-dependent and have achieved relatively less success in net foreign exchange earnings through exports. Some of the main internal problems hindering industrial expansion are underutilized capacities, low productivity and lack of integration with other major sectors.

ASEAN countries, other than Singapore, grew primarily by exporting primary commodities. They are industrializing successfully, as is demonstrated by the declining weight of primary goods in their total exports and the decline in imports of manufactured goods. This points to the simultaneous development of import-substituting and export-oriented industries in these countries. However, industrialization in South Asia has progressed mainly in the form of import substitution.

To sum up, some countries of the region have achieved remarkable progress in industrial development and exports and have been able to achieve structural change in manufacturing, while the majority of the developing economies are still heavily dependent on agro-based industries and are exporters of primary products (Tables 8 and 10). Thus, these economies are facing problems of low-valued manufactured products. Furthermore, the growing use of new substitute materials has threatened their income-earning capacities. These countries should, therefore, attempt to strengthen their efforts towards intensified processing of their raw materials and products through improvement of technologies, standardization and quality control. They should aim at establishing greater linkage between industry and other sectors of the economy, especially agriculture. They should attempt new methods of production techniques and processing to meet international standards. The newly industrializing countries are already manufacturing skill-and technology-intensive products; the large countries of the region could also move more effectively towards manufacturing these types of products.

The developing countries of the ESCAP region have, again and again, stressed the need for the application of modern technology to solve their development problems. Though new technologies provide an opportunity to match developing countries' needs and conditions, efforts in this direction at the national level are hardly noticeable. A new large-scale effort in this regard has to be mounted. Unless they adopt appropriate policies, developing countries are not likely to benefit from technology transfer and development and will also face a situation of greater technological dependence. This would adversely affect the industrial restructuring process. Since alertness to new technologies has to go hand in hand with serious appraisals, the developing countries of the ESCAP region need to closely monitor developments in new technologies. They also need to strengthen their capacities for selecting and acquiring new technologies suited to local conditions. Inappropriate selection and acquisition of technology is likely to have a serious adverse impact on the industrial structure.

In general, the development of human resources is of crucial concern to developing countries in the region. However, in most developing countries a comprehensive plan for human resources development is lacking. Priority should be given, in particular, to new approaches to the development of human resources for technological progress since newly industrializing countries and several developing countries are moving towards a wider use of new and emerging technologies, especially in micro-electronics, informatics, bio-technology, new industrial materials and genetic engineering. These new technologies urgently require the generation of new technical skills and expertise.

Almost all developing countries have liberalized their economic policies with the aim of increasing the role of the private sector in manufacturing and exports. Policy measures have been enacted to transfer public sector undertakings to the private sector. Although the role of the public sector in industrialization remains crucial in several developing countries, the new policy initiatives have started to achieve significant results. The experience of East and South-East Asian countries in enlarging the private sector's role without adversely affecting the contributions of public sector agencies is of special interest in the areas of technological development, technology transfer and investment promotion.

Small and medium-scale industries have a significant role to play in the industrial growth of Asian and Pacific countries. They can be effective instruments of industrial structural change as well as of export promotion. However, at present, in the majority of developing countries, they remain at a stage of technological backwardness and low productivity. Efforts should therefore be strengthened, on a priority basis, to upgrade the technological level of these industries. Adequate skilled and semi-skilled manpower should be provided for such enterprises through intensive and specially-tailored training programmes.

Increasing challenges are expected during the 1990s in terms of technology developments for industrial production techniques, products and entrepreneurial organization, market access, altering price structures and capital flows. The major issue is whether the developing countries of the ESCAP region, collectively and individually, will be able to anticipate these developments well in advance and to arrange increasing industrial co-operation among themselves, including trading, transferring technology and financing. In fact, the process of restructuring, even though modest and limited in its geographical spread, has already commenced in the developing part of the ESCAP region.

The above-mentioned basic problems and recently-emerged challenges urgently require appropriate attention. Solutions, if they are to be really effective, should be sought through transforming economic and industrial structures within a limited time span. These radical and speedy economic and industrial structural changes constitute the most important elements of the overall process of restructuring. It should be emphasized that this process is not confined to changes in proportions among sectors, subsectors and industries. It also includes substantial improvements in the use of productive factors such as technology, skilled labour, organization and management that have the potential to realize structural transformation. At the enterprise level, structural realignment is targeted especially at the achievement of higher productivity, lower cost per unit of production, greater competitiveness in foreign markets and improved profitability.

A number of key issues seem to arise in this context. Developing countries would need to constantly monitor developments in the international market and attempt to modify policies and strategies in order to avoid the rigidities and structural problems that now seem to hamper some of the industrialized countries. Developing countries would also need to continuously and effectively support each other by sharing their experience in the production of capital goods. Technological developments should be perceived by developing countries with an appropriate time frame through national and international information networks. New forms and modes of redeployment from the developed countries should be examined for packages of service and skills, along with production possibilities.

For the future long-term global restructuring process, more systematic consideration will need to be given to achieving international harmonization of national industrial strategies and policies. New national concepts for a "preferred" industrial structure in the 1990s would have to be harmonized at the subregional and regional levels in order to move towards new (but flexible) forms of international division of labour.

II. Review of Industrial Progress and Special Needs for Industrialization in Least Developed Countries and Island Developing Countries of the Asian and Pacific Region

INTRODUCTION

In comparison with other developing countries, the least developed and many island developing countries of the Asian and Pacific region have remained far behind in socio-economic development, in general, and industrialization, in particular. These economies, with vulnerable agricultural sectors and low levels of industrialization, have remained stagnant, and, in certain cases, have experienced deterioration in the overall living conditions of their people. Agricultural productivity has declined in several of these countries. Relatively high growth rates of population and limited employment opportunities have aggravated the problem further. The impact of global recession and the protectionist measures of the late 1970s and early 1980s have adversely affected their export of a limited range of primary commodities. As import requirements are rising, substantial increases in trade and balance-of-payments deficits have resulted.

Several least developed and island developing countries in the ESCAP region have attempted greater mobilization of domestic financial and physical resources in recent years. However, they remain heavily dependent on external resource transfers for financing their economic and industrial development. Relatively low and declining disbursements of external assistance and shrinking export earnings, especially of least developed countries, have created serious problems in their development efforts. They have been unable to achieve the general resilience in economic development which has characterized other developing countries of the region during the recent period of recession and protectionism.

Taking into account these difficult external developments and internal constraints, this article briefly reviews the current state of industrialization in the least developed and selected island developing countries of the ESCAP region and raises some major issues related to policies and strategies, the role of the public and private sectors and of small-scale industries, technological options, and the urgency for development of human resources for technological progress. The article concludes with the identification of some special needs of critical importance for the industrialization of these countries and the measures that could be undertaken at national and regional levels to meet those needs.

A. Review of Industrial Progress

1. Least developed countries

There are eleven least developed countries in the ESCAP region.[1] This article reviews industrial progress in eight least developed countries: Afghanistan, Bangladesh, Bhutan, the Lao People's Democratic Republic, Maldives, Nepal, Samoa and Vanuatu. Their total population of 131 million in 1982 increased at the rate of 2.4 per cent per annum during the last decade and, at present, constitutes 44 per cent of the total population of all least developed countries.

These countries have very low rates of economic growth. During 1960-1970, their average annual growth rate of per capita GDP was less than 1 per cent. During the 1970s, when the annual growth rates of Asian newly industrializing economies were 8.5 to 10 per cent, middle-income ASEAN countries 7 to 8 per cent and low-income developing countries 3.5 to 5 per cent, the least developed countries of the region, as a group, had a negative growth rate of per capita GDP of 0.5 per cent per annum. This resulted in declining real income per head. The average per capita GDP in ESCAP least developed countries was $US 133 in 1982, which was less than one-third of the average for all least developed countries.[2]

While the economies of the developing countries of the region have undergone some structural transformation, the economic structures of the

[1] Afghanistan, Bangladesh, Bhutan, Burma, Kiribati, the Lao People's Democratic Republic, Maldives, Nepal, Samoa, Tuvalu and Vanuatu.

[2] UNCTAD, *The Least Developed Countries, 1984 Report* (United Nations Publication, Sales No. E.84.II. D.25, Vol. I).

