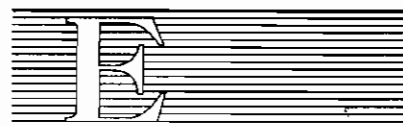




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**Capacities to Exploit Natural Resources  
and Diversify African Economies into  
Processing and Manufacturing**



## EXECUTIVE SUMMARY

It is currently an established consensus that the underdevelopment of the African region is by and large a result of failure for Africa itself and also her partners in development to synthesize the right mix of the required endogenous capacities. One critical component of these capacities is the exploitation of natural resources to produce goods and services which match consumption patterns of the region while being externally competitive. In order to successfully exploit Africa's natural resources, however, a deliberate concerted effort must be made to build mutually supportive human and institutional capacities, as well as to upgrade physical infrastructural capacities in the region.

Industrial manpower training institutions are required to produce a technical cadre, so are institutions to mobilize the financial resources required for sustained and sustainable natural resource exploitation and industrialization. Also, it is not possible to over-state the importance of sound national economic policies within the framework of a well-conceived strategic plan, as well as a political and socio-economic climate that is conducive to private sector development, in general, and the development of the industrial sector, in particular. Industrial policies and specific institutions should aim at developing strong linkages between natural resources and the industrial sector as a basis for sustained economic growth and development. Also, since no country can go it alone, the need for cooperation and integration is crucial and the role of subregional economic groupings is important.

The African region as a whole is well-endowed with a variety of natural resources in the form of land, water, fauna and flora, different energy resources, and deposits of metallic and non-metallic minerals. The general situation, however, is such that reserves need to be further surveyed and updated; practically all of the continent's natural resources are not fully and efficiently used and industrially processed locally; and minerals and fossil fuels are mainly exported in crude or semi-processed form, with only about 10 per cent processed and used locally.

African industries are generally characterized by import dependency for intermediate inputs, equipment and replacement parts. At the same time, most African countries rely on foreign suppliers for a substantial part of manufactured products for consumption. The agro-based industrial subsector accounts for over 60 per cent of the region's manufacturing value-added (MVA). Even then, only a relatively small part of the region's agricultural output is industrially processed.

It is clear, therefore, that Africa needs to move from its present state of dependence on producing and exporting primary commodities while, at the same time, importing most of its industrial products and requirements, to a more balanced economy which combines agricultural and food production and natural resources extraction with the production of manufactured goods as well as providing services. Such a transformation, and the concomitant progress towards self-reliance, can only come about largely through the process of industrialization. This will require the share of manufacturing in total regional GDP to steadily increase from its currently low level of 10.6 per cent, as well steps to boost the rate of utilization of installed industrial capacity from the prevailing low levels of 30 to 50 per cent.

Human capacity to transform natural products is the prime requirement for accelerated growth and sustainable development; and science and technology are critical tools in this process. It is incumbent on African policy-makers to review the issue of basic education and manpower training in this light. Priority should be given to skilled and specialized training of manpower in natural resources exploration and exploitation, entrepreneurship, food production, processing and preservation, industrial development, modes of transportation, enterprise management, trade promotion and research and development. It is also important to develop in Africa a modern industrial culture with attitudes to work which promote innovation and productivity growth and high-quality standards. African countries should not only train specialized manpower, they should also make full use of their expertise instead of preferring expatriate personnel.

In the era of free market forces and privatization, African countries should promote private sector institutions. Particularly, they should endeavour to develop indigenous entrepreneurship, starting with the promotion of small-scale enterprises. Countries should also, individually or collectively, establish institutions or use existing ones, such as the African Institute for Economic Development and Planning (IDEP) and the African Regional Centre for Engineering, Design and Manufacturing (ARCEDEM), to promote the development of new managerial and operational skills.

The implementation of a strategy of natural resources exploitation will require considerable investment capital. It is therefore imperative that effective subregional and regional mechanisms for the mobilization of investible resources for industrial projects be established. In this regard, earlier proposals for the establishment of an African Industrial Development Fund (AIDF) should be given practical support by African Governments and external partners. The experience of other regions, especially East and South-east Asia, clearly shows that foreign direct investment (FDI) has a significant role to play.

For sound industrial development to materialize, a strong and effective institutional machinery is needed to assist African Governments to develop capabilities to foster the process of industrial transformation. Some kind of programming is essential, extending beyond the macro level to include industrial and service subsectors. Mechanisms for coordination and implementation should be defined, however.

The implementation strategy for building capacities to exploit natural resources and diversify African economies into processing and manufacturing should be based on four components: massive invest in human and institutional capacities; forging regional economic cooperation and integration; the role of FDI; and coordination within and among African countries.

## I. INTRODUCTION

1. It is currently an established consensus that the underdevelopment of the African region is by and large a result of failure for Africa itself and also its partners in development to synthesize the right mix of the required endogenous capacities. In this regard, science and technology is central to the development of society. Furthermore, it is of crucial consideration that a workable technology for Africa is the one with a critical mass to produce the goods and services that meet consumption patterns of the African people.
2. The present failure for Africa to develop calls for a fervent reassessment as to what extent has the region followed the path of self-reliance so well articulated notably in the Monrovia Declaration and the Lagos Plan of Action, since only negligible success have been recorded. The downward trend of African underdevelopment must be arrested and be replaced by sustainable growth and development.
3. One critical component of the required endogenous capacities is the exploitation of natural resources to produce goods and services which match consumption patterns of the region while being externally competitive. The present paper therefore first assesses the present capacities to exploit natural resources and diversifying African economies; and then goes beyond to propose mechanisms for improvement where constraints and bottlenecks exist.
4. The first part of this document provides an assessment expose of the manufacturing capacity in Africa. An overview of Africa's natural resources reveals that the region is abundantly endowed but the degree of utilization of these resources is appallingly low. It is also notable that even the limited manufacturing facilities in Africa are not geared to the vast majority of the African people who are in rural areas. Consequently, this majority does not develop taste for manufactured goods which is a further deterrence to local manufacturing. There is therefore no strong link between African natural resources and the domestic market, and in most cases, there has been no success in meeting the needs and standards for the external market.
5. It is also noteworthy that any production techniques to be used, should as much as possible bear in mind the African Common Position in Environment and Development. They should therefore opt for appropriate technologies which are less detrimental to the environment.
6. In order to successfully exploit Africa's natural resources, however, a deliberate concerted effort must be made to build mutually supportive human and institutional capacities. An assessment of these capacities will be a determinant factor as to what is immediately available for use and what improvement is required, for example in the form of retraining or re-orientation. This calls for devising and/or reorientation of curricula dovetailed to the scientific and technological requirements for exploiting Africa's natural resources.
7. Further, development of human capacities calls for availability of relevant institutions. Private sector institutions are vital to energize the African indigenous private sector which presently is extremely weak. Industrial manpower training institutions are required to produce a technical cadre geared to Africa's industrial mode of production relevant to the needs of the region. In addition to financial institutions, it is important to also have institutions linking natural resources and manufacturing in order to harmonize the resource base and processing.
8. The paper concludes by highlighting some elements for an implementation strategy for building capacities to exploit natural resources and diversifying African economies. While as far as possible self-reliance will form the backbone for this turn around, the sight for foreign direct investment will not be lost. Also since no country can go it alone, the need for cooperation and integration is therefore crucial. The role of the sub-regional economic groupings is important in fostering further cooperation, investing in development of human and institutional capacities and cementing further integration with a view to achieving the goals of the Abuja Treaty

establishing the African Economic Community. Furthermore, improved coordination is of paramount importance both within and among countries, in order to increase synergetic effects.

