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INTER-AFRICAN MANUFACTURING AND TRADING IN THE ALUMINIUM INDUSTRY

TECHNICAL REPORT

SPONSORED BY

THE UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION (UNIDO) AND THE UNITED NATIONS ECONOMIC COMMISSION FOR AFRICA (UNECA)

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INTRODUCTION

This study was sponsored by the UNECA and UNIDO with a view to promoting the increased production and utilization of aluminium in the African region by all development actors including African governments, the domestic and foreign private sectors, and all other interested parties. Particular emphasis in this study is directed to possible areas of cooperation among development actors in the African countries so that the development of t his important metal may contribute to regional economic integration, pursuant to the requirements of the 1991 Abuja Treaty establishing the African Economic Community.

The two sponsoring institutions (UNECA) and (UNIDO) plan to disseminate the study to all interested parties so that relevant actions concerning the development of the African aluminium industry can be taken. Additionally the study will act as an input to consultative meetings among aluminium development actors organized by the two institutions, in collaboration with other interested aluminium development operators in the African region, so that the African aluminium industry actors may determine how best to develop and use the metal in the African region.

The first part of the document provides an executive summary that summarizes the major issues, conclusions and recommendations of the study. The second part reviews the status of the world aluminium industry relative to the African aluminium industry. The third part assesses the existing African aluminium industry on the basis of information derived from the relevant countries and other institutions . The fourth part contains summaries of national reviews of the aluminium industries of some African countries visited by the writers of the report. The fifth part gives information about some African Countries not visited by the mission.

The study was prepared by consultants Eng. SOLIMAN REDA, Chairman and Chief Executive of EGYPTALUM, assisted by ABOUSEIF AMAAR, G.M. OF Export Dept. of EGYPTALUM.

The writers of this report wish to express their appreciation to all the individuals and institutions that provided them with support while undertaking their assignment.

EXECUTIVE SUMMARY

The main purpose of this report is to bring to attention of the officials in the African countries the huge mineral and metal resources in the continent with high light on Inter-Alia bauxite and alumina that are the basic raw materials for production of aluminium industry aiming at the following :

- **assessment of the structure of this industry and the utilization of the existing capacities and production.**
- **The current consumption of aluminium in the countries covered by the mission and to some extent in other African countries according to the availability of such information.**
- **prospects of industrial and trade cooperation between the African countries.**

For this purpose the members of the mission have visited the countries which were agreed to be covered in this mission (Ghana, Guinea, Sierra-Leone, Cameroon, Cote d'ivoire, Ethiopia, Kenya, Tanzania, Zambia, Morocco, Algeria, Tunisia and Egypt) to bring the up-dated information by meeting the officials in these countries, sometimes in view of limiting of information and up-dated statistics availability the team have used such information from other sources as international organizations where needed to bridge the gap.

In our report we hope that we can focus on the possibilities of co-operation commercially and technically.

Also we will try to identify the existing reserves of bauxite, alumina capacities and aluminium production, in the same time the possibility of trade between countries, and the barriers will be explored.

Overlook on Bauxite, Alumina and Aluminium Industry

Background

Bauxite, Alumina Industry

Bauxite production grew in the last thirty years at a very high rate. Although production of bauxite is reported to be in more than 26 countries all over the world, the actual production is more or less concentrated in few countries which produce the majority of the international output of the Western world countries.

In this concern Australia on the top, about 44 million M/T, Africa ranked as the third producer of alumina in the world after Latin America with 36 million ton, and after it comes Africa, about 19 million M/T, as shown in the enclosed Table No. (1). It is well-known that about 95% of the mined bauxite is refined into aluminum hydroxide for aluminum industry, other uses is small in comparison but bauxite and alumina are important for the manufacture of refractories, chemical ceramics catalysts and cement. The main producers of the alumina are in Australia, Latin America, North America, Asia and finally Africa . This is inspite of the fact that around 17% of Western countries's bauxite production is from Guinea and Sierra Leone as shown in the enclosed Table No. (1).

Aluminium Indus: v

Producing aluminium metal in electrolytic cells by reduction of the aluminium oxide (alumina) refined from impure hydrate alumina found in bauxite is still workable as basic processes inspite of many technological researches and improvements which have been made through over many years on this method since producing the metal in commercial quantities in 1888. Because of its properties the aluminium metal is considered the most used metal after iron as it has relatively low density, high electrical and thermal conductivity, good resistance to corrosion and good malleability. It is also non magnetic, non sparking and highly reflective. It can be treated to get a high strength to weight ratio.

The main producers of the primary aluminium metal are in USA and Canada. The total of primary production in the western world is 14.8 millions M/T, during 1992 including 617 Th M/T produced in Africa the same year as shown in the enclosed Table No. (2).

* As for the Eastern Europe and China , the total production is around 5.3 million M/T. The aluminium production in CIS reached around 3.3 million tons in 1992. The internal consumption reported to be 2.3 million tons the same year and the export was about 850 Th M/T, (750 Th. M/T to the western countries and 100 Th. M/T. to the Eastern Europe countries in the area) as shown in Table No. (3) and it is expected that CIS will continue exporting the same quantities or even more in the coming years due to the need of the hard currency and the lack of internal demand for the current circumstances.