ESCAP least developed countries have remained traditional with heavy dependency on agriculture. In 1984, the agricultural sector contributed as much as 57 per cent to GDP in Afghanistan and 53.6 per cent in Nepal. In Bangladesh, it was 49 per cent (Table 1). The agricultural sector employed as much as 92 per cent of the labour force in Bhutan and Nepal. In other

Table 1. Growth and sectoral shares of GDP 1981-1985[a]

(Percentage)

	Annual growth rates				*Percentage shares*		
	GDP	*Agriculture*	*Industry*	*Services*	*Agriculture*	*Industry*	*Services*
Afghanistan							
1981	1.8	3.1	−1.7	3.0	62.6	25.1	12.3
1982	2.0	0.5	3.2	7.7	61.7	25.4	13.0
1983	5.9	2.2	16.3	3.3	59.5	27.8	12.6
1984	4.1	–	12.3	5.3	57.2	30.0	12.8
Bangladesh							
1981	7.0	7.0	6.2	4.5	48.7	14.9	36.3
1982	−0.6	−0.6	2.4	2.7	48.8	15.3	36.0
1983	4.7	4.7	−1.8	4.7	49.4	14.6	36.0
1984	3.6	3.6	6.3	4.6	49.4	14.5	36.1
1985[b]	3.8	2.8	4.3	5.0	47.0	14.9	38.1
Bhutan							
1980	7.1	..	..	..	..	..	..
1981	9.0	..	..	..	63.2	6.3	30.5
Lao People's Democratic Republic							
1980	9.3	..	..	..	..	..	..
1981	9.2	..	..	..	..	..	..
Maldives							
1981	7.9	1.3	29.0	6.6	30.8	16.8	52.3
1982	9.6	4.8	16.0	18.2	29.9	15.8	54.3
1983	5.9	5.1	3.4	6.7	29.7	17.9	52.4
1984	12.8	12.4	10.0	14.1			
Nepal							
1981	8.3	10.4	−5.5−		59.8	−40.1−	
1982	3.8	3.5	−4.2−		59.7	−40.3−	
1983	−1.4	−2.5	−0.4−		59.0	−41.0−	
1984	7.4	8.7	−5.5−		53.6	−46.4−	
1985	2.8	1.7	−4.5−		52.4	−47.6−	
Samoa							
1980	−6.1	−20.1	10.4[c]	..	..	..	..
1981	−9.1	−13.7	8.9[c]	..	..	..	..
1982	−1.0	16.8	10.5[c]	..	..	..	..
1983	0.5	−2.3	20.7[c]	..	..	..	..

Sources: Asian Development Bank, *Key Indicators of Developing Member Countries of ADB* (Manila, April 1984); UNCTAD, *Basic Data on the Least Developed Countries* (United Nations publication, Sales No. E.84.II.D.25, Vol. II); ESCAP, *Economic and Social Survey of Asia and Pacific 1985* (United Nations publication, Sales No. E.86.II.F.I), and national sources.

[a] Excluding Vanuatu.

[b] Provisional.

[c] Manufacturing plus utilities only.

Note: Two dots (. .) indicate that data are not available or are not separately reported.

countries, except Maldives, the share was more than 70 per cent. The industrial sector's share in total GDP and employment was very low.

Output from the manufacturing sector in the ESCAP least developed countries is extremely low as a percentage of GDP. Except for Afghanistan and Maldives, all of these countries have less than 9 per cent of GDP originating in the manufacturing sector. The rates of growth of GDP arising from the manufacturing sector were also low during the 1970-1982 period (Table 2).

Afghanistan has been pursuing an industrialization strategy that emphasizes maximum utilization of existing industrial capacities and completion of already implemented industrial projects. Emphasis has been on the production of copper, iron ore smelting, production of fertilizer, energy and coal mining. The main industrial products consist of processed foods like dried fruit, cottonseed oil, and sugar, as well as carpets, wool and cotton materials, cement and plastic products. Natural gas is one of the most important products, forming the country's biggest export. Mineral processing is also making good progress. A geological map of the country has been completed, and Afghanistan is said to possess considerable unexploited oil reserves. A major copper mining project is under implementation. Besides copper, there are deposits of chrome, coal, iron and bauxite.

During the five-year plan period (1986-1990) GNP is planned to grow by 25 per cent, agriculture by 15 per cent and the industrial sector by 37 per cent.[3]

[3] The Economist Intelligence Unit, *Quarterly Economic Review of Pakistan, Afghanistan*, No. 1, 1986.

Afghanistan continues to increase its efforts in natural gas and coal extraction. It is expected that coal extraction will increase by 1 1/2 times during 1986-1990, cement production will double, and electricity generation will increase by 40 per cent. The volume of output of light industries, including food processing, is expected to increase by 120 per cent during the period.

Bangladesh, the biggest least developed country of the region, achieved a growth rate of GDP of 6.8 per cent in 1981, and a slightly lower rate in 1983-1985. In 1982 it experienced a negative growth rate of 0.6 per cent.

Industrial production, which accounts for 15 per cent of GDP, increased at the rate of 2.4 to 6.2 per cent during 1981-1985, except in 1983, when industrial output decreased by 1.8 per cent.

The manufacturing sector remains small and narrowly based in Bangladesh. Most of the manufacturing output consists of processing agricultural raw materials. Efforts to broaden the industrial base have met with limited success. The main industrial products consist of jute, sugar, cotton textiles, edible oil, newsprint, leather, cigarettes and tea. The most important branch is jute processing, followed by textiles. Manufacturing processes are basically labour-intensive and the majority of industries are small-scale enterprises producing for the domestic market; jute, however, is export-oriented.

Indices of industrial production have shown that manufacturing output grew by 14 per cent between 1977 and 1981, with significant gains coming from chemicals and chemical products, machinery, beverages and food processing. However, the growth rate slowed down to 1.6 per cent in 1982 and 1983, owing to the world recession at that time and a combination of factors, such as the decline in domestic demand following a succession of crop failures. However, the situation eased somewhat and the manufacturing output recorded an increase of 3.6 per cent in 1984 and was expected to increase further by 4.3 per cent in 1985.

The third five-year plan (1985-1990) has a target of increasing industrial production by 10.1 per cent per annum during the plan period. It aims to increase the contribution of the manufacturing sector to GDP to 11.9 per cent by 1990.

In 1982, the Bangladesh Government embarked upon a comprehensive programme of industrial liberalization and rationalization to increase the role of the private sector. It has sought to expand the current small base of non-traditional exports and to increase the competitiveness of domestic industry. Trade and industrial policy reforms have been launched with a view to strengthening the tariff structure and promoting private industrial investments.

The Government has also taken a number of other measures. The investment approval process has been simplified by increasing the sanctioning authority delegated to financial institutions and providing greater flexibility in controls exercised by government departments Certain measures for import liberalization have been introduced in order to provide flexibility for easy import of industrial requirements.

Since 1982, there has also been increasing concern about

Table 2. The share of the manufacturing sector in GDP and its growth rates in ESCAP least developed countries, 1970-1982

	Percentage share in GDP, 1982	*Manufacturing GDP growth rates*			*Per capita GDP in manufacturing (US dollars 1982)*	*Annual average growth rates of per capita GDP arising in manufacturing*	
		1970-1980	*1980-1981*	*1981-1982*		*1970-1980*	*1980-1982*
Afghanistan	21	4.6	−2.1	2.1	48	1.9	−2.5
Bangladesh	8	11.8	7.7	0.3	9	8.9	−3.8
Bhutan	3	..	40.3	..	5	..	37.4[a]
Lao People's Democratic Republic	4	−3.2	13.2	..	4	−5.7	10.4[a]
Maldives	16	..	31.8	13.0	57	..	−6.3
Nepal	4	..	..	..	6	..	..
Samoa	..	..	..	..	..	..	..
All least developed countries	8	4.1	−0.7	0.2	16	1.4	−2.8
All developing countries	17[a]	6.9	−0.2	0.3	170[a]	4.2	−2.4

Source: UNCTAD, *The Least Developed Countries, 1984 Report* (United Nations publication, Sales No. E.84.II.D.25, Vol. I).

[a] For 1981.

Note: Two dots (. .) indicate that data are not available or are not separately reported.

improving the performance of public sector enterprises. In 1983, the report of the Committee for the Reorganization of the Public Statutory Corporation was published. It argued for a substantial contraction of the role of public sector enterprises and recommended large-scale divestment. Currently, the Government is following a policy of divestment, selling some nationalized plants to their original owners or to other private entrepreneurs. By the end of 1983, about 70 major units in the manufacturing sector were turned over to private ownership. The Government has also permitted foreign private investment as a minority shareholder in association with a public corporation.

The attitude of the Bangladesh Government towards foreign private investment has become much more favourable in recent years, as portrayed in the Foreign Private Investment (Promotion and Protection) Act 1980, and it encourages potential foreign investment in the country.

Manufacturing output in Bhutan accounted for a little over 3 per cent of GDP in 1981. Cottage industries alone accounted for 25 per cent of the total manufacturing output. Total employment in the organized industrial sector was only about 2,000. Bhutan has few industrial units and the only notable establishments are one horticultural processing factory, three distilleries, a match factory and a 300-ton per day cement plant. Except for the horticultural processing factory, which is under joint ownership, all are in the public sector.

Because of its large forest resources, Bhutan has good prospects for forest-based products. At present, logs, sawn timber and plywood are produced for export. Small-scale production of paper also exists in the country. The Government has established industrial estates in Puntsholing and Gayleghphung to provide physical facilities for mainly small- and medium-sized industries.

Industrialization is constrained owing to lack of power and other basic infrastructure, trained manpower and entrepreneurial skills. With the commissioning of the Chukha hydroelectric project, power will become abundantly available for industries.

In Bhutan, the industrial development policy and strategy as currently adopted provides that the public sector play the leading role in large-scale industries. However, the Government fully recognizes the role of the private sector in setting up small-scale industries, especially agro-based and handicraft industries.

The Asian Development Bank has recently undertaken an industrial survey of Bhutan aimed at identification of industrial opportunities and needs.

The Lao People's Democratic Republic is a landlocked, mountainous and agriculturally-based country in which transport is very difficult and costly. Two-thirds of its land is densely forested. Only 10 per cent of the land area is in use, including exploited forest areas, inland waterways and mining, and only about 13 per cent is cultivated. Agriculture's share in total output is 84 per cent, while industry contributes 6 per cent. About 85 per cent of the labour force is engaged in agriculture, including forestry. Only 1.2 per cent is engaged in industry, mining and construction.

