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**POTENTIAL FOR VERTICAL DIVERSIFICATION OF
INDUSTRIAL PRODUCTION IN AFRICA**

A Contribution to the Implementation of the United Nations
New Agenda for the Development of Africa
in the 1990s

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Contents

	<i>Page</i>
Executive summary	1
Introduction	4
<i>Chapter</i>	
I. EXISTING INDUSTRIAL PRODUCTION STRUCTURES	6
II. THE WAY FORWARD	9
III. DIVERSIFICATION OF AFRICAN INDUSTRIES	10
A. Competitiveness	10
B. The limits to rehabilitation	11
C. Impact of modern methods of production	12
IV. NEW INITIATIVES IN INDUSTRIAL PROCESSING	14
A. Agro-based industries	14
B. Minerals processing	17
C. Conclusions	18
V. THE DIVERSIFICATION FUND	19

Explanatory notes

The following abbreviations are used in this study:

FMS flexible manufacturing systems

GDP gross domestic product

MVA manufacturing value added

UN-NADAF United Nations New Agenda for the Development of Africa in the 1990s

References to dollars (\$) are to United States dollars.

Executive summary

At present industrial production structures in most countries of Africa remain narrowly concentrated on the semi-processing of export commodities and on basic consumer goods. The production of intermediate goods and consumer durables is minimal, and the production of capital goods is virtually non-existent. The outstanding exception to this general description is South Africa.

The United Nations New Agenda for the Development of Africa in the 1990s (UN-NADAF) stresses, *inter alia*, the need for diversification of production with a view to stabilizing and increasing export earnings. Applied to the industrial sector, this vision compels consideration of the directions in which and the means by which industry in Africa should grow. The strategic objective of UN-NADAF is for African industry to become part of the world industrial system, which is clearly not the case today. To achieve this objective and its attendant spin-offs, it will be imperative to diversify industrial production in Africa.

A diversified manufacturing sector will be able to produce some capital goods and many of the intermediate goods required by industry, in addition to consumer goods. It will lead to a network of input/output relationships linking product groups within the same and other manufacturing subsectors and linking the manufacturing sector with other sectors of the economy. Such intra-industry and inter-industry linkages are the hallmark of industrial transformation, induced by the deepening and widening of industrial activities.

Deepening of industrial activities may take all or any of the following forms:

- Technological upgrading of products and processes.
- Entry into more complex and demanding industrial activities.
- Increasing local content.
- Mastery of more complex technological tasks.

Vertical diversification focuses the diversification options on resource-based industrialization, through processing of indigenous raw materials. Such a focus may be encouraged by the view that a natural resource endowment automatically gives a country a comparative advantage in the manufacture of consumer goods or intermediate goods from that resource. However, the real test of comparative advantage is the cost, price and quality of a product in relation to that of competing or substitute products, after the raw materials factor of production has been combined with all other factors. To assume comparative advantage on the basis of one factor of production alone is misleading.

The issue of international competitiveness is central, therefore, to a discussion of the potential for vertical diversification of industrial production in Africa. It is generally acknowledged that, with a few exceptions, the existing stock of industries in most of Africa was established under policies and in circumstances that were not conducive to efficient production. Little consideration, if any, was given to international competitiveness. Today the policy environment has changed, and trade liberalization and open trading systems are the order of the day. The survival of existing industries

and the future creation of industries will depend on the ability of those industries to compete in domestic and export markets.

The dismantling of protectionist arrangements makes it more imperative than ever to address the underlying causes of inefficient industrial production in Africa. Some of the operative factors lie within the domain of Governments, for example, remedying of deficiencies in the physical infrastructure, strengthening of institutional support for industrial training, industrial research and technology development and, above all, pursuit of macroeconomic policies that create a favourable and stable investment climate. Other operative factors are within the domain of African businessmen, for example, the practice of modern management principles in all the management functions (production, quality, marketing, financial and human resource management) and the removal of bottlenecks in production operations, including the modernization of plant and equipment as necessary.

Some Governments have already embarked on programmes of rehabilitation for State-owned enterprises, usually in preparation for divestment. The benefits of rehabilitation programmes should be carefully weighed in view of the role that private investors are expected to play in introducing dynamic change.

Before embarking on industrial diversification, Governments should also anticipate the impact of rapidly changing technologies. A critical feature is the high degree of automation now characteristic of production processes. On the one hand, automation often requires technical skills that are in short supply in Africa; on the other hand, it means fewer jobs. In extreme cases, such as sophisticated, computer-driven flexible systems for manufacturing garments and in certain assembly industries, such technologies may erode the comparative advantage that some African countries enjoy based on relatively cheap labour costs in those industries.

The resource-based approach to industrialization inherent in the concept of vertical diversification invites classification of industries according to the raw material inputs:

- Industries that utilize agricultural products (agro-based industries).
- Industries that utilize forest-based products (forest-based industries).
- Industries that utilize mineral products.
- Industries that utilize non-metallic mineral products.

It is not possible to identify in this study all the products and subsectors in which African countries might be able to compete internationally. On the basis of historical evidence, however, it is a safe assumption that the industries with the greatest potential initially are textiles and clothing, food products, leather and leather products and metal products.

A cursory examination of the prospects for new initiatives in industrial processing tends to confirm the following:

- Comparative advantage in industrial processing does not necessarily rest with the country endowed with the input raw materials.
- The creation of interindustry and intra-industry linkages, although potentially significant in several manufacturing subsectors, may be equally constrained on grounds of comparative advantage.

- Some processing industries are very intensive in capital, technology and/or highly skilled labour, factors that are scarce in Africa.
- The economies of scale that are necessary for efficiency in these capital- or technology-intensive industries may not be realizable owing to the small size of domestic markets.
- In the minerals-processing subsector, the progress of vertical diversification may well be dictated by alliances between African Governments and the multinationals that already have vested interests in the subsector.