## II. MANUFACTURING CAPACITY

### A. Overview of Africa's natural resources

9. The African region as a whole is well-endowed with a variety of natural resources. Its land, water, flora, fauna, different sources of energy, together with very large reserves of various metallic and non-metallic minerals, create a wide base for the development of processing and manufacturing industries.

#### 1. Land, water and biological resources

10. Land: Africa is the second largest continent, covering about 25 per cent of the total land surface of the earth. However, while Africa's permanent meadows and pastures amount to 25 per cent of the world, total arable land represents only 13 per cent of the world's total. Moreover, only 10 per cent of the arable land in Africa is under permanent crops such as coffee, tea, cocoa, rubber, coconut, palm oil, nuts, fruit trees, vines, etc., and Africa has only about 5 per cent of the world's irrigated land. Other land resources amount to about 30 per cent of the world total and include unused but potentially productive land, built-in areas, wastelands, parks, gardens, roads and barren land.

11. Flora and fauna: Bisected by the equator, surrounded by two oceans and two seas, comprising a number of climatic zones ranging between humid and hot lowlands, deserts, semi-arid areas, and cool highlands, the African region is perhaps the most endowed continent in flora and fauna. The climatic conditions allow to produce such cash crops as coffee, tea, cocoa, cotton, tobacco, natural rubber, as well as cereals, roots, pulses, fruits, vegetables, oils, sugar, meat, fishery and dairy products both for internal use and exports. It should be noted that, in spite of the above advantages, self-sufficiency in food in the region has been declining, forests have been destroyed indiscriminately, and survival of animal life has been endangered.

12. With respect to forest resources, tropical forests and woodlands in Africa were estimated to comprise 17 per cent of the world forests. However, about 90 per cent of total round-wood production have been used as a fuel wood and charcoal, thus contributing substantially to the rampant deforestation and soil degradation leading to the spread of desertification

13. With regard to fauna, the region accounts for total livestock population of 13 per cent of the world comprising cattle, buffalos, sheep, goats, pigs, camels, horses, donkeys and poultry at about 230 million of tropical livestock units, in which one unit corresponds to an animal weighting 250 kg. The continent is also endowed with a huge quantity of wildlife animals and birds. Moreover, resources of the oceans, seas, rivers and lakes (water, aquatic animals and certain essential minerals such as salt and soda ash) are relatively abundant.

#### 2. Mineral resources

14. The African region has very large reserves of the most important metallic and non-metallic minerals essential for industrialization. There are substantial reserves of natural and fossil fuels together with sufficient water resources and hydro-potential for electricity generation. The continent has large reserves of major additives and construction materials and many other mineral input materials essential for sustainable industrialization. Details of mineral resources for industrial development are given in the subsequent paragraphs.

(a) Metallic minerals

15. Iron ore: Iron ore reserves in 35 African countries are estimated at 45 billion tons, accounting for about 20 per cent of the world total. Among them, 14 countries have reserves of more than 1 billion tons each. However, the majority of all known iron ore deposits have not been fully exploited.

16. Alloying metals: The African region is relatively well-endowed with several major alloying metals such as manganese, chromium, cobalt and nickel. Unquantified and unexploited deposits of these metals are known to exist in 25 African countries. As indicated below, the major manganese reserves are in West and Central Africa, while the major chromium, nickel and cobalt reserves are mainly located in the Eastern and Southern African subregion:

(a) Manganese: Africa has 78 per cent of the world's known manganese reserves. Mining of this mineral exists in Ghana and Gabon which alone account for 26 per cent of the world's reserves;

(b) Chromite: Africa accounts for 95 per cent of world known chromite reserves. Most of the production comes from Zimbabwe with proven reserves over 500 million tons. Chromite is also being exploited in the Sudan and Madagascar;

(c) Cobalt: Africa's share of world cobalt reserves is about 33 per cent, comprising deposits located mainly in Zaire and Zambia (75 and 20 per cent of the region's reserves respectively). Other significant deposits are found in Botswana, Uganda and Zimbabwe;

(d) Nickel: The main nickel deposits in Africa are found in Burundi, Botswana and Zimbabwe. These account for 10 per cent of the world's reserves;

(e) Other alloying metals: Tungsten reserves of commercial value are found in Zaire and Zimbabwe. Columbium and tantalum are found in Zaire, Mozambique and Zimbabwe.

(b) Non-ferrous metals

17. The most important in this category are bauxite, copper, lead, zinc, tin, precious and special metals:

(a) Bauxite: Africa's bauxite reserves which are found in 24 countries represent nearly 47 per cent of the world total, with Guinea alone accounting for 33 per cent of the world's reserves;

(b) Copper: Africa's copper reserves are found in 16 countries, Zambia and Zaire accounting for 13 per cent of the world's reserves;

(c) Lead, zinc, tin: Africa has more than 13 million tons, about 8 per cent of the world total lead reserves. The corresponding figures for zinc are 21 million tons and 9 per cent. The non-ferrous metals are found in Morocco, Algeria, Tunisia, Egypt, Zaire, Nigeria, the Congo, Kenya, Namibia, Zambia and Zimbabwe. African countries possess 11 per cent of world tin reserves, which are found in Nigeria, Zaire, Rwanda, Namibia and Zimbabwe, the shares of Nigeria and Zaire being 40 and 30 per cent of all African tin resources respectively;

(d) Precious and special metals: Gold, silver and platinum are among the important precious metals that are produced in several African countries, though in very small amounts. A few countries, including Zaire,

Sierra Leone, Namibia and Zimbabwe, produce such special metals as titanium, lithium, magnesium, beryllium, cesium, zirconium, cadmium mercury, etc.

(c) Non-metallic minerals

18. The following non-metallic minerals are found in Africa:

(a) Phosphates: Africa's phosphate rock deposits in 22 countries constitute the world's largest reserves. They amount to about 100 billion tons or 70 per cent of the world's identified commercially exploitable reserves. Morocco alone has more than 50 per cent of the world's reserves;

(b) Potash: Significant potash reserves are found in eight African countries of which the most important are in Ethiopia and in the Congo. All the potash reserves remain unexploited, and the continent is a net importer of potash fertilizers;

(c) Other non-metallic minerals: Many African countries are endowed with substantial reserves of materials for construction and chemical industry such as salt, soda ash gypsum, sulphur, fluorspar, limestone, dolomite rock and stones including marble, granite, sandstone, precision stones, clays, kaolin, graphite, asbestos, mica, quartz, etc. However, their active exploration involves only a few countries, and many deposits are unexploited.

3. Fossil fuels and energy resources

19. The following are the fossil fuels and energy resources of Africa:

(a) Coal: Africa accounts for more than 10 per cent of the world's coal reserves. These are located in 18 countries and amount to 64 billion tons out of the world's total of 610 billion tons. The bulk of Africa's coal reserves are in the Eastern and Southern African subregion. Zimbabwe, Botswana and Mozambique have 80 per cent of Africa's total reserves and are the largest coal producers on the continent;

(b) Petroleum and natural gas: African oil and natural gas reserves account for nearly 10 and 8 per cent of the world's total respectively. A total of 18 countries, mainly in North, West and Central Africa, have significant reserves of oil and natural gas:

(i) The largest petroleum reserves of the region are in the Libyan Arab Jamahiriya, Nigeria and Algeria representing more than 60 per cent of the region's total. These countries are also major oil producers and exporters;

(ii) The largest natural gas reserves of Africa are in Algeria, Nigeria, Egypt and the Libyan Arab Jamahiriya, accounting for 88 per cent of Africa's natural gas reserves. Algeria is a major producer and exporter of natural gas;

(c) Uranium: Ten African countries have identified uranium reserves estimated at about 5 million tons which represents over 15 per cent of the world's reserves. Production so far exists only in Gabon, Namibia and the Niger exclusively for export. There are no nuclear power stations in Africa, with the exception of South Africa;

(d) Hydro-power potential: All African countries, with a few exceptions (Algeria, the Libyan Arab Jamahiriya, Botswana, Chad and Togo) have significant exploitable water resources for electricity production and for industrial use. Africa's technically exploitable hydro-power potential is estimated at over 360 GW, a little over 16 per cent of the world's total, of which less than 5 per cent is exploited. Zaire alone has a hydro-power potential of more than 100 GW. The major electricity producers are the Libyan Arab Jamahiriya, Algeria, Nigeria, Morocco, Zambia and Zimbabwe.

