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ATLAS OF AFRICAN INDUSTRY

IRON AND STEEL

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna, 1989

Data for this publication were collected by Mr Basil U.N. Igwe.

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Abbreviations used

AISU	-	Arab Iron and Steel Union
BOF	-	Basic Oxygen Furnace
bbl	-	Barrel
Cb	-	Columbium
Co	-	Cobalt
Cr	-	Chromium
EAF	-	Electric Arc Furnace
ECA	-	UN Economic Commission for Africa
ECCAS	-	Economic Community of Central African States
ECOWAS	-	Economic Community of West African States
EIU	-	Economist Intelligence Unit
Fe	-	Iron
GATT	-	General Agreement on Tariffs and Trade
GDP	-	Gross Domestic Product
gwh	-	Giga-watt-hour
IISI	-	International Iron and Steel Institute
ITC	-	International Trade Centre
Kwh	-	Kilo-watt-hour
LD	-	Linz-Donawitz Converter
LDC	-	Least Developed Country
LNG	-	Liquefied Natural Gas
Mn	-	Manganese
MVA	-	Manufacturing Value-Added
MW	-	Megawatt
m^3	-	Cubic metres
N.A.	-	Not available
Ni	-	Nickel
OAU	-	Organization of African Unity
OECD	-	Organization for Economic Co-operation and Development
P	-	Phosphorus
P_2O_5	-	Phosphorus pentoxide
PTA	-	Preferential Trade Area for Eastern and Southern African States
S	-	Sulfur
SADCC	-	Southern African Development Co-ordination Conference
SiO_2	-	Silicon dioxide (silica)
Ta	-	Tantalum
Ta_2O_5	-	Tantalum pentoxide
Ti	-	Titanium
TiO_2	-	Titanium dioxide
ton	-	Metric ton (1,000 kg)
UN	-	United Nations
UNCTAD	-	UN Conference on Trade and Development
UNIDO	-	UN Industrial Development Organization
V	-	Vanadium
V.M.	-	Volatile matter
W	-	Tungsten

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FOREWORD

The programme of the African industrial sector during the 1980s has not borne out the optimism that had been lavished on it in the preceding decades as the inevitably catalyst for the region's economic salvation. Despite huge investments, the sector has, to a large extent, failed to contribute its commensurate share to economic production in many countries. Manufacturing value-added as a proportion of Gross Domestic Product (GDP) has not risen above 15 per cent in nearly 40 African countries. Additionally, not only has the austere economic environment in many countries during the 1980s forced a drastic curtailment of fresh investments in the sector, but even operating facilities are functioning at very low levels of capacity utilization as a result of chronic non-availability of imported raw materials, spare parts and technical skills.

It was UNIDO's recognition of the critical and indispensable role of industry in the balanced economic development of Africa that had inspired the declaration of the 1980s as the Industrial Development Decade for Africa (IDDA). The Decade has, among other things, served to sensitize the world to the peculiar industrialization problems of the continent, and the need to mobilize domestic and foreign resources in the interest of promoting African industry.

The Decade has also focused priority attention on certain core subsectors which are believed to possess the greatest potential for galvanizing rapid industrial development. The iron and steel subsector is one such core industry, not only by virtue of its numerous backward and foreward linkages, but also because of its potential for utilizing locally available natural endowments of minerals, energy and other resources.

However, planning the iron and steel industry in Africa has often suffered from a death of basic information on the region-wide status of the industry and of those resources on which it is based. UNIDO's contribution to filling this need has, fortunately, meshed smoothly with the long-standing and often-repeated requests of African Ministers of Industry for an understandable reference document (in the form of an Atlas) that would provide a reliable bird's eye-view of the iron and steel industry in the entire region. This Atlas is UNIDO's response to that request.

It is hoped that, by providing data and information (in a form that is readily understandable by laymen) on the African steel industry and the availabilities and status of exploitation of those mineral and other resources on which the industry depends, the atlas would be useful to industrial planners of both the iron and steel subsector and its linked downstream industries. It should also be of use for formulating and implementing co-operation projects at the bilateral, subregional and regional levels. In a broader context, the atlas should be valuable for packaging and implementing technical assistance and performance improvement projects, as well as for purposes of technology selection and plant-level rehabilitation.

INTRODUCTION

This atlas of the African Iron and Steel Industry is, it is hoped, the first of a series presenting information on key subsectors of industry. The objective is to furnish data in a concise and visually attractive form to assist decision-makers in arriving at a general understanding of some of the major characteristics of the subsector.

Because the iron and steel industry exists in and is affected, for good or ill, by the economic environment in which it exists (nationally, regionally and worldwide), it is relevant that any discussion of the industry should be prefaced by an understanding of the general society and economy. For this reason, the atlas presents first a number of key geographical, demographic and economic parameters which, directly or indirectly, impinge on the character and performance of the industry. Thus, such apparently peripheral issues as the growth (or otherwise) of the Gross Domestic Product per capita, population density and growth rate, and the external debt burden, all can potentially affect the development of the industry and the performance of enterprises within it.

It is also recognized that the steel consumption pattern can exert a major influence on any decision to enter the league of producers. In an era of restricted availability of foreign exchange with which to import foreign manufactured products (including steel), an African country is now looking inwards with a view to maximizing its degree of self-reliance through reduced dependence on imports.

What is more, knowledge of the consumption patterns of several countries within a subregion could be useful in formulating projects for collaboration. This is all the more important given the limited financial and other resources with which individual countries could implement, on their own, such capital-intensive projects as iron and steel.

Another motivating factor in any decision to undertake an iron and steel project is the local availability of the necessary raw material and energy resources. Accordingly, the atlas also presents the African reserves of iron ore, coal, petroleum and natural gas, and the important alloying minerals. To a large extent, much of the iron ore and coal resources remains unexploited. As for petroleum and natural gas, many African countries are already world-scale producers, although emphasis should now be shifting towards increased local processing prior to export.

Because steel production is highly energy-intensive, the ready availability of cheap power is a factor in favour of the industry. In particular, the mini-mills that are numerically dominant in Africa consume more electricity per unit of steel production than any other process. As such, the atlas also presents, in largely qualitative terms, the hydro-potentials of African countries as well as the status of exploitation in each country.

Steel plant

For the avoidance of doubt, our definition of a steel plant is narrowly restricted to those producers of rolled steel products, starting with either (a) iron ore, pig iron, reduced iron or ferrous scrap (or a combination of these), or (b) semi-finished steel products such as billets, blooms, slabs, scrap, etc. As such, foundries, forge-shops, corrigating and galvanizing mills which do not produce rolled products and/or are not consumers of the above input materials are excluded from consideration.

Limitations

In compiling the data for this atlas, it became apparent that many African countries need to treat their data and other economic information with much more seriousness. In several cases, critical data were either not available or, where they were, they were either not properly organized or too out-dated to be useful for current planning. In fact, in most cases, the most up-to-date data available related to 1985.

In a similar manner, the data on mineral and other resource endowments were several years old. In most countries, exploration for new resources had been brought to a standstill by the severe economic difficulties of the last ten years. Thus, the actual quantities of most reserves could, in fact, exceed what is recorded in the atlas.

Finally, the atlas does not pretend to reflect plant-level data. Information on the patterns and structures of employment, energy consumption, plant ownership, technology and equipment sources, etc., which can best be obtained by plant-by-plant canvassing, has not been included. It is hoped that future editions of the atlas would incorporate these and other useful data for purposes of planning, technical assistance and rehabilitation.

Consultations

The basic data for the atlas was collected and collated by Mr Basil Igwe of Nigerian Institute of Social and Economic Research (NISER) who for the purpose, undertook a comprehensive mission to Africa and several international development agencies. On the basis of these data, Dr Nicholas Middleton, Environmental and Economic Development Consultant, School of Geography, Oxford, produced the atlas.

SECTION ONE

GEOGRAPHIC, DEMOGRAPHIC AND ECONOMIC BACKGROUND

1.1 COUNTRIES AND SUBREGIONS

Africa, for the purpose of this Atlas, has been demarcated into four geographical subregions as follows:

NORTHERN AFRICA: The five Arab Mediterranean countries, - Algeria, Egypt, Libyan Arab Jamahiriya, Morocco and Tunisia, - plus Sudan;

WESTERN AFRICA: The sixteen member-states of the Economic Community of West African States (ECOWAS), - Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone and Togo;

CENTRAL AFRICA: The eleven member-states of the Economic Community of Central African States (ECCAS), - Angola (which currently has an observer status but is expected to ultimately become a full member), Burundi, Cameroon, Central African Republic, Chad, Congo, Equatorial Guinea, Gabon, Rwanda, Sao Tome and Principe, and Zaire;

EASTERN AND SOUTHERN AFRICA:
Consisting essentially of seventeen member-states of the Preferential Trade Area (PTA) of Eastern and Southern Africa and/or the Southern African Development Coordination Conference (SADCC) less Angola, Burundi and Rwanda. These are Botswana, Comoros, Djibouti, Ethiopia, Kenya, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Seychelles, Somalia, Swaziland, Uganda, the United Republic of Tanzania, Zambia and Zimbabwe.

The fifty countries covered encompass an aggregate land area of 28 million square kilometers and exhibit great diversities in national land areas and geographical features. They include such expansive entities as Sudan, Algeria, Zaire and the Libyan Arab Jamahiriya, as well as such tiny island nations as Comoros, Mauritius, Sao Tome and Principe, and Seychelles.

Twenty-eight of the world's Least Developed Countries (LDCs), as defined by the UN using such criteria as per capita Gross Domestic Product (GDP), share of manufacturing in total GDP, and literacy rate in the age group of 15 years and over, are located in Africa. Only one, however, - Sudan - is in Northern Africa. Western, Central and Eastern and Southern Africa account for eleven, six and ten respectively.

1.1 (a) Subregional groupings

SUBREGIONAL GROUPINGS OF AFRICAN COUNTRIES

SUBREGION	COUNTRY	LAND AREA (thousand km^2)	CAPITAL CITY
NORTHERN AFRICA			
	Algeria	2382	Algiers
	Egypt	1001	Cairo
	Libyan Arab Jamahiriya	1,760	Tripoli
	Morocco	447	Rabat
	Sudan*	2506	Khartoum
	Tunisia	164	Tunis
WESTERN AFRICA			
	Benin*	113	Cotonou
	Burkina Faso*	274	Ouagadougou
	Cape Verde*	4	Praia
	Côte d'Ivoire	323	Abidjan
	Gambia*	11	Banjul
	Ghana	239	Accra
	Guinea*	246	Conakry
	Guinea-Bissau*	36	Bissau
	Liberia	111	Monrovia
	Mali*	1240	Bamako
	Mauritania*	1031	Nouakchott
	Niger*	1267	Niamey
	Nigeria	924	Lagos
	Senegal	196	Dakar
	Sierra Leone*	72	Freetown
	Togo*	57	Lomé
CENTRAL AFRICA			
	Angola	1247	Luanda
	Burundi*	28	Bujumbura
	Cameroon	475	Yaoundé
	Central Afr. Republic*	623	Bangui
	Chad*	1284	N'Djamena
	Congo	342	Brazzaville
	Equatorial Guinea*	28	Malabo
	Gabon	268	Libreville
	Rwanda*	26	Kigali
	Sao Tome+Principe*	1	Sao Tomé
	Zaire	2345	Kinshasa
EASTERN AND SOUTHERN AFRICA			
	Botswana*	600	Gaborone
	Comoros*	2	Moroni
	Djibouti*	22	Djibouti
	Ethiopia*	1222	Addis Ababa
	Kenya	583	Nairobi
	Lesotho*	30	Maseru
	Madagascar	587	Antananarivo
	Malawi*	119	Lilongwe
	Mauritius	2	Port Louis
	Mozambique*	802	Maputo
	Seychelles	1	Victoria
	Somalia*	638	Mogadiscio
	Swaziland	17	Mbabane
	Uganda*	236	Kampala
	U.R. of Tanzania*	945	Dar-Es-Salaam
	Zambia	753	Lusaka
	Zimbabwe	391	Harare

* Least Developed Country.

1.1 (b) New List

ALGERIA
ANGOLA
BENIN
BOTSWANA
BURKINA FASO
BURUNDI
CAMEROON
CAPE VERDE
CENTRAL AFRICAN REPUBLIC
CHAD
COMOROS
CONGO
COTE D'IVOIRE
DJIBOUTI
EGYPT
EQUATORIAL GUINEA
ETHIOPIA
GABON
GAMBIA
GHANA
GUINEA
GUINEA-BISSAU
KENYA
LESOTHO
LIBERIA
LIBYAN ARAB JAMAHIRIYA
MADAGASCAR
MALAWI
MALI
MAURITANIA
MAURITIUS
MOROCCO
MOZAMBIQUE
NIGER
NIGERIA
RWANDA
SAO TOME AND PRINCIPE
SENEGAL
SEYCHELLES
SIERRA LEONE
SOMALIA
SUDAN
SWAZILAND
TOGO
TUNISIA
UGANDA
UNITED REPUBLIC OF TANZANIA
ZAIRE
ZAMBIA
ZIMBABWE

1.1 (c) Land area by subregion (thousand km^2)

NORTHERN AFRICA	8,260
WESTERN AFRICA	6,136
CENTRAL AFRICA	6,667
EASTERN AND SOUTHERN AFRICA	6,950

1.1 (d) Countries ranked by land area (thousand km^2)

Sao Tome+Principe*	1
Seychelles	1
Comoros*	2
Mauritius	2
Cape Verde*	4
Gambia*	11
Swaziland	17
Djibouti*	22
Rwanda*	26
Burundi*	28
Equatorial Guinea*	28
Lesotho*	30
Guinea-Bissau*	36
Togo*	57
Sierra Leone*	72
Liberia	111
Benin*	113
Malawi*	119
Tunisia	164
Senegal	196
Uganda*	236
Ghana	239
Guinea*	246
Gabon	268
Burkina Faso*	274
Côte d'Ivoire	323
Congo	342
Zimbabwe	391
Morocco	447
Cameroon	475
Kenya	583
Madagascar	587
Botswana*	600
Central Afr. Republic*	623
Somalia*	638
Zambia	753
Mozambique*	802
Nigeria	924
U.R. of Tanzania*	945
Egypt	1001
Mauritania*	1031
Ethiopia*	1222
Mali*	1240
Angola	1247
Niger*	1267
Chad*	1284
Libyan Arab Jamahiriya	1,760
Zaire	2345
Algeria	2382
Sudan*	2506

1.2 POPULATION

The mid-1986 total population of the four subregions was 546.32 million, disaggregated as follows:

NORTHERN AFRICA	-	131.8 million
WESTERN AFRICA	-	179.6 "
CENTRAL AFRICA	-	73.49 "
EASTERN AND SOUTHERN AFRICA	-	161.43 "

The average population density of 19.5 persons per square km is not considered excessive per se. However, against the background of an explosive average annual growth rate of about 2.9 per cent, grossly under-developed social and physical infrastructures, an increasingly youthful population ratio, and massive rural-to-urban migration often exacerbated by natural and man-made disasters, the population factor becomes one of the most critical elements in the deteriorating economic plight of many African countries.

Over the last decade, African countries have exhibited the highest population growth rates of any region in the world, with at least 24 countries registering 3.0 per cent per annum and above during the 1980-1986 period. Accordingly, whatever increases were achieved in economic output were readily neutralized by even higher increases in population, resulting in declining real incomes and standards of living for the majority of the population. In a real sense, it was, in part, the pressures of high population growth that forced many countries to adopt policies focusing on present consumption to the detriment of the industrial and other investments necessary for ensuring higher consumption in the future.