Industrial activity in the Lao People's Democratic Republic is limited basically to tin and gypsum mining, processing of agricultural products, small-scale manufacturing of agricultural tools and some consumer goods such as soap, beverages, tobacco and textiles. Modern manufacturing is very limited, with the traditional sector accounting for three-fourths of total industrial output. Efforts are directed towards increasing capacity utilization of existing units rather than establishing new ones.

The Lao People's Democratic Republic's five-year plan (1981-1985) had set a target of increasing industrial production by 2 to 2.2 times in 1985, in comparison with production in 1980.

In recent years, it has greatly liberalized regulations governing the operations of state enterprises, including state industries. The new measures allow the managers of enterprises to draft, implement and revise production plans in consultation with their local administrative authorities, thus giving them a free hand in determining how to make the most efficient and profitable use of fixed and other capital assets.

The industrial sector in Maldives is small, but growing. It consists of enterprises producing consumer goods for the local market, including non-alcoholic beverages, bread, furniture, clothing, fishing boats and handicrafts. Handicrafts include coir yarn weaving, mat weaving and lacquerware. Boat building is the traditional industry. Such activities accounted for 3 per cent of GDP. As with agriculture, most of the manufacturing done in Maldives is of the small-scale, cottage industry variety. Besides these, there are three large industrial undertakings. One is In-

sulectra Maldives Ltd., manufacturing electronic components. The other is the Maldives Nippon Corporation, which exports canned fish. The third is the Fisheries Corporation, which is a state-owned commercial enterprise carrying out the activities of fishing, processing and exporting of fish.

Since 1981, Maldives has developed its garment industry primarily for export. By 1983, garment exports accounted for nearly half of all Maldives exports. However, the net contribution to the balance of payments has been smaller, owing to the high import content. The contribution of this subsector to GDP has been about 10 per cent. Employment in this sector is quite significant, accounting for 22 per cent of the labour force.

The fishery sector remains the mainstay of the Maldivian economy and continues to play an important socio-economic role in the life of the Maldivian people, despite the fact that tourism now generates nearly twice as much in gross foreign exchange earnings. Fishing has provided the main livelihood for the vast majority of the island population outside the capital, Male. It was estimated that in 1982, about 29,000 people, i.e. 44 per cent of the total labour force, was employed in this subsector.

Though Nepal has achieved some progress in establishing a few light consumer industries, the industrial sector is quite small, with manufacturing accounting for less than 5 per cent of GDP During 1981-1984, manufacturing output increased at the average rate of 10.9 per cent per annum. The country is now self-sufficient in biscuits and confectionery, soaps, vegetable ghee and stainless steel utensils. About 70 per cent of the manufacturing sector, which consists of a small number of factories, are mainly public enterprises, producing construction materials, textiles, footwear and some processed foods. The other 30 per cent come from rural household-level cottage and small industries. Recently, cement production has increased owing to the operation of a new factory and the expansion of the other. Other projects under construction are a paper mill, sugar factory, and lead, zinc and magnesium-processing plants. Last year, the Government promulgated the seventh plan (1985-1990) and it is estimated that industrial production will increase at the rate of 12.7 per cent per annum during the plan period. The Government has been attempting to enlist larger involvement of the private sector through the opening up of areas earlier reserved for the public sector and through the provision of liberal incentives and institutional support. It has also been encouraging private foreign investment in the country.

Liberal tax relief has been granted to industries. Cottage industries have been granted income tax relief up to the period of six years starting from the date of operation. Small, medium and large industrial enterprises have been granted income tax relief for different time periods, depending upon the amount of value added. If the value added is between 20 and 50 per cent, then the industry is entitled to income tax relief for five years. Furthermore, for each additional 10 per cent value added over 50 per cent, the industry is entitled to an additional one-year income tax concession. Apart from this, an additional two-year income tax holiday will be provided to industries producing essential consumer goods and an additional three-year holiday for industries set up in the backward areas.

In spite of all the efforts made in both public and private sectors, Nepal's industrial sector has a large number of handicaps. While some of these can be overcome through increased efficiency and experience in industrial management and through the effective implementation of industrial policies, others clearly require good-will co-operation from Nepal's trading partners. The two most formidable problems that the country faces today are the small size of the Nepalese market and the country's land-locked situation.

Samoa, a Pacific island country listed as least developed, has only a few manufacturing industries servicing the local market. While agriculture remains the largest economic sector, the share of industry, although quite small at present, is gradually increasing and has considerable potential. In recent years the Government has established a brewery, a feed mill and a cigarette factory which provide valuable import-substitution. The local beer, "vailima", produced by the brewery, is becoming a major export item. Apart from these plants, local factories exist for the manufacture of garments, footwear, food processing, soft drinks, meats, plastics, paper products, timber, fabricated steel products, paint and matches.

Samoa's earlier plans had emphasized import-substituting activities. The fourth five-year plan (1980-1984) continued this approach but on a selective basis. With a trade balance continuing on the negative side, the Government has been encouraging both foreign and local investment in productive areas such as manufacturing and processing of primary products. Recently, greater emphasis is being placed

on the development of export-oriented industries. Import-substitution industries have so far provided considerable employment and foreign exchange savings, and further potential exists for manufacturing, especially in small, labour-intensive industries. However, in recognition of the limited domestic market and the limited range of internationally competitive products, priority in awarding fiscal incentives has been given to processing industries aimed at exports. Samoa has adopted an industrial strategy of encouraging both the private and public sectors. Furthermore, the Samoan Government treats local and foreign enterprises alike in terms of its policies and priorities and there are no excluded areas for foreign enterprises, including those in the primary industries.

During the last decade the ESCAP region achieved remarkable industrial growth in comparison with other developing parts of the world, by progressing steadily, even during the times of global recession and economic difficulties. However, in this process, the weakest position was that of the least developed countries of the region. As explained earlier, the ESCAP least developed countries fell far behind other developing countries in their industrial and economic growth during the 1970s and this trend continued during the first half of the 1980s. The evidence suggests that this trend will continue throughout the remainder of this decade. The basic problem, of course, is that these countries have few natural, human, technological and financial resources available to them. They also lack an internal market of a reasonable size because of small populations and extremely low per capita incomes on which to base their industrial development. Furthermore, they face exceptional difficulties in reaching major world markets owing to their geographic locations. Thus, the constraints to industrial development in these countries are far greater than in other developing countries of the region.

The least developed countries of the ESCAP region face a difficult and paradoxical situation in their industrial development. On the one hand, they have limited capability, at present, to accelerate industrial development; on the other hand, they need to increase industrialization in order to raise their standard of living, meet basic human needs, generate employment and achieve some degree of self-reliance. Some form of modernization and restructuring of the traditional economy through industrial development is urgently required to enable least developed countries to survive as economically viable nations.

2. Island developing countries

The island developing countries of the ESCAP region encounter special problems in industrialization as a result of geographical location and territorial scatter. They possess highly diverse economic structures and development prospects. Some of them possess a large primary resource base, while others have highly limited natural resources.

Economic growth in most of these countries is largely dependent on export-related activities. Higher demand and external prices for most commodities are important to the Pacific island countries. These include coconut produce, palm oil, rubber, cocoa, copper and gold.

In broad macro-economic terms, the economic performance of Pacific island countries improved considerably in 1983-1984. Countries like Fiji, Papua New Guinea and Solomon Islands were able to reverse the poor growth performance of the early 1980s through increased exports. Much of this improvement was due to economic recovery in industrialized countries. However, the effect of increased external demand varied greatly among the Pacific island countries, depending on both the commodities they exported and the conditions in the markets of their traditional trading partners.

At present, the industrial sector in Fiji is dominated by traditional food processing and other related subsectors, including sugar, coconut oil, fish canning, flour milling, biscuits, beer, soft drinks, cigarettes and cement. During 1981-1984, growth in value added in the manufacturing sector averaged 3.2 per cent per annum. The share of the manufacturing sector in total GDP has remained at 12 per cent since 1970. It employs 18 per cent of the total labour force. Overall industrial production grew by 21 per cent in 1984, owing to the recovery of sugar production.

Although small in terms of overall economic impact, the industrial sector in Fiji holds considerable potential. It is a sector where, in recent years, local capital has made significant inroads and shown considerable dynamism. Unlike tourism, which has remained predominantly international in character and control, the manufacturing sector is now largely controlled by local entrepreneurs. Local manufacturers have also been more enterprising in terms of exploiting new export opportunities, either on their own or through joint-venture arrangements.

The Government encourages private sector involvement through the maintenance of an open and unregulated economic environment to foster increased industrial investment. The ninth development plan (1986-1990) emphasizes the need to streamline institutional support services and the provision of infrastructural facilities to encourage industrial development. It also aims to strengthen industrial policy formulation and co-ordination of activities with governmental agencies to promote private industrial investment.

Papua New Guinea had a growth rate of real GDP of 3.5 per cent in 1984, a satisfactory achievement in the light of the very slow growth since 1978. The country possesses substantial resources such as forests, fishery and minerals which are not yet fully developed and exploited. At present, the manufacturing sector consists of small-scale industries whose contribution to GDP is 9.5 per cent. The manufacturing output consists of items such as food, soft drinks, beer, cigarettes, stationery, glass and plastic goods for domestic consumption. Export items include copra, plywood, palm oil, rubber, gold and copper. The main stimulus behind Papua New Guinea's economic growth in 1984 was the improved performance in the export sector. While the volume of gold and copper exports did not rise much, coconuts, cocoa and other agro-products registered substantial increases in exports.