20. The general situation regarding Africa's relatively huge natural resources endowment is that:

(a) These reserves need to be further surveyed, studied, assessed and updated since the actual reserves seem to be much larger than those known to date;

(b) Practically all natural reserves of the continent including land, water, biological resources such as resources of flora and fauna, agricultural and forests, livestock and fishery are not fully and efficiently utilized and industrially processed locally;

(c) Mineral resources including metallic and non-metallic minerals, fossil fuels and energy resources, mainly exported in crude or semi-processed form in order to earn foreign exchange, and only about 10 per cent of them is processed and used locally.

#### B. Degree of utilization of natural resources in Africa

21. In spite of its substantial share in both world area and population, Africa's contribution to the total world output (GDP) is only 1 per cent. Specifically, while in terms of natural resources endowment, Africa clearly has comparative advantage over other continents, it remained the least industrialized region in the entire world.

22. The major industrial activities in the region are mining and beverages, tobacco, textiles, wearing apparel, leather, rubber and metal consumer goods industries. The African industrial sector is presently dominated by food processing and light industries which account for about 60 per cent of both manufacture value added (MVA) and industrial employment. Geographically, industry is spread very unevenly. At the beginning of the 1990s, four countries (Algeria, Egypt, Morocco and Nigeria) jointly accounted for about 55 per cent of the continent's MVA, 13 countries accounted for another 44 per cent, while the remaining 34 countries represented less than 1 per cent of the region's MVA.

23. The present situation with respect to utilization and processing of the vast African natural resources leaves very much to be desired. The rate of utilization of natural resources is very low and production facilities for metals, chemicals, engineering products as well as for the processing of reserves of flora and fauna are inadequate. Such facilities exist only in a limited number of countries and their capacity utilization is very low (between 30 and 50 per cent). As a result, the continent is heavily dependent on imports of most of its requirements in manufactured goods including food, steel, chemicals, machinery and equipment, spare parts and many other consumer goods.

##### 1. Utilization of land, water and biological resources

24. From Africa's total land area of 29.6 million km<sup>2</sup>, the share of arable land is only 5.7 per cent, of which 6.5 per cent is irrigated. Thus, 94 per cent of the region's total land area still remains unused, and over 93 per cent of the arable land is not irrigated in spite of huge ground and underground water resources available in the region.



25. With regard to utilization of flora and fauna resources, it should be noted, firstly, that post-harvest losses in Africa could be as high as 40 per cent for grains and 20-40 per cent for fish catch; secondly, only a relatively small part of these resources is industrially processed. For example, in 1992, the rates of processing into final stage were 40 per cent for oilseeds, 50 per cent for cotton, 20 per cent for hides and skins, 20 per cent for fish and between 10-15 per cent for meat, fruits, vegetables, cocoa and tobacco.

26. The above situation has made the region a net importer of food and other major essential processed agricultural products for which it is supposed to have comparative advantages. In 1990, Africa imported relatively large quantities of sugar (2.3 million tons), oils (1.5 million tons), meat (0.42 million tons), fish (0.62 million tons), milk (0.63 million tons), and even some fruits. Moreover, while the region is a net exporter of tropical fruits and vegetables (12 per cent of the world production), coffee (21 per cent), tea (11 per cent) and cocoa (17 per cent), only a small part of these cash crops is industrially processed in a limited number of countries, mainly in Kenya, Côte d'Ivoire, Ghana, Cameroon and Nigeria.

27. Production of roundwood in Africa amounted to 440 million tons in 1990 (13.2 per cent of the world), but 90 per cent of this is used as fuel, while finished wood products amount to less than 1 per cent of total wood production. As a consequence, the region is a net importer of plywood and paper.

## 2. Utilization of mineral resources

### (a) Metallic minerals

28. Iron ore: The major exporters of iron ore in Africa are Mauritania and Liberia, which combined production in 1990 was about 23 million tons as against an average of 30-33 million tons in the 1980s. Algeria, Egypt and Zimbabwe are the major producers of iron ore for domestic processing. Nigeria, Tunisia and Morocco are also exploiting their deposits. But vast iron ore reserves, including those in Zaire, Côte d'Ivoire, the Libyan Arab Jamahiriya, Guinea, Ghana, Angola, Senegal, Sierra Leone, Gabon and others, remain unexploited. The level of exploitation and utilization of Africa's iron ore reserves to produce iron and steel is therefore and by far not commensurate with the abundance of this raw material.

29. Other metals: Most of African metals are not processed into semi-finished and finished products, except in a few countries. For example, only a few African countries including Zimbabwe, Nigeria, Algeria and Egypt produce ferro-alloys and special grade steel using alloying metals. With respect to non-ferrous metals, bauxite is mined in only five countries (Ghana, Guinea, Mozambique, Sierra Leone and Zimbabwe), while alumina is produced only in Guinea and primary aluminium in three countries (Cameroon, Egypt and Ghana).

30. As already indicated, special and precious metals such as gold, silver, titanium, lithium, beryllium, cesium, zirconium, cadmium, mercury, etc., are produced in very limited quantities in a few countries including Zaire, Namibia and Zimbabwe. Uranium is produced exclusively for export only in Namibia, the Niger and Gabon.

### (b) Non-metallic minerals

31. Phosphates, potash and nitrogenous fertilizers: Africa, with the largest reserves, accounts for only 25 per cent of the world's phosphate production, of which 60 per cent is exported. Phosphate fertilizers are produced only in five countries (Morocco, Egypt, Algeria, Tunisia and Senegal). As indicated earlier, there is no exploitation of Africa's potash reserves. Nitrogen fertilizers such as ammonia and ammonium nitrate are

produced from natural gas only in six countries (Algeria, the Libyan Arab Jamahiriya, Egypt, Nigeria, Zambia and Zimbabwe).

32. Building materials: Although the African continent is well-endowed with a variety of construction minerals such as limestone, sand, clay, sandstone, granite, marble, silica, quartz, etc., their exploration and industrial processing exists only in a few countries. For example, significant production of sheet glass exists only in Nigeria and the United Republic of Tanzania; production of clay-based tiles exists mainly in Egypt, Nigeria and Tunisia, and Africa spends annually some US\$ 300 million for imports of bricks and refractories; even such materials which are widely available locally, as sand, crushed stone and gravel, were imported at a cost of \$200 million in 1990. Moreover, although more than a half of African countries are cement producers, import of cement in 1990 amounted to \$300 million.

### 3. Fuel and energy resources

33. Primary energy production in Africa is very low, at about 6 per cent of the world's output. Commercial energy consumption is concentrated in urban areas, industry and transport sector and traditional energy in the rural areas, mainly in the forms of fuel wood and charcoal (80-90 per cent). Oil is the major energy source in the industrial and transport sectors (about 70 per cent of total commercial energy consumption), while natural gas and coal account for about 10 and 20 per cent respectively. It should be noted that utilization of the abundant sun and wind energy is marginal.