Finally, it is recommended that a segment of the proposed African Diversification Fund should be earmarked for financing pre-investment studies of projects that meet certain criteria.

Introduction

The 52 countries of Africa contrast greatly in resources and size (table 1). They are as diverse and varied, not least with respect to their national industrial sectors, as they are numerous. Therefore, care must be exercised in contemplating prescriptions for general application to all of them.

Table 1. Africa: population, area, density and total and per capita GDP, 1991

	Population (millions)	Area (thousands of km ²)	Density (per km ²)	GDP (\$) @/	
				Total (millions)	Per capita
North Africa	143.7	8 258.6	17.4	170 620	1 187.3
Algeria	25.6	2 381.7	10.7	59 968	2 342.5
Egypt	53.6	1 001.4	53.5	40 967	764.3
Libyan Arab Jamahiriya	4.7	1 755.5	2.7	32 228	6 857.0
Morocco	25.7	446.6	57.5	16 418	638.8
Sudan	25.9	2 505.8	10.3	10 945	422.6
Tunisia	8.2	163.6	50.1	10 094	1 231.0
West Africa	199.9	6 142.7	32.5	139 447	697.6
Benin	4.8	112.6	42.6	1 143	238.1
Burkina Faso	9.2	274.2	33.6	1 765	191.8
Cape Verde	0.4	4.0	100.0	189	472.5
Côte d'Ivoire	12.4	322.5	38.4	6 572	530.0
Gambia	0.9	11.3	79.6	231	256.7
Ghana	15.5	238.5	65.0	5 892	380.1
Guinea	5.9	245.9	24.0	3 063	519.2
Guinea-Bissau	1.0	36.1	27.7	208	208.0
Liberia	2.7	111.4	24.2	997	369.3
Mali	9.5	1 240.0	7.7	1 467	154.4
Mauritania	2.1	1 030.7	2.0	843	401.4
Niger	8.0	1 267.0	6.3	1 591	198.9
Nigeria	112.1	923.8	121.3	110 091	982.1
Senegal	7.5	196.2	38.2	3 058	407.7
Sierra Leone	4.3	71.7	60.0	1 501	349.1
Togo	3.6	56.8	63.4	836	232.2
Central Africa	85.8	6 667.4	12.9	32 985	384.4
Angola	9.5	1 246.7	7.6	8 827	929.2
Burundi	5.7	27.8	205.0	1 447	253.9
Cameroon	11.9	475.4	25.0	6 440	541.2
Central African Republic	3.1	623.0	5.0	766	247.1
Chad	5.7	1 284.0	4.4	850	149.1
Congo	2.3	342.0	6.7	2 160	939.1
Equatorial Guinea	0.4	28.1	14.2	93	232.5
Gabon	1.2	267.7	4.5	3 794	3 161.7
Rwanda	7.3	26.3	277.6	1 687	231.1
Sao Tome and Principe	0.1	1.0	100.0	38	380.0
Zaire	38.6	2 345.4	16.5	6 883	178.3

	Population (millions)	Area (thousands of km ²)	Density (per km ²)	GDP (\$) ^{a/}	
				Total (millions)	Per capita
East and Southern					
Africa	193	7 771.4	24.8	49 859	258.3
Botswana	1.3	600.4	2.2	1 996	1 535.4
Comoros	0.6	2.2	272.7	125	208.3
Djibouti	0.5	22.0	22.7	463	926.0
Ethiopia	51.4	1 221.9	42.1	5 429	105.6
Kenya	24.4	582.6	41.9	8 210	336.5
Lesotho	1.8	30.4	59.2	355	197.2
Madagascar	12.4	587.0	21.1	3 063	247.0
Malawi	10.0	112.5	84.4	1 393	139.3
Mauritius	1.1	2.0	550.0	1 578	1 434.5
Mozambique	14.5	801.6	18.1	4 277	295.0
Namibia	1.5	823.1	1.8	1 568	1 045.3
Seychelles	0.1	0.3	333.3	224	2 240.0
Somalia	8.9	637.7	14.0	742	83.4
Swaziland	0.8	17.4	46.0	444	555.0
Uganda	18.1	236.0	76.7	3 131	173.0
United Republic of Tanzania	26.9	945.1	28.5	8 864	329.5
Zambia	8.4	752.6	11.2	2 358	280.7
Zimbabwe	10.3	390.6	26.4	5 639	547.5
South Africa	35.3	1 221.0	28.9	132 890	3 766.1
Total (excluding South Africa)	622.4	28 840.1	21.6	392 911	631.3

Sources: African Development Bank, *Selected Statistics on Regional Member Countries*, 1993; *World Development Report* (Oxford University Press, 1992); International Monetary Fund, *International Financial Statistics*, 1993.

^{a/} Constant 1985 dollars.

Some studies attempt to get around this dilemma by treating the continent in terms of the regional and subregional groupings that have emerged in the recent past, namely, the Economic Community of West African States (ECOWAS), the Eastern and Southern African Preferential Trade Area (PTA), the Southern African Development Community (SADC), the Economic Community of Central African States (ECCAS), the Union douanière économique Afrique centrale (UDEAC) and the Maghreb countries (Algeria, Libyan Arab Jamahiriya, Mauritania, Morocco and Tunisia). This is not the most felicitous of solutions, particularly for a study such as this, inasmuch as the considerable resources with which the continent is endowed are distributed very unevenly among the countries and regions. However, for the sake of convenience (it being impossible to consider every country individually, even if the relevant information were available), the potential for vertical diversification of industrial production will be examined mainly on a regional basis.