In Solomon Islands, real GDP increased by 13 per cent in 1984. The economic upsurge in that year was basically due to increased exports of palm oil and copra. Another major factor contributing to the growth was increased log production. The manufacturing sector is very small and consists of smaller undertakings such as producing boats, clothing, spices, furniture, beverages and some handicrafts.

The other countries of the region had mixed economic performance. Tonga had a growth rate of 15 per cent in 1980-1981 – 1981-1982, which, however, decelerated sharply to 5.8 per cent in 1982-1983. In Tuvalu, growth had fluctuated sharply in the first half of the 1980s, with a significant fall in 1981-1983.

Kiribati, Tonga and Tuvalu have attempted to enlist larger participation of the private sector in industrial development in order to promote employment, technological advancement and the opening up of new external markets. They have also enacted certain liberal measures for attracting foreign investment.

The prospects for improved economic performance and industrialization in several Pacific island countries are reasonably good. However, at present, these countries face serious limitations owing to:

(a) Lack of perspective in industrial development plans and programmes at national levels;

(b) Inadequate project identification and feasibility studies;

(c) Limited trained and professional manpower;

(d) Small and fragmented markets and resources;

(e) High costs connected with communication, transportation and other infrastructural facilities;

(f) Problems in identifying and penetrating viable markets;

(g) Low levels of domestic savings for investment.

B. Issues in the Industrialization Process

Based on the review of the level, status and prospects of industrial progress in least developed and island developing countries, a few selected issues of significance are highlighted below:

1. Role of the public and private sectors in the industrialization of least developed and island developing countries of the ESCAP region

At present, the role of the public sector is of substantial importance in the industrialization of least developed and island developing countries in the region, as it provides the major proportion of industrial output and employment. The inadequacy of the private sector and the need to meet some of the social objectives have prompted these countries to make relatively heavy investments in public sector industrial enterprises. Though originally intended to fill the gaps in industrial development by supplementing the private sector, the public industrial enterprises have been extended to the production and distribution of a variety of goods, sometimes competing with potential private sector enterprises. These enterprises, which were also viewed as instruments for industrial policy reorientation for the economic and social betterment of the masses, are facing several problems at present. These include management inefficiency as well as declining productivity and profitability. Despite considerable direct support from the government, the majority of such enterprises have remained

Table 3. Pacific island subregion: principal physical and economic characteristics, 1983 and 1984

	Land area (sq km)	*Sea area[a] (thousands of sq km)*	*Population 1984[b]*		*GDP/GNP 1983[c]*		*Growth rates of real GDP/GNP 1984 (US dollars) 1983 to 1984*
			Total (thousands of persons)	*Density[d] (persons/ sq km)*	*Total (millions of US dollars)*	*Per head (US dollars)*	
Cook Islands	240	1 830	17.6	75	20	1,360	–
Fiji	18,272	1,290	686.0	38	1,200	1,790	8.5
Guam	541	218	113.2	209	478[e]	4,223	–
Kiribati	690	3,550	63.5	92	29[f]	478[f]	–
Nauru	21	320	7.3[g]	348[g]	–	–	–
Niue	259	390	3.4[g]	13[g]	3[g]	1 080[g]	–
Papua New Guinea	462,840	3,120	3.3[h]	7	2 510	780	3.5
Solomon Islands	28,530	1,340	260.0	9	160	640	13.1
Tonga	699	700	99.6	142	88	904	–
Trust Territory of Pacific Islands	1,847	7,561	155.9	84	130[i]	1,030[i]	–
Commonwealth of the Northern Mariana Islands	471	1,823	19.6	42	–	–	–
Federated States of Micronesia	701	2,978	88.4	126	111	1,302	–
Marshall Islands	179	2,131	34.9	195	–	–	–
Palau	494	629	13.0	26	–	–	–
Tuvalu	26	900	8.4[j]	323	3	431	–

Source: ESCAP, *Economic and Social Survey of Asia and the Pacific 1985* (United Nations publication, Sales No. E.86. II.F.1); and The Economist Intelligence Unit, *Quarterly Economic Review of Pacific Islands: Papua New Guinea, Fiji, Solomon Islands. Western Samoa, Vanuatu, Tonga,* No. 1, 1986.

[a] Unofficial estimates based on 200-mile exclusive economic zones made by the South Pacific Commission.

[b] Mid-year estimates.

[c] Figures rounded to the nearest million and dollar respectively.

[d] Figures rounded to the nearest unit.

[e] Declared taxable income for 1983.

[f] 1982 data.

[g] 1980 only.

[h] Millions of persons.

[i] GNP estimates for 1982.

[j] Mid-1983 estimates.

economically inefficient, with increasing requirements for subsidies and additional funds to even maintain operation. They suffer from high costs of production, inability to innovate, delays in delivery of goods produced and unwarranted external interference, causing management and organizational inefficiency.

Some least developed countries of the region have recently introduced measures aimed at improving the performance of public sector industrial enterprises. These include divestment of such enterprises to the private sector, capital restructuring, greater functional autonomy

and the implementation of a performance monitoring system. Bangladesh and Nepal have also enacted measures to restrict the unwarranted growth of public sector industrial enterprises in order to pave the way for enlarged private sector involvement.

Though the public sector industrial enterprises are faced with the problems mentioned above, their necessity and presence for some time to come cannot be completely ruled out in the least developed and island developing countries of the region. Owing to the rudimentary state of the private sector, where entrepreneurs are few and institutional support measures are inadequate, the public sector industrial units have to perform certain economic functions. There is, therefore, a need to create a favourable environment under which the public industrial enterprises can function more efficiently. In this respect, further decentralization of operational authority, provision of flexibility in modernization and adoption of technologies, more realistic pricing policies and improved training facilities are the crucial issues.

Although, at present, the public sector prevails in industrial enterprises in least developed and island developing countries, a shift in emphasis from public to private sector enterprises is being observed in some countries. Bangladesh and Nepal, and some countries in the Pacific, are moving towards more private sector involvement. These countries have been providing liberal incentives to private sector firms of both domestic and foreign origin.

Thus, in recognition of the need for complementation of the private and public sectors in the process of industrial development, the least developed and island developing countries have implemented measures to enlist greater involvement of the private sector in their industrialization efforts. However, it may be recognized and re-emphasized that a strong political commitment, relatively open economy and greater institutional support arrangements such as concessional credit, extension services, entrepreneurial development programmes and larger provision of physical infrastructural facilities are necessary for greater private sector involvement. It is essential to streamline the activities of governmental agencies, so that the promotional measures become easily available to private sector units. At present, the complex bureaucratic process has resulted in discouraging the private sector from risky industrial enterprises. The building up of private sector confidence is crucial for diverting funds from trading activities to industrial ones.

2. *Small- and medium-scale industries as the backbone for industrial progress*

Small- and medium-scale industries occupy a predominant position in the industrial sector of the least developed and island developing countries of the region. Such industries have been contributing substantially to GDP and manufacturing value added. They have great potential, owing to low capital intensity and employment promotion, especially in rural areas, for alleviating regional disparities. They require simple entrepreneurial skills and small investment funds, and could make much greater use of locally available resources. In view of the potential and suitability of these industries, Governments of the least developed and island developing countries have designed and implemented special promotional measures like concessional credits, liberal incentives like tax relief, provision of physical infrastructure, priority in raw materials provision and training and extension services. Such measures are clearly intended to assist the development of small and medium industries but, at times, because of the lack of conformity with the broader economic framework and policies of overall industrial development, small industries have been unable to utilize such measures fully. Furthermore, small-scale industrial enterprises, being widely scattered, mostly in rural areas, have been unable to avail themselves of these facilities owing to the absence of decentralized functional and service centres catering to their needs. Even some of the small industrial units located in the urban or semi-urban areas, when able to reach these support programmes, have faced complex bureaucratic procedures leading to delays and uncertainties. It should be well considered that small industrial enterprises are less organized in making representations to government and much less effective in protecting their interests.

Apart from these problems, the major issues of concern for small industrial enterprises in least developed and island developing countries of the region are severe technological backwardness, highly nonstandardized production, low quality and severe limitations on the upgrading of skills. Lack of exposure to available technologies and inadequacy of training opportunities have confined them to traditional and outdated methods of production. The problem of linkage with, and supplementation to, large-scale industries is also of crucial concern.

In the light of rapidly changing economic and technological conditions, it may be desirable to examine the approach and measures which have been adopted for the development of small industries in these countries. It may be especially desirable to re-examine the facilities for enhancing production know-how, through reassessment of general education and training systems aimed at the provision of basic to medium-level skills for small industries. Measures to develop entrepreneurial and managerial skills on an extensive scale are also of crucial concern to these countries. It should be ensured that the overall economic and business environment is favourable to small industries through the promotion of effective mechanisms for subcontracting or partial processing of products and parts in order to ensure their continuity and growth. It may also be desirable to consider complementary schemes for the products of small-scale enterprises, especially in the light of emerging technologies like electronics and microprocessors.