34. The production of the various types of energy resources is reviewed below:

(a) Coal is generally used for electricity generation. In addition, it is used in only few countries (Algeria, Egypt and Zimbabwe) in metallurgical and chemical industries;

(b) Oil and natural gas: Oil is produced mainly in the Libyan Arab Jamahiriya, Nigeria and Algeria. Other oil producers include Gabon, Angola, Benin, Cameroon, the Congo, Côte d'Ivoire, Egypt, Tunisia and Zaire. As for oil, natural gas production also is concentrated in Algeria, Nigeria and the Libyan Arab Jamahiriya. It is produced in Egypt, Morocco and Senegal for domestic consumption;

(c) Hydro-electric power: Although most African countries are endowed with a high hydro-energy potential, the total installed capacity is only 5 per cent of the exploitable potential. Moreover, 85 per cent of this capacity is concentrated in 10 countries and the remainder are mostly net energy importers. Moreover, half of African countries produce less than 5 GWh energy per year and their per capita energy consumption is less than 1 GK, which is 50-60 times less than the world's average.

### C. Present state of production and consumption of manufactured products in Africa

35. African industries are generally characterized by import dependency. Except for the traditional domestic resource-oriented industries producing food, textiles, leather goods and cement to meet part of domestic requirements, most African countries rely on foreign suppliers for a substantial part of manufactured products for consumption or production. It should be stressed that significant industrial sector, with the relevant infrastructure, exists only in a limited number of African countries.

## 1. Chemical industry

36. Eight African countries have a relatively important chemical subsector with refineries, petrochemical and fertilizer plants. They are Algeria, Cameroon, Côte d'Ivoire, Egypt, Gabon, Morocco and Nigeria. A brief survey of the industry is provided below.

### (a) Fertilizers

37. During the 1980s, the production of phosphate fertilizers more than doubled, from 0.8 million tons in 1981 to 2.2 million tons in 1991. Morocco, the world's largest producer of phosphates, recently built the world's largest production unit of di-ammonium phosphate at Jost Losfar. Morocco has a total capacity of 5.2 million tons per year for the production of phosphoric acid. In 1990, the country became the world's largest exporter of this product. Egypt has also four complexes for the production of phosphoric acid and phosphate fertilizers.

38. The current production of nitrogenous fertilizers in Africa stands at 1.8 million tons per year. The combined production capacity of the continent is around 2 million tons. Egypt is one of the main producer with five production units for ammonia and nitrogenous fertilizers.

39. Other significant producers of fertilizers are Tunisia (about 1.2 million tons) of DAP/NPK) of which a substantial part is exported; Algeria, with an ammonia complex and nitrogenous fertilizer plant (0.9 million tons per year); and Nigeria, with a nitrogenous fertilizer complex of three units having combined capacity 1.1 million tons per year. Other producers are Zimbabwe and the Libyan Arab Jamahiriya (production in 1991 was 71,000 and 89,000 tons respectively). It is to be noted that the total fertilizer production of the continent represents only about 5 per cent of the world's output, while Egypt alone is one of the most largest customers of fertilizers in the world with 360 kg/ha of arable land.

40. Currently, Africa imports all its total requirements of potash fertilizers. The production being concentrated in a few countries and the region, as a whole, depends heavily on imports (80 per cent of the total in 1991).

### (b) Petrochemicals

41. So far, Algeria and Egypt are the only African countries with a significant petrochemical industry, producing ammonia, methanol and ethylene from natural gas. Methanol is used for the production of synthetic resins and ethylene for the production of polyethylene and polyvinyl chloride.

### (c) Pharmaceuticals

42. Although there are pharmaceutical formulation units in many African countries, especially in North Africa, facilities for the production of active ingredients do not exist on the continent. Specifically, the region has largely neglected the huge potential for producing pharmaceuticals based on medicinal plants.

### (d) Basic chemicals

43. With reserves of natural soda ash of 530 million tons, Africa has a combined annual production capacity of only 0.4 million tons. The annual production is about 0.3 million tons. Caustic soda is produced only in

Algeria, Egypt and Kenya (50,000-60,000 tons/year), while the estimated annual demand for the region is about 0.8 million tons.

## 2. Metal industry

### (a) Iron and steel

44. During the 1980s, steel production in Africa doubled from about 2.5 to 5 million tons. Today, there are eight integrated iron and steel complexes located in six countries: Algeria, the Libyan Arab Jamahiriya, Egypt, Tunisia, Nigeria and Zimbabwe. A number of other countries (Algeria, Egypt, Morocco, Ghana, Mauritius, Uganda, the United Republic of Tanzania, Nigeria and Kenya) have also established mini-steel plants and rolling mills. There are also 29 mini-steel plants works and 45 rolling mills in 22 African countries. However, with the combined annual installed capacity of all steel plants in Africa at about 11 million tons, their current production of about 5 million tons, represents only 0.6 per cent of the world's output, while the estimated regional demand for 1990 was over about 20 million tons.

### (b) Copper

45. Among the 12 African producers of copper concentrates, six countries produce smelter copper and five countries refined copper. Copper products are manufactured mainly in Zambia, Zimbabwe, Cameroon, Ghana, Egypt and Algeria.

### (c) Aluminium

46. Bauxite production in Africa rose from 12.5 to 19.2 million tons in 1982 and 1991 respectively. Alumina is produced only in Guinea (0.65 million tons in 1991). There are three smelters in Egypt, Ghana and Cameroon respectively with a total production of 0.44 million tons aluminium in 1991, the major part of which being exported. Aluminium products are manufactured in Ghana, Egypt, Algeria and Cameroon.

## 3. Engineering industries

### (a) Foundry and forging facilities

47. Algeria, Egypt, Kenya, Nigeria and Zimbabwe are among the few countries in Africa which have fairly developed foundry and forging facilities. Total installed capacity of foundries in Africa is estimated at about 0.5 million tons a year with current annual production at around 0.2 million tons, or 40 per cent of capacity utilization. The corresponding figures for forging facilities are 0.14, 0.09 million tons and 60 per cent of capacity utilization.

### (b) Assembly plants

48. There are assembly plants in many countries. However, most of the parts and components (50-90 per cent) for assembly as well as for the repair and maintenance are imported.

(c) Agricultural tools and implements

49. In 1990, the regional gap between production and demand was estimated at 31.5 million for hand tools, 3.8 million for animal-drawn implements and 0.25 million for powered implements. The region is currently importing large quantities of agricultural machinery, tools and implements.

(d) Transport equipment and electrical machinery

50. With respect to transport equipment and electrical machinery, Africa's share in world production is only 0.3 per cent on average. Most equipment is therefore imported.

4. Agro-based industries

51. Although this subsector accounts for over 60 per cent of the MVA of the region, a relatively small part of the agricultural commodities is industrially processed. Installed industrial processing capacities in the region are not adequate and their level of utilization is very low, averaging between 30 and 50 per cent. Africa is therefore a net importer of the major processed agricultural products, such as fish, meat, milk, oils, flours, sugar, etc. The same applies for forest- and aquatic-based industries.

5. Linking natural resources to domestic and external requirements

52. From the above review, it is clear that Africa needs to move from its present state of a continent largely dependent on producing and exporting primary commodities, to a more balanced economy which, in addition to agricultural and food production, will also produce manufactured goods and provide services that are needed. Such a transformation and the consequent achievement of self-reliance can only come about largely through the process of industrialization.

53. The performance of the African economies, however, and the industrial sector in particular remains appallingly poor. The share of manufacturing in total regional GDP remained low at an average of 10.6 per cent during the period 1990-1992. Manufacturing value added has been constantly declining. A major cause for industrial decline in Africa has been a very low utilization of installed industrial capacity ranging from 30 to 50 per cent in most countries. Therefore, the process of transforming and restructuring the industrial sector of the African economy with a view to bring about sustainable development must be preceded by a reassessment of capacity utilization and its relevance to the natural resources base.