I. Existing industrial production structures

The diversity of African countries is reflected in the relative sizes and composition of their industrial sectors. Analysis at the country level reveals that those countries with the largest industrial sectors (defined to include manufacturing and mining, petroleum, construction and utilities) are in fact countries generally dependent on exports of unprocessed or semi-processed minerals or hydrocarbons. Thus, in 1991 industry accounted for 46.1 per cent of gross domestic product (GDP) in Angola (petroleum), 54.5 per cent in Botswana (diamonds), 45.4 per cent in Nigeria (petroleum), 45.5 per cent in Zambia (copper) and 54.1 per cent in the Libyan Arab Jamahiriya (petroleum). African countries with the smallest industrial sectors were the Comoros (10.5 per cent), the Gambia (11.7 per cent), Somalia (8.8 per cent), Uganda (11.7 per cent) and the United Republic of Tanzania (10.3 per cent).

Manufacturing in Africa (excluding South Africa) accounted for 11.7 per cent of GDP in 1991, with the smallest sectors found in Equatorial Guinea (2.4 per cent), the Comoros (3.7 per cent) and, in marked contrast to the size of their industrial sectors, Gabon (4 per cent) and Botswana (4.3 per cent) (table 2).

Table 2. Africa: GDP by kind of economic activity at current factor cost, 1991
(Millions of dollars)

	GDP	Agriculture		Industries				Services	
		Total	Share (%)	Total	Share (%)	Manu- factur- ing	Share (%)	Total	Share (%)
North Africa	165 361	26 926	16.3	53 486	32.3	20 844	12.6	84 949	51.4
Algeria <i>a/</i>	39 042	4 305	11.0	11 704	30.0	4 467	11.4	23 033	59.0
Egypt	29 708	5 390	18.1	8 376	28.2	4 729	15.9	15 942	53.7
Libyan Arab Jamahiriya	30 850	1 711	5.5	16 695	54.1	2 376	7.7	12 444	40.3
Morocco <i>a/</i>	26 725	4 456	16.7	8 806	33.0	4 870	18.2	13 463	50.4
Sudan	27 437	8 979	32.7	4 246	15.5	2 372	8.6	14 212	51.8
Tunisia	11 599	2 085	18.0	3 659	31.5	2 030	17.5	5 855	50.5
Western Africa	70 981	24 003	33.8	22 361	31.5	6 115	8.6	24 617	34.7
Benin	1 957	705	36.0	278	14.2	171	8.7	974	49.8
Burkina Faso	3 184	1 075	33.8	798	25.1	454	14.3	1 311	41.2
Cape Verde <i>a/</i>	404	59	14.6	69	17.1	33	8.2	276	68.3
Côte d'Ivoire	8 035	3 067	38.2	2 010	25.0	1 453	18.1	2 958	36.8
Gambia	279	92	33.0	31	11.1	18	6.5	156	55.9
Ghana <i>a/</i>	6 830	3 313	48.5	1 110	16.3	650	9.5	2 410	35.3
Guinea	2 663	1 102	41.4	593	22.3	84	3.2	968	36.3
Guinea- Bissau <i>a/</i>	92	94	46.5	32	15.8	6	3.0	76	37.6
Liberia	1 260	473	37.5	284	22.5	92	7.3	503	39.9
Mali <i>a/</i>	2 451	1 082	44.1	303	12.4	130	5.3	1 066	43.5
Mauritania	1 120	287	25.6	302	27.0	99	8.8	531	47.4
Niger <i>a/</i>	2 414	899	37.2	359	14.9	165	6.8	1 156	47.9
Nigeria	32 406	9 952	30.7	14 699	45.4	1 873	5.8	7 755	23.9
Senegal <i>a/</i>	5 731	1 114	19.4	1 083	18.9	727	12.7	3 534	61.7
Sierra Leone	484	178	36.8	71	14.7	23	4.8	235	48.6
Togo <i>a/</i>	1 561	514	32.9	339	21.7	137	8.8	708	45.4

	GDP	Agriculture		Industries			Services		
		Total	Share (%)	Total	Share (%)	Manufacturing	Share (%)	Share (%)	
Central Africa	31 091	7 410	23.8	12 104	38.9	3 035	9.8	11 577	37.2
Angola	5 626	1 310	23.3	2 595	46.1	448	8.0	1 721	30.6
Burundi	1 000	558	55.8	154	15.4	91	9.1	288	28.8
Cameroon <i>a/</i>	11 221	2 897	25.8	4 326	38.6	1 463	13.0	3 998	35.6
Central African Republic	1 208	522	43.2	170	14.1	93	7.7	516	42.7
Chad <i>a/</i>	1 208	366	30.3	371	30.7	194	16.1	471	39.0
Congo <i>a/</i>	2 999	442	14.7	944	31.5	232	7.7	1 613	53.8
Equatorial Guinea	155	92	55.8	16	9.7	4	2.4	57	34.5
Gabon <i>a/</i>	5 524	487	8.7	3 002	54.3	221	4.0	2 040	36.9
Rwanda <i>a/</i>	1 358	515	37.9	312	23.0	213	15.7	531	39.1
Sao Tomé and Príncipe	42	11	26.2	6	14.3	2	4.8	25	59.5
Zaire <i>a/</i>	740	215	29.1	208	28.1	74	10.0	317	42.8
East and Southern Africa	42 460	12 410	29.2	11 379	26.8	6 122	14.4	18 671	44.0
Botswana <i>a/</i>	3 461	179	5.2	1 887	54.5	148	4.3	1 395	40.3
Comoros <i>a/</i>	241	91	37.8	25	10.4	9	3.7	125	51.9
Djibouti	390	11	2.8	66	16.9	17	4.4	313	80.3
Ethiopia	5 555	2 540	45.7	801	14.4	524	9.4	2 214	39.9
Kenya	7 340	1 895	25.8	1 594	21.7	849	11.6	3 851	52.5
Lesotho	545	87	16.0	229	42.0	82	15.0	229	42.0
Madagascar <i>a/</i>	2 488	822	33.0	349	14.0	378	15.2	1 317	52.9
Malawi	1 959	691	35.3	387	19.8	255	13.0	881	45.0
Mauritius	2 297	259	11.3	750	32.7	532	23.2	1 288	56.1
Mozambique	1 070	654	61.1	218	20.4	171	16.0	198	18.5
Namibia	1 961	325	16.6	597	30.4	119	6.1	1 039	53.0
Seychelles <i>a/</i>	309	17	5.5	59	19.1	36	11.7	233	75.4
Somalia	989	645	65.2	87	3.8	46	4.7	257	26.0
Swaziland	665	156	23.5	214	32.2	139	20.9	295	44.4
Uganda	2 452	1 622	66.2	288	11.7	132	5.4	542	22.1
United Republic of Tanzania	2 336	1 208	51.7	240	10.3	107	4.6	888	38.0
Zambia <i>a/</i>	3 154	493	15.6	1 480	46.9	1 140	36.1	1 181	37.4
Zimbabwe	5 248	715	13.6	2 108	40.2	1 438	27.4	2 425	46.2
South Africa	297 895	17 874	6.0	131 074	44.0	71 495	24.0	148 948	50.0
Total (excluding South Africa)	309 893	70 749	22.8	99 330	32.1	36 116	11.7	139 814	45.1