1.2 (a)

POPULATION

COUNTRY	AVERAGE ANNUAL GROWTH (1980–1986) (percent)
Kenya	3.9
Rwanda	3.7
Côte d'Ivoire	3.6
Libyan Arab Jam.	3.6
Congo	3.5
Zambia	3.5
U.R. of Tanzania	3.5
Togo	3.4
Cameroon	3.3
Botswana	3.3
Madagascar	3.3
Nigeria	3.3
Comoros	3.3
Benin	3.2
Liberia	3.2
Malawi	3.2
Ghana	3.1
Uganda	3.1
Zaire	3.1
Niger	3.0
Senegal	3.0
Zimbabwe	3.0
Gambia	3.0
Swaziland	3.0
Algeria	2.9
Somalia	2.9
Sudan	2.9
Central Afr. Rep.	2.9
Angola	2.8
Gabon	2.8
Mauritania	2.8
Equatorial Guinea	2.8
Burundi	2.7
Lesotho	2.7
Mozambique	2.7
Sierra Leone	2.6
Sao Tome+Principe	2.6
Burkina Faso	2.5
Chad	2.5
Ethiopia	2.4
Guinea	2.4
Mali	2.3
Egypt	2.2
Morocco	2.2
Tunisia	2.2
Guinea-Bissau	2.1
Cape Verde	2.0
Mauritius	1.2
Seychelles	0.6
Djibouti	N.A

1.2 (c)

POPULATION

	MID-1986 POPULATION (millions)
NORTHERN AFRICA	131.8
WESTERN AFRICA	179.6
CENTRAL AFRICA	73.49
EASTERN AND SOUTHERN AFRICA	161.43

1.2 (d)

POPULATION

COUNTRY	MID-1986 POPULATION (millions)	PROJECTED POPULATION 2000 (millions)
Seychelles	0.07	N.A.
Sao Tome+Principe	0.11	N.A.
Cape Verde	0.34	N.A.
Djibouti	0.36	N.A.
Equatorial Guinea	0.38	N.A.
Comoros	0.41	N.A.
Swaziland	0.69	N.A.
Gambia	0.77	N.A.
Guinea-Bissau	0.91	N.A.
Gabon	1.0	1
Mauritius	1.0	1
Botswana	1.1	2
Lesotho	1.6	2
Mauritania	1.8	2
Congo	2.0	3
Liberia	2.3	3
Central Afr. Rep.	2.9	4
Togo	3.1	5
Sierra Leone	3.8	5
Libyan Arab Jam.	3.9	6
Benin	4.2	7
Burundi	4.8	7
Chad	5.1	7
Somalia	5.5	8
Rwanda	6.2	10
Guinea	6.3	9
Niger	6.6	10
Senegal	6.8	10
Zambia	6.9	11
Tunisia	7.3	10
Malawi	7.4	12
Mali	7.6	11
Burkina Faso	8.1	12
Zimbabwe	8.7	13
Angola	9.0	13
Cameroon	10.5	17
Madagascar	10.6	16
Côte d'Ivoire	10.7	17
Ghana	13.2	20
Mozambique	14.2	22
Uganda	15.2	23
Kenya	21.2	36
Algeria	22.4	33
Morocco	22.5	30
U.R. of Tanzania	23.0	37
Sudan	26.0	34
Zaire	31.7	48
Ethiopia	43.5	65
Egypt	49.7	59
Nigeria	103.1	164

1.3 STRUCTURE OF PRODUCTION

GROSS DOMESTIC PRODUCT (GDP)

The decade of the 1980s has witnessed a major economic retreat by many African countries. In the face of a crushing debt overhang, high interest rates, unstable exchange rates, unpredictable deterioration in the prices of their exports, and effective out-transfer of net financial resources, only a few countries have been barely able to achieve, in 1986, per capita GDP levels equal to those of 1980. In most cases, there were stagnations or outright declines. Whereas in 1980, 15 African countries had GDP per capita of $300 or less (in constant 1980 prices), by 1986, the number had increased to 17. In fact, the average annual GDP growth rate was negative during the period in 13 countries. Unfortunately, indications are that decline and stagnation will probably continue for most African economies for the balance of the decade.

INDUSTRY AND MANUFACTURING

Industry and manufacturing were both victims and culprits of the general economic malaise. Prior to the early 1980s, manufacturing growth rates in African countries were generally comparable to those in other developing countries. Africa's share of the world's manufacturing value-added (MVA) indeed rose from 0.7 per cent in 1970 to 1 per cent in 1982. Since then, however, industrial performance has deteriorated relative to other developing regions. Manufacturing capacity utilization rates have declined to well below 50 per cent for most subsectors. For the heavy industries in particular (including the iron and steel subsector), values below 40 per cent have generally been the norm. The few exceptions have occurred in Northern Africa.

It is instructive to isolate the respective contributions of industry and manufacturing to GDP. Where industrial contribution has been high (above 40 per cent), it has generally reflected the impact of the mining and minerals subsector which is characterized by minimal domestic processing prior to export. Manufacturing contribution to GDP, on the other hand, did not exceed 24 per cent for any country in 19[illegible]. This is an unhealthy situation, given the fact that manufacturing can help in providing basic needs goods for the rapidly growing population. It can also assist in raising income levels, lowering unemployment, laying the foundation for technological progress, and providing inputs and equipment to other economic sectors, thus reducing import dependence.

1.3 (a) GDP per capita:

	1980	1986	1980-1986 AVERAGE ANNUAL GDP GROWTH RATE (%)
LIBYAN ARAB JAMAHIRIYA	11,692	7,146	-3.1
GABON	5,305	3,776	-0.9
ALGERIA	2,268	2,483	5.0
SEYCHELLES	2,302	2,281	1.4
BOTSWANA	1,126	1,590	11.3
CONGO	1,115	1,489	7.8
MAURITIUS	1,181	1,465	4.8
TUNISIA	1,369	1,460	3.8
CAMEROON	986	1,261	7.2
COTE D'IVOIRE	1,222	1,032	0.8
DJIBOUTI	1,127	1,019	2.0
NIGERIA	1,095	723	-3.5
SWAZILAND	960	926	2.4
UGANDA	948	831	0.8
MOROCCO	836	842	3.4
ZIMBABWE	750	816	3.8
EGYPT	590	755	6.7
ZAMBIA	677	548	0.1
SENEGAL	524	545	3.2
SUDAN	544	458	-0.5
SAO TOME & PRINCIPE	543	367	-4.5
MAURITANIA	534	463	-0.4
LIBERIA	494	369	-1.5
CAPE VERDE	351	476	7.8
NIGER	471	411	0.8
ANGOLA	449	463	3.4
GHANA	446	371	0.5
TOGO	443	337	-1.2
KENYA	426	388	2.3
CENTRAL AFRICAN REPUBLIC	387	370	1.5
COMOROS	364	379	4.0
SIERRA LEONE	377	253	-4.1
GAMBIA	373	332	1.2
MADAGASCAR	372	300	0.0
BENIN	333	294	0.5
SOMALIA	296	262	0.7
GUINEA	295	207	-2.6
LESOTHO	285	267	1.7
U.R. TANZANIA	272	232	0.9
BURUNDI	232	260	4.2
MALI	238	227	1.4
ZAIRE	233	216	1.7
RWANDA	225	217	2.2
CHAD	224	164	-3.2
MALAWI	203	186	2.6
MOZAMBIQUE	199	103	-9.3
GUINEA-BISSAU	190	196	2.5
BURKINA FASO	185	181	1.2
EQUATORIAL GUINEA	157	162	2.5
ETHIOPIA	106	101	0.2

1 3 (d) Contribution of industry and manufacturing to GDP in 1986 (%)

	Industry	Manufacturing
GUINEA-BISSAU	3	1
COMOROS	4	4
UGANDA	4	4
SOMALIA	6	5
EQUATORIAL GUINEA	6	5
CAPE VERDE	9	5
BURUNDI	8	7
GAMBIA	8	7
GHANA	8	7
MALI	9	6
SEYCHELLES	8	7
U.R. TANZANIA	8	7
BENIN	9	7
CHAD	9	8
LESOTHO	10	8
SUDAN	10	8
NIGER	15	4
CENTRAL AFR. REPUBLIC	12	9
GUINEA	18	3
MAURITANIA	16	5
BURKINA FASO	12	11
DJIBOUTI	13	10
COTE D'IVOIRE	14	10
SAO TOME & PRINCIPE	14	10
ETHIOPIA	13	12
TOGO	18	7
KENYA	15	12
SIERRA LEONE	20	7
MALAWI	15	13
ANGOLA	27	2
MADAGASCAR	15	14
NIGERIA	28	3
LIBERIA	24	9
ZAIRE	31	3
RWANDA	18	17
MAURITIUS	20	17
MOROCCO	23	16
SENEGAL	22	17
TUNISIA	26	14
EGYPT	32	14
BOTSWANA	44	3
ZIMBABWE	29	20
SWAZILAND	27	23
ALGERIA	42	10
MOZAMBIQUE	29	24
ZAMBIA	35	20
GABON	49	7
CAMEROON	38	19
CONGO	48	9
LIBYAN ARAB JAMAHIRIYA	61	4

1.4 THE DEBT BURDEN

Both the quantity and accelerated rate of growth of the external debt of African countries have resulted from the adverse economic environment of the last ten years. They still continue to impede economic recovery and resumed growth.

The total regional external debt as of the end of 1986 (excluding South Africa) stood at about US$ 198,900 million, much of it incurred to meet the fall in export receipts. The subregional disaggregation was as follows:

NORTHERN AFRICA - US$ 78,554 million
WESTERN AFRICA - US$ 49,689 million
CENTRAL AFRICA - US$ 20,096 million
E + S AFRICA - US$ 49,561 million

The economy of Sub-Saharan Africa (which is least able to service and repay these debts) has been most adversely affected in that resources that would otherwise have been invested in productive economic activities have had to be diverted into servicing past (and not necessarily productive) consumption. Whereas, in 1982, Sub-Saharan Africa had an external debt of US$ 45.4 billion, by 1986 the figure had escalated to about US$ 120 billion. The debt-service ratio increased, over the same period, from 8.4 per cent to 10.8 per cent. In several countries, the ratio is currently running at more than 30 per cent of the annual export earnings.

This heavy debt overhang, coupled with the slump in the prices of many primary commodities on the world market, has created serious balance-of-payments problems for most countries. Moreover, capital flows have tended to dry up as investors, donors and international financial institutions have lost confidence in African economies. The scarcity of foreign exchange, which is an outcome of these developments, has prevented the importation of raw materials and essential equipment and spare parts for many industries. The lack of these imports has, in turn, led to the low rates of manufacturing capacity utilization and widespread equipment breakdowns that are now a feature of the African manufacturing sector.

1.4 (a)

TOTAL EXTERNAL DEBT

COUNTRY	TOTAL EXTERNAL DEBT, 1986 (millions of US$)	EXTERNAL DEBT PER CAPITA (US$)	DEBT SERVICE 1986 AS PERCENTAGE OF GDP	DEBT SERVICE 1986 AS PERCENTAGE OF EXPORTS OF GOODS AND NON-FACTOR SERVOCES
NORTHERN AFRICA				
ALGERIA	17,929	800	8.2	49.8
EGYPT	28,556	575	5.8	37.3
LIBYAN ARAB JAMAHIRIYA	3,200 (1985)	821	N.A.	N.A.
MOROCCO	14,610	649	10.0	40.9
SUDAN	8,272	318	0.8	11.8
TUNISIA	5,987	820	8.4	29.3
WESTERN AFRICA				
BENIN	890	212	4.4	19.8
BURKINA FASO	665	82	2.8	10.1
CAPE VERDE	107	315	3.4	43.4
COTE D'IVOIRE	10,865	1,015	8.0	18.5
GAMBIA	221	287	5.8	25.3
GHANA	2,385	181	1.3	8.4
GUINEA	1,516	241	6.2	19.3
GUINEA-BISSAU	294	323	5.6	49.9
LIBERIA	1,303	567	3.6	6.2
MALI	1,716	226	2.3	14.4
MAURITANIA	1,761	978	10.0	17.4
NIGER	1,460	221	4.0	13.5
NIGERIA	21,876	212	2.6	20.5
SENEGAL	2,990	440	5.5	20.7
SIERRA LEONE	590	155	1.4	9.3
TOGO	1,050	339	13.4	35.2
CENTRAL AFRICA				
ANGOLA	3,071	341	N.A.	N.A
BURUNDI	551	115	2.5	20.0
CAMEROON	3,533	337	2.7	17.4
CENTRAL AFR. R.	453	168	1.7	7.7
CHAD	187	37	0.3	1.8
CONGO	3,534	1,767	16.0	38.4
EQ. GUINEA	152	400	3.8	10.9
GABON	1,568	1,568	5.7	11.2
RWANDA	439	71	0.8	7.2
SAO TOME+PRINCIPE	74	672	3.6	9.3
ZAIRE	6,534	206	11.0	18.8

1.4 (a) (Continued)

TOTAL EXTERNAL DEBT

COUNTRY	TOTAL EXTERNAL DEBT, 1986 (millions of US$)	EXTERNAL DEBT PER CAPITA (US$)	DEBT SERVICE 1986 AS PERCENTAGE OF GDP	DEBT SERVICE 1986 AS PERCENTAGE OF EXPORTS OF GOODS AND NON-FACTOR SERVICES
EASTERN AND SOUTHERN AFRICA				
BOTSWANA	358	326	5.9	10.0
COMOROS	156	381	1.1	6.7
DJIBOUTI	119	331	2.0	5.1
ETHIOPIA	2,139	49	3.2	25.9
KENYA	4,504	212	6.0	40.5
LESOTHO	186	116	3.6	35.1
MADAGASCAR	2,899	274	4.3	32.4
MALAWI	1,114	151	9.0	36.1
MAURITIUS	644	644	5.3	9.0
MOZAMBIQUE	3,200	225	N.A.	N.A.
SEYCHELLES	106	1,514	4.7	7.9
SOMALIA	1,580	287	3.7	40.7
SWAZILAND	232	336	5.7	12.7
UGANDA	1,193	78	0.7	5.5
U.R. TANZANIA	3,955	172	1.1	23.7
ZAMBIA	5,300	762	4.5	9.7
ZIMBABWE	21,876	2,514	6.4	27.6

1.4 (c)

EXTERNAL DEBT BY SUBREGION, 1986

(millions of US$)

NORTHERN AFRICA	78,554
WESTERN AFRICA	49,689
CENTRAL AFRICA	20,096
EASTERN AND SOUTHERN AFRICA	49,561

1.4 (d)

TOTAL EXTERNAL DEBT, 1986
(millions of US$)

SAO TOME+PRINCIPE	74	
SEYCHELLES	106	
CAPE VERDE	107	
DJIBOUTI	119	
EQUATORIAL GUINEA	152	
COMOROS	156	
LESOTHO	186	
CHAD	187	
GAMBIA	221	
SWAZILAND	232	
GUINEA-BISSAU	294	
BOTSWANA	358	
RWANDA	439	
CENTRAL AFRICAN REPUBLIC	453	
BURUNDI	551	
SIERRA LEONE	590	
MAURITIUS	644	
BURKINA FASO	665	
BENIN	890	
TOGO	1,050	
MALAWI	1,114	
UGANDA	1,193	
LIBERIA	1,303	
NIGER	1,460	
GUINEA	1,516	
GABON	1,568	
SOMALIA	1,580	
MALI	1,716	
MAURITANIA	1,761	
ETHIOPIA	2,139	
GHANA	2,385	
MADAGASCAR	2,899	
SENEGAL	2,990	
ANGOLA	3,071	
LIBYAN ARAB JAMAHIRIYA	3,200	(1985)
MOZAMBIQUE	3,200	
CAMEROON	3,533	
CONGO	3,534	
UNITED REPUBLIC TANZANIA	3,955	
KENYA	4,504	
ZAMBIA	5,300	
TUNISIA	5,987	
ZAIRE	6,534	
SUDAN	8,272	
COTE D'IVOIRE	10,865	
MOROCCO	14,610	
ALGERIA	17,929	
NIGERIA	21,876	
ZIMBABWE	21,876	
EGYPT	28,556	

SECTION TWO

STEEL PRODUCTION AND CONSUMPTION

2.1, 2.2 STEEL PRODUCTION AND CONSUMPTION

While the world's crude steel production increased by 15 per cent from 675 million tons in 1977 to 778 million tons in 1988, most of that increase occurred in non-EEC Western European countries, Eastern Europe, and the developing countries of Africa, Latin America, the Middle East and Asia.

Africa's steel output (excluding South Africa) has more than doubled from about 2 million tons in 1978 to over 4 million tons in 1987. Its share of the world's total has steadily increased from 0.29 per cent in 1978 to 0.56 per cent in 1987.

Although 15 African countries are producers of crude steel, the bulk of the output generally comes from five countries, - Algeria, Egypt, Nigeria, Tunisia and Zimbabwe, - these countries usually accounting for more than 90 per cent of the annual output.