54. Given the region's huge natural resources including flora, fauna, minerals, water and energy and their more efficient utilization, the prospects are very promising for development of various facilities, including agro-forest and aquatic-based, chemical, metal, engineering, building materials industries. Assuming a better linkage between natural resources and manufacturing facilities and improvement in the capacity utilization of the latter, Africa's industrial output would steadily increase at least twice. Examples illustrating such prospects are given in the subsequent paragraphs.

55. The Food and Agriculture Organization of the United Nations (FAO) estimates that Africa has the potential to achieve a 36 per cent share of the fertilizer production. This would enable the region to become the world's largest producer of fertilizers. Production and demand forecast for fertilizers in the region shows that it could be self-sufficient in the majority of fertilizers.

56. With respect to metal industries, capacity utilization is only 50 per cent on average. With increased capacity utilization and as well as planned iron and steel projects, the continent could produce at least 50 per cent of the required steel. However, further efforts are needed to reach self-sufficiency in steel and basic metals in the region, using huge unexploited and unutilized resources of metallic ores, fuels and additional materials available.

57. With respect to agricultural tools and machinery, the region is currently producing from 30 to 50 per cent of its requirements. At the same time, the capacity utilization of existing engineering industries is in the range of 30 to 50 per cent. Therefore, by increasing capacity utilization and tapping unexploited natural resources, the region could be self-sufficient in agricultural tools and machinery.

### III. HUMAN CAPACITY

58. Human capacity to transform natural products and use them for the benefit of the people is the prime requirement for accelerated growth and sustainable development particularly in Africa. It is paradoxical to note that over the last three decades following the independence of African countries, manpower could not contribute effectively to economic growth and development in spite of substantial investment in human resources.

59. Specifically, science and technology, critical tools for socio-economic transformation, have not been given adequate attention in Africa's primary, secondary and tertiary curricula. The result has been that the number of Africa's scientists, technologists and engineers have not reached the necessary critical mass to contribute effectively to the transformation and upgrading the region's raw materials.

60. It is incumbent on African policy-makers to review the issue of manpower training and accord priority to improving science and technology education at all levels. This should aim at providing proper training of cadres responsible for processing agricultural products, transforming raw materials and upgrading existing products and services. It is also necessary to embark on the overhaul of primary, secondary and tertiary education with completely new curricula, with the accompanying teaching, laboratory and equipment requirements.

#### A. Entrepreneurial capacity for industrialization

61. Evidence shows that in both the public and private sectors of African economies, the capability to initiate development ideas, plan, design, execute and evaluate the corresponding projects as well as manage industrial investments lies mostly with administration and management. More important, the translation of national development strategies and objectives into entrepreneurial and industrial programmes and activities requires substantial administrative capability and managerial skills at all levels. These administrative, managerial and entrepreneurial capabilities operate through people and within established organizational structures, procedures, rules and regulations. The effectiveness, relevance and efficiency of these structures and procedures and of the people who run them in public and private enterprises will, as a last resort, determine the pace of entrepreneurial development and industrialization in Africa.

62. In view of the above, all types of trained manpower and at all levels are required; but the limitations of financial and institutional facilities for training make it mandatory that some priority areas should be determined. This would have to be in relation to the priorities set at national, subregional and regional levels including, *inter alia*, self-sufficiency in food, establishment of a sound industrial base and physical integration of the African region.

63. In this regard, priority would have to be given to skilled and specialized training of manpower in respect of natural resources exploration and exploitation; entrepreneurship; food production, processing and preservation; industrial development and processing of raw materials; all modes of transportation and communications; administration and enterprise management; trade development and promotion; scientific and technological research, etc. Once the priorities have been agreed upon, then the next issue would be to determine the specific requirements of knowledge, skills and attitudes in respect of each priority sector, subsector and development project and programme.

64. Yet it is increasingly acknowledged that the future growth in Africa, particularly industrial growth, rests with entrepreneurs, markets and supportive policy frameworks provided by African Governments and private sector management. Indeed, private sector enterprises provide a dynamic and potentially efficient means of spearheading emerging challenges of African development within the context of the democratization process sweeping across the continent. In this regard, it will be necessary to build entrepreneurial capacity and enhance private sector development by ensuring that African Governments' policies are fully supportive.

65. Building entrepreneurial capacity presupposes that the people who are expected to participate in entrepreneurial activities, investment ventures and development projects have full knowledge of what role they are expected to play as entrepreneurs. Hence, there is need for entrepreneurial education for policy-makers, planners, entrepreneurs, educators, employers, labour leaders and workers and industrialists. Elements of entrepreneurial education should cover such areas as:

- (a) Peace, security and stability, since entrepreneurship at any level cannot thrive in a context of instability;
- (b) Information systems of micro-economic and market behaviour with emphasis on institutional capacity, particularly in government for policy development and policy coordination and analysis of existing enterprises;
- (c) Development of financial markets and institutions, particularly capital markets and banking institutions to enable formal sector entrepreneurs to have access to finance and credit for enterprise development;
- (d) Investment promotion and economic management with emphasis on investment ventures both national and foreign and on the development of managerial, technical and technological skills for managing economic and investment ventures.

#### B. Technical and managerial capacity and utilization of trained personnel

66. Over the last two decades, identification has been made of skill-gaps in terms of manpower availability, skills and knowledge requirements as well as management capability for industrial development and exploitation of natural resources. Such an identification has revealed serious weaknesses which must be remedied in order to develop the needed human resources for industrial development. Among the actions which must be taken are:

- (a) Foster the will to develop industrially and to genuinely cooperate;
- (b) Develop institutional infrastructure for specialized training in critical manpower areas and research for development, particularly in scientific and technological skills and by ensuring that educational institutions are provided with adequate financial, material and human resources to be able to produce adequate and qualitative outputs;

- (c) Reduce over-reliance on the use of foreign technical assistance;
- (d) Develop curricula and course content in formal education institutions in terms of skill-knowledge base for manpower development and harmonize education with natural resources endowment and the socio-economic milieu of the country;
- (e) Develop adequate quantity of middle-level technical and supervisory staff as well as highly trained senior staff in critical manpower areas while at the same time reducing the under-utilization and mal-utilization of available highly trained manpower; and
- (f) Achieve a better ratio between arts and social sciences on the one hand, and science, technical and technological subjects on the other so as to develop and foster functional skills and know-how for solving development problems.

67. The required manpower in industry, agriculture, natural resources and scientific and technological development will need to be produced by education and training institutions. However, to produce the required and necessary manpower for industrial development, greater emphasis will have to be put on the training of better and qualified teachers at the first and second levels, as well as the training of teacher trainers, tutors, lecturers and researchers, technical and management staff.

68. More important is the training of a cadre of academics and research staff for tertiary level teaching in the sciences, mathematics, technical and technological subjects. It should be emphasized that qualitative human resources requirements can only be produced by educational and training institutions which are themselves manned by a cadre of well-trained and qualified teachers, lecturers, tutors, trainers and academics at all levels of the education system. As a producer of educated and trainer manpower, education sector must itself be well endowed with qualified manpower particularly in the scientific and technological fields.

### 1. Education and training

69. Knowledge, skills, know-how and attitudes that are crucial in the development process of industries and enterprises can better be acquired through education. In this regard, the structure and delivery capability and capacity of the education system, the quality of its staff/human resources, the content of the subject matter taught and the courses offered particularly in the scientific and technological fields, as well as the judicious mix of academics and functional skills requirements are of paramount importance in the preparation and training of manpower for industrial development as well as socio-economic and technological transformation.

70. An important aspect is the extent of the adequacy and relevance of prevailing educational systems, course offerings and course content in each of the three levels of the educational system. In this regard, where deficiency have been identified, it would be necessary to initiate appropriate reform measures in respect of educational development policies and objectives; the orientation of education to the socio-economic, industrial, entrepreneurial and technological needs of society and the community served; reforms in curricula, context and teaching methods so as to produce the needed technical managerial and technological knowledge, skills and attitudes; reform in the management of education system itself; and in the sharing of responsibilities between education management, school authority, the teachers, parents and the community and those who are taught.