Sources: African Development Bank, *Selected Statistics on Regional Member Countries*, 1993; International Monetary Fund, *International Financial Statistics*, 1993; UNIDO database.

a/ At current market prices.

The principal production base in African countries is agriculture and agro-products processing. There is some transformation of mineral resources, for example, zinc, copper and alumina processing, but in most cases this does not go beyond the extractive or primary processing stage. The manufacturing sector produces generally for the domestic market, supplying products such as beer and tobacco and simple consumer goods like soap, matches and, particularly, textiles. Advances in the production of intermediate goods and consumer durables have been minimal, and the production of capital goods is virtually non-existent. Ventures into heavy industry (steel-making, for example), have not been successful. Metal fabrication and processing and the production of foundry products are

generally undertaken at low levels of technology. On the whole, the production structures remain narrow, concentrated on the semi-processing of export commodities and on products that are closest to final demand in the market (basic consumer goods).

The range of manufacturing activities that have close linkages with other sectors (intersectoral) and linkages within the sector itself (intrasectoral) is very limited. Not surprisingly, it is in the agro-industries branch that intersectoral linkages have been created, between the agricultural and manufacturing sectors.

In stark contrast to the rest of Africa is South Africa, where manufacturing activity has advanced beyond the production of final consumer goods from imported inputs to the production of intermediate goods and consumer durables and on to the production of capital goods. For example, a large-scale iron and steel industry has been created with linkages into metal fabrication, including transport equipment. Other activities include the manufacture of industrial and other chemicals, electrical and non-electrical machinery, paper and paper products and petroleum refining.

II. The way forward

If it is to grow, African industry must aim to become part of the world industrial system. To illustrate, Africa's share of world manufacturing value added (MVA) in 1975 was 1 per cent. Nearly 20 years later, it is still around 1 per cent. Nothing in the intervening years has changed the position of African industry in relation to world industry as a whole.

It is significant, therefore, that UN-NADAF should have as its priority objectives "the accelerated transformation, integration, diversification and growth of the African economies in order to strengthen them within the world economy, reduce their vulnerability to external shocks and increase their dynamism, internalize the process of development and enhance self reliance". UN-NADAF stresses the need for African countries to emerge from dependence on primary commodities by diversifying production. Such a course of action could stabilize and increase African export earnings in the face of the persistent decline in the prices of many primary commodities and stem the deteriorating terms of trade faced by African economies.

There are a number of prerequisites for Africa to enter into the mainstream of the global international economy:

- Advanced technological capacities (industrial sophistication in know-how and know-what).
- Extensive and intensive training of manpower in the wide range of skills and competencies including entrepreneurial skills, needed for the advanced technologies.
- Improved access to financing for industry investment.
- Cost-effective production as a foundation for competitiveness and export capability.
- Networked databases of information on technologies, markets and investment opportunities.

The thrust forward must be grounded in sound macroeconomic policies geared to fiscal discipline, stable and realistic exchange rates and market-driven price levels.

III. Diversification of African industries

Ordinarily, a diversified manufacturing sector produces some capital goods and a wide range of intermediate goods and consumer goods, with the result that new products can be developed because the materials and components for making them are available. An undiversified manufacturing sector, by contrast, offers only limited prospects for the supply of inputs and the creation of the attendant relationships.

In one sense, any additional investment in new and/or upgraded industrial production is conducive to diversification. However, a diversification strategy that does not have strong linkage effects is not sufficient to bring about industrial transformation. Such a transformation comes from a "deepening" of industrial activities, by all or any of the following means:

- Technological upgrading of products and processes.
- Entry into more complex and demanding industrial activities.
- Increasing local content.
- Mastering more complex technological tasks.

Deepening is both the outcome of and the facilitator for establishing linkages between industry and other sectors, particularly between industry and agriculture and industry and mining. Within the industrial sector itself, deepening promotes intersectoral and intra-sectoral linkages in a network of outputs and inputs. An increase in domestic MVA is the result.