Local production is generally supplemented by imports to meet the domestic demand for steel. In this connection, Africa generally imports more finished and semi-finished steel products than it produces locally. As of 1981, imports had already exceeded 9 million tons, although the economic stagnation and decline of the 1980s had driven imports down to about 5.8 million tons by 1987.

The severity of import dependence may also be illustrated by the figures for apparent steel consumption (defined as domestic production plus imports less exports). Whereas local production of crude steel has never exceeded 0.56 per cent of the world total in any year, apparent consumption has consistently exceeded 1.39 per cent since 1978. In fact, a figure of 1.92 per cent was attained in 1981.

In terms of per capita apparent consumption, most African countries are well below the 50-kg mark. The only exceptions are the North African Mediterranean countries, - Algeria (127 kg in 1987), Egypt (49 kg), Libyan Arab Jamahiriya (106 kg) and Tunisia (66 kg). The figures for most Sub-Saharan African countries (except Gabon) are usually below 30 kg.

The importance of apparent per capita steel consumption derives from its empirical relationship to national technological take-off. Steel is an important technological material with linkages to several industries and economic sectors. A high per capita steel consumption generally suggests vigorous productive activities in these linked sectors and industries. It is reasoned that a threshhold per capita consumption of about 50-kg is necessary for meaningful technological take-off. The figures for some of the newly-industrialized countries tend to support this view, - Brazil (114 kg in 1987), Mexico (85 kg), and Republic of Korea (358 kg). As for the industrialized countries of Europe, Asia and North America, their consumptions have for decades been well in excess of the threshhold e.g. USA (422 kg in 1987), Federal Republic of Germany (454 kg), Japan 620 kg) and USSR (577 kg).

2.1 (a)

AFRICAN CRUDE STEEL PRODUCTION VIS-A-VIS WORLD OUTPUT 1978-1987 (thousand tons)

AFRICAN CRUDE STEEL PRODUCTION VIS-A-VIS WORLD OUTPUT 1978-1987 (thousand tons)

REGION/COUNTRY	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
AFRICA:										
ALGERIA	211	450	388	557	868	950	1,080	1,414	1,400	1,400
EGYPT	823	925	1,153	1,141	1,161	979	928	1,043	1,000	1,600
NIGERIA	15	15	20	22	90	182	229	341	218	236
TUNISIA	160	176	189	173	107	163	166	160	161	188
ZIMBABWE	778	740	805	691	538	647	423	731	680	615
OTHER AFRICA*	60	65	70	70	70	75	75	75	75	75
TOTAL AFRICA	2,047	2,371	2,614	2,654	2,834	2,996	2,901	3,764	3,554	4,114
EUROPEAN COMMUNITY	145,309	153,990	142,012	139,876	125,084	123,214	134,407	135,650	123,844	126,654
OTHER WESTERN EUROPE	18,202	19,822	19,329	19,038	19,206	20,726	22,674	23,266	23,963	24,700
OTHER WESTERN INDUSTRIALIZED COUNTRIES**	257,040	268,714	245,638	242,962	193,977	199,863	218,540	215,327	202,244	209,363
LATIN AMERICA	24,053	27,188	28,832	26,987	26,734	28,600	33,153	35,630	37,351	39,569
MIDDLE EAST	1,576	2,103	1,946	1,963	1,982	2,227	2,812	3,139	3,017	3,423
ASIA	20,201	22,911	23,838	26,908	29,279	29,892	31,863	34,589	36,602	40,622
EASTERN EUROPE	211,083	209,444	209,158	206,126	203,450	210,016	214,267	214,077	221,649	224,366
CUBA, CHINA, DPR KOREA	37,184	40,212	43,225	41,434	43,261	46,485	50,157	53,624	58,916	63,175
WORLD TOTAL	716,695	746,755	716,592	707,948	645,807	664,019	710,774	719,066	713,140	735,986
AFRICA'S SHARE	0.29%	0.32%	0.37%	0.38%	0.44%	0.45%	0.41%	0.52%	0.50%	0.56%

* IISI Estimates
** Canada, USA, Japan, Australia, New Zealand, South Africa

2.1 (c)

WORLD CRUDE STEEL PRODUCTION, 1977 - 1988
(million tons)

YEAR	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
PRODUCTION	675.4	716.7	746.8	716.6	707.9	645.8	664.1	711.0	719.0	713.1	735.9	778.0
CHANGE PER CENT	-	+6.1	+4.2	-4.0	-1.2	-8.8	+2.8	+7.1	+1.1	-0.8	+3.2	+5.7

2.1 (f)

APPARENT CONSUMPTION OF CRUDE STEEL (thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
NORTHERN AFRICA										
ALGERIA	2,033	1,943	2,092	2,437	2,524	2,664	3,015	3,250	3,257	2,948
EGYPT	1,274	1,692	2,299	2,243	2,473	2,619	2,590	3,237	2,304	2,498
LIBYAN ARAB JAMAHIRIYA	506	694	1,053	1,260	447	650	362	568	324	411
MOROCCO	615	656	620	585	750	632	799	753	488	511
SUDAN	75	95	135	172	106	68	61	-	-	-
TUNISIA	386	574	618	511	588	667	544	499	505	507
WESTERN AFRICA										
COTE D'IVOIRE	223	219	226	167	130	85	76	81	-	-
GHANA	62	35	32	27	26	24	23	21	-	-
GUINEA	23	12	20	17	15	15	14	16	-	-
LIBERIA	39	27	35	30	24	24	26	17	-	-
NIGERIA	3,970	4,142	4,664	4,690	4,077	1,983	1,614	2,813	1,910	2,149
SENEGAL	82	88	67	55	86	76	60	46	-	-
SIERRA LEONE	11	12	16	14	10	10	12	5	-	-
TOGO	44	25	28	20	18	18	20	14	-	-
CENTRAL AFRICA										
ANGOLA	39	52	81	77	53	15	72	57	50	50
BURUNDI/RWANDA	21	20	24	26	35	37	38	36	30	30
CAMEROON	97	109	78	60	51	51	60	85	85	90
CEN. AFR. REP.	22	20	18	15	9	6	7	10	8	8
CONGO	17	32	84	27	70	62	62	60	55	32
GABON	40	35	72	74	71	53	64	70	60	58
ZAIRE	48	58	73	62	62	59	85	28	22	16

2.1 (f)

APPARENT CONSUMPTION OF CRUDE STEEL (thousand tons)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
EASTERN AND SOUTHERN AFRICA										
ETHIOPIA	22	50	60	52	54	70	69	-	-	-
KENYA	266	251	238	164	115	198	210	-	-	-
MADAGASCAR	46	69	70	15	23	31	30	-	-	-
MALAWI	21	21	20	17	10	9	9	-	-	-
U.R. TANZANIA	92	53	83	39	79	83	68	65	48	58
ZAMBIA	30	47	28	14	11	9	13	27	28	29
ZIMBABWE	191	233	179	366	267	280	158	378	418	207
OTHER AFRICA*	191	152	117	400	300	287	547	966	869	728
TOTAL AFRICA	10,536	11,422	13,137	13,641	12,488	10,791	10,714	13,102	10,461	10,330
EUROPEAN COMMUNITY	113,309	124,824	117,723	106,574	102,806	97,868	103,027	101,761	103,094	103,222
OTHER WESTERN EUROPE	20,873	21,409	22,760	21,455	21,193	20,801	22,242	21,607	23,134	25,596
OTHER WESTERN INDUSTRIALIZED COUNTRIES	236,257	247,353	220,405	228,454	175,660	181,317	211,505	203,374	188,702	202,525
LATIN AMERICA	29,026	31,186	34,812	32,414	27,961	22,386	26,847	27,534	30,157	32,112
MIDDLE EAST	14,313	16,113	15,155	14,664	19,107	20,689	16,965	18,875	10,075	8,957
ASIA	34,295	37,932	38,548	41,647	43,459	44,013	43,444	46,889	49,932	55,229
EASTERN EUROPE	213,199	211,102	209,254	205,415	204,648	210,794	212,620	214,517	219,132	217,920
CUBA, CHINA, DPR KOREA	49,089	51,885	50,364	46,178	48,048	59,613	68,210	79,824	82,224	86,636
WORLD TOTAL	720,897	753,225	722,194	710,443	654,985	668,272	717,575	727,482	716,912	740,527
AFRICA'S SHARE	1 46%	1.52%	1.82%	1.92%	1.85%	1.62%	1.49%	1.80%	1.46%	1.39%

* Estimated totals for countries not listed and/or for which reliable data are not available.

2.1 (g)

APPARENT STEEL CONSUMPTION PER CAPITA (kilograms of crude steel)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
NORTHERN AFRICA										
ALGERIA	124	114	119	127	127	130	143	148	145	127
EGYPT	32	41	55	52	56	57	55	67	46	49
LIBYAN ARAB JAMAHIRIYA	181	238	346	396	134	187	100	158	187	106
MOROCCO	33	36	30	31	37	30	37	34	22	22
SUDAN	4	5	7	9	5	3	3	-	-	-
TUNISIA	37	43	36	46	90	84	82	68	68	66
WESTERN AFRICA										
COTE D'IVOIRE	29	28	28	20	15	9	8	-	-	-
GHANA	6	3	3	2	2	2	2	-	-	-
GUINEA	4	2	4	3	3	3	2	-	-	-
LIBERIA	13	15	19	16	12	12	12	-	-	-
NIGERIA	53	53	58	56	47	22	18	30	19	21
SENEGAL	15	16	12	9	14	12	10	-	-	-
SIERRA LEONE	3	4	5	4	3	3	3	-	-	-
TOGO	18	10	11	8	7	6	7	-	-	-
CENTRAL AFRICA										
ANGOLA	5	7	10	10	7	2	8	7	6	6
BURUNDI/RWANDA	2	2	3	3	4	4	4	3	3	3
CAMEROON	12	13	9	7	6	5	6	9	8	9
CEN. AFR. REP.	10	9	8	6	4	2	3	4	3	3
CONGO	12	21	55	17	43	38	37	34	31	17
GABON	39	33	68	69	65	48	57	61	51	49
ZAIRE	2	3	3	2	2	1	3	2	1	1

2.1 (g)

APPARENT STEEL CONSUMPTION PER CAPITA (kilograms of crude steel)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
EASTERN AND SOUTHERN AFRICA										
ETHIOPIA	1	1	2	1	1	2	2	-	-	-
KENYA	17	16	14	9	6	10	11	-	-	-
MADAGASCAR	6	8	8	2	3	3	3	-	-	-
MALAWI	4	4	3	3	2	1	1	-	-	-
U.R. TANZANIA	7	5	4	2	4	4	3	3	-	-
ZAMBIA	6	9	5	3	2	1	2	4	4	4
ZIMBABWE	28	34	25	50	35	36	20	45	50	24
SOME OTHER DEVELOPING COUNTRIES										
BRAZIL	106	111	117	97	82	62	77	82	111	114
INDIA	17	19	18	21	19	16	17	20	20	20
IRAN	200	97	113	89	122	153	115	111	42	37
MEXICO	121	129	151	162	113	82	94	99	84	85
REP. OF KOREA	189	200	160	193	194	216	262	275	293	358
SAUDI ARABIA	284	473	370	418	665	576	453	473	248	217
VENEZUELA	236	196	190	199	195	95	119	109	154	187
WESTERN INDUSTRIAL COUNTRIES										
CANADA	575	635	538	553	371	448	516	471	478	508
F.R. GERMANY	526	602	549	503	436	486	489	481	483	454
FRANCE	367	395	373	325	318	276	276	258	254	258
JAPAN	579	673	675	603	586	549	619	606	576	620
UNITED KINGDOM	357	366	243	265	252	252	257	256	238	264
U.S.A.	672	640	508	565	363	404	479	451	403	422
EASTERN EUROPE AND CHINA										
CHINA	46	47	43	39	41	50	57	68	69	72
CZECHOSLOVAKIA	756	720	729	735	724	719	700	709	717	704
GERMAN D.R.	605	591	583	561	569	550	536	572	569	581
U.S.S.R.	587	570	566	563	557	578	579	581	589	577

SECTION THREE

THE STEEL INDUSTRY TODAY

Item 3.1 THE STEEL INDUSTRY TODAY

There are 69 installed steel plants in Africa (excluding South Africa). Included in this number are five plants that were not in production in late 1988 due to either technical/raw materials/operational problems, civil strife or product market constraints. These are IMCI, Abidjan, Atlantic Steelworks, Monrovia, Société Nationale de Sidérurgie, Maluku (Zaire), Ethiosider Iron and Steel Foundry, Asmara (Ethiopia), and Steel Billet Castings, Dandora (Kenya). In numerical terms, the greatest concentrations of steel plants are in Nigeria and Kenya, with 21 and 10 plants respectively.

The subregional breakdown of these plants, in terms of steelworks types, is as follows:

	NORTHERN AFRICA	WESTERN AFRICA	CENTRAL AFRICA	EASTERN AND SOUTHERN AFRICA	TOTAL
Number of steel plants	14	27	3	25	69
of which:					
Integrated	5	2	-	1	8
Mini-mills	6	10	2	7	25
Meltshops	-	-	-	2	2
Rolling mills	3	15	1	15	34

Iron making:

The regional iron-making capacity is 8.459 million tons per year. Five plants, with an aggregate production capacity of 5.354 million tons per year are located in Northern Africa, - Algeria, Egypt (2), Libyan Arab Jamahiriya and Tunisia. The Libyan plant is one of two commercial scale plants in Africa based on the gas-fueled Midrex direct reduction process.

Both iron-making plants in Western Africa are located in Nigeria, - at Aladja where the only (Midrex) direct reduction plant in Sub-Saharan Africa has been in operation since 1982, and at Ajaokuta where a blast-furnace-based complex is due to be commissioned in 1991.

The only iron-making plant in Eastern and Southern Africa is the 40-year old Zimbabwe Iron and Steel Company (ZISCO) steelworks at Redcliff, with a pig iron production capacity of 735,000 tons per year. It is currently undergoing rehabilitation involving the relining of its coke ovens and blast furnaces and the installation of byproduct, desulfurization and power plants.

Steelmaking:

The aggregate regional crude steelmaking capacity is 10.41 million tons per annum:

Northern Africa: - 6.636 million tons

Consisting of: Algeria - 2.18 million tons
Egypt - 2.932 million tons
Libyan Arab Jamahiriya - 1.304 million tons
Morocco - 0.03 million tons
Tunisia - 0.19 million tons

Western Africa: - 2.618 million tons

Consisting of: Ghana - 0.05 million tons
Mauritania - 0.012 million tons
Nigeria - 2.556 million tons

Central Africa: - 0.150 million tons

Consisting of: Angola - 0.03 million tons
Zaire - 0.12 million tons

Eastern and Southern Africa: - 1.0045 million tons

Consisting of: Ethiopia - 0.024 million tons
Kenya - 0.0955 million tons
Uganda - 0.025 million tons
United Rep. of fanzania - 0.02 million tons
Zimbabwe - 0.84 milion tons

Eighty-seven per cent of the crude steel capacity (equivalent to 9.06 million tons per year) is contributed by the large integrated steelworks, the balance coming from the smaller and (usually) electric arc furnace-based mini-mills and meltshops.

Rolling:

Steel rolling capacity in the region stands at about 11.62 million tons per annum:

NORTHERN AFRICA	7.177 million tons
WESTERN AFRICA	2.869 million tons
CENTRAL AFRICA	0.190 million tons
EASTERN AND SOUTHERN AFRICA	1.386 million tons

Of this, only 2.99 million tons (or about 25 per cent) is devoted to flat products. Furthermore, all the flat rolling capacity is restricted to Northern Africa, - Algeria, Egypt and Libyan Arab Jamahiriya. In other words, there is no flat steel production in Sub-Saharan Africa, implying total import dependence for flat products which, for most countries, accounts for at least 50 per cent of steel demand.

Product mix:

There is a clear predominance of long products, particularly reinforcing bars, rods and light sections, in the region's steel product mix. This category of products accounts for about 75 per cent of the installed rolling capacity. The construction and light engineering industries are usually the major consumers of these products.