71. A review of institutional capabilities should also be made of the existing second and third level institutions in order to determine whether in the light of industrial and entrepreneurial development, existing institutions are in a position to train and produce the required manpower in adequate quantity, and where this is not



the case, necessary changes should be made. Also, educational and vocational and career guidance and counselling should be a necessary component of education and training because it is important to take into account the job aptitudes of individuals pursuing different courses of study and training. Action should be taken to inform students and job seekers what jobs are available in the employment market, and what jobs to expect in future so as to facilitate individual choices of fields of study and occupation whose potentials are closest to their respective skills and aptitudes.

## 2. Labour, employment and the brain-drain

72. The critical issues facing Africa today are the low quality of the work force in terms of productivity and attitude to work; acute shortages of highly skilled and specialized manpower particularly in the technical, managerial scientific and technological fields; increasing unemployment among school leavers and university graduates and serious underemployment in rural areas; and increased level of dependence on foreign skills, know-how and expertise while African graduates remain unemployed and unutilized. Such a situation may relate to a number of issues including the relevance of the type of education received; job expectations or social constraints and attitudes; job opportunities and availability of development projects that can utilize the type of knowledge and skills in African economies, including choice and adaptation of technology to facilitate substantial increases in employment of school leavers and graduates; etc. It also relates to the areas in which industrial investments, agriculture, services and public and private enterprises should be given more attention in order to create increasing volume of work and enhance a higher rate of work force participation in the labour market and economic activities.

73. The African manpower situation is also characterized by brain-drain. The brain-drain phenomenon is now endemic in Africa - millions of uneducated and educated Africans are living and working outside the region; several thousands of qualified Africans (scientists, engineers, lawyers, academics, researchers, etc.) are today resident abroad.

74. The causes of the African brain-drain range from political victimization; civil wars resulting from political conflicts, search for better educational and research facilities; inability to secure jobs with commensurate remunerations and appropriate to narrow educational specializations; and ineffective machinery to encourage the return of nationals living and working abroad. There is need to improve the effectiveness of policies, programmes and administrative machinery for reversing the brain-drain and persuading skilled and trained manpower to return to Africa so as to get involved in national development activities. Accelerating the pace of industrial and entrepreneurial development might just act as a catalyst for attracting some of the skilled and trained manpower to return to Africa.

## 3. Technical and managerial capability

75. Manufacturing enterprises development requires not just scientific and technological manpower, but technical and managerial skills and know-how. Considerable attention has been given to resource mobilization and management, governmental structures and procedures, project development and investment ventures and their management. What should not be overlooked, however, is the materials and maintenance function of industrialization. The importance of materials management should be recognized when account is taken of the size of national resources devoted to the purchase and importation of industrial machinery, equipment, raw materials and other stock needed for development projects investments. The administration of these materials, equipment and machinery - i.e., ordering, shipping, transportation, customs clearance, inventory, storekeeping and supplies as well as distribution - constitute major management tasks.

76. Building technical and managerial capability should include staff training and professionalization of procurement and supply function. Cooperation among African countries through intra-African trade and formation of regional and subregional associations of public and private services could help to promote efficiency and reduce corruption and waste in public and private procurement and supply management and finance.

77. Equally deserving attention is maintenance management in both public and private investments. Substantial financial resources in Africa are spent on the purchase of machinery, equipment, tools, buildings, furniture, computers; departmental, parastatal or company vehicles while apathy prevails in their maintenance to ensure optimum life and service. It is therefore not uncommon to find that for lack of maintenance or a small spare part, very expensive machines and equipment are allowed to go out of use. What Africa needs therefore is to treat the maintenance function as important as purchasing and installation of new machinery and equipment; to provide resources for maintenance management; and to ensure that trained personnel with technical and managerial skills and know-how provide needed maintenance services; and cultivating a more positive attitude with regard to the use and care of machinery, equipment and property to ensure optimum life and service.

### C. Scientific and technological training for industrialization

78. Accelerated growth and sustainable development can start with the application of appropriate science and technology. The diffusion of appropriate technologies in the rural areas can be accelerated through the integration of such technologies in the school curricula. For example, they should include appropriate technologies which are part of the domestic environment such as solar heaters, coolers, driers, biogas units, improved stoves, improved cooking methods, yoga and meditation, integrated farming and pest control, biofertilizer making, repair and maintenance of household equipment and a host of other practical elements.

79. At a higher level, the transfer of relevant manufacturing technologies from outside should be encouraged through people trained in technology assessment, negotiation and acquisition. The application of these technologies should be the starting point for adaptation and innovation, leading to research and development. For this to materialize, governments should give all possible incentives to entrepreneurs, including risk-venture capital and tax-free holidays for the application of technologies to upgrade raw materials and commodities. This is to be coupled with new legislation to attract foreign direct investment in firms that will enhance employment opportunities to qualified people. Training for policy-makers, researchers, entrepreneurs and people in such service sectors as banking and consultancy services should also be organized as a priority. These will create the enabling environment within which technology transfer can accelerate economic growth and development.

80. However, this will also require the development of a modern industrial culture and the associated technology, occupational and job attitudes as well as the development of adequate supply of technical, managerial and supervisory skills for the operation of industrial processes and design. In this context, the training of an entrepreneurial capacity is a priority and the content of scientific and technological curriculum, particularly in institutions of higher learning, should focus on the real requirements of processing and manufacturing. To this end, emphasis should be put on:

- (a) Strengthening existing national machinery to cope with endogenous technology development;
- (b) Strengthening existing science and technology education so as to produce students coming out of the education system with essential skills for national development; and
- (c) According a high priority to science and technology especially in financial allocations as well as strengthening existing machinery for the regulation of technology transfer transactions.

#### **D. African industrial cultures and traditions**

81. Cultures, traditions, values and norms in Africa have been greatly affected by the emergence of an industrially based exploitative social system which is, in turn, based on maladaptive values. At the same time, cultural values and traditions are threatened by Africa's imported life styles, a high degree of dependence on Western science and technology, technical and financial assistance and food aid as well as instructional materials, textbooks, equipment and trained and specialized education personnel.

82. African countries are making efforts to ensure that education and mass media, radio and television are used to maintain a sense of cultural identity and promote nation building, i.e., the creation and development of homogeneous and self-sufficient and self-sustaining social and economic systems. This, however, is being done at a price not easily affordable by rural communities. What has happened is that rural communities are cut off from urban and peri-urban areas with adopted lifestyles which have put excessive trust in Western ways of life as well as trust in manufactured goods and products, tastes and technology.

83. It is important that Africa develops an industrial culture and tradition which incorporates modern professional and industrial ethics particularly in respect of materials and maintenance management with due consideration to traditional values. Africa has also to develop a tradition for respect for public or private property; care and maintenance of property, machinery and equipment; and reduce financial waste.

84. Trained and specialized manpower must possess not just knowledge and skills but proper attitudes and self-confidence for national development. Equally important is for African Governments to change their attitudes towards indigenous trained manpower and qualified experts who are always bypassed in recruitment in preference to expatriate personnel. Less qualified consultants and experts from developed countries are recruited at the expense of well-trained and qualified nationals. This attitude has to change and stop if Africa is to build its own human capacity and capability.

#### **IV. INSTITUTIONAL CAPACITIES DEVELOPMENT**

85. The nature of institutional capacities that have to be strengthened depend to a large extent on the challenges outlined in sections II and III. In particular, appropriate institutions are required in the areas of private sector development, human resources, institutional linkage between primary and industrial sectors, political and administrative institutions and other support institutions.