The term "vertical diversification" refers to diversification based on the processing of indigenous raw materials, particularly those which are now exported from Africa as primary commodities, in order to increase local content. It rests on the widely held notion that the mere possession or occurrence of a natural resource in a particular country automatically gives that country a comparative (perhaps absolute) advantage in making products from it that will compete successfully in the international market-place. While there may indeed be a potential to manufacture downstream products for the national or international markets, the real test of this potential is to combine the raw materials factor of production with all the other factors of production and then answer the question, can a product be delivered at the factory gate which is competitive in price and quality?

A. Competitiveness

The international competitiveness of African industry and the ways in which it can be improved are central to this discussion of the potential for vertical diversification. The issue is made urgent by the international climate of trade liberalization, from which Africa has not escaped. Indeed, for many Governments, structural adjustment programmes have involved, among other things, a commitment to introduce open trading regimes, which would dismantle the wall of protection erected earlier to encourage industrialization. Further, by signing the treaty on the Uruguay Round of trade negotiations, African countries entered into undertakings that will make their markets more accessible to imports and erode traditional preferential treatment of their commodity exports to Europe.

It is widely recognized that the indiscriminately protectionist policies in support of industrialization efforts pursued by African Governments from the 1960s into the 1980s fostered industries that are inefficient, generally speaking. (The more these industries depend on imported raw materials and other inputs, the more vulnerable they are.) It is not that the policies themselves forced the industries to be inefficient, but by sheltering them from competition they enabled them to survive and removed the main stimulus to efficiency. The evidence of inefficiency is in the very low capacity utilization of most industrial units, that is, plants and equipment are not in use for much of the time.

The factors that have contributed to the high incidence of down time (low capacity utilization) experienced in African industry have been documented time and again. Some of these factors lie outside the control or competence of the owners and managers of industrial plants:

- Poor physical infrastructure (transport, communications, utilities).
- Shortages of foreign exchange for procuring inputs, including spares and replacement parts.
- Macroeconomic policies of Governments that lead to high inflation and monetary instability.
- A weak or non-existent financial infrastructure.
- Lack of industrial information.
- Inadequate institutional support in training, industrial research and technology development.

Other factors that undermine the production and business functions of manufacturing in Africa lie within the control or competence of owners and managers:

- The use of obsolescent industrial plants for which spares are no longer available from original equipment suppliers. In many cases these plants incorporate outmoded technologies that are not efficient by modern standards.
- Unreliable or scarce supplies of raw materials and complementary inputs from domestic sources, aggravated by the absence of contractual supply arrangements. The result is erratic deliveries and delivery times and ambiguities over price and quality.
- Inadequate management, particularly in production, finance and marketing, and a general absence of quality control.
- A shortage of technical skills at both the shop floor and the supervisory level. This shortage is aggravated by low remuneration and the absence of incentives, both of which make it difficult to attract and retain highly skilled personnel.

Clearly, to make itself internationally competitive, industry in Africa must remedy the deficiencies identified above. For their part, most Governments now recognize a responsibility to create conditions that will be conducive to the efficient operation of industries. To do this they must upgrade the infrastructure and generally alleviate the burdens on industry.

B. The limits to rehabilitation

Already, Governments have expended much effort and resources, at times with international assistance, on the rehabilitation of industrial plants in strategic industrial subsectors. At the same time,

many of them now believe that it is the private sector that will in future be the main engine of growth for their economies, not least in the industrial sector. Accordingly, State-owned industrial enterprises are being privatized by offering them for sale to domestic or foreign investors or joint ventures between these. The question arises whether Governments should prepare their ailing enterprises for sale by further investments in rehabilitation or offer them for sale as is. An important factor is whether the plant is worth rehabilitating. The country's interests might be better served by investing in a new plant that incorporates modern, although not necessarily state-of-the-art, technologies and that, all other things being equal, would be better able to meet international competition.

It is worth remembering that in the new private-sector-driven climate, decisions such as these on whether to "throw good money after bad" are likely to be made by the entrepreneur or investor himself, national or foreign. In the event of privatization, Governments will be forced to recognize that they may not be able to recoup their investment and must instead accept a realistic market price for the assets or the business as a going concern.

The foregoing discussion has reflected on the ability of the current stock of industries in Africa to cope with international competition in their domestic markets. By extension, it follows that they are in no way ready to compete in international markets. No account has so far been taken of how the small size of most domestic markets clouds the prospect of operating plants at optimum levels of efficiency. These prospects can, however, be brightened, at least to some extent, by gaining access to neighbouring markets in the region or subregion on a reciprocal basis. Any ensuing competition will be all to the good. However, since in terms of consolidated GDP even the regional markets remain small, it will be some time before intra-African trade in capital- and scale-intensive industrial products is profitable.

C. Impact of modern methods of production

Turning to new developments in industry in Africa, another set of issues is having an effect on the competitiveness of African industry, and these relate to modern industrial technologies worldwide. The underlying factor is the high level of automation that has become the rule in many production lines. Automation eliminates or drastically reduces the labour input into the manufacturing process, while increasing productivity significantly. In the African context, it would call for higher levels of skills than probably exist at present, creating a cadre of industrial workers who were better trained and would expect to be better paid; at the same time, fewer jobs would have been created in a labour-surplus region. There is, accordingly, a risk that widespread recourse to such technologies could erode the comparative advantage of African countries, which is based on relatively low labour costs.

The most advanced form of automation is the flexible manufacturing system (FMS), which is now widely applied, with varying results, in certain industrial operations in the highly developed market economies of Japan, the United States and Western Europe. Stated formally, the objectives of an FMS are twofold:

- To approach the efficiencies and economies of scale normally associated with mass production.
- To maintain the flexibility required for producing small and medium lot sizes (low to middling volume) of a variety of parts.