3. Technological options

At a time when the developed and several developing countries are taking enormous advantage of rapid technological advancements, all the least developed and island developing countries of the ESCAP region remain in a state of technological backwardness. These countries, which are at the earliest phase of industrialization, have been unable to develop, adapt and even acquire modern industrial technologies for their needs. The lack of information and finance, especially foreign exchange, and the inadequate capability to use these, even if available, have resulted in this situation. However, accelerated industrial growth must make extensive use of modern technology. Although the intimate relationship between the use of modern technology and large-scale production persists and may seem unworkable in least developed and island developing countries, the scope exists, and is growing, for the applicability of efficient modern technology in the small and medium industries which are highly relevant for such countries.

When one thinks of industrial development in general terms as a complex process of technology and management, the process of selecting technology in the industrialization process exerts a great influence on the subsequent progress of overall economic development. In a situation in which high-level, capital-intensive technology is introduced in specific industries, if the technology is above the overall development level of a country, then such industries will be restricted enclaves and will not be firmly rooted in the host country. This situation may not provide further momentum for industrial and technological development within the country.

The least developed and island developing countries of the ESCAP region could consider the adoption of industrial technologies in a more discriminating manner. It may be desirable to adopt modern technologies to produce mass consumption items for both domestic and foreign markets; at the same time they should consider the adoption of intermediate technologies for small and medium industries. In this respect, development of traditional technologies, especially in the areas of woodworking, furniture, ceramics, bambooware, handloomed clothes, carpet-making and jewellery-making could be considered and promoted.

The selection of technology, whether imported or domestic, goes beyond the problems of selecting hardware; software is very important, in such areas as production planning, markets, management, accounting, labour relations and employment. Industrialization is not simply a matter of installing machinery and equipment and starting up an operation, but a continuous process of operations involving the integration of management and technology, which results in securing adequate markets.

The least developed and island developing countries of the region, because of their stage of economic development and resource constraints, may find difficulty in launching programmes in innovation and inventions. They may wish to provide increased allocation of resources for technology acquisition, unpackaging and adoption to suit their special requirements. However, many of these countries lack a technology policy. Inadequate technological consideration in socio-economic development programmes and inadequacy of infrastructures for enhancing technological know-how have been a serious limitation.

4. Human resources development

The least developed and island developing countries of the ESCAP region suffer from critical inadequacy of core skills and technological capabilities. Though the level of literacy is rising in all these countries, a significant proportion of their populations is illiterate. The facilities for technical education are quite inadequate. The lack of a comprehensive human resources development strategy for the provision of scientific and technical skills even in

priority areas, significant illiteracy and inadequate educational policies, with hardly any science base in primary and secondary schooling, account for the present socio-economic and technological under-development in the least developed and island developing countries. These countries have certain inherent strengths in terms of their potential in irrigation, hydropower, marine and mineral resources, and forestry, but even the minimum levels of human skills required to use these resources are yet to be developed. These countries may wish to consider greater allocation of their financial resources to human resources development in the key development sectors, and paying closer attention to their informal sectors through increased provision of trade schools and other training opportunities, in both rural and urban sectors.

Greater priority may be given to technical education and vocational training. The least developed countries are aware of the importance of science and technology for change and development. It is also clear that technological capabilities encompass not only the hardware and skills needed for production, but also the selection, acquisition and adoption of technologies. However, at present, their individual bargaining power for "unpackaging" technologies is weak, and can only be strengthened by giving their citizens education and training that will enable them not only to assimilate technology but also to develop acquisition and negotiating skills to obtain technologies appropriate to their needs.

Furthermore, the least developed and island developing countries of the ESCAP region export mainly primary commodities and some industrial raw materials such as minerals and agricultural products. Development of the manufacturing sector is only beginning. This low level of industrialization has not been able to provide sufficient employment to the growing labour force. Therefore, in the interest of adding greater value to local raw materials and generating new employment, it is highly desirable to augment capacity for full or partial processing of raw materials within the country. In this respect, these countries have to enhance facilities for planning, engineering and importing technological skills of medium to high levels, particularly in the choice of technology, design and engineering of manufacturing facilities and management.

It has also to be recognized that these countries possess dual economic and manufacturing sectors. While their modern sectors are small, their traditional rural sectors are relatively large and highly unorganized. Their human resources development strategies should carefully take into account the needs of their rural informal sectors. Attempts should also be made to preserve and develop traditional craftmanship and artisanship. Development of entrepreneurial skills and management capabilities, especially in the rural areas, is of greater priority in these countries.

C. Special Needs

The least developed countries, being at a very early stage of industrialization, require special consideration and assistance to build up a stable industrial base if they are to achieve a manufacturing growth rate of 9 per cent per annum, as envisaged in the Substantial New Programme of Action for the 1980s for the Least Developed Countries. Some of these countries have taken certain steps to strengthen their planning machinery, reformulated policies and strategies, created certain basic infrastructure and adopted liberal incentive measures. Most of the island developing countries are yet to effectively proceed in these areas. In several Pacific island developing countries, a clear perspective and priority is yet to emerge for planning medium- to long-term industrial development programmes. It is therefore urgent that national-level surveys be undertaken in least developed and island developing countries to assess their industrial potential. Some least developed countries have already conducted such surveys. However, the majority of island countries lack information about their industrial potential and limitations. In the absence of such information, planning and establishment of priorities are difficult. A regional industrial survey of South Pacific island developing countries was undertaken in 1983, basically looking at the broad macro industrial performance and the prospects for regional co-operation. In order to supplement the findings of the survey, these countries may find it desirable to undertake new surveys to identify resource availabilities and concrete industrial projects. A sound industrial development plan is of considerable value for the donor countries/agencies as well. The lack of well-organized industrial development programmes in several least developed and island developing countries has resulted in lower assistance to these countries.

Project identification and feasibility studies are the basic prerequisities for sound industrialization. However, unless there is some awareness of tech-

nological possibilities and appropriate selection, industrial development will not succeed. From the beginning stage of project formulation, considerable stress must be placed on technological suitability and advances in order to bring new approaches to industrialization in the least developed and island developing countries so that they can overcome their size limitations. In this respect, identification of technological needs and capabilities is of serious urgency in these countries.

Small- and medium-sized firms do not have to exist wholly apart from government enterprises and large firms in the private sector, Strengthening the linkages whereby small- and medium-sized firms receive, along with others, assistance and guidance from government enterprises and large private sector firms with regard to capital, technology and management, is advantageous for both parties, and essential for the dynamic, integrated development of industry in small countries. Therefore, due regard should be paid, in a forward-looking manner, to the interdependent relationship between small- and medium-sized firms and large companies, for the active development of the former. In this respect, increased attempts should be made to examine the prospects for ancillary or complementary relationships between large and small industries.

The selection and application of industrial technology call for various levels of scientific and technological skills and specialization and, also, require the ability to work in multidisciplinary groups. The mere existence of large quantities of unskilled human resources, as is the case in these countries, is not necessarily useful to society, as they cannot contribute significantly to overall national development unless they become economically productive through education and training. Industrial production processes based on technological innovation have become increasingly complex and call for highly specialized operating skills and abilities. These have to be developed through intensive training in specialized areas of technology application, superimposed on the normal pattern of engineering education and training. Such specialized training also has to be imparted to skilled workers and technicians. Therefore, the least developed and island developing countries ought to enlarge the provision for such training facilities both within and outside the country. To begin with, these countries should identify critical gaps in skills and plan for the development of manpower with the appropriate technological skills.

At the regional level, the ESCAP secretariat has been providing assistance to least developed and island developing countries through the implementation of various activities. The member countries have appreciated activities such as the prime-mover industry project launched in Bangladesh and Nepal, investment promotion meetings, activities under the "club" for industrial co-operation and regional advisory services. The ESCAP secretariat, in its ongoing activities, has provided special consideration to the needs and requirements of least developed and island developing countries of the region in the areas of industry and technology. Activities in the fields of energy-saving in industry, development of the machine tools industry, the technology atlas, renewable sources of energy, technology policy planning and management and technology transfer are being carried out with a view to providing assistance to these countries, through the promotion of regional co-operation. The secretariat has given special consideration and has devised measures for the promotion of economic and technical co-operation from developing countries to least developed and island developing countries in these fields.

III. Computer Aided Design and Computer Aided Manufacturing[1]

INTRODUCTION

With the advent of the new technology associated with computer Aided Design (CAD)/Computer Aided Manufacturing (CAM), the performance of the small and medium engineering industries in many developing countries (especially newly industrializing countries) has been remarkably enhanced since the early 1980s. In the developing countries, small- and medium-scale enterprises (SMEs) have become aware of their technological deficiencies in turning out competitive products with respect to product design, cost and delivery dates.

The traditional advantage of cheaper labour in developing countries has greatly lost its significance in face of the greater flexibility of modern production systems using computer-aided facilities.[2] This new technology directly contributes to significant cost reduction and faster production in all types of engineering industries. SMEs in developing countries are now realizing the necessity of upgrading their production techniques by employing better production methods. This will require the blending of new technologies with the existing set-up in order to improve efficiency and reduce production cost. Thus, entrepreneurs will have to face the question: What new approaches should engineering industries adopt?

The process of automation in industrialized countries has reduced the input of labour per unit of output and, thereby, often reduced the total cost of production.

For example, computer numerically controlled machine tools (CNCMTs) save on skilled labour in the form of operators of conventional machine tools. At the same time, other skills are required, such as capabilities to programme, set, maintain and repair the CNCMTs. However, the amount of repair and maintenance work per unit of output decreases at the same time, since one CNCMT replaces several conventional machine tools.