Operational status (1987/88):

The combination of raw materials scarcity, severe limitations on foreign exchange with which to import essential supplies and spare parts, poor equipment maintenance, and market constraints brought on by the depression in

the construction and light engineering industries has resulted in gross under-utilization of installed steelmaking and rolling capacity. Exceptions are apparent in Northern Africa and Zimbabwe where capacity utilizations often exceeding 65 per cent were registered in 1987. The higher levels of technological skills prevalent in these areas, coupled with a higher degree of self-reliance for materials and supplies, must have contributed to the good performance record in these areas. In other countries, capacity utilizations below 30 per cent were common in 1987 and 1988.

3.1 (b) AFRICA'S INSTALLED STEEL PLANTS

COUNTRY	PLANT/LOCATION	TYPE OF PLANT	IRONMAKING PROCESS AND CAPACITY (per year)	STEELMAKING PROCESS AND CAPACITY (per year)	CASTING PROCESS	ROLLING CAPACITY (per year)	PRODUCT MIX	OPERATIONAL STATUS (1988)
NORTHERN AFRICA								
ALGERIA	i) ENTPL, Oran	Mini-mill	-	3 30-ton Open-Hearth furnaces; 100,000 tons	One 3-strand continuous caster	80,000 tons long products	Bars and rods	80% capacity utilization
	ii) SIDER, El Hadjar	Integrated	2 Blast furnaces; 1.69 million tons	3 90-ton & 3 60-ton LD converters; one 80-ton EAF. Total capacity 2.08 million	3 4-strand for billets; two 1-strand for slabs	540,000 tons for long products; 1,450,000 tons for flat products	Bars; rods; coils; plates; welded and seamless pipes	63% capacity utilization for long and 45% for flat products
EGYPT	i) Egyptian Iron & Steel Co., Helwan	Integrated	4 Blast furnaces; 1.70 million tons	4 17-ton Bessemer converters; 3 80-ton LD converters; 2 12-ton EAF. Total capacity 1.55 million	3 4-strand for billets; 2 2-strand for slabs	380,000 tons for long products; 822,000 tons for flat products	Bars, rods, sections, plates	57% capacity utilization for long and 50% for flat products
	ii) Delta Steel Mill, Mostorod Cairo	Mini-mill	-	2 3-ton EAF; 1 12-ton EAF; 1 18-ton EAF; 2 25-ton EAF. Total capacity of 100,000 t.	1 3-strand continuous caster for billets	140,000 tons long products	Bars, rods, sections	79% capacity utilization
	iii) Egyptian Copperworks, Alexandria	Mini-mill	-	1 5-ton and 1 25-ton EAFs; 2 25-ton and 1 50-ton Siemens-Martin furnaces. Total capacity of 192,000 t.	Ingots	72,000 tons long products	Bars, rods	76% capacity utilization
	iv) National Metal Industries, Cairo	Mini-mill	-	2 35-ton EAFs; 2 35-t. Siemens-Martins furnaces. Total capacity 250,000 tons.	1 3-strand for billets	180,000 tons long products	Bars, rods	94% capacity utilization
	v) Alexandria National Iron & Steel Co., Dikheila	Integrated	One Midrex Direct Reduction furnace, 704,000 tons	4 70-ton EAFs; 840,000 tons	3 4-strand for billets	750,000 tons long products	Bars, rods	80% capacity utilization

COUNTRY	PLANT/LOCATION	TYPE OF PLANT	IRONMAKING PROCESS AND CAPACITY (per year)	STEELMAKING PROCESS AND CAPACITY (per year)	CASTING PROCESS	ROLLING CAPACITY (per year)	PRODUCT MIX	OPERATIONAL STATUS (1988)
NORTHERN AFRICA								
LIBYAN ARAB JAM.	i) Libyan Metal Industr., Tripoli	Mini-mill	-	2 5-ton and 1 10-ton EAFs; Total capacity 40,000 tons	One 2-strand for billets	60,000 tons long products	Bars and rods	Below 50% capacity utilization
	ii) Executive Board Iron and Steel Co.(EBISCO), Misurata	Integrated	2 Midrex Direct reduction furnaces; 1.1 million tons	6 90-ton EAFs; capacity 1.264 m. tons	1 2-strand for billets; 1 2-str. for stabs	520,000 tons for long products; 720,000 tons flat products	Bars, rods, sections; hot and cold-rolled sheets	Commenced production 1987; operated at below 10% of capacity
MOROCCO	i) Société Nat. de métallurgie (SOMETAL), Casablanca	Rolling mill	-	-	-	35,000 tons long products	Bars, rods	70% capacity utilization
	ii) Sociéte Nat. de Sidérurgie (SONASID), Nador	Rolling mill	-	-	-	480,000 tons long products	Bars, rods	60% capacity utilization
	iii) Société Sidérurgie du Maroc, Tangiers	Mini-mill	-	EAF; 30,000 tons	Ingots	50,000 tons long products	Bars	55% capacity utilization
SUDAN	Sudanese Steel Products, Khartoum	Rolling mill	-	-	-	70,000 tons long products	Bars; rods	50% capacity utilization
TUNISIA	Société Tunisienne de Sidérurgie, El Fouladh	Integrated	One 4-m hearth blast furnace; 400,000 tons	2 20-ton LD Converters; one 20-ton EAF. Total capacity 190,000 tons	3 4-strand for billets	180,000 tons long products	Bars; rods	90% capacity utilization

COUNTRY	PLANT/LOCATION	TYPE OF PLANT	IRONMAKING PROCESS AND CAPACITY (per year)	STEELMAKING PROCESS AND CAPACITY (per year)	CASTING PROCESS	ROLLING CAPACITY (per year)	PRODUCT MIX	OPERATIONAL STATUS (1988)
WESTERN AFRICA								
COTE D'IVOIRE	IMCI, Abidjan	Rolling mill	-	-	-	30,000 tons long products	Bars	Not in operation
GHANA	i) GIHOC Steel-works Co., Tema	Mini-mill	-	2 EAFs; total capacity 30,000 tons	Ingots	30,000 tons long products	Bars	Below 10% capacity utilization but planned for rehabilitation
	ii) WAHOME Steel Co., Tema	Mini-mill	-	1 EAF; 20,000 tons	Ingots	20,000 tons long products	Bars; rods	Commissioned in 1989
LIBERIA	Atlantic Steel-works, Monrovia	Rolling mill	-	-	-	5,000 tons long prod. (based on ship-breaking scrap	Bars	Commissioned 1987, closed down 1988
MAURI-TANIA	Société Arabe du Fer et d'Acier (SAFA), Nouadhibou	Mini-mill	-	1 5-ton EAF; capacity 12,000 tons	Ingots	36,000 tons long products	Bars	12.5% capacity utilization
NIGERIA	i) Ajaokuta Steel Co. Ltd., Ajaokuta	Integrated	Blast furnace; capacity 1.35 m. ton	LD converters; capacity 1.3 mill. t.	3 4-strand for blooms	540,000 tons long products	Bars, rods, light sections	Iron and steelmaking plants due for commissionning 1991; configuration may be altered to also produce flats; about 5% capacity utilization (1987)
	ii) Alliance Steel Co., Ibadan	Rolling mill	-	-	-	20,000 tons long products	Bars	15% capacity utilization (1987)
	iii)Allied Steel Co., Onitsha	Rolling mill	-	-	-	20,000 tons long products	Bars	10% capacity utilization (1987)
	iv) Asiatic Man-darin Ind., Ikeja	Rolling mill	-	-	-	60,000 tons long products	Bars; sections	10% capacity utilization (1987)
	v) Continental Iron & Steel Co., Ikeja	Mini-mill	-	1 20-ton EAF; 60,000 tons	Ingots	150,000 tons long products	Bars; sections	33% capacity utilization (1987)

COUNTRY	PLANT/LOCATION	TYPE OF PLANT	IRONMAKING PROCESS AND CAPACITY (per year)	STEELMAKING PROCESS AND CAPACITY (per year)	CASTING PROCESS	ROLLING CAPACITY (per year)	PRODUCT MIX	OPERATIONAL STATUS (1988)
WESTERN AFRICA								
NIGERIA (Cont'd)	vi) Delta Steel Co., Aladja	Integrated	2 Midrex 600-series Direct Reduction furnaces; capacity 1.02 m.t.	4 110-ton EAFs; capacity 1.0 mill. tons	3 6-strand for billets	320,000 tons long products	Bars; rods; sections	14% capacity utilization in 1988; non-availability of iron ore
	vii) Federated Steel Industry, Otta	Mini-mill	-	1 12-ton EAF; capacity 40,000 tons	Ingots	140,000 tons long products;	Bars; sections	30% capacity utilization (1987)
	viii) General Steel Mills, Asaba	Mini-mill	-	1 8-ton EAF; 14,000 t.	Ingots	50,000 tons long products	Bars	15% capacity utilization (1987)
	ix) Jos Steel Rolling Co., Jos	Rolling mill	-	-	-	210,000 tons long products	Bars, rods	10% capacity utilization (1987)
	x) Katsina Steel Rolling Co., Katsina	Rolling mill	-	-	-	210,000 tons long products	Bars, rods	15% capacity utilization (1987)
	xi) KEW Metal Industries, Ikorodu	Mini-mill	-	-	Ingots	20,000 tons long products	Bars; sections	28% capacity utiliation (1987)
	xii) Kwara Commercial, Metal and Chemical Industries, Ilorin	Rolling mill	-	-	-	40,000 tons long products	Bars	6% capacity utilization (1987)
	xiii) Mayor Eng. Co., Ikorodu	Rolling mill	-	-	-	228,000 tons long products	Bars; sections	6% capacity utilization (1987)
	xiv) Metcombe Steel Co., Owerri	Rolling mill	-	-	-	10,000 tons long products	Bars	5% capacity utilization (1987)

COUNTRY	PLANT/LOCATION	TYPE OF PLANT	IRONMAKING PROCESS AND CAPACITY (per year)	STEELMAKING PROCESS AND CAPACITY (per year)	CASTING PROCESS	ROLLING CAPACITY (per year)	PRODUCT MIX	OPERATIONAL STATUS (1988)
WESTERN AFRICA								
NIGERIA (Cont'd)	xv) Nigerian-Spanish Eng. Co., Kano	Mini-mill	-	1 20-ton EAFs; 72,000 tons	1 2-strand for billets	188,000 tons long products	Bars; sections	13% capacity utilization in 1987
	xvi) Nigersteel Co., Enugu	Mini-mill	-	1 12-ton EAF; 20,000 tons	Ingots	40,000 tons long products;	Bars	10% capacity utilization (1987)
	xvii) Oshogbo Steel Co., Oshogbo	Rolling mill	-	-	-	210,000 tons long products	Bars; rods	19% capacity utilization (1987)
	xviii) Qua Steel Products, Eket	Rolling mill	-	-	-	60,000 tons long products	Bars, sections	10% capacity utilization (1987)
	xix) Selsametal, Otta	Rolling mill	-	-	-	100,000 tons long products	Bars	5% capacity utilization (1987)
	xx) Union Steel Co., Ilorin	Rolling mill	-	-	-	20,000 tons long products	Bars	13% capacity utilization (1987)
	xxi) Universal Steel Co., Ikeja	Mini-mill	-	2 12-ton EAFs; capacity 50,000 tons	Ingots	80,000 tons long products	Bars, sections	45% capacity utilization (1987)
TOGO	Société Nationale de Sidérurgie, Lomé	Rolling mill	-	-	-	32,000 tons long products	Bars (from used rails)	40% capacity utilization

COUNTRY	PLANT/LOCATION	TYPE OF PLANT	IRONMAKING PROCESS AND CAPACITY (per year)	STEELMAKING PROCESS AND CAPACITY (per year)	CASTING PROCESS	ROLLING CAPACITY (per year)	PRODUCT MIX	OPERATIONAL STATUS (1988)
CENTRAL AFRICA								
ANGOLA	Siderurgia Nationale UEE, Luanda	Mini-mill	-	1 18-ton EAF; capacity 30,000 tons	Ingots	50,000 tons long products	Bars;	12% capacity utilization
CAMEROON	SOLADA, Douala	Rolling mill	-	-	-	40,000 tons long products	Bars;	75% capacity utilization in 1987
ZAIRE	Société Nationale de Sidérurgie, Maluku	Mini-mill	-	1 50-ton EAF; capacity 120,000 tons	1 4-strand for billets	100,000 tons long products; 150,000 tons for cold rolling and corrugation	Bars, rods, cold-rolled hoop and strip	Sporadic operation since 1986; 2% capacity utilization (1988)

COUNTRY	PLANT/LOCATION	TYPE OF PLANT	IRONMAKING PROCESS AND CAPACITY (per year)	STEELMAKING PROCESS AND CAPACITY (per year)	CASTING PROCESS	ROLLING CAPACITY (per year)	PRODUCT MIX	OPERATIONAL STATUS (1988)
EASTERN AND SOUTHERN AFRICA								
ETHIOPIA	i) Ethiopian Iron and Steel Foundry, Akaki	Mini-mill	-	1 5-ton EAF; capacity 12,000 tons	Ingots	30,000 tons long products;	Bars, wire	40% capacity utilization (1987)
	ii) Ethiosider Iron and Steel Foundry, Asmara	Mini-mill	-	1 5-ton EAF; capacity 12,000 tons	Ingots	34,000 tons long products	Bars; rods, wire	Operations suspended since early 1980s
KENYA	i) City Engineering Works, Dandora	Mini-mill	-	1 1-ton medium frequency induction; 5,500 tons	Ingots	6,000 tons long products;	Bars, sections	45% capacity utilization (1987)
	ii) EMCO Steel Works, Dandora	Mini-mill	-	1 12-ton EAF; capacity 24,000 tons	Ingots	36,000 tons long products	Bars;	33% capacity utilization (1987)
	iii) Iron Int'l	Rolling mill	-	-	-	40,000 tons long products;	Bars,	Started production in 1988
	iv) Kenya United Steel Co., (KUSCO), Mombasa	Mini-mill	-	2 5-ton EAF; capacity 25,000 tons	1 1-strand for billets	30,000 tons long products	Bars; rods; sections	80% capacity utilization (1987)
	v) Morris and Co., Nairobi	Rolling mill	-	-	-	30,000 tons long products;	Bars, sections	53% capacity utilization (1987)
	vi) ROLMIL Kenya, Nairobi,	Mini-mill	-	1 7-ton EAF; 15,000 tons	Ingots	20,000 tons long products	Bars, sections	40% capacity utilization (1987)

COUNTRY	PLANT/LOCATION	TYPE OF PLANT	IRONMAKING PROCESS AND CAPACITY (per year)	STEELMAKING PROCESS AND CAPACITY (per year)	CASTING PROCESS	ROLLING CAPACITY (per year)	PRODUCT MIX	OPERATIONAL STATUS (1988)
EASTERN AND SOUTHERN AFRICA								
KENYA (Cont'd)	vii) Special Steel Mills, Ruiru	Rolling mill	-	-	-	50,000 tons long products	Bars; rods; sections	60% capacity utilization (1987)
	viii) Steel Billet Castings, Dandora	Meltshop	-	1 12-ton EAF; capacity 26,000 tons	1 2-strand for billets	-	Billets	Went into receivership 1987; scrap scarcity
	ix) Steel Rolling Mills, Kikuyu	Rolling mill	-	-	-	44,000 tons long products	Bars; sections	27% capacity utilization (1987)
	x) Steelmakers, Eldoret	Rolling mill	-	-	-	30,000 tons long products;	Bars, sections	50% capacity utilization (1987)
MADA-GASCAR	Toamasina Steel-works, Toamasina	Rolling mill	-	-	-	6,000 tons long products	Bars; sections	33% capacity utilization (1987)
MAURITIUS	i) Desbro Int'l, Port Louis	Rolling mill	-	-	-	40,000 tons long products;	Bars, sections	42% capacity utilization (1986)
	ii) R.M. Indus-tries, Port Louis	Rolling mill (using scraps)	-	-	-	3,000 tons long products	Bars; sections	26% capacity utilization (1986)
	iii) Sections Rolling, Port Louis	Rolling mill	-	-	-	17,000 tons long products;	Bars, sections	41% capacity utilization
	iv) Shipbreaking and Steel Inds., Port Louis	Rolling mill	-	-	-	17,000 tons long products	Bars, sections	21% capacity utilization