An FMS can be thought of as an automated job shop or as a miniature automated factory.

To evaluate the relevance of the FMS concept to industrial production in Africa and its potential impact there, it should be noted that FMS techniques are applicable to two kinds of manufacturing

systems: assembly systems, which assemble components into final products, and forming systems, which actually form components or final products. For the most part FMSs are appropriate in assembly operations, electronic components, printing, garment making and various metal-forming processes.

The key elements in an FMS are machine tools, which are serviced by an automated handling system and are computer-controlled. Each machine tool is linked to an FMS computer (a system of supervisory computers and micro-processors that plan jobs and work flows and that monitor and troubleshoot work in progress, among other things). Such systems use distributed logic control with many levels of intelligent decision-making capabilities.

Clearly, FMS is used in connection with sophisticated high-technology manufacturing, which relies heavily on computer-based management information systems and communication systems in manufacturing. This level of sophistication requires personnel who have equally sophisticated technical literacy and management competence.

Given the inadequate skills base and inadequate technological capacities and capabilities in Africa, it is unlikely that FMS will flourish in the near or medium term, except in special instances. What is more, with a few notable exceptions, such as Egypt, Kenya, South Africa and Zimbabwe, the engineering industries engaged in metal-working and metal-forming have not yet matured nor are computer-aided design or numerically controlled tooling widely used.

There is one further consideration. Conventional thinking is that, based on comparative wage and productivity levels, developing countries as a whole, including some in Africa, such as Mauritius, enjoy a comparative advantage in certain assembly industries, e.g. electronic components and garment manufacturing. It does not necessarily follow that if FMS were introduced this comparative advantage would disappear and that the future of these industries as generators of large-scale employment would be in jeopardy. As a matter of fact, experience in the industrialized world has shown that manual assembly can sometimes be carried out at lower cost than automated assembly. However, the process of modernization may well involve a gradual introduction of FMS into these industries.

Diversification will be pursued at a time when technological changes are fundamentally altering the methods and organization of the production of goods and services and the skills, information, infrastructure and institutions needed to operate an economy efficiently. These forces are shrinking economic space and intensifying direct competition between countries for markets, capital and technologies. Patterns of comparative advantage are changing accordingly, and this may affect the decisions that are made on new investments in industry in Africa.

IV. New initiatives in industrial processing

It has already been observed that natural resource endowment may not, in itself, provide economic justification for the development of processing industries. The selection of specific processing industries is likely to be constrained by the technological and operational factors prevailing in the country where the raw materials are located. Those factors include the minimum economic size of plant, the size of the market targeted, whether domestic, regional or interregional, technological complexity, managerial and skilled manpower, and the availability and quality of the physical infrastructure and other institutional support services. In the final analysis, investment decisions designed to capitalize on perceived potential will rest on a thorough evaluation of the feasibility of the venture as it is affected by these factors.

When attempting to identify new industrial processing opportunities based on the raw materials endowment factor only, it is convenient to focus initially on the raw materials inputs into four industrial sectors:

- Industries that use agricultural products, known as agro-based industries.
- Industries that use forest-based products.
- Industries that use metallic mineral products.
- Industries that use non-metallic mineral products.

Since many of these raw materials feature prominently in Africa's current exports of primary products, one obvious avenue is to process them further in their countries of origin and then enter into the competition for external markets for semi-processed and/or final consumer products. Another avenue could be to replace imported intermediate inputs by domestically processed primary raw materials.

It is not possible in this study to identify all the manufactured products in which some African countries may be able to achieve a comparative advantage. Suffice it to say that, historically, resource-based industries such as textiles and clothing, food products, leather and leather goods, and metal products have prepared the way for a diversified manufacturing sector. The outlook for some representative product groups is discussed next.

A. Agro-based industries

1. Processing of cocoa

The main cocoa-producing countries in Africa are Cameroon, Côte d'Ivoire, Ghana and Nigeria. In all four countries cocoa beans are either exported or processed into intermediate products, e.g. cocoa butter and cocoa powder. By one estimate, the degree of processing achieved is 12-18 per cent. This would suggest that there was room for further processing. However, inasmuch as there is no significant market in Africa for chocolate products, investment for this purpose would need the export market in developed countries to be profitable. In any event there is already underutilization of processing capacity in all of the countries.

Today, it is generally the large international companies that play the leading role in cocoa processing, in both the producing and consuming countries. In Ghana, however, the Government owns and operates the processing companies and in Nigeria the sector is dominated by locally owned companies. Processors in cocoa-producing countries face fierce competition from their counterparts in countries where the market is, who are in any event more efficient. Indeed, processors in countries of origin are known to be high-cost. Additionally, when, as sometimes happens, African cocoa butter and cocoa powder fail to meet quality specifications, they are often sold at discounted prices. This would appear to call into question the real value added by these processing activities given the premium prices that raw African beans command.

Looking to the future, Africa's share of the European market for semi-finished cocoa products is under threat in the wake of the Uruguay Round negotiations. Under the Convention of Lomé,* West African producers exported all their cocoa products to the European Union free of tariff duties. They now face a 100 per cent erosion on export of cocoa beans and 50 per cent erosion on finished products. To protect their shares of this market, African producers must therefore make themselves more competitive in respect of their cost of production and adherence to quality specifications for processed products.

2. Processing of fish

The marine fisheries industry is located in Côte d'Ivoire and Senegal (West Africa), Angola, Mozambique, Namibia and South Africa (Southern Africa) and Morocco (North Africa). The inland industry has developed in Kenya, Uganda and the United Republic of Tanzania (East Africa), as well as in Chad and Egypt. Africa's share of world trade in fish products was 4.5 per cent in 1990, compared to Latin America's 7.2 per cent and Asia's 32 per cent.