While computer aided design (CAD) software contains accumulated knowledge, new skills are also required to operate, maintain and repair the CAD units. Hence, these technologies, while saving on some skills, require others. Nevertheless, on the whole, both CNCMTs and CAD are skill-saving in the sense that the mass skills required per unit of output is considerably reduced.

Apart from the basic requirements for operating an efficient engineering industry through proper man-machine-materials balance, the application of computer-aided facilities in the design and manufacturing line can also tremendously boost the production capability. Although this would require a sizeable initial investment, it could be offset within a relatively short time as compared with investment in traditional production hardware.

The terms CAD/CAM are applied in three different but interrelated contexts as follows:

(a) Computer-aided design (CAD)

A CAD system incorporates one or more computers for carrying out some of the calculations and action involved in the design process.

(b) Computer-aided manufacturing (CAM)

A CAM system incorporates one or more computers for carrying out some of the tasks involved in the organization, scheduling and control of the operations in the manufacture of the product. For the purposes of machining, a CAM system usually involves CNC machine tools and the means for producing part programmes for them. It may also involve a central computer for scheduling, planning and controlling the operation of the system. It may involve a Direct Numerical Control (DNC) system using either the central computer or a separate computer control of such as stores, orders.

[1] Drawn from the Proceedings of the Workshop on CAD/CAM Systems for Small and Medium Scale Engineering Industries in Selected ESCAP Developing Countries, organized by UNIDO and ESCAP in co-operation with TECHNONET ASIA, at Singapore from 9 to 20 May 1988.

[2] See UNIDO, Capital goods industry in developing countries: a second world-wide study, Sectoral Studies Series No. 15, Volume I, UNIDO/IS. 530, 1985; and UNIDO, Final Report of the UNIDO/ESCAP Technical Working Group on Production and Use of Machine Tools in the Engineering Industry of ESCAP Developing Countries, Singapore, 17-21 November 1986, Sectoral Working Paper Series No. 55, PPD. 17, 1986.

(c) CAD/CAM system

In a CAD/CAM system, computers are used to carry out some of the tasks involved in designing and manufacturing a product. In particular, computers are often used to directly produce from the design data part programmes for the CNC machines in the system.

WORKSHOP ON CAD/CAM SYSTEMS FOR SMALL AND MEDIUM SCALE ENGINEERING INDUSTRIES IN SELECTED ESCAP DEVELOPING COUNTRIES

UNIDO and ESCAP, in co-operation with TECHNONET ASIA, organized the above-mentioned workshop at Singapore from 9 to 20 May, 1988. The main objective of the Workshop was to provide a forum for the consideration of specific problems faced by the engineering industry in the introduction of new information technologies by means of CAD and CAM systems.

The Workshop was attended by national experts from Bangladesh, China, India, Indonesia, Malaysia, the Philippines, the Republic of Korea, Singapore, Sri Lanka and Thailand.

The Workshop was organized into five modules:

Module 1

This provided the participants with an appreciation of CAD/CAM technologies and their integration into the production environment. Major topics covered were CAD/CAM terminologies, applications, benefits, potentials, systems available for installation, selection and evaluation, justification of system installation and training of personnel.

Module 2

This provided the participants with basic experience in the application of CAD/CAM systems for the design and drawing of mechanical parts and tools. Topics included hardware briefing, familiarization with the commands, graphics generation and information management.

Module 3

This was a practical orientation programme on the use of CAD/CAM systems for integration into production machines (NC/CNC). Demonstrations of point to point routing, machine tool paths and files processing were made on the computer.

Module 4

This programme brought the participants to actual users' premises in the engineering industries. They appreciated the general capability of CAD/CAM applications in the manufacturing process and assessed their versatility in product design and production.

Module 5

This provided the participants with the opportunity to draw conclusions, make recommendations and consider the final report of the Workshop.

The Workshop enabled the participants from developing countries to gain knowledge on:

(a) Design creativity through the use of computer graphics and better design development through optimization and scientific analysis;

(b) Possibilities for improved production performance and reduction of scrap materials through the minimization of fabrication error;

(c) Posibilities of improving the quality of parts and manufacturing productivity through numerical control and automated testing as well as through rationalized production planning;

(d) The needs for CAD/CAM in the engineering industries of the participating countries concerned, and technical assistance possibilities from UNIDO.

CONCLUSIONS

The Workshop concluded that Computer-aided design/Computer-aided manufacturing are beginning to have a significant impact in the engineering industries of developing countries. Moreover, CAD/CAM is one area of technological change which is being introduced very rapidly at present, since it helps to improve the competitive position of small- and medium-scale enterprises (SME) through more flexibility in product development.

In fact, the development and diffusion of industrial automation technologies has started a new industrial revolution, the impact of which is already felt but which will become increasingly strong in the years to come. Because of the techno-economic linkages that exist in the world economic system, this will have a profound effect on the industrialization process in all developing countries.

The production process in the manufacturing sector is strongly influenced by the rapid diffusion of highly sophisticated technologies, mainly CAD and CAM.

These technologies not only tend to save labour, but also provide other substantial benefits to firms implementing them. If this diffusion is faster in industrialized than in developing countries, then the existing technological gap will widen, in which case the anticipated industrial share of developing countries in industrial production is likely to be even smaller than current perspectives suggest.

Rapid advances in computers and microelectronics are the main driving forces in CAD/CAM. The computer is a tool which is increasingly finding its application in both the production process and its planning. The challenge of the future will be to utilize computer technology in the manufacturing process from the moment of product conception, according to market information, to its final delivery to the customer. The success of this concept of industrial automation will depend, to a large extent, on the capability and reliability of the information system which controls and supervises all the processes involved.

While mechanization has had the aim of making the material processing system self-contained, industrial automation makes it possible to achieve not only a self-containted but also an integrated information and material processing system. This is because, originally, the interest was focussed on the process of industrial automation at plant level. The new trends shifted the emphasis towards the domain of engineering, production planning and administrative control.

In order to integrate computers into the manufacturing process, new components are required. These components are related not only to the hardware, i.e. oriented integration of computers and machine tools, but also to computer software, systems engineering, production and other organizational aspects, and include a true understanding of the manufacturing process which the system is supposed to support.

The hardware component can be seen as:

- Programmable Logical Controllers (PLC's);
- Computer Numerical Controllers (CNC's);
- Computer Robot Controllers (CRC's);
- Computers;
  * Microcomputers and Personal Computers;
  * Mini, Super-mini computers (process computers);
  * Mainframes;
- Engineering Workstations;
- Data-collection and identification terminals;
- Communication components;
- Test and quality control equipment.

In considering the systems software, the following were identified:

CAE (Computer Aided Engineering)

CAD (Computer Aided Design)

CAM (Computer Aided Manufacturing)

CIM (Computer Integrated Manufacturing)

CAP (Computer Aided Planning)

CAPP (Computer Aided Production Planning)

CAT (Computer Aided Testing)

CAQ (Computer Aided Quality Assurance)

CAR (Computer Aided Robotics)

CAA (Computer Aided Assembly)

From the above, it was concluded that industrial automation results in a fundamental change in the production process from machine work to programming and from direct production to, interalia, repair, maintenance and supervision, which requires highly qualified, specialized and flexible staff.

The most important postulates arising from the presentation of the experts were as follows:

(i) A technical pre-requisite for successful implementation of CAD/CAM is the automation of the main stages of the manufacturing process. Furthermore, it is necessary to undertake a critical review of the product development process and the process technology applied.

(ii) CAD/CAM efficiency can only be achieved after an indepth analysis of all existing data and of their functional relations, with a view to streamlining the network of information and reducing, to a minimum, the stock of necessary data to be stored in the central data bank.

(iii) CAD/CAM systems radically modify the activities linked with production planning. New professions are also created associated with activities related to software, administration and maintenance.

The participants concluded that the incorporation of CAD/CAM in the production process in developing countries may be justified, considering the following benefits:

– Increased labour productivity in design and production planning.

– Cost reduction in technical production planning, reduced time taken in production planning.

– Cost reduction in manufacturing (emphasis on cutting material costs through material saving and the reduction of waste).

– Attainment of return-on-investment targets, increase of profits.

– Reduction of periods of development and preparation for manufacturing, and of lead time.

The participants in the Workshop, therefore, concluded that CAD/CAM systems have great potential for rapid diffusion in developing countries, thanks to the very recent and substantial decreases in cost through the emergence of personal computer-based CAD/CAM systems. Developing countries may be able to use CAD/CAM for leapfrogging in the field of design since the CAD/CAM software embodies accumulated design and draughting experience. Such experience is currently a scarce resource in most developing countries, which is indicated by their heavy reliance on foreign technical licences.

The value and benefits of CAD/CAM, including productivity improvement ratios of more than 3:1, with faster and better quality designs and more accurate drawings, are now well recognized by the metalworking and engineering industries. The question for developing countries is how to identify the system which is most suitable for them.

The participants also concluded that the Workshop offered a practical way to familiarize themselves with the various applications of computer-aided facilities applicable to small- and medium-scale enterprises in the engineering industries. Particular emphasis was given to the application of knowledge concerning known processes, methods, techniques, equipment, modifications and approaches to existing operations, affected by the transfer of technical information and provision of industrial advisory services.