COUNTRY	PLANT/LOCATION	TYPE OF PLANT	IRONMAKING PROCESS AND CAPACITY (per year)	STEELMAKING PROCESS AND CAPACITY (per year)	CASTING PROCESS	ROLLING CAPACITY (per year)	PRODUCT MIX	OPERATIONAL STATUS (1988)
EASTERN AND SOUTHERN AFRICA								
MOZAM-BIQUE	Cia Industrial Fundicao e Lamina-gem (CIFEL), Maputo	Rolling mill	-	-	-	80,000 tons long products	Bars; rods; sections	20% capacity utilization (1987)
UGANDA	i) East African Steel Corp., Jinja	Mini-mill	-	1 10-ton EAF; capacity 25,000 tons	Ingots (Plans to instal 2-strand caster)	30,000 tons long products	Bars; rods; sections	6% capacity utilization
	ii) Jinja Steel Rolling Mill, Jinja	Rolling mill	-	-	-	10,000 tons long products	Bars; sections	6% capacity utilization
U. REP. TANZANIA	i) Steelcast Ltd (Div. of ALAF), Dar-Es-Salaam	Meltshop	-	1 12-ton EAF; 20,000 tons	1 12-ton EAF, 20,000 tons	-	Billets	55% capacity utilization (1987)
	ii) Steel Rolling Mills, Tanga	Rolling mill	-	-	-	24,000 tons long products	Bars; sections	40% capacity utilization
ZIMBABWE	i) Zimbabwe Iron and Steel Co., (ZISCO), Redcliff	Integrated	One 5.5 m. and one 8.75 m. blast furnaces, combined capacity 735,000 tons	2 50-ton LD coverters, capacity 840,000 tons	1 2-strand for billets; plus ingots	750,000 tons long products;	Bars, sections rods, rails	77% capacity utilization, under rehabilitation and expansion to 1m. tons
	ii) Lancashire Steel, Kwe-Kwe	Rolling mill	-	-	-	52,000 tons long products	Rods; wire	90% capacity utilization
	iii) Tor Steel	Rolling mill	-	-	-	7,000 tons seamless tubes	Seamless tubes	86% capacity utilization

3.1 (c)

CRUDE STEEL PRODUCTION CAPACITY BY SUBREGION

	Annual Steelmaking capacity (tons)
Northern Africa	6,636,000
Western Africa	2,618,000
Central Africa	150,000
Eastern and Southern Africa	1,004,500
Total Africa	10,408,500

3.1 (d)

ROLLING CAPACITY BY SUBREGION

	Annual rolling capacity, flat products (tons)
Northern Africa	2,992,000
Western Africa	0
Central Africa	0
Eastern and Southern Africa	0
Total Africa	2,992,000

3.1 (e)

	Annual rolling capacity, long products (tons)
Northern Africa	3,537,000
Western Africa	2,869,000
Central Africa	190,000
Eastern and Southern Africa	1,386,000
Total Africa	7,982,000

SECTION FOUR

THE RESOURCE BASE

4.1 IRON ORE

The U.S. Bureau of Mines estimates that Africa (including South Africa) accounts for about 7 per cent (or 14,832 million tons) of the world's iron ore reserve base of about 210,000 million tons. However, a country-by-country analysis of available data suggests that the region's reserve base could be well in excess of 34,111 million tons of ore, not all of which is necessarily economically or technically exploitable.

The distribution of these resources is as follows:

NORTHERN AFRICA	- 6,964	million tons
WESTERN AFRICA	- 13,633	" "
CENTRAL AFRICA	- 8,360	" "
EASTERN AND SOUTHERN AFRICA	- 5,154	" "

While the data on reserves in most countries are still subject to confirmation, indications are that the largest known reserves occur in the following areas:

- The Kilomoto haematite deposit in Zaire, 5,000 million tons.
- The Manesi range low-grade deposit in Zimbabwe, 3,300 million tons.
- The Gora Djebilet deposit in Algeria, 3,025 million tons.

Other large deposits occur in Côte d'Ivoire, Libyan Arab Jamahiriya, Mauritania, Liberia and Sierra Leone.

Notwithstanding Africa's extensive resource base, only a few deposits are being commercially exploited. Thus, only Algeria, Egypt, Liberia, Mauritania, Morocco, Tunisia and Zimbabwe rank among the world's iron ore producers. Nigeria's production is only on a semi-commercial basis pending the commissioning of necessary beneficiation facilities and the completion of infrastructural and other projects at the Ajaokuta steelworks. The mines in Angola, Sierra Leone and Swaziland are no longer in production.

Most of Africa's iron ore resources remain largely undeveloped due to such constraints as non-availability of the necessary investment resources from both domestic and international sources, the general sluggishness of the world's iron ore market, the relative inaccessibility of many reserves, necessitating large investments in transportation and other infrastructures, and civil and political strifes that impede orderly development.

Liberia and Mauritania are the only African exporters of iron ore. The volume of export has, however, been declining from over 31 million tons in 1979 to 22.5 million tons in 1987, equivalent to 7.8 per cent and 6.2 per cent respectively of the world's total exports.

Liberia's exports are in the form of concentrates and pellets from the Bong mine, and lump ore and washed fines from the Mount Nimba mine. Mauritania's exports are concetrates from the Guelbs and natural fines and lump ore from the Kédia d'Idjil mine which is due to be mined out in the early 1990s.

Up to 1984, Algeria was a significant exporter of iron ore, but with the commissioning of the El Hadjar integrated steelworks, all its production has now been diverted to domestic consumption. Similarly Egypt, Morocco, Tunisia and Zimbabwe produce for their domestic steel plants only.

4.1 (a)

AFRICA'S IRON ORE RESOURCES

SUBREGION: NORTHERN AFRICA

COUNTRY	RESERVE LOCATION	RESERVE SIZE (million tons)	RESERVE CHARACTERISTICS	DEVELOPMENT STATUS
Algeria	i) Ouenza Boukhadra	194	55.5% Fe	Open-cast mines (capacity of 4 m.t/yr) now produce over 75% of Algeria's iron ore output for the El Hadjar Steelworks.
	ii) Gara Djebilet	3,025	High phosphorus; 57% Fe; 0.7% P	Largest deposit in the Arab world; undeveloped.
Egypt	El-Djadida, Assouan Baharia and El-Ghozali	389	44-58.5% Fe; 0.50-1.90%P	Baharia mine in production; capacity of 3.3 m.t/yr.
Libyan Arab Jamahiriya	Wadi Shatti	2,575	3 horizons of magnetites/haematites, siderites/chlorites/sulfides, and oxides, 35-55%Fe, 0.9%P	Planned for development to feed Mitsurata steelworks, but contingent on 900km rail link to Mitsurata
Morocco	Mellila (in the Rif region)	34	Magnetite; 54-60% Fe	Mine commissioned 1971; capacity of 0.4 m.t/yr
Sudan	Scattered reserves in the Red Sea and Central Desert areas and at Bahrel Ghazal	735	60-69% Fe (Red Sea and Central Desert); 0.21%P	Undeveloped
Tunisia	Scattered reserves in the Djerissa, Tamera, Ganara and Mali Douaria areas	12	47-53% Fe;	Mine in operation pre-1960, rated at 0.4 m.t/yr

COUNTRY	RESERVE LOCATION	RESERVE SIZE (million tons)	RESERVE CHARACTERISTICS	DEVELOPMENT STATUS
Benin	Loumbou-Loumbou	266	50–55% Fe; 3–16% SiO_2	Undeveloped
Burkina Faso	Say	50	58% Fe; 12% SiO_2	Undeveloped
Cape Verde	–	–	–	–
Côte d'Ivoire	i) Monogaga-Victory	140	42% Fe; oolitic	Undeveloped
	ii) Man	2,870	33–46% Fe	Undeveloped
Gambia	–	–	–	–
Ghana	Oppong Mansi	40	38–40% Fe	Undeveloped
Guinea	Mount Nimba	800	High-grade; 67% Fe	Planned for development at 4.5 m.tons ore per yr in early 1990s
Guinea-Bissau	–	–	–	–
Liberia	i) Nimba Tokadeh	1,636	High-grade; 62% Fe	In production since 1963; capacity of 4 m.t/yr.
	ii) Bong range	371	Haematite, 36.5% Fe	In production since 1965; rated at 7.2 m.t/yr.
Mali	i) Bafing-Makana	150	36–37% Fe	Undeveloped
	ii) Falémé	8	Not available	Undeveloped

APPENDIX - Mineral deposits (continued)

COUNTRY	RESERVE LOCATION	RESERVE SIZE (million tons)	RESERVE CHARACTERISTICS	DEVELOPMENT STATUS
Mauritania	i) Kédia d'Idjil	54	High-grade 55-66% Fe	Deposit due for exhaustion in early 1990s.
	ii) The Guelbs (El Rhein, Oum Arwagen and Merizet)	2,010	37%Fe	In production since 1985; mine rated at 4 m.t/yr.
	iii) West of Zouerate	980	High-grade; 67%Fe	Undeveloped
Niger	Say	650	Low-grade oolitic haematite, 48-53% Fe	Undeveloped but commercially viable
Nigeria	i) Itakpe	650	39% Fe; 43% SiO_2	Being developed to produce upto 8.7 m.t/yr for Ajaokuta Steelworks
	ii) Agbaja	1,000	Low-grade; high P (4.2% P_2O_5)	Undeveloped
	iii) Ajabonoko and Choko-Choko	130	Low-grade	Undeveloped
Senegal	Faléme (near the Mali border)	633	High-grade; 62-67% Fe	Proposed for development along with rail links to Dakar and port facilities
Sierra Leone	Marampa; Tonkolili and Bagala Hill	1,100	38-54% Fe	Production terminated in 1985, pending recruitment of new management.
Togo	Baseri	95	Not available	Undeveloped.

COUNTRY	RESERVE LOCATION	RESERVE SIZE (million tons)	RESERVE CHARACTERISTICS	DEVELOPMENT STATUS
Angola	i) Kassinga	100 (40% Fe cutoff) 1,000 (30-35% Fe)	Limonite, haematite, martite 30-34% Fe	Mine rehabilitated 1986 but mining not yet resumed due to internal political problems.
	ii) Kassala-Kitungo	300	Low-grade titanomagnetite; 30-35% Fe	Undeveloped
Burundi	-	-	-	-
Cameroon	i) Kribi (in the Mamella belt)	240	30-40% Fe	Studied but undeveloped
	ii) Mbalam area	440	High-grade; 60% Fe	" " "
Chad	-	-	-	-
Cent. Afr. Rep.	-	-	-	-
Congo	i) Zanaga	100	43% Fe; 20% SiO_2	Undeveloped
	ii) Mayoko	30	50% Fe; 8.8% SiO_2	"
Eq. Guinea	-	-	-	-
Gabon	Haut-Ivindo on the border with Congo	1,000	High-grade; 64% Fe with high P(>0.07%)	Undeveloped; exploitation tied to Transgabonaise railway from Booué
Rwanda	-	-	-	-
Sao Tome & Principe		-	-	-
Zaire	i) Kisanga; Kambove and Kanunka	50	56% Fe	Undeveloped
	ii) Kilomoto	5,000	45-65% Fe	Undeveloped
	iii) Luebo	100	35% Fe	Undeveloped

COUNTRY	RESERVE LOCATION	RESERVE SIZE (million tons)	RESERVE CHARACTERISTICS	DEVELOPMENT STATUS
Botswana	Matsiloja Hills	Unquantified	Not available	Undeveloped
Comoros	-	-	-	-
Djibouti	-	-	-	-
Ethiopia	i) Bikilal (Wellega Province)	18 (provable)	26% Fe; 14-15% TiO_2	Undeveloped
	ii) Dello (Bale Province)	Unquantified	Not available	Undeveloped
Kenya	Scattered deposits in the Mrima, Burkura, McCalder Mine and Uyoma areas	Aggregate of about 42	Low-grade	Undeveloped
Lesotho	-	-	-	-
Madagascar	i) Soalala	400	High-grade, 60%Fe	Under study for possible development
	ii) Ambatovy-Analamay	20	Medium-", 50% Fe	Undeveloped
Malawi	Scattered deposits north of Blantyre	0.16	Banded haematite magnetite gneiss	Undeveloped
Mauritius	-	-	-	-
Mozambique	i) Monte Muande (in Tete Province)	200	High quality (60% Fe)	Undeveloped
	ii) Honde	37	Meta-itaberites	Undeveloped
Seychelles	-	-	-	-
Somalia	Bur & Kisimaio areas	170	Low-grade 30-39% Fe	Undeveloped
Swaziland	Ngwenya area	50	45% Fe	Ngwenya mine closed in 1978, not yet reopened.

COUNTRY	RESERVE LOCATION	RESERVE SIZE (million tons)	RESERVE CHARACTERISTICS	DEVELOPMENT STATUS
Uganda	Muko and Sukulu Hills	71	High-grade 62-68%Fe	Undeveloped
U.R. of Tanzania	i) Liganga	200	51% Fe, 12.8% Ti 0.67% V	Undeveloped
	ii) Chunya	50	Low-grade, 32%Fe	Deposit being mined.
	iii) Hundusi	8	Titaniferrous Magnetite, 40% Fe	Undeveloped
	iv) Mbelala	32	Magnetite, 28-32% Fe	"
Zambia	i) Nambala	220 (available) of which 60 is 62-64% Fe	Haematite-magnetite 8-10% SiO_2, 0.07-0.2%P	Being evaluated for proposed direct reduction project
	ii) Mwomboshi	1.4	60% Fe, 9%SiO_2	Undeveloped
Zimbabwe	i) Buchwa	134	High-grade 61.5%Fe	To be mined out by 1995.
	ii)Ripple Creek	200	53.4%Fe	Being developed to supply ZISCO requirements.
	iii) Manesi range	3,300	Low-grade, 40%Fe	Undeveloped.

4.1 (c) Iron ore reserves by subregion (million tons)

NORTHERN AFRICA	6,964
WESTERN AFRICA	13,633
CENTRAL AFRICA	6,960
EASTERN AND SOUTHERN AFRICA	6,554

4.1 (d) Countries ranked by iron ore reserve size (million tons)

MALAWI	0.16
TUNISIA	12
ETHIOPIA	18
MOROCCO	34
GHANA	40
KENYA	42
BURKINA FASO	50
SWAZILAND	50
UGANDA	71
TOGO	95
CONGO	130
MALI	158
SOMALIA	170
ZAMBIA	221
MOZAMBIQUE	237
BENIN	266
U. R. OF TANZANIA	290
EGYPT	389
MADAGASCAR	420
SENEGAL	633
NIGER	650
CAMEROON	680
SUDAN	735
GUINEA	800
GABON	1,000
SIERRA LEONE	1,100
ANGOLA	1,400
NIGERIA	1,780
LIBERIA	2,007
LIBYAN ARAB JAMAHIRIYA	2,575
COTE D'IVOIRE	3,010
MAURITANIA	3,044
ALGERIA	3,219
ZIMBABWE	3,634
ZAIRE	5,150

AFRICA'S SHARE (AS OF 1 JANUARY 1984) OF THE WORLD'S IRON ORE RESERVE BASE*
(Million tons)

REGION	RESERVE CRUDE ORE	BASE IRON CONTENT
AFRICA	14,832	9,651
ASIA	17,981	9,244
EUROPE	71,416	30,578
NORTH AMERICA	51,098	16,152
OCEANIA	34,540	21,130
SOUTH AMERICA	19,708	13,206
WORLD TOTAL	209,575	99,961
AFRICA'S SHARE	7.08%	9.65%

* The U.S. Bureau of Mines defines RESERVE BASE as the quantity of in-place demonstrated (measured plus indicated) resource that meets specified minimum physical and chemical criteria related to current mining and production practices, including those for grade, quality, thickness and depth. The reserve base includes those resources that are currently economic (i.e. reserves), marginally economic (marginal reserves), and some of those that are currently subeconomic (subeconomic resources).