Fish are preserved for export by freezing or canning, and a number of processing plants have been established. French canners have invested in Côte d'Ivoire, Morocco and Senegal. Their Spanish competitors have invested in South Africa and Namibia. The processing plants in East Africa, which concentrate on frozen products for export to Europe, are mostly owned by nationals, with some joint ventures. No information is available on MVA in these processes; the operations are labour-intensive.

Fisheries and fish processing have the potential to stimulate the boat- and shipbuilding industry (refitting, repair and maintenance) and the ice making and refrigeration industries. These are the upstream backward linkages. Downstream, by-products such as fish-meal and fish oil are inputs into the animal feeds and edible oil industries, respectively. These are the forward linkages.

The promotion and upgrading of these linked industries, both backward and forward, is potentially the most important development impact. In particular, there is scope for new processing facilities producing higher value added products such as individually quick frozen fillets, for which there is demand in Europe.

Finally, to preserve access to the European Union market, to which Africa's exports of fish products are geared, producers must ensure that they develop and maintain the ability to comply with the entry regulations of those countries for fish and fish products.

*Agreed between the African, Caribbean and Pacific Group of States and the European Economic Community on 31 October 1979.

3. Leather and leather products

The hides and skins of slaughtered animals are the raw materials for the leather and leather products branch. The availability of these raw materials depends uniquely on the population of livestock herds, on which there are no reliable data in most parts of Africa. Because of the risks that impact the size of this population, hides and skins are thought to be the most volatile of all agricultural commodities. Moreover, the commercially available supply of raw hides and skins is determined by slaughter and preservation practices and by the arrangements and facilities set up for collecting this "scrap" for industrial use.

Available information suggests that there have been great advances in the leather sector in the eastern and southern regions of Africa. Ethiopia is the most advanced country, followed by Zimbabwe, Kenya, the United Republic of Tanzania and Sudan. There have been a few advances, in countries such as Rwanda and Burundi, Mali and Niger, but the industry is generally not well developed in those countries.

An export trade in raw hides and skins from Africa to Europe and Asia is well entrenched. The challenge is to transform the status of the African leather sector from supplier of raw materials to the world to supplier of leather and leather products. Some countries have moved into exports of higher valued products, but performance to date has been erratic, depending as it does on raw materials availability, tannery capacity, price trends and the like.

Net value added at each processing step of the leather and leather products branch is shown in table 3. Also shown are foreign exchange earnings and employment creation. Clearly Africa could gain by moving beyond the export of raw hides and skins. Against the foreign exchange earnings, however, must be set off the cost of importing chemicals for specific processes and finishes and equipment and spare parts required to manufacture competitive products.

At present, most of the tanneries can only process to the wet blue stage, at which point value added is minimal (table 3). Investments in chrome tanning are gradually being made, but production of finished leather is not yet commonplace. The forward linkage is into the production of footwear and other leather products such as garments, belts, handbags and the like. Ethiopia has made great headway in this production and exports to Europe. Zimbabwe is an important exporter of footwear, principally to Southern Africa. However, much of the footwear and leather goods production takes place in the informal sector, generating labour-intensive employment.

Leather products are extremely sensitive to quality specifications, particularly in international markets. African suppliers have suffered, in the eyes of international buyers, from the inability of most suppliers to offer goods of consistent grade or quality or of a specified mix. As the supplier moves up the processing ladder, so the risk of non-acceptance by the customer grows; alternative outlets are thus needed in the domestic market, in the region or elsewhere.

Indeed, there is a danger that too much emphasis will be placed on the demanding markets of the developed world, while neglecting the considerable scope for deepening the manufacturing base and expanding the market in the home country, the region and other less traditional places.

Table 3. Economic costs and benefits comparison at various levels of leather processing

<i>Material</i>	<i>Raw hides</i>	<i>Wet blue</i>	<i>Chrome crust</i>	<i>Finished</i>	<i>Footwear</i>
Raw materials <u>a/</u>	550	1 100	1 100	1 100	2 900
Processing costs up to f.o.b. stage <u>b/</u>	115	640	990	1 350	4 940
Total costs	665	1 740	2 090	2 450	7 930
Export price f.o.b. (\$) <u>c/</u>					
per kg	2.2				
per ft ²	0.46	0.80	1.10	1.27	3.50
per pair					7.09
Returns from export sales <u>c/</u> (thousands of \$)	1 100	1 880	2 590	2 990	8 230
Net value added (thousands of \$)	435	145	500	540	300
Cumulative		580	935	975	1 275
Gross foreign exchange earnings (thousands of \$)	1 100	1 880	2 590	2 990	8 230
Less foreign exchange inputs	70	310	460	670	4 430
Net foreign exchange earnings (thousands of \$)	1 030	1 570	2 130	2 320	3 800
Net/gross ratio (%)	94	84	82	78	46
Employment creation	15	19	58	81	365
Cumulative number of jobs		34	73	96	461
Income creation <u>d/</u> (thousands of \$)		24	64	92	350
Cumulative	14	38	78	106	456
Corporate tax <u>e/</u> (thousands of \$)	44	15	50	54	30

a/ Based on purchases of 100,000 bovine hides. Purchase price assumed to be \$1.10 per kilogram, i.e. half the f.o.b. export value at a hide weight of 5 kilograms in dry form.

b/ Chemicals, labour, administration, depreciation, interest and marketing costs (packaging, transport, clearing and loading).

c/ Splits have been ignored in this example.

d/ Total net salaries for the jobs created.

e/ Assumed to be 10 per cent.