##### **A. Private sector institutions**

86. In an era of free market forces and privatization, Africa finds itself with a weak indigenous private sector. African countries should, therefore, endeavour to develop indigenous private/cooperative entrepreneurship starting with the promotion of small-scale enterprises. To improve the capabilities for local private entrepreneurs at the overall economic level, the government should promote growth of local management consultancy and problem-solving skills and set up institutions to help potential entrepreneurs in selecting projects of their choice. Physical and financial support systems should be set up, including provision of common testing facilities and industrial standardization and quality control methods, subsidized interest rates on loans, transport subsidies, price supports, consultancy services and setting up of special institutions for marketing products of small-scale entrepreneurs.

87. In the specific area of natural resources development, the private sector must be encouraged to play a leading role including establishing its own institutions. The private sector should also devise innovative

institutions to attract foreign direct investment. Such institutions could act as national bodies for the domestic improvement of industrialization legislation to minimize the contradictions between objectives of the foreign private entrepreneurs and the goals of the host country; for better package of incentives such as tax relief to attract more foreign investment; easy access should be made to information on investment opportunities, economic climate, resource endowment and other data which a potential foreign investor needs to develop interest in investing in the national economy; of particular importance is the establishment of an investment centre which could provide all the information and facilities to potential investors. Such an organization could have offices or constantly channel information to various countries abroad - even on joint basis with other African countries.

88. Five basic functions are needed to ensure effective popular participation in the formulation and implementation of a strategy to exploit natural resources and diversify African economies through industrialization. These include identification, outreach, dialogue, assimilation, and feedback. It may be necessary to envisage private sector mechanisms or institutions that would shoulder these responsibilities.

89. With respect to identification, it is important and necessary to identify groups or individual members of the public who may be interested in or affected by the industrial action. As for outreach, the public can contribute effectively only if its component parts are provided with accurate, understandable, pertinent and timely information on industrial plants issues, alternatives and decisions. The information should be shaped along non-technical, general and value lines. Very technical, specific and detailed information required from the public usually discourages its participation in industrial ventures. On the contrary, projects should be stated clearly in the outreach information.

90. Dialogue may take several forms such as meetings, workshops, hearings, personal contact or personal correspondence and may conclude the establishment of special groups such as advisory committees and task forces. The assimilation of the public (private) viewpoints and preferences into final conclusions consists of putting together the results of the "outreach" and the "dialogue" phases. The feedback should include a statement of the industrial action that was taken and show the effect popular participation will have on that action.

#### B. Industrial manpower training and research institutions

91. Skills are required for corporate planning and implementation, including project analysis and production control in both the private and government sectors. In this connection, countries should individually and/or collectively establish institutions for promoting development of new and anticipated managerial and operational skills. African universities and other institutions such as the African Institute for Economic Development and Planning (IDEP) and the African Regional Centre for Engineering, Design and Manufacturing (ARCEDEM) should therefore develop programmes consistent with these needs. Institutes for industrial feasibility studies have also to be set up. Other methods of manpower development could be developed through fellowships, workshops, seminars and study tours.

92. There is also need to deepen local intermediate skills. This problem, that has pervaded the import-substitution policies in African countries, has resulted in high-cost industries and has weakened the potential comparative advantages of the African region. In essence, African countries have to deal with the content of syllabi, particularly at the secondary and tertiary school levels; the strengthening of existing research and development institutions; intensification of on-the-job training; and creation of new institutions such as African multinational industrial and mining corporations; etc. Furthermore, technical assistance should be used rationally with as many local staff as possible.

93. African countries will also require to develop large-scale absorptive capacities for adaptable inventions already made elsewhere. The capacity to "unpack" technology systems would need to be acquired presumably first in the framework of regional economic cooperation. The role of the African Regional Centre for Technology (ARCT) in Dakar, Senegal and the African Institute for Higher Technical Training and Research (AIHTTR) in Nairobi, Kenya will certainly be an important factor in this respect.

94. Other specific research projects in relevant institutions will need to focus on the areas of meeting basic needs of the majority of the African population. These will include:

(a) Indigenous food production, processing, storage and preservation to overcome hunger and malnutrition;

(b) Development of forest-based industries leading to the reduction of import of such products as pulp for paper mills plastics synthetic fibres, adhesives and by-product chemicals from charcoal;

(c) Low-cost housing using building materials available in Africa and other developing countries;

(d) Alternative energy technology: through active research to produce energy from non-conventional sources so as to supplement further work on exploration, appraisal and development of existing conventional energy resources in the region;

(e) Medicinal plants and bio-mass chemicals: by characterizing locally available raw materials and upgrading their quality for industrial processing in the pharmaceutical and other chemical industries;

(f) Genetic engineering through the establishment of a regional research centre for experimentation and training in biotechnology aimed at building up a nucleus of local researchers to explore ways of solving problems of critical relevance to Africa, e.g., growing better crops; producing vaccines and medications for malaria, cholera, hepatitis, etc.; and

(g) Engineering design, fabrication and production including maintenance, repair and manufacture of spare parts, components, machines tools, etc. ARCEDEM should be strengthened, in this respect, and receive the patronage of the African industry which it is meant to serve.

### C. Financial institutions

95. For the purpose of industrial financing, member States should individually or collectively take practical steps towards establishing an industrial fund for financing projects of social significance that would supplement industrial development programmes and lay down policies for long-term loans for financing the growth of priority sub-industrial areas. In the African context, government expenditures constitute significant portions of all expenditures in any economy and this purchasing power can be and has historically been used to stimulate the growth of specific branches of industries. Therefore, it is recommended that member States should allocate certain shares of purchases for small- and medium-scale industries. Such measures could be supplemented by a rationalization programme aimed at upgrading equipment, financial support, standardization, quality control and efficient organization of marketing possibility through a small-scale industrial development and marketing corporation.

96. As noted earlier, the implementation of a strategy of natural resources exploitation will require considerable investment capital. Given the financial needs of the national industrial programmes, it is highly unlikely

that individual countries can finance from their own national budgets their share of the capital needed for major core-industrial enterprises. It is, therefore, imperative that effective subregional and regional mechanisms for mobilization of investment funds be established for industrial projects. In this connection, the proposal of an African Industrial Development Fund (AIDF) should be given enough practical support to assist the member States in mobilizing the necessary resources from within and outside the region.

97. Other financial institutions should be designed to increase the ability of member States to raise the large capital outlay needed for heavy investment (i.e., industrial development banks). Also, such mechanisms as organization of investment finance, joint loan guarantee and contracting; organization of intercountry purchase agreements and buy-back arrangements from national plants by the other partner countries should be set up.

#### D. Institutions for linking primary and industrial sectors

98. Studies of the linkage effects of agricultural and mining activities with the industrial activities, particularly in economies where agricultural produce and mineral extraction accounts for a high share of GDP suggested that mining or agricultural sectors have been particularly weak in creating production and consumption linkages. Whether additional indirect linkages are created subsequently depends upon the investment projects for which these funds are used. These linkages depend on the institutional structure and the efficiency of the State in taxing (without stifling the entrepreneurial profit motive) and investing the revenues from agricultural produce and mineral extraction in a diversified and productive way for the rest of the economy.

99. On the other hand, the agricultural and mineral processing industries directly generate backward linkages through the purchase of intermediate goods and services and forward linkages through sales to other sectors of intermediate inputs and this leads to economic diversifications and growth and can be a powerful stimulant to economic and industrial development. The impact of agricultural and mining investments in terms of both income and employment may become a substantial stimulus to industrial development if incorporated with economic activities of other sectors - a possibility that increases with the level of existing economic diversification.