4.1 (f) Africa's share of world iron ore reserves (per cent)

	Per cent
AFRICA	7
ASIA	9
EUROPE	34
NORTH AMERICA	24
OCEANIA	17
SOUTH AMERICA	9

4.1 (g)

IRON ORE PRODUCERS

PRODUCTION (thousand tons)

COUNTRY	1979	1981	1983	1985	1987
AFRICA:					
ALGERIA	3,120	3,481	3,684	3,376	3,382
EGYPT	1,701	2,015	2,007	2,000	2,000
LIBERIA	18,350	19,540	15,410	16,120	13,810
MAURITANIA	8,910	8,270	6,600	9,200	9,000
MOROCCO	60	50	300	140	200
NIGERIA	0	0	0	0	208
SIERRA LEONE	0	0	360	70	50
TUNISIA	390	400	300	310	291
ZIMBABWE	1,201	1,096	924	1,098	1,328
TOTAL AFRICA	33,822	34,852	29,585	32,314	30,269
EUROPEAN COMMUNITY	49,154	34,187	24,814	22,512	16,766
OTHER WESTERN EUROPE	41,613	38,584	29,318	36,649	37,074
OTHER WESTERN INDUSTRIALIZED COUNTRIES	261,459	238,766	158,647	209,249	209,346
LATIN AMERICA	130,163	133,993	116,840	163,457	171,325
ASIA	40,454	42,267	38,345	44,988	49,215
EASTERN EUROPE	248,834	248,751	251,147	253,992	256,661
CHINA, DPR KOREA	127,260	112,590	121,660	139,500	165,500
WORLD TOTAL	932,759	883,990	770,356	902,661	936,156
AFRICA'S SHARE	3.6%	3.9%	3.8%	3.6%	3.2%

ACTIVE MINES AND PRODUCTION CAPABILITY
(tons per year)

Ouenza (4 million)
Bahariya (3.30 million)
Bong Mining Co. (7.20 million); Mt. Nimba (4 million)
Kedia (8.20 million)
Seferif (0.4 million)
Itakpe (0.35 million)

Djerissa (incl. Tamera and Douari 0.4 million)
Buchwa (1.44 million); Ripple Creek (0.42 million)

4.1 (h) Iron Ore Producers (1987)

COUNTRY	1987 PRODUCTION (thousand tons)
LIBERIA	13,810
MAURITANIA	9,000
ALGERIA	3,382
EGYPT	2,000
ZIMBABWE	1,328
TUNISIA	291
NIGERIA	208
MOROCCO	200
SIERRA LEONE	50

4.1 (i)

IRON ORE EXPORTERS

EXPORTS (thousand tons)

COUNTRY	1979	1981	1983	1985	1987
AFRICA:					
ALGERIA	2,484	1,507	1,302	7	13
EGYPT	0	0	0	0	0
LIBERIA	19,348	20,670	15,358	16,126	13,539
MAURITANIA	9,313	8,609	7,402	9,333	9,002
MOROCCO	0	0	0	0	0
NIGERIA	0	0	0	0	0
SIERRA LEONE	0	0	355	80	50
TUNISIA	0	0	0	0	0
ZIMBABWE	0	0	0	0	0
TOTAL AFRICA	31,145	30,786	24,417	25,546	22,554
EUROPEAN COMMUNITY	12,301	7,798	6,237	6,790	5,855
OTHER WESTERN EUROPE	12,301	21,243	17,255	20,820	19,292
OTHER WESTERN INDUSTRIALIZED COUNTRIES	150,569	136,296	113,469	134,823	123,596
LATIN AMERICA	100,788	105,427	85,107	111,369	118,718
ASIA	27,970	23,927	22,001	28,840	29,001
USSR	44,504	43,453	42,805	43,880	43,000
CHINA, DPR KOREA AND OTHER EASTERN EUROPEAN COUNTRIES	N O T A V A I L A B L E				
WORLD TOTAL	397,001	368,930	311,361	372,068	366,066
AFRICA'S SHARE	7.8%	8.3%	7.8%	6.9%	6.2%

4.1 (j) Africa's iron ore exports vis-à-vis other regions of the world (per cent)

	Per cent
AFRICA	6
EUROPEAN COMMUNITY	2
OTHER WESTERN EUROPE	5
OTHER WESTERN INDUSTRIALIZED COUNTRIES	34
LATIN AMERICA	32
ASIA	8
USSR	12
CHINA, DPR KOREA AND OTHER EASTERN EUROPEAN COUNTRIES	1

Item 4.2: COAL

According to estimates by the International Energy Agency, Africa accounts for about 6 per cent of the world's accessible coal in significant reserves. This amounts to about 34,600 million tons out of 581,000 million tons.

The bulk of Africa's coal reserves occur in Southern Africa, with Botswana and Zimbabwe endowed with the most extensive deposits. Botswana's coalfields contain up to 17,000 million tons of washable steam coal, of which at least 3,500 million tons is recoverable. The Morupule mine is in production and has the capacity to produce up to one million tons per year. Zimbabwe's coal output comes from the Hwange coalfields. It is the source of metallurgical coal for ZISCO's steelworks. Other coal producers in Southern and Eastern Africa are Malawi (from the Kaziwiziwi mine), Mozambique (whose reserves include up to 2.5 billion tons coking coal), Swaziland, the United Republic of Tanzania, and Zambia (from the Maamba mine).

Algeria, Egypt and Morocco are significant coal producers in Northern Africa. Egypt's Maghara mine has been recently rehabilitated to enable it to achieve an output of 600,000 tons per annum. In Morocco, the Jerada mine has the capacity to produce up to one million tons per year.

Nigeria and Niger are the only coal producers in Western Africa. Since the early 1970s, Nigeria's output had steadily declined to less than 50,000 tons per annum, but efforts are now being made to rehabilitate the mines to produce for domestic power plants and industries, as well as for the export market. Niger's production from the Anou-Araren mine is consumed by local power plants.

In Central Africa, coal is produced from the Luena and Lukuga mines in Zaire. Annual output now averages only about 125,000 tons.

4.2 (a)

COAL RESOURCES

COUNTRY	RESERVE LOCATION	RESERVE SIZE (million tons)	RESERVE CHARACTERISTICS	STATUS OF EXPLOITATION
NORTHERN AFRICA				
ALGERIA	The Gara Bechar, Mazarif and Gara Antar deposits.	100	Significant anthracite and hard coal with good coking properties and medium volatility (22-35%); high sulfur (2.24-2.78%).	Kenadza mines are in production.
EGYPT	Near Suez and in the Sinai (including Maghara)	80	Maghara brown coal contains high sulfur (up to 4.9%).	Maghara mine rehabilitated and targeted to produce 600,000 tons in 1989.
MOROCCO	The Jerada basin	120	Anthracite; 40 mill. tons recoverable; low ash (3-4%), low volatiles (5-6%).	Jerada mine production approaching one million tons per year.
WESTERN AFRICA				
NIGER	Anou-Araren deposit	6	-	Anou-Araren mine supplies coal to fuel power plant at site.
NIGERIA	Deposits around Enugu (in Anambra State) and in Benue and Plateau States	Estimated between 650 and 1,500	Sub-bituminous and lignite with high-ash (8-22%) and high volatiles (36-43%); generally non-coking.	Mines in Anambra and Benue States being rehabilitated; output of 117,000 tons in 1987.

4.2 (a) (continued)

COAL RESOURCES

COUNTRY	RESERVE LOCATION	RESERVE SIZE (million tons)	RESERVE CHARACTERISTICS	STATUS OF EXPLOITATION
CENTRAL AFRICA				
ANGOLA	Scattered small reserves	Up to 600 (estimated)	Low-quality brown coal in thin seams, and lignite.	Undeveloped.
BURUNDI	Peat reserves	About 1.0	-	On-going 6-year study of exploitation potential.
RWANDA	Peat reserves	2,116 (estimated)	-	Undeveloped.
ZAIRE	Luena and Lukuga in Shaba Province	720	Average to low quality bituminous with high-ash and low calorific value.	Production from Luena at about 100,000 tons/year, and from Lukuga at about 25,000 tons/year.
EASTERN AND SOUTHERN AFRICA				
BOTSWANA	Morupule, Moijabana, Mmamabula, Letlhakeng and Dutlwe fields	17,000 (of which 3,500 is recoverable)	High-ash medium-volatile steam coal; washable to yield product with about 12% ash and less than 1% S.	Morupule mine in production, with production capacity of 1 million tons/year.
ETHIOPIA	Small deposit near Chilga in Gondav Province	Unquantified	Lignite.	Undeveloped.

4.2 (a) (continued)

COAL RESOURCES

COUNTRY	RESERVE LOCATION	RESERVE SIZE (million tons)	RESERVE CHARACTERISTICS	STATUS OF EXPLOITATION
MADAGASCAR	Sakoa and Imaloto fields	Up to 810	Sub-bituminous and bituminous steam coals; 15-30% ash and 1.4-2.4% S.	Undeveloped.
MALAWI	The Livingstonia coal fields, and in the south near Chiromo	800	Sub-bituminous and bituminous steam coal, with 15-30% ash and 1.4-2.4% S.	Kaziwiziwi mine in production since 1985; produced 16,500 tons in '87 (half of domestic consumption).
MOZAMBIQUE	The Moatize, Mucanha-Vuzi, Minjova, Sanangoe, Metangula and Espungabera basins.	Over 7,500	Up to 2.5 billion tons coking grade, 20% ash and 30% volatile matter; balance medium-to-high ash steam coal (20% ash, 26% volatile matter, 6,600 kcal/kg).	Moatize basin being mined, although civil strife has depressed production to only 20,000 tons in 1985.
SWAZILAND	North-to-south basin in Eastern Swaziland running the length of the country.	Up to 1,000	Moderate to good quality low-volatile to anthracite (cokable) coal in the lower zone; inferior anthracite in upper zone.	Production of 165,000 tons in 1987 for domestic use and exports.
U.R. TANZANIA	Mchuchuma reserves	Up to 1,500	Steam coal, 20.8% ash, 25% volatiles, and 0.48% sulfur.	Mining at Ilima in Mbeya region; below 10,000 tons output in 1985.
ZAMBIA	The Zambezi, Luangwa, Luano and Lukusashi valleys, and the Western Zambia trough system.	90	Non-coking sub-bituminous steam coal with high ash (17%) and low volatiles (19%).	Maamba mine in the mid-Zambesi valley is the only active mine, with output of 463,000 tons in 1987.
ZIMBABWE	23 fields located mainly in the Mid-Zambezi and Sabi-Limpopo basins.	Up to 30,000	Over 2 billion tons of coking grade.	Current production only from Hwange coalfield in the mid-Zambezi basin.

4.3 (c)

AFRICA'S SHARE OF THE WORLD'S PROVEN PETROLEUM RESERVES

(million barrels)

REGION	1981	1982	1983	1984	1985	1986	1987
NORTH AMERICA	36,726.0	34,878.0	34,169.8	34,418.1	33,472.0	31,695.0	30,076.0
LATIN AMERICA	75,664.2	81,339.8	83,858.9	84,829.8	112,636.5	112,623.3	114,491.0
WESTERN EUROPE	18,349.4	17,058.8	17,444.5	17,123.8	19,358.1	18,510.8	22,648.3
MIDDLE EAST	364,860.0	387,005.9	392,175.3	430,399.8	431,640.7	536,837.7	567,028.3
AFRICA	55,550.8	57,555.5	56,964.3	56,248.7	57,706.6	57,602.1	57,957.7
ASIA AND THE FAR EAST	17,522.2	17,216.1	16,841.9	16,871.7	17,238.3	17,848.7	18,102.6
OCEANIA	1,879.8	1,791.1	1,756.0	1,585.9	1,625.0	1,879.8	1,852.0
CENTRALLY-PLANNED ECONOMIES	106,195.0	106,638.0	105,301.0	100,960.0	82,805.0	80,700.0	78,950.0
TOTAL WORLD	676,747.4	703,483.2	708,511.7	742,437.8	756,482.2	857,697.4	891,105.9
AFRICA PERCENTAGE	8.21%	8.18%	8.04%	7.58%	7.63%	6.72%	6.50%

4.4 (c)

AFRICA'S SHARE OF THE WORLD'S PROVEN NATURAL GAS RESERVES

(billion standard cubic metres)

REGION	1981	1982	1983	1984	1985	1986	1987
NORTH AMERICA	8,258.4	8,310.9	8,296.3	8,414.4	8,259.6	8,171.1	8,040.0
LATIN AMERICA	5,094.2	5,260.4	5,330.3	5,441.0	5,662.3	6,564.4	7,038.8
WESTERN EUROPE	4,269.0	4,252.1	5,463 *	5,637.3	5,551.1	5,586.1	5,529.1
MIDDLE EAST	24,579.9	25,410.6	25,88?	27,120.9	27,559.7	30,316.4	31,170.9
AFRICA	5,944.6	6,427.1	5,923.3	5,920.6	5,948.3	7,163.0	7,195.0
ASIA AND THE FAR EAST	4,157.3	4,366.9	4,675.3	5,226.1	5,742.5	6,592.3	6,754.3
OCEANIA	1,050.0	1,065.0	1,183.7	1,611.0	1,697.2	2,278.0	2,516.0
CENTRALLY-PLANNED ECONOMIES	34,227.7	36,523.5	37,413.0	38,909.0	41,468.0	42,618.0	43,301.0
TOTAL WORLD	87,581.7	91,616.5	94,184.2	98,280.2	101,888.7	109,289.3	111,545.1
AFRICA PERCENTAGE	6.79%	7.02%	6.29%	6.02%	5.84%	6.55%	6.45%

4.5 (a)

RESERVES OF ALLOYING MINERALS

COUNTRY	ALLOYING MINERALS	RESERVE LOCATION AND SIZE	STATUS OF EXPLOITATION
NORTHERN AFRICA			
SUDAN	Chromite	Ingessama Hills near the Ethiopian border; 15 million tons.	Current production at 10,000 to 15,000 tons/year for export.
WESTERN AFRICA			
BURKINA FASO	Manganese	Tamboa on the northern border; 13 million tons oxide ore (50-55% Mn) and 13 million tons carbonate ore (48% Mn).	Development impeded by suspension (in 1986) of rail connection project to Ouagadougou.
COTE D'IVOIRE	Manganese	Grand Lahou and Ziemongoula deposits; total of 2.7 million tons (44-47% Mn).	Undeveloped.
GHANA	Manganese	Nsuta deposit; 49 million tons.	Ghana is major manganese exporter, production of 253,000 tons ore (1987)
NIGERIA	Columbite/ Tantalite	In association with tin on the Jos Plateau.	Declining output due to exhaustion of easier-to-mine deposits.
TOGO	Manganese	The Bayega deposit.	Undeveloped.

4.5 (a)

RESERVES OF ALLOYING MINERALS

COUNTRY	ALLOYING MINERALS	RESERVE LOCATION AND SIZE	STATUS OF EXPLOITATION
CENTRAL AFRICA			
ANGOLA	Manganese	Maiombe region (Cabinda) and the Lucala, Quicama and Capuia areas. Reserves of at least 5 million tons.	Undeveloped.
BURUNDI	Nickel	Buhinda (northeast of Musongati); 29 million tons at 0.8% Ni cut off.	Undergoing tests for possible exploitation.
	Vanadium	Mukanda deposit; 12-15 million tons averaging 0.66% V.	Undeveloped.
GABON	Manganese	Moanda area (near Franceville); 200 million tons.	26% of world's reserves; production of 2.4 million tons in 1987.
ZAIRE	Cobalt	Shaba region; 1.36 million tons in association with copper.	World's leading producer of cobalt; 1986 output of 14,500 tons.
	Columbite/ Tantalite	Kivu region; 33,600 tons.	In semi-commercial production; output of 120 tons concentrate in 1986.
	Manganese	Near Kisenge; 5 million tons.	Undeveloped.
	Tungsten	Kivu region; 3,000 tons.	Co-product with tin, columbite and tantalite; output of 15 tons tungsten content in 1986.

RESERVES OF ALLOYING MINERALS

COUNTRY	ALLOYING MINERALS	RESERVE LOCATION AND SIZE	STATUS OF EXPLOITATION
EASTERN AND SOUTHERN AFRICA			
BOTSWANA	Nickel/ Cobalt	The Selebi-Phikwe deposit (in eastern Botswana); 400,000 tons Ni and 27,000 tons cobalt.	Matte pellets produced at smelter, 18,974 tons contained nickel and 163 tons contained cobalt in 1986.
ETHIOPIA	Nickel/ Chromium	West of Kenticha; unquantified.	Undeveloped.
	Columbite/ Tantalite	Kenticha in Sidamo Province; unquantified.	Undeveloped.
MADAGASCAR	Chromite	The Adriamena, Befandriana and other southern zone deposits; total of 7.61 million tons of ore.	Exploited by SOMAREX; total installed capacity of 340,000 tons/year.
MOZAMBIQUE	Columbite/ Tantalite	Central Zambézia Province; 5,800 tons Ta_2O_5.	Limited mining and declining production (only 4.3 tons Ta_2O_5 concentrate in 1985).
UGANDA	Cobalt	The Kilembe deposit; unquantified.	On a care-and-maintenance basis during 1987.
U.R. OF TANZANIA	Titanium/ Vanadium	Liganga (in association with iron); unquantified.	Undeveloped.