B. Minerals processing

1. General

This subsector of industrial activity tends to be highly technology- and capital-intensive. It entails large-scale production, highly skilled managerial and labour inputs and huge investments of capital. This explains why those mineral processing industries that have been established to exploit some of Africa's mineral endowments are owned and controlled by transnationals, whose international interests the African plants must fit into and serve. African interests have invariably been limited to a minority shareholding by Governments in the subsidiaries of those transnationals. For the foreseeable future, opportunities for expansion and/or diversification in this subsector will continue to rest on the evaluations made by transnational companies.

2. Primary aluminium production

The African continent as a whole possesses large reserves of bauxite and energy, the two most important requirements for the production of primary aluminium. The bauxite reserves are enormous. They are concentrated in West Africa (Ghana, Guinea, Guinea-Bissau, Mali and Sierra Leone) and to a lesser extent in Central Africa (Cameroon and Zaire) and East Africa (Madagascar and Malawi). Energy reserves are equally large: East Africa and Southern Africa have coal reserves, several countries of Central, West and North Africa have oil and natural gas, and many countries have hydroelectric potential.

In 1992, Africa produced an estimated 19 million tonnes of bauxite (nearly 16.5 per cent of world output), 0.6 million tonnes of alumina (1.5 per cent of world output) and 0.6 million tonnes of primary aluminium (3.1 per cent of world primary aluminium production). Production of bauxite was concentrated in Guinea (over 1.6 million tonnes) and to a relatively smaller extent in Ghana (400,000 tonnes) and Sierra Leone (1.3 million tonnes). Production of alumina is based solely in Guinea. Primary aluminium reduction capacities are established in Cameroon, Egypt, Ghana and South Africa.

African bauxite producers export largely to Europe, the United States and Asia; the alumina is similarly exported, except for the portion that goes to Cameroon for aluminium production; aluminium produced in Africa is for the most part exported outside the continent.

The forward linkage of the industry is the supply of aluminium for the fabrication of aluminium products. Except for Cameroon, Egypt and Ghana, where local fabricators obtain their supplies from the domestic aluminium plants, all other aluminium metal fabricators in Africa rely on imported metal. In practice, therefore, the linkage remains underdeveloped.

C. Conclusions

This limited sampling of production areas in which vertical diversification could be contemplated confirms the following:

- The country endowed with the input raw materials does not necessarily have a comparative advantage in their industrial processing.
- The creation of linkages, both interindustry and intra-industry, though potentially significant in several manufacturing subsectors, may be equally constrained on grounds of comparative advantage.
- Some processing activities are very intensive in capital, technology and/or highly skilled labour, factors which are scarce in most of Africa.
- In these capital- and technology-intensive industries, the production scales that are necessary for high efficiency may not be feasible, because domestic markets are so small.
- In the minerals-processing subsector, the progress of vertical diversification may be dictated by alliances between African Governments and the multinationals that already have vested interests in the industry.

It can be concluded that while diversification is necessary, its realization will take time. The mix of processing industries and the timing will differ from country to country depending on the level of economic advancement, the macroeconomic policies being pursued and the resource endowments. It might be misleading to assume a comparative advantage, especially in view of infrastructural deficiencies and an inability to cope with technological advances.

V. The diversification fund

In the final analysis, consideration must be given to the nature of the vertical diversification of industrial production and the pace at which it is likely to be achieved in Africa. Progressive diversification, by deepening and widening the scope of industrial operations, is a natural consequence of the maturing process in industrial development. However, such progress is not inevitable, and its patterns and incidences can differ considerably. (The contrasting experience of Taiwan Province of China and Singapore is instructive in this regard.) For latecomers, and Africa is a latecomer, the risks inherent in venturing into more difficult and perhaps more sophisticated technologies may act as deterrents to deepening, unless Governments promote such ventures by means of appropriate strategies.

These promotion strategies must include measures that would set in train the following:

- The modernization of the physical infrastructure to the standards required by modern industry, namely, improved domestic and international transportation networks, efficient telecommunications and reliable power and water supplies).
- Appropriation of the technical and technological capabilities and capacities required by modern industry.
- Acquisition of sophisticated management and business skills.
- Growth of supportive financial institutions.

Interestingly, UN-NADAF recognized the necessity of strategic supports for the diversification programmes that African countries may decide to pursue. One support mechanism is the proposed African Diversification Fund, one of whose purposes would be to help finance the development and implementation of diversification programmes.

It is recommended that a segment of the Fund should be set aside for financing pre-investment studies of projects that meet pre-defined criteria. Some of these criteria might be as follows:

- Promoting a fuller utilization of Africa's natural and human resources and contributing to technological advancement and the development of technical skills and competences in the labour force.
- Contributing significantly to the expansion of non-traditional exports, to greater competitiveness and to increasing MVA in existing industries and in new production capacity.
- Contributing to programmes of industrial diversification in Africa.

Criteria such as these will differentiate the pre-investment financing facility from other funding arrangements for pre-investment studies that may be available from the African Development Bank and other national development finance institutions. While the criteria will deliberately limit the number of projects that qualify to access this facility, it can be anticipated that such projects will require extensive studies before an investment decision can be made. The studies should embrace the following:

- Prefeasibility studies, which give enough information (including market data) to permit a preliminary assessment of the viability of the project and to determine if there is justification for developing the project further.
- Feasibility studies, which appraise the techno-economic prospects of the project based on in-depth analysis of the assumptions made and issues identified in the prefeasibility study.
- Final engineering designs, which comprise the plans, cost estimates and technical specifications necessary for executing an investment project whose feasibility has been demonstrated.

There remains the issue of the source(s) of funding for the pre-investment financing facility proposed herein. It is conceivable that some seed capital can be provided in the form of an international development assistance loan to the African Development Bank for the purpose and matched by counterpart contributions by interested Governments in Africa.