IV. Investment Promotion for Industrial Growth Through Business Collaboration

The Economic and Social Commission for Asia and the Pacific (ESCAP) has been undertaking several activities aimed at assisting the developing countries of the region in the field of industrial development. In recent years, it has strengthened and expanded its activities in promoting investment for industrial growth. Since 1986, ESCAP, with the assistance of UNIDO Investment Promotion Services and funds provided by the Federal Republic of Germany, has been organizing business collaboration meetings between potential investors from the Federal Republic of Germany and the developing member countries of the region.

In 1986, a symposium-cum-study tour on the promotion of business collaboration in small and medium industries was organized in the Federal Republic of Germany. It was attended by 21 representatives from the private sector and the investment authorities of seven ESCAP member countries: India, Indonesia, Malaysia, the Philippines, the Republic of Korea, Sri Lanka and Thailand.

The programme was organized in two parts. The first part comprised a one-day preparatory workshop in Bangkok. The second part was organized in the Federal Republic of Germany, in conjunction with the Hanover Fair. The symposium consisted of a workshop, a seminar and a study tour.

The preparatory workshop covered discussions on the business environment and contractual practices in the Federal Republic of Germany; the role of ESCAP; the investment promotion services of UNIDO in Cologne; and the role of the German Chambers of Commerce abroad in setting up joint ventures and manufacturing under license in developing countries of the ESCAP region.

The programme in the Federal Republic of Germany was also attended by several high level representatives of the Government, private and public investment promoting organizations and German entrepreneurs who had business collaboration in Asian countries.

The participants, in their evaluation of the Symposium-cum-Study Tour, indicated that the programme had two very positive effects: (i) it contributed to a direct dialogue between prospective partners for collaboration, i.e. the German entrepreneurs and their Asian counterparts; and (ii) it also initiated dialogue on possible collaboration among the entrepreneurs of the participating countries, including the formulation of concrete proposals for continued technical co-operation among developing countries.

As a direct follow-up of the above-mentioned symposium-cum-study tour, in which seven countries had participated, ESCAP initiated the organization of similar activities for interested individual countries. The first in this series was organized for Thailand in 1987, and another one is planned for Nepal in 1989.

The objectives of this programme are:

(a) To provide a forum for potential investors from developing countries to discuss and negotiate their investment proposal portfolios with interested potential investors in developed countries. It also aims to create direct contact with potential investors from both sides to discuss and negotiate projects for mutual implementation.

(b) To provide opportunities, during the meeting, for exposure to new and available technologies and the assessment of technology transfer possibilities.

(c) To provide potential investors and project sponsors with an opportunity to familiarize themselves with the industrial or business structures, manufacturing techniques, marketing and collaboration policies of each others countries.

The Symposium-cum-Study Tour on the Promotion of Business Collaboration between Thailand and the Federal Republic of Germany, with emphasis on Metal Working and Agro-Industries, was organized in October 1987. A total of 20 Thai entrepreneurs and 3 officials of the Board of Investment of Thailand participated in the programme. Another 14 Thai entrepreneurs accompanied the group as observers. ESCAP made provisions for technical and legal advisory services during the business promotion meeting.

Three Thai Chambers of Commerce and the Association of Thai Industries (new renamed the Federation of Thai Industries) also participated. DEG (German Finance Company for Investments in Developing Countries), as the local counterpart agency, made excellent preparations and provided the necessary logistical support. The Ministry for Economic Co-operation of the Government of the Federal Republic of Germany was represented at a senior level.

1. Preparatory Work in Bangkok and in Germany

After the project was approved in December 1986 extensive preparatory activities were undertaken to prepare for the six-day event in Cologne and other places in the Federal Republic of Germany. The event was advertised in Thailand's local newspapers to seek applications from interested parties. The Thai Board of Investment (BOI), assisted applicants in preparing and assessing company and project profiles. A team of experts assigned by ESCAP, BOI and the DEG examined the prospective profiles before submission to DEG in Cologne. Whenever possible, visits to factory sites within Thailand were made to assess the capabilities of the entrepreneurs for possible collaboration with German counterparts. By March 1988, seventeen Company and Project Profiles were prepared and sent to DEG, Cologne to enable them to promote these projects there. The DEG was formally contacted to carry out the promotional activities and, also, to provide host facilities to the collaboration meeting later in the year in Cologne.

In May 1987, a one-day workshop was organized by ESCAP/BOI/DEG to appraise the selected business entrepreneurs of developments regarding the collaboration meeting which was to follow in Cologne. The workshop dealt mostly with ESCAP activities in relation to investment promotion, joint ventures and negotiating techniques. Its capabilities and available expertise for the benefit of the entrepreneurs at that particular time or during the main collaboration meeting in October 1987 was elaborated soon. The BOI discussed in details the policies of the Thai Government and its promotional activities for investment. The DEG explained in detail the preparations thus far made in the Federal Republic of Germany. The project profiles were screened and sent to several interested parties and some selected industries that the DEG had thought would be interested in the projects. A consolidated list of interested and selected entrepreneurs, with a short description of their companies and projects was also published and widely distributed in Germany.

During June of the same year, the DEG received a delegation of the BOI in Cologne and appraised them of the preparations that were taking place.

The DEG had followed up with companies in Germany that had received the Company and Project Profiles. It transmitted, to the BOI, their various queries and explanations which, in turn, were relayed to the Thai businessmen for their comments and explanations. The answers and explanations thus received were transmitted back to the original enquirers through the DEG. Therefore, constant follow-up with the DEG and potential investors was maintained.

2. Seminar-cum-Study Tour

The programme was organized in Cologne, Federal Republic of Germany, from 18 to 24 October, 1987. Besides the Thai delegation, DEG, ESCAP, UNIDO and BOI officials, 61 German company representatives also attended the Seminar.

The one-day seminar dealt with the following main points: investment opportunities in Thailand, promotion of German investment in Thailand, experience of Thai businessmen with German collaborators, and the joint venture experience of a German entrepreneur in Thailand.

The seminar was followed by individual meetings and visits. Among these, two main visits are cited below.

One visit was made to the BDI, the German Association of Industries, where the Board of Investment officials made their presentation on the opportunities for investment in Thailand. When the forum was opened for discussions with the attending German company representatives, interesting queries were raised and answered. The outcome was that while many participants felt that opportunities existed for investment in Thailand, only a question of choice remained. However, it was also clear that many expanding German companies were first looking for markets in Europe and the United States. That is why their investments in the Asian and Pacific region had not developed in relation to the opportunities that existed there.

Another interesting meeting was held with officials of the Asia and Pacific Centre (APC), sponsored by Stadtsparkasse Koln. The Group was informed that the Centre was established to collect investment and business information and to disseminate it to requesting persons or firms. They also undertook

feasibility studies if contracted to do so. However, it was clarified that, for the development of the Asian and Pacific region, a constant dialogue should be maintained between the government investment promotion agencies and APC to initiate the investment process.

A total of 109 appointments for 21 companies from Thailand had been arranged by DEG for discussions. Some of these meetings extended beyond the time stipulated by ESCAP, 18-24 October. However, due to some rescheduling, the actual number of meetings held were 82, which constituted an impressive achievement. During these appointments, several parties reached advanced stages of negotiation. It was expected that at least 8 to 10 collaborative arrangements would result from this exercise.

It was further decided that a series of follow-up meetings with the BOI would be arranged to monitor developments. DEG would also send its report to BOI. Although investment discussions were taken in a rather cautious manner and negotiations were sometimes protracted, a considerable number of collaborations are expected to result from the business collaboration meeting.

V. Human Resources Development for Industrial Growth

The Economic and Social Commission for Asia and the Pacific (ESCAP) has been implementing several activities, by incorporating elements in sectoral programmes and through specific activities, aimed at human resources development in developing countries of the region. In recent years, it has further strengthened such activities.

The Commission, at its 42nd session held in 1986, deliberated on the secretariat study, "Human Resources Development: Its Technological Dimensions", and adopted the "ESCAP Plan of Action on National and Regional Initiatives for Human Resources Development: Its Technological Dimensions". The Commission, at that session, also adopted two resolutions on the subject.[1]

The Commission, through the ESCAP Plan of Action, emphasized that "technology has a profound influence on social and economic development. The importance of human resources for technology, as a determinant of social and economic development, required re-affirmation and new commitments by politicians and policy-makers, administrators, scientific personnel and technologists, public and private enterprises, workers organizations and so on". It further emphasized that developing countries should undertake activities aimed at strengthening the overall co-ordination of forecasting, planning, development and management of human resources. It also stressed that the creation of adequate opportunities for formal, non-formal and informal education and training were necessary. It also pointed out that it was essential to establish systems for effective and efficient utilization of skills and capabilities in furtherance of national technological and socio-economic objectives.

The plan contains several proposals for initiating and strengthening efforts towards the development of human resources for technological development in developing countries of the region by undertaking new activities at the national, sub-regional and regional levels. It emphasizes the fact that production processes based on technical innovation have become increasingly complex and call for highly specialized operating skills and abilities. Those have to be developed through intensive training in specialized areas of technology application, superimposed on the normal pattern of engineering education and training.

The Commission, at its forty-third and forty-fourth sessions convened in 1987 and 1988, also dealt with other aspects of human resources development. In 1987, the deliberations focussed on social aspects and, in 1988, the Commission considered an integrated plan of action on human resources development for the region.