4.5 (a)

RESERVES OF ALLOYING MINERALS

COUNTRY	ALLOYING MINERALS	RESERVE LOCATION AND SIZE	STATUS OF EXPLOITATION
EASTERN AND SOUTHERN AFRICA (Continued)			
ZAMBIA	Cobalt	The Copperbelt, in the areas around Nchanga, Mufulira, Nkana, Luanshya and Konkola; 544,300 tons.	Co-product with copper; production by Zambia Consolidated Copper Mines Ltd. (ZCCM), part-owned by the Government (60.3%).
ZIMBABWE	Chromite	Kwe-kwe, Gwelo and Tebekwe areas; reserves are effectively inexhaustible; proven reserves of over 500 million tons.	Mined and smelted to ferrochrome; Zimbabwe is the world's third largest producer.
	Nickel	In the Shamva, Fort Victoria and Gatooma areas; reserves are adequate for 50 years exploitation.	Nickel domestically smelted and refined for export by Anglo-American Corporation.
	Cobalt	In association with copper in the Zawi-Sinola areas and north of Umtali.	In production; 1986 recoverable mine output of 76 tons of metal.
	Columbite/ Tantalite	In association with tin east of Wankie.	Processed to metal and alloys.
	Tungsten	Northwest of Shamva.	Ore and concentrate produced for export.

EXPLOITATION OF HYDRO-RESOURCES

COUNTRY	HYDRO-RESOURCES AND STATUS OF EXPLOITATION
NORTHERN AFRICA	
ALGERIA	Very limited hydro-resources.
EGYPT	About 1/4 of electricity demand generally comes from hydro-sources. Installed capacity of Aswan High Dam is 2,000-MW; thermal generating capacity of 1,000-MW.
LIBYAN ARAB JAMAHIRIYA	Not only is current emphasis on thermal power generation using gas and oil, but hydro-resources are relatively limited.
MOROCCO	Less than 20% of power output is hydro-based from 23 plants with a combined capacity of 604-MW. Among newly commissioned plants is the 67-MW Amougguez plant fed from the Ait Chouarit dam; additional capacity would be provided by the 240-MW M'Jara hydro-station and dam when completed.
SUDAN	515-MW of the total installed capacity of 1,035-MW is hydro-based, although supply is regularly disrupted by the seasonality of flow of the Blue Nile.
TUNISIA	Hydro-potential is limited (350-MW) and currently supplies only about 5% of power output.

4.6 (a) (continued)

EXPLOITATION OF HYDRO-RESOURCES

COUNTRY	HYDRO-RESOURCES AND STATUS OF EXPLOITATION
WESTERN AFRICA	
BENIN	The 62-MW Nangbeto dam project on the Mono River (jointly executed with Togo) was completed in 1988.
BURKINA FASO	Three hydro-plants are under construction, the 7.5-MW Bagre dam on Nankebe River, the 60-MW Noumbiel dam on the Mouhoun River, and the Kompienga dam (15-MW) at Pama (completed in 1988). These will supplement 38.9-MW operating thermal capacity.
CAPE VERDE	Very limited hydro-resources.
COTE D'IVOIRE	376-MW hydro-capacity in operation at Koussou and at Taabo and Buyo dams.
GAMBIA	Hydro-resources, though limited, are unexploited.
GHANA	Installed hydro-power capacity is 552-MW, from the Akosombo Dam on the Volta River (792-MW) and the Kpong project (160-MW). Third hydro-dam under study at Bui on the Black Volta.
GUINEA	There is a large but undeveloped hydro-potential, although 70% of installed generating capacity is hydro. Studies are in progress for a 375-MW hydro-project on the Konkouré river.
GUINEA-BISSAU	Vast undeveloped hydro-potential, particularly on the Corubal river.
LIBERIA	Mount Coffee Dam on St. Paul River feeds a 75-MW station. There are proposals for a station on the Cavalla River.
MALI	Selingué Dam has a 45-MW hydro-station, supplying over 90% of consumption. The Manantali dam station on the Senegal river valley should be commissioned soon.
MAURITANIA	Should benefit from the Manantali dam project when eventually commissioned. Other hydro-electric resources are limited.

EXPLOITATION OF HYDRO-RESOURCES

COUNTRY	HYDRO-RESOURCES AND STATUS OF EXPLOITATION
WESTERN AFRICA (CONTINUED)	
NIGER	Supplements its domestic thermal electricity output with imported power from Kainji station in Nigeria while long-term plans are being made for a 125-MW dam and station at Kandadji on the Niger river.
NIGERIA	The installed hydro-capacity consists of the Kainji station (320-MW, with plans for eventual expansion to 960-MW), the Jebba dam and station (540-MW) and the Shiroro dam (600-MW). Output is often hampered by low water levels due to drought.
SENEGAL	There are no hydro-stations at present although this situation should be remedied by the Manantali dam when completed.
SIERRA LEONE	Virtually all operating capacity is thermal, but work has recommenced on the 67-MW Bumbuna Falls hydro-scheme on the Seli river.
TOGO	Very limited hydro-resources.
CENTRAL AFRICA	
ANGOLA	289-MW installed hydro capacity, although there is a large potential on Rivers Kwanza, Cunene, Kubango and Queve. A 520-MW plant is being planned for the early 1990s at Kapanda on the Kwanza River.
BURUNDI	18-MW hydro-plant at Rwegura with additional supplies purchased from Zaire's Ruzizi hydro-plant.
CAMEROON	500,000-MW hydro-potential, of which 55% derives from the Sanaga River. Total installed hydro-capacity of 384-MW at Edéa (263-MW) and Song-Loulou. New 200-MW station being planned at the Nachtigal Falls.
CEN. AFR. REP.	10-MW hydro-station at the Boali falls; there are plans for a new dam on the M'Bali River.

EXPLOITATION OF HYDRO-RESOURCES

COUNTRY	HYDRO-RESOURCES AND STATUS OF EXPLOITATION
CENTRAL AFRICA (CONTINUED)	
CHAD	Very limited hydro-resources.
CONGO	Most electricity generation comes from hydro-dams on the Djoué (15-MW) and Bouenza rivers (74-MW). New capacities (over 100-MW) are planned on the Léfini, Sabgha and at Adinga.
EQUAT. GUINEA	Hydro-plant near Bata supplies 3.2-MW of net installed capacity of 7-MW.
GABON	80% of power output is derived from hydro-stations at Kinguélé, Tchimbélé and Poubara; this represents only a small fraction of the large hydro-electric resources on the rivers.
RWANDA	Hydro-potential is about 200-MW, but current exploitation is limited to the Mukwunga station (commissioned in 1983) and the 11-MW Ntaruku station.
SAO TOME AND PRINCIPE	The only installed hydro-capacity is the 1.9-MW station at Neves.
ZAIRE	Total potential hydro-capacity is about 100,000-MW, representing about 13% of the world's total, although installed capacity is only 2,490-MW. Largest plants are the 1,272-MW Inga project on the Lower Zaire and the Ruzizi plant in Kivu.
EASTERN AND SOUTHERN AFRICA	
BOTSWANA	Very limited hydro-resources.
COMOROS	Construction is in progress on a 4.5-MW hydro-electric dam and station on Tafinga River.
ETHIOPIA	Hydro-potential of 60,000 gwh per year, of which only 1% has been harnessed. New hydro-plants are proposed at Kaffa (300-MW), Shoa, and Melka Wakana (150-MW).

EXPLOITATION OF HYDRO-RESOURCES

COUNTRY	HYDRO-RESOURCES AND STATUS OF EXPLOITATION
EASTERN AND SOUTHERN AFRICA (CONTINUED)	
KENYA	62% of 575-MW installed capacity, all on the Tana river, is hydro. Total hydro-potential is 910-MW. There are plans for a 106-MW station at Turkwell Gorge, and a 49-MW station on the Sondu river.
LESOTHO	Substantial but untapped hydro-resources; construction has commenced on the Highland Water Scheme, with a 200-MW hydro-electric energy component due for completion in 2003. A 56-MW hydro-scheme in the Oxbow is also under study, and mini-hydro projects are being implemented at Mantsonyane, Semonkong, Tlokoeng and Qacha's Nek.
MADAGASCAR	45-MW (of the total installed capacity of 100-MW) is hydro-based from seven stations. Andekaleka scheme phase I (58-MW) was commissioned 1982, but Phase II (58-MW) is delayed.
MALAWI	114-MW (of the 169-MW total installed capacity) is hydro-electric, consisting of the 40-MW Shire river scheme in Tedzani and the Nkula Falls scheme. Total hydro-potential is 1,000-MW, and future projects are under study at Kapachira Falls and at Kholombidzo Falls.
MAURITIUS	The Champagne station commissioned in 1985, is the only hydro-electric plant supplying about 25% of power demand; current emphasis is on thermal generation fuelled by bagasse from sugar cane.
MOZAMBIQUE	The Cahora Bassa dam and 2,075-MW station on the Zambezi river is the largest hydro-scheme. Its transmission lines are being rehabilitated and should resume operation in 1990. Other hydro-projects are the Chicamba (40-MW) and Mavuzi (46-MW) on the Revue river. Consideration is being given to the second phase of the Cahora Bassa project, including a 1,648-MW plant.
SEYCHELLES	Very limited hydro-resources.
SOMALIA	All electricity production is currently thermal, but there is on-going construction on the Bardera dam in the Juba river valley to supply 5-MW of electricity.

EXPLOITATION OF HYDRO-RESOURCES

COUNTRY	HYDRO-RESOURCES AND STATUS OF EXPLOITATION
EASTERN AND SOUTHERN AFRICA (CONTINUED)	
SWAZILAND	Of 50-MW installed generating capacity, 20-MW is derived from the Luphohlo-Ezulwini hydro-electric project.
UGANDA	Hydro-potential is estimated to be about 2,000-MW. Owen Falls station is rated at 150-MW and is being expanded to 210-MW, although completion has been delayed.
U.R. TANZANIA	Total installed hydro-capacity is about 259-MW from four plants, one of which is the 200-MW Kidatu station. Several micro-hydro-plants are being proposed.
ZAMBIA	A net exporter of electricity, with 70% of domestic needs met by hydro from the Kafue Gorge scheme (900-MW) and the Kariba North Bank scheme (600-MW) on the Zambezi river.
ZIMBABWE	Has substantial hydro-electric potential and is a joint venture partner with Zambia on the Kariba plant. Total installed hydro-capacity is about 633-MW.

4.2 (c) Coal reserves by subregion (million tons)

NORTHERN AFRICA	300
WESTERN AFRICA	656-1,506
CENTRAL AFRICA	3,437
EASTERN AND SOUTHERN AFRICA	58,700

AFRICA'S SHARE OF THE WORLD'S ACCESSIBLE COAL IN SIGNIFICANT COALFIELDS

(million tons)

REGION/COUNTRY	BITUMINOUS COAL AND ANTHRACITE	SUB-BITUMINOUS COAL	BROWN COAL/ LIGNITE	TOTAL
OECD	106,456	39,350	53,988	199,794
AFRICA	34,319	231	62	34,612
ASIA	92,023	387	2,267	94,677
USSR	73,830	21,043	77,375	172,248
EASTERN EUROPE	37,600	5,750	24,420	67,770
CENTRAL+SOUTH AMERICA	6,103	5,224	20	11,347
TOTAL WORLD	351,051	71,985	158,132	581,168
AFRICA'S SHARE	9.78%	0.32%	0.04%	5.96%

4.2 (f) Countries ranked by size of coal reserves (million tons)

BURUNDI	1
NIGER	6
EGYPT	80
ZAMBIA	90
ALGERIA	100
MOROCCO	120
ANGOLA	600
ZAIRE	720
MALAWI	800
MADAGASCAR	810
SWAZILAND	1,000
NIGERIA	650-1,500
U. R. OF TANZANIA	1,500
RWANDA	2,116
MOZAMBIQUE	7,500
BOTSWANA	17,000
ZIMBABWE	30,000
ETHIOPIA	NA

Item 4.3: PETROLEUM

In 1987, Africa accounted for 6.5 per cent of the world's proven petroleum reserves. In general, this ratio has been declining since 1981 when a figure of 8.21 per cent was recorded. This trend apparently stems from the collapse of petroleum prices on the international market, coupled with the diminished tempo of new exploration in most African countries.

The largest petroleum reserves occur in Libyan Arab Jamahiriya (25.9 billion barrels), Nigeria (18 billion barrels), and Algeria 8.5 billion barrels). These three countries, along with Gabon (1.02 billion barrels), are members of the Organization of Petroleum Exporting Countries (OPEC). Non-OPEC African producers of crude oil include Egypt, Tunisia, Benin, Côte d'Ivoire, Angola, Cameroon, Congo and Zaire.

Item 4.3 (a)

PETROLEUM RESERVES

COUNTRY	LOCATION & SIZE OF RESERVES	STATUS OF EXPLOITATION (1987)
NORTHERN AFRICA		
ALGERIA	Hassi Messaoud/Haoud el Hamra and Zarzaitine-Edjeleh fields; 8.5 billion barrels recoverable (1985).	Low production rate (700,000 bbls/day in 1986) expected to sustain production for 25 to 30 years.
EGYPT	Gulf of Suez fields; 5 billion barrels.	720,000 bbls/day production rate in 1986, 85% for domestic consumption.
LIBYAN ARAB JAMAHIRIYA	The Sirte basin; 25.9 billiion barrels proven.	Sulfur-free light sweet crude; production at about 1 million bbls/day in 1987, 78% for export.
MOROCCO	Small reserves in Harisha, Sidi Ghalem, Sidi Fili and Toukmit fields. Also significant oil shale reserves located mainly at Timahdit and Tarfaya; 20 billion tons with an oil content of 8 billion tons.	No significant production at present.
SUDAN	Near Bentiu in Upper Nile Province, and in the Red Sea; 850 million barrels of which 28% is recoverable.	Undeveloped.
TUNISIA	El-Borma and Ashtart (offshore) fields; 1.514 billion barrels (1985).	Declining reserves and production would lead to net importation in the 1990s.

Item 4.3 (a) (Continued)

PETROLEUM RESERVES

COUNTRY	LOCATION & SIZE OF RESERVES	STATUS OF EXPLOITATION (1987)
WESTERN AFRICA		
BENIN	The Sémé (offshore) field; 100 million barrels.	1987 production at 5,000 to 7,000 bbls/day.
COTE D'IVOIRE	The offshore Espoir and Bélier fields; 110.5 million barrels (1985).	Declining output, minimal exploration and drilling.
GHANA	The offshore Saltpond field.	Production discontinued 1986 due to falling production and profitability.
NIGERIA	Niger delta and offshore fields; 18 billion barrels.	Production at 1.3 million bbls/day.
SENEGAL	The offshore Dôme Flore field; 2.1 billion barrels.	Undeveloped.

Item 4.3 (a)

PETROLEUM RESERVES

COUNTRY	LOCATION & SIZE OF RESERVES	STATUS OF EXPLOITATION (1987)
CENTRAL AFRICA		
ANGOLA	The Cabinda fields (including Numbi), and the Palanca and Pacassa fields; 2.1 billion barrels recoverable.	Production in 1987 at 328,000 bbls/day.
CAMEROON	Kole field (offshore) in the Rio del Rey basin, the Lokele and Moudi fields; 540 million barrels proven.	Declining production rate to about 90,000 bbls/day by early 1990s.
CHAD	Lake Chad region; 146 million barrels.	Undeveloped.
CONGO	Emeraude, Likouala, Loanga and Yanga/Sendji offshore fields, and Pointe-Indienne, Bindi, Kundji and Mengo onshore fields; 5.8 billion barrels.	1987 production at 126,000 bbls/day.
GABON	The Port Gentil, Kounga, Rabi and Obando fields; 1.02 billion barrels.	1987 production at about 160,000 bbls/day.
ZAIRE	Offshore Lukami, Mibale, Motoba and Mwambe fields; 140 million barrels.	1986 production at 0.5 million bbls/day.