100. Other linking institutions include the following:

(a) Raw material institutions: coordinated national institutions for multinational pooling and procurement of resources; organization of production in subsidiary companies to provide complementary natural resources inputs required both by the national plants and multinational heavy industry plants, making fuller utilization of local raw materials available within the participating countries;

(b) Institutions to deal with semi-finished and intermediate goods problems: institutions to solve excess capacity by promoting complementarity and specialization in intermediates as well as components and parts and accessories for industrial plants; bulk purchase and procurement of supplies overcoming technical restrictions imposed by the scale of operations and exploiting economies of scale through sub-contracting, co-contracting and co-production, etc.;

(c) Technology institutions: institutions to strengthen technological capabilities for "unpackaging" and adapting imported technology; developing indigenous expertise to solve local technological problems affecting industries, capability for design, standardization and quality engineering; determining the technological type and the kind of by-products to be generated as a result of special characteristics of raw materials; research and development (R&D) in basic needs sectors and in the equipment required; joint organization of negotiations for access to technology/equipment and commercialization of indigenous R&D results, etc.



## E. Support institutions

### 1. Overall government support institutions

101. In the African context in particular, it was found that the systematic economic breakdown and industrial backwardness is principally the result of the political and social conditions of the continent - poor governance, lack of public accountability, lack of popular participation by the majority of the population, an increasing narrow base of decision-making, resulting in a crisis of confidence between the government and the governed. There is need, therefore, for a strong and thoroughly reformed State which has political legitimacy and the capacity to devise and implement dynamic and redistributive industrial policies alongside with the private sector. In fact, while at the very outset, the policies of the 1990s were overly concerned with getting "prices right", the early 1980s are seeing a decidedly new political paradigm of getting "human conditions right" or "putting the people first" as spelled out at the International Conference on Popular Participation in the Recovery and Development Process in Africa in 1990 as part of the democratization process.

102. For sound industrial development to materialize, a strong and effective institutional machinery is needed to assist African Governments to develop capabilities and infrastructures to foster the process of industrial transformation and development. It is important in this regard to establish and revitalize key institutions responsible for national capacity building, policy formulation and central guidance, and to integrate the institutional reform programme within the overall national development and industrial planning.

103. African Governments must, as a matter of necessity, create and strengthen their administrative capabilities and make them effective instruments for maximizing development and minimizing wastage or misallocation of resources. It is paramount as a first step to undertake administrative reforms that ensure the efficiency and the operationality of the public sector and make it a viable instrument for fostering and directing the process of industrial development. Political and administrative decision-making should be decentralized to allow a greater participation of the people in the industrial development process by reversing the present over-centralized structures.

### 2. Other support institutions

104. As part of the institutional infrastructure to promote industrial and mining development and cooperation, it will be necessary to strengthen existing or to create the following other support institutions:

(a) Market and marketing institutions: national institutions, coordinated at multinational level, to develop collaboration in relation to market size and structure diversity of product lines and product mixes; distribution and marketing of products; joint price policies;

(b) Information institutions: institutional machinery to facilitate documentation and exchange of information required for operations in the major problem areas indicated above; pooling of experience on the activities of member States; distribution of profiles and lists of firms with a view to establishing industrial contracts and soliciting partnerships among the member States, whenever necessary;

(c) Consultancy organizations: in order to reinforce the activities of the above-mentioned institutions, indigenous traditional consultancy organizations should be created to perform the following services: preparation of pre-investment studies, specifications, bids and contracts; appraisal of feasibility studies and industrial bids and contracts; procurement of raw materials, equipment and inspection before delivery; organization of local procurement of raw materials under competitive bids; overall monitoring and assessment, on behalf of

government, of all project activities including scheduling, supervising and synchronizing their implementation at national and multinational levels; coordination with other interested African countries for joint organization, exchange and sub-contracting of consultancy and other industrial services.

105. Mechanisms for coordination and implementation should be defined. World-wide experience suggests that while a rigid planning system for industrial development is unsustainable, since it frequently fails to take into account changes and unanticipated needs, the absence of programming of any kind is also not suitable. Some kind of programming is therefore essential, extending beyond the macro level to include the subsectors and service sectors, with built-in efficient government and private mechanisms to monitor divergences between the expected output and actual demand, as well as changes in technological, manpower and natural resource development. In order to ensure the effectiveness of the required industrial and institutional capabilities, a coordinating advisory body consisting of representatives from the various institutional sectors of the economy, especially the business and industrial communities, chambers of commerce, industry, etc., could be created to help in the formulation and implementation of sound industrial policies.

## V. IMPLEMENTATION STRATEGY

106. The paper has attempted to highlight three main areas of critical importance in building capacities to exploit natural resources and diversify African economies. The promotion of the manufacturing and processing of Africa's abundant natural resources is essential to reduce the region's external dependence on sole export of primary commodities and import of essential manufactured products and to establish its competitiveness in world markets. In order to achieve this objective, a critical investment is the building of human capacity at all levels of the process of producing goods and services, including entrepreneurship development, continuous upgrading of technical skills, reorienting the academic curriculum in science and technology, etc. The achievement of this objective will also require sound institutional infrastructures and appropriate policies.

107. The above requirements would not be met without a well-defined facilitating implementation strategy. In this regard, four elements have to be taken into account, namely the need to invest massively in human and institutional capacity, the role of foreign direct investment in the diversification of the economy and in technology transfer, the necessity of regional cooperation and integration and the importance of coordination within and among countries.

### A. Investing in development of human and institutional capacity

108. People are the main actors and beneficiaries of development. This is particularly relevant to the industrial sector, which is a major engine in the process of structural transformation. Governments should therefore depart drastically from past budgetary policies with inadequate resources devoted to education especially higher technical training and research.

109. While pursuing tight fiscal policies in the context of ongoing reform programmes, the above objective could be achieved in shifting resources from non-productive expenditures in defence and other administrative bureaucracies. Also, through fiscal incentives, governments could encourage the private sector in investing increasingly in research.

110. The same applies to institutions, public and private, directed towards the structural transformation of African economies. It is essential that adequate resources be allocated for the strengthening of such institutions.



#### B. The role of foreign direct investment (FDI)

111. The experience in other regions, especially East and South East Asia, clearly shows that FDI plays an essential role not only in increasing and diversifying the productive capacity, but also in such critical areas as entrepreneurship development, transfer and adaptation of technology. It is therefore imperative for African countries to reverse the present trend of declining FDI. There is no doubt that prerequisites for such objective are peace, security, stability and a conducive economic environment. The efforts under way in these areas should therefore be pursued and developed. Also, a major incentive to foreign investors is the reverse of the present trend of capital flight and reinvestment of financial assets of nationals from abroad. In this regard, the importance of an attractive investment code cannot be overemphasized.

#### C. Regional economic cooperation and integration

112. Regional economic cooperation and integration is a major facilitating instrument in building African capacities for exploiting natural resources and diversifying African economies into processing and manufacturing. In addition to the pooling of resources and competence, economic cooperation and integration results in enlarging markets thereby increasing production opportunities for both African and foreign investors.

113. The efforts under way in the region with respect to economic cooperation and integration should be stepped up in order to create the above conditions. In this regard, the coming into force of the Treaty establishing the African Economic Community, in addition to the already existing regional economic communities, is an essential instrument.

#### D. Coordination

114. Coordination is a major component of the implementation strategy. However, coordination should not mean a direct involvement of the state in the productive sectors. On the contrary, it should entail a wide range of support aimed at achieving the various objectives in the areas that have been identified as essential in building capacities for exploiting natural resources into processing and manufacturing. Coordination is also necessary in ensuring a proper balance among these main areas. Finally, coordination is called for in the harmonization of economic policies among countries in order to take full advantage of the benefit of regional cooperation and integration.