The secretariat, in compliance with the directives contained in the resolutions and Plan of Action adopted in 1986, implemented various activities related to human resources development. Among those, two important activities implemented in 1987 were:

(i) Workshop on Human Resources Development Policy and Planning for Technology and Development; 19 October – 6 November 1987, Seoul, Republic of Korea.

(ii) Regional Seminar on Forecasting, Planning and Development of Technological Human Resources, 30 November – 6 December 1987, Xiamen, China.

The Workshop on Human Resources Development Policy and Planning for Technology and Development was attended by senior and middle level officials from 10 developing countries of the region. They extensively deliberated on technology and human resources development, and the experience of the Republic of Korea and Japan in these respects.

The Workshop dealt with various issues, problems and prospects related to the development of human resources for technology in the context of changing economic and technological situations in Asian and Pacific developing countries. It also covered areas of possible economic and technical co-operation among developing countries (ECDC/TCDC) for strengthening activities in the development of human resources for technological progress.

It underlined the fact that development of human resources was one of the most crucial as-

[1] (i) Resolutions 247(XLII) Forecasting, Planning and Development of Technological Human Resources, and (ii) 256(XLII) ESCAP Plan of Action on National and Regional Initiatives for Human Resources Development: Its Technological Dimensions.

pects in the process of overall development and, therefore, investment in human capital was an indispensable, complementary factor to investment in physical capital. Emphasis was laid on the need to devise new policy measures and mechanisms and infrastructural arrangements towards better dynamic interfacing between science and technology, on the one hand, and production sectors and human resources in technology, on the other.

Extensive and detailed discussions were held on the experience of the Republic of Korea in the areas of "technology development" and "development of human resources" Those areas covered the role of technology in the overall development of the Republic of Korea, technology policies and strategies, infrastructure-building for human resources development, technical manpower planning, and legal and fiscal measures for skills development.

In addition, interesting discussions were held on the various experiences of the represented developing countries, in the areas of "technology development" and "development of human resources for technology".

The Seminar recommended the following: .

A. General Recommendations

1. Increased resource allocation for education and training by all levels and types – general, technical and formal, as well as informal.

2. Increased efforts to enlarge the provision of vocational and technical education and training; concentration on priority sectors and in areas where the countries had comparative advantage.

3. Treatment of human resources development as an organic whole, encompassing the integrated approach through the implementation of programmes having closer interrelations.

4. The human resources development strategy and approach should fully take into account the prevailing socio-economic and cultural factors in the countries.

5. In several developing countries of the region, a comprehensive human resources development policy was lacking or, at least, inadequately developed. Difficult as it might be, specific manpower planning was also necessary for overall development. That should involve short- and long-term measures covering the identification of existing skill gaps, and those likely to emerge from the changing technological environment. Provision of infrastructure and funds for alleviating such skill gaps should be enlarged. Efforts should be strengthened to reduce the mismatch between producers and users of human resources.

6. Provisions for meeting the human resources development needs of disadvantaged groups, including the rural and informal sectors, should receive higher priority in national-level action programmes.

7. Efforts should be strengthened, and opportunities created, for greater private sector participation, where feasible, in the promotion of technical education and training. That would involve re-examination of existing incentives and policy mechanisms and institutional support to the private sector.

8. Specifically, management training for technical personnel should receive greater priority.

9. Entrepreneurship development programmes at the national level should be strengthened and enlarged; Governments should play an active role in that respect.

10. In the process of human resources development, an appropriate environment should be created for equal opportunity and competitiveness, so that individual motivation for self-development was encouraged and reinforced. Personal evaluation systems should be designed to encourage and fully exploit individual potential in order to maximize the use of talents and skills.

B. Regional Co-operation Measures

The development of human resources was both complex and difficult, as it was the end and the means of entire human development. Even if there was strong commitment at the national level to the development of both general and technical human resources adequate means were not always available at a national level alone. Therefore, it was essential that co-operative measures at regional and sub-regional levels be implemented to aid and strengthen national action. Such measures should include:

1. Initiation of research and studies for analyzing and developing macro- and micro-level indicators for effective human resources development policies and planning, suitable to the developing countries of the region.

2. Assisting developing countries in identifying critical skill

gaps through surveys, and monitoring and forecasting new technologies.

3. Collection, analysis and dissemination of information about technological innovations, trends and the demands for new skills.

4. Improvement of existing, and development of new, methodologies for manpower forecasting and overall human resources planning, with emphasis on technical and managerial areas of skill formation.

5. Assisting developing countries in improving their data base for education, and human resources planning and forecasting. That should also include networking of various institutions involved in education and human resources planning, employment promotion and productive and research activities.

6. Assisting member countries in institution-building for the formation of low- and medium-level skills relevant to rural and informal sectors.

7. Organizing training programmes for trainers in skill upgrading and skill development on a priority basis through the organization of regional training courses.

8. Providing greater opportunities for exchange of trainers involved in "on-the-job-training and in-plant training."

9. It was recommended that activities related to human resources development should incorporate programmes aimed at developing leadership capabilities for both private and public sector production units.

The Regional Seminar on Forecasting, Planning and Development of Technological Human Resources was attended by 17 participants from 7 developing countries of the region.

The Seminar deliberated on technology and development: new and emerging technologies and their impact on demands for new skills, planning and development of technical human resources, forecasting methodologies for technology and manpower, and regional co-operation in human resources development. While emphasizing that human resources development was a critical strategy for social economic development, it was pointed out that human resources development should receive greater priority in national plans and programmes. The Seminar recommended the following:

A. General Recommendations

1. Research should be undertaken not only in the context of development of technologies, but as an integral part of the educational process. Since technical manpower worked at the interface of application of science and technology to the social systems, the range of research methodologies in institutions of technological education must encompass not only the methodologies used in science and technology, but also those developed in the field of social and human sciences.

2. A balanced development among various levels of technical manpower was necessary to obtain the optimum benefit from available human resources. The planning of different levels should therefore be co-ordinated well. Furthermore, a system of appropriate wage structure, career advancement and recognition should be created to support the desired balance between different levels.

3. Many levels were involved in planning the development of the human resources – from the global system level down to the level of individual institutions. To ensure consistency of direction, it was necessary to set up suitable structures/fora for policy co-ordination at the national level.

4. Implementation of such plans was greatly facilitated and ensured by the preparation of detailed programmes of action. Each concerned agency should be expected to prepare such programmes in relation to their specific role in implementation.

5. Manpower forecasting should be conceived as "indicative" to manpower development and training. Such forecasting exercises provided a scenario which would provide guidelines to planners and policy makers for different possible alternatives.

6. Efforts in technological manpower development should adequately consider the strengthening of entrepreneurial and managerial resources and capacities crucial for industrial modernization. Therefore, a comprehensive financial scheme for qualifying that target group needed to be designed. In view of the importance of entrepreneurship in the process of economic and social development, it was essential that such programmes be supported through a well-designed macro-strategy with clear policy mechanisms, institutional support systems and training.

B. Regional Co-operation measures

1. International and regional agencies should undertake activities aimed at improving the methodologies for manpower forecasting. Manpower-forecast-

ing methodologies, as they now stood, were not able to take into account the various aspects unique to developing countries. It was, therefore, essential that regional bodies such as ESCAP initiate action in reviewing and examining existing methodologies.

2. In the current era of fast-changing technological situations, manpower-forecasting results would be of limited use if likely changes in technology could not be anticipated. It was, therefore, essential that regional and international bodies and agencies such as ESCAP and ILO also strengthen their activities towards technology forecasting.

3. Increased emphasis should be placed on sharing of experience in science and technology, and development of human resources, both among developing and developed countries and among developing countries of the region. In that respect, exchange of (a) scientific and technical personnel, (b) trainers in technical areas, and (c) policy makers in technical education, would greatly facilitate the process. Furthermore, efforts to enlarge fellowships and scholarships for technical education and training should be strengthened. Exchange visits of students in technical areas should also be encouraged. Opportunities for education and training should increasingly be provided in the developing countries themselves.

4. Regional and international agencies should be involved to a greater extent in information dissemination of science and technological policies as well as of opportunities for development of human resources for technology.

5. Regional workshops should be organized to examine ways and means of developing educational strategies and action for the promotion of entrepreneurship. A regional workshop on the design of technical manpower information systems should be organized.

6. Regional agencies should provide technical and advisory assistance in data base improvements required for manpower forecasting and overall human resources planning.

7. A science and technology environment and communication system should be promoted to induce a "science and technology culture" through the effective use of various media, the organization of science and technology fairs and the granting of science/engineering innovation awards, and so on.

8. Selected national institutions of training of science and technology personnel should be accredited and converted into "Centres of excellence". Regional training programmes should be developed and organized in those centres by adding expertise and facilities.

9. Donor countries and agencies should increase their financial commitment to regional bodies such as ESCAP for activities in the field of human resources development. ESCAP should endeavour to function as a nodal agency in human resources development activities in the Asian and Pacific region. It should develop a detailed programme of action with specific targets and implementation schedules, and the progress of implementation of human resources development activities should be reviewed at Intergovernmental Meetings.

The secretariat has planned the following activities for 1989-1990 in the area of human resources development for industrial growth and development:

1. High-level seminar-cum-study tour on human resources development policy and planning for technology and development.

2. Development of industrial skills through greater economic and technical co-operation among developing countries of the region.

3. Diversification and upgradation of industrial skills of women in member countries of the region.

4. Entrepreneurship development in least developed countries of the region.

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