Item 4.3 (a)

PETROLEUM RESERVES

COUNTRY	LOCATION & SIZE OF RESERVES	STATUS OF EXPLOITATION (1987)
EASTERN AND SOUTHERN AFRICA		
MADAGASCAR	Heavy oil (4.8 billion bbls) at Tsimororo; Morodava (offshore) and Sakhara areas (1.46 billion bbls); and Bemolanga bituminous sands near Mahajanga (584 million bbls oil content).	Undeveloped.

4.3 (e) Countries ranked by size of petroleum reserves (billion barrels)

BENIN	0.10
COTE D'IVOIRE	0.11
ZAIRE	0.14
CHAD	0.15
CAMEROON	0.54
SUDAN	0.85
GABON	1.02
TUNISIA	1.51
ANGOLA	2.1
SENEGAL	2.1
EGYPT	5
CONGO	5.8
MADAGASCAR	6.84
ALGERIA	8.5
NIGERIA	18
LIBYAN ARAB JAMAHIRIYA	25.9
MOROCCO	58.4
GHANA	N.A.

Item 4.4: NATURAL GAS

In 1987, Africa's share of the world's proven natural gas reserves was 6.45 per cent, equivalent to about 112 trillion cubic metres. The greatest accumulations are in Algeria (3,000 billion m^3) and Nigeria (2,400 billion m^3).

Algeria is a major world producer of natural gas and gas condensates, and is the largest producer in OPEC. Production (in the form of liquefied natural gas (LNG)) is exported mainly to Europe, although domestic consumption (which amounts to less than 15 per cent) has been increasing in recent years.

Most of Nigeria's associated gas output is flared. In fact, less than 10 per cent is marketed to local steelworks, fertilizer plants and power stations. Plans are being made for an LNG project which is expected to come on-stream in the late 1990s. The target market would be Europe and North America.

Other significant African gas producers for domestic consumption are Egypt, Morocco and Senegal. Angola's associated gas output is mostly reinjected to stimulate oil recovery, and virtually all the production from Congo is flared.

Item 4.4 (a)

NATURAL GAS RESERVES

COUNTRY	LOCATION & SIZE OF RESERVES	STATUS OF EXPLOITATION (1987)
NORTHERN AFRICA		
ALGERIA	Hassi R'Mel, Rhourde Nouss, Alrar, Rhourde Adra, Gassi Touil and Bassin d'Illizi fields; Proven reserves of 3,000 billion m^3.	Major producer and exporter of gas (as LNG); gross production in 1986 was 97.40 billion m^3 with 40 billion m^3 marketed.
EGYPT	Western desert and the Nile delta; 300-1,500 billion m^3.	Commercially produced as natural gas, condensates and LPG.
LIBYAN ARAB JAMAHIRIYA	Marsa el Brega, Raguba, Oasis and Amoseas fields; 728 billion m^3.	Gas export in form of LPG (0.5 billion m^3 in 1986).
MOROCCO	Keshoula, Jear, Harisha, Donar Jebar, Meskala and Oved Youssef fields; over 3 billion m^3.	Meskala field is source for gas gathering network for phosphate calcination at Youssoufia.
TUNISIA	The Miskar field (in Gulf of Gabes); 84-180 billion m^3.	Undeveloped.

Item 4.4 (b)

NATURAL GAS RESERVES

COUNTRY	LOCATION & SIZE OF RESERVES	STATUS OF EXPLOITATION (1987)
WESTERN AFRICA		
COTE D'IVOIRE	The Espoir and Bélier fields (offshore); 23 billion m^3.	Undeveloped.
NIGERIA	East and West of the Niger Delta; total estimated reserves (associated and non-associated) of up to 2,400 billion m^3.	Over 80% of production now flared; plans being made for an LNG project to be commissioned in the mid-1990s.
SENEGAL	The Diam-Niadio field; about 50 million m^3.	In production at about 28,000 m^3/day for power generation.

Item 4.4 (b)

NATURAL GAS RESERVES

COUNTRY	LOCATION & SIZE OF RESERVES	STATUS OF EXPLOITATION (1987)
CENTRAL AFRICA		
ANGOLA	The Luvuite field (in Cabinda) and the Malongo field; 62.4 billion m^3.	Associated gas reinjected to stimulate oil recovery.
CAMEROON	The Rio del Rey field and offshore from Kribi; 94 billion m^3.	Undeveloped.
CONGO	The Pointe-Indienne field; 71 billion m^3.	98% of (associated) gas production is flared.
GABON	The Port Gentil, Kounga and Rabi fields; 18 billion m^3.	Undeveloped.
RWANDA	Natural methane gas in Lake Kivu; 50 billion m^3.	Undeveloped.
ZAIRE	The Motoba field (offshore) and the coastal basin; about 1 billion m^3.	Undeveloped.

Item 4.4 (b)

NATURAL GAS RESERVES

COUNTRY	LOCATION & SIZE OF RESERVES	STATUS OF EXPLOITATION (1987)
EASTERN AND SOUTHERN AFRICA		
ETHIOPIA	The Ogaden region; 25 billion m^3.	Undeveloped.
MOZAMBIQUE	The Pande-Buzi field; up to 320 billion m^3.	Undeveloped.
TANZANIA	Songo Songo on Kilwa Island, and Kimbiji; up to 173 billion m^3.	Undeveloped.

4.4 (e) Countries ranked by size of natural gas reserves (billion m^3)

SENEGAL	0.05
ZAIRE	1
MOROCCO	3
GABON	18
COTE D'IVOIRE	23
ETHIOPIA	25
RWANDA	50
ANGOLA	62
CONGO	71
CAMEROON	94
TANZANIA	173
TUNISIA	84–180
MOZAMBIQUE	320
LIBYAN ARAB JAMAHIRIYA	728
EGYPT	300–1,500
NIGERIA	2,400
ALGERIA	3,000

Item 4.5: ALLOYING MINERALS

Relative to many other regions of the world, Africa is relatively well endowed with several alloying minerals.

Africa alone accounts for about 95 per cent of the world's known reserve base of chromite (although the largest reserves occur in South Africa). Zimbabwe's proven reserves are over 500 million tons, of which a substantial proportion consists of the shipping-grade high-chromium variety. Most of its production comes from the Great Dyke, and is processed into ferro-chromium prior to export. Other significant African reserves of chromite occur in Madagascar, where it is mined and beneficiated for export by the state corporation KRAOMA, and in Sudan where it is exploited by Ingessana Hills Mining Corporation. Its operations are, however, beset by chronic undercapitalization and antiquated mining equipment and facilities.

Africa's share of the world's cobalt reserves is about 33 per cent, mostly from sulfide and oxide deposits in Zaire and Zambia, the former accounting for over 75 per cent of the region's reserve base, while the latter contributes about 20 per cent. Other significant reserves occur in Botswana (along with nickel and copper in the Selebi-Phikwe area), near Kilembe in Uganda, and in association with copper in Zimbabwe.

Africa contains 78 per cent of the world's known reserve base of manganese. In fact, Gabon is estimated to possess about 26 per cent of the world's reserves (second only to South Africa) and is the second largest producer of manganese ore. Ghana is also an important producer, particularly following the modernization of the Nsuta mine and plant and the improved rail connection to Takoradi. Other African countries endowed with significant but hitherto undeveloped manganese resources are Angola, Burkina Faso near Tamboa (although near-term development of this reserve is now doubtful due to the suspension of the rail project to Ouagadougou), Côte d'Ivoire, Togo and Zaire.

Africa's share of the world's known tantalite reserve base is about 24 per cent. Generally found in association with columbite, large exploited reserves occur in Nigeria and Zaire. Other reserves occur in Ethiopia (undeveloped), Mozambique and Zimbabwe where it is processed into the metal and its alloys.

Nickel reserves in Africa account for nearly 10 per cent of the world's total. Virtually all the reserves are, however, concentrated in Central and Southern Africa. Botswana's reserves contain up to 400,000 tons nickel which is locally mined and smelted. In Burundi, studies are being carried out on the nickel laterites at Musongati. Discussions are in progress regarding the financing of a mining/smelting project. In Zimbabwe, there are four mines, - the Epoc, Madziwa, Shangani and Trojan, - and two refineries for treating domestically produced matte. The product is high-grade electrolytic nickel for export to Europe, Japan and the United States. Scattered and unquantified reserves of nickel have also been reported in Ethiopia around Kenticha in Sidamo Province.

Another alloying mineral of which there are commercial reserves in Africa is tungsten which occurs in association with tin, columbite and tantalite in the Kivu region of Zaire, and in Zimbabwe, northwest of Shamva.

4.5 (c) World distribution of alloying mineral reserves (1983)

MANGANESE

Region	Reserve base* (000 tons Mn content)	Share of World Total
AFRICA**	2,811,700	78.1%
ASIA	56,234	1.6%
EUROPE	507,920	14.1%
NORTH AMERICA	7,800	0.2%
OCEANIA	152,376	4.2%
SOUTH AMERICA	62,583	1.7%
WORLD	3,598,613	

* Reserve base includes demonstrated resources that are currently economic, marginally economic, and some of those that are currently sub-economic.

** Including South Africa.

4.5 (e) Countries ranked by size of manganese reserves (million tons)

COTE D'IVOIRE	2.7
ANGOLA	5
ZAIRE	5
BURKINA FASO	26
GHANA	49
GABON	200
TOGO	NA

4.5 (f) World distribution of alloying mineral reserves (1983)

CHROMITE

Region	Reserve base* (million tons)	Share of World Total
AFRICA**	6,440	94.7%
ASIA	163	2.4%
EUROPE	181	2.7%
NORTH AMERICA	4	0.06%
OCEANIA	4	0.06%
SOUTH AMERICA	9	0.1%
WORLD	6,801	

* Reserve base includes demonstrated resources that are currently economic, marginally economic, and some of those that are currently sub-economic.

** Including South Africa.

4.5 (h) Countries ranked by size of chromite reserves (million tons)

MADAGASCAR	7.61
SUDAN	15
ZIMBABWE	500
ETHIOPIA	NA

4.5 (i) World distribution of alloying mineral reserves (1983)

COBALT

Region	Reserve base* (million Kgs.)	Share of World Total
AFRICA**	2,753	33.0%
ASIA	984	11.8%
EUROPE	431	5.2%
NORTH AMERICA	2,934	35.1%
OCEANIA	1,088	13.0%
SOUTH AMERICA	163	2.0%
WORLD	8,353	

* Reserve base includes demonstrated resources that are currently economic, marginally economic, and some of those that are currently sub-economic.

** Including South Africa.

4.5 (k) Countries ranked by size of cobalt reserves (million tons)

BOTSWANA	0.027
ZAMBIA	0.544
ZAIRE	1.36
UGANDA	N.A.
ZIMBABWE	N.A.

4.5 (1) World distribution of alloying mineral reserves (1983)

NICKEL

Region	Reserve base* (000 tons)	Share of World Total
AFRICA**	9,614	9.5%
ASIA	11,338	11.2%
EUROPE	12,652	12.5%
NORTH AMERICA	15,963	15.8%
OCEANIA	21,496	21.3%
SOUTH AMERICA	29,840	29.6%
WORLD	100,903	

* Reserve base includes demonstrated resources that are currently economic, marginally economic, and some of those that are currently sub-economic.

** Including South Africa.

4.5 (n) Countries ranked by size of nickel reserves (million tons)

BOTSWANA	0.4
BURUNDI	29
ETHIOPIA	N.A.
ZIMBABWE	N.A.

4.5 (o) World distribution of alloying mineral reserves (1983)

TUNGSTEN

Region	Reserve base* (tons tungsten content)	Share of World Total
AFRICA**	20	0.6%
ASIA	1,535	44.3%
EUROPE	665	19.2%
NORTH AMERICA	985	28.46%
OCEANIA	150	4.3%
SOUTH AMERICA	110	3.2%
WORLD	3,465	

* Reserve base includes demonstrated resources that are currently economic, marginally economic, and some of those that are currently sub-economic.

** Including South Africa.

4.5 (q) Countries ranked by size of tungsten reserves (thousand tons)

ZAIRE	3
ZIMBABWE	N.A.

4.5 (r) World distribution of alloying mineral reserves (1983)

COLUMBIUM

Region	Reserve base* (million Kgs. columbium) content	Share of World Total
AFRICA**	181	3.6%
ASIA	9	0.2%
EUROPE	907	18.0%
NORTH AMERICA	317	6.3%
OCEANIA	-	-
SOUTH AMERICA	3,628	72.0%
WORLD	5,042	

* Reserve base includes demonstrated resources that are currently economic, marginally economic, and some of those that are currently sub-economic.

** Including South Africa.

4.5 (t) World distribution of alloying mineral reserves (1983)

TANTALUM

Region	Reserve base* (million Kgs. tantalum) content	Share of World Total
AFRICA**	10.4	24.2%
ASIA	10.9	26.3%
EUROPE	7.3	17.6%
NORTH AMERICA	2.3	5.6%
OCEANIA	9.1	22.0%
SOUTH AMERICA	1.4	3.4%
WORLD	41.4	

* Reserve base includes demonstrated resources that are currently economic, marginally economic, and some of those that are currently sub-economic.

** Including South Africa.

4.5 (v) Countries ranked by size of columbite/tantalite reserves
(thousand tons)

MOZAMBIQUE	5.8
ZAIRE	33.6
ETHIOPIA	N.A.
NIGERIA	N.A.
ZIMBABWE	N.A.

Item 4.6: HYDRO-RESOURCES

Africa's technically exploitable hydro-potential is estimated to be over 358,000 MW, equivalent to about 16.2 per cent of the world's total. Of this, only about 17,184 MW (4.8 per cent) had been exploited as of 1980. In contrast, Europe and North America had harnessed their respective potentials to the tune of 59 per cent and 36 per cent, respectively.

All African countries, except Algeria, Botswana, Cape Verde, Chad, Seychelles and Togo, have exploitable hydro-potentials. The oil price escalations of the 1970s spurred many countries into reassessing their hydro-resources for purposes of exploitation. The recent downward movement in petroleum prices may have slowed down, but not eliminated, the interest in harnessing these renewable energy resources.

The greatest hydro-potential in Africa exists on the Zaire River, the second largest waterway in the world. Its hydro-electric potential is estimated at 100,000 MW. Other countries endowed with very extensive hydro-potentials are Ethiopia and Mozambique.

4.6 (b)

WORLD HYDRO-POTENTIAL AND USE (1980)

REGION	TECHNICALLY EXPLOITABLE POTENTIAL (MW)	EXPLOITED POTENTIAL (MW)	SHARE OF POTENTIAL EXPLOITED
AFRICA	358,000	17,184	4.8%
ASIA	610,100	53,079	8.7%
EUROPE	163,000	96,007	58.9%
NORTH AMERICA	356,400	128,872	36.2%
OCEANIA	45,000	6,795	15.1%
SOUTH AMERICA	431,900	34,049	7.9%
U.S.S.R.	250,000	30,250	12.1%
WORLD	2,214,700	366,236	16.5%

AFRICA'S SHARE 16.2%

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DATA SOURCES

Item number	Data sources
1.1 (a)-(d)	13; 44;
1.2 (a)-(d)	7; 13; 44;
1.3 (a)-(d)	41;
1.4 (a)-(d)	5; 7; 44;
2.1 (a)-(g)	1; 11; 26; 28; 29; 30; 31; 33; 34; 36; 37; 38; 39;
3.1 (a)-(e)	1;4; 14; 20; 21; 23; 25; 26; 28; 29; 30; 36; 37;
4.1 (a)-(j)	1; 4; 10; 12; 16; 17; 18; 19; 20; 21; 23; 27; 29; 30; 32; 33; 36; 37; 38; 40; 43;
4.2 (a)-(f)	1; 3; 4; 6; 8; 9; 16; 17; 18; 19; 20; 21; 23; 27; 30; 35; 36; 37;
4.3 (a)-(e)	1; 6; 8; 9; 16; 17; 18; 19; 20; 21; 22; 23; 27; 35; 36; 37;
4.4 (a)-(e)	1; 4; 6; 9; 16; 17; 18; 19; 20; 21; 22; 27; 35; 36; 37;
4.5 (a)-(v)	1; 2; 4; 12; 15; 16; 17; 18; 19; 20; 21; 23; 24; 27; 30; 36; 37; 42; 43;
4.6 (a)-(b)	1; 6; 8; 9; 35.