Utilization of Bauxite, Alumina and Aluminium

1. Bauxite and Alumina

The utilization of Bauxite and Alumina can be summarized in the following :

* **Mainly in the aluminium industry as about 95% of the mined bauxite is refined into alumina.**
* **Manufacturing of refractories.**
* **Production of abrasives as there are two main varieties of fused aluminium oxide abrasives white and brown about 75 of the world production of the aluminium oxide abrasives is of the brown variety.**
* **In the aluminium chemicals as aluminium sulphate, aluminium chloride, aluminium trihydrate and sodium aluminate.**
* **In cement production for special uses - like when rapid hardening and resistant to chemicals is required, also for furnaces.**

2. Aluminium

Aluminium covers a wide range of applications in many industries. There are more than 100 alloys already commercially used in the majority of the industrial fields, and many new alloys are developed every year. The main uses of the aluminium are in the following fields :

* **Electrical Industries.**
* **Chemical Industries.**
* **Construction work, Packaging, Utensils and can industry.**
* **Automotive, Transport and Engineering.**

Substitutes of Bauxite, Alumina and Aluminium

1. Bauxite and Alumina

Although there are many raw materials that have been considered as sources for aluminum like alunite, aluminous shale, dawsonite, clay, igneous rocks and nepheline rocks, still bauxite and alumina are the main raw material for aluminium production specially Bayer plants do not permit using any other raw material. Alumina is the only commercial raw material from which Primary Aluminum extracted.

2. Aluminium

In this concern there are some material that can substitute aluminium like, steel, copper, wood, fiber, plastic but substitution in an existing manufacturing processes is almost impossible. On contrary aluminium have substituted more of them. The only competition the aluminium metal face is from its own scrap.

The Secondary Market or the Scrap

The main sources of this market can be classified as follows :

1. **Scrap coming from aluminium wrought or cast product when they are processed into end product like cans, cars, engineering parts..... etc.**
2. **Circulating at the foundry and fabrication stages.**
3. **Used beverage cans or goods that reached the end of their functional life.**

The market of secondary aluminium became very important and is growing very fast for the following reasons :

- **Coastwise specially in consumption of energy, about 5% from smelting needs.**
- **The increase of the demand for aluminium castings for automobile industry, most castings are formed from secondary metal.**
- **The increase in manufacturing of the aluminium products, which has led to an increase in recycling especially in some sectors like packaging and cans.**

Outlook of Last Market Situation
Aluminium Supply and Demand

Since early 1989 there has been a growing surplus of aluminium in the western world and the market is expected to be in continued surplus during 1993 due to the following :

- **Supply remain strong as primary aluminium production operating at close to 100% of capacity.**
- **Demand is very low due to the international recession that has led to slow-down in real GNP of the industrialized G -7 nations.**
- **High export rate from CIS, about 750 Th. M/T to the western world with expectation that internal consumption in CIS may continue to decline during the next few years, The same exported quantity or even more will flow into the western markets.**

Consequently the L.M.E. prices are expected to remain at the recent level 1150/1250 US$ during 1993 which are at or near the bottom. At this level of prices about 65% of western primary producers are operating at a loss but all are reluctant to make effective cut backs for technical reasons concerning the cost of the shut-down related to the labor force and re-operating when markets start to improve ,such situation is not expected before mid 1994.

Bauxite and Alumina Supply and Demand

As mentioned before, bauxite and the alumina produced by refining of bauxite are the main raw materials in producing primary aluminium as they form 50-60% of the raw material cost. Others as calcined coke, cryolite, pitch, aluminium fluoride, pots relining material and less important materials from the balance.

The bauxite capacities of western world including Africa were around 110 million M/T 1992 and alumina capacities were around 36 million M/T as shown in table No.(4).

Alumina Prices

After peaking in 1989, in alumina spot markets' prices reached US $ 600 to 750 per ton, alumina prices had sharply fallen starting 1990, collapsed during 1991/1992 to reach about $165 as average of the spot alumina, the prices are not expected to recover before 1994. However, the low levels of primary aluminium prices at the time being affect the improvement in spot alumina prices as many major producers had alumina contracts linked with metal price.

Overlook at the World and the African Economies 91/92

The year 91/92 reflected the effects of international recession that had begun 1989 and also the substantial fall in the economies of former Soviet Union as well as several Europe countries. Accordingly, the rate of growth of the world economy declined to about 1% in 1991 from 2.2 in 1990, as shown in Table No. (5) which presents world real output growth. Same effect was on world trade that declined sharply, and the growth rate in the volume of the international trade fell to 0.6% in 1991 from 4.3% in 1990 (ADB African Development .report 1992)

Generally all economical sectors were affected by the reflects of the recession. As for African countries, the rate of the growth was 2.4 percent in 1991 that is below the rate of population growth resulting in a decline in real per capita income inflation

reached about 17%, the trade deficit reached $4.5 billion due to the slowdown of export and increase of import, combined with the low prices of the export commodities. This led to doubling the current account deficit to $8.5 billion and the debt service ratio to 28%, 2% percent over 1990.

(ADB African Development report 1992 gives an idea about the effect of the international recession on the African countries). some internal reasons like the sharp fall of the domestic demand which have a direct effect on the growth of GDP, also contributed to this situation.

Summary of The African Aluminium Industry and Some Proposals for Improving its Operations

1. Bauxite :

Mining in Africa is mainly in Ghana, 400 thousands M/t, Guinea about 17 millions M/t and Sierra Leone about 1.4 million M/t. This makes total capacity of about 19 millions M/t per year. There is no announced plans for increasing these capacities till the year 2000 except some studies for mining bauxite and establishing alumina refinery in SADCC region (Mulange/Manica Bauxite Project).

2. Alumina

The only refinery in Africa is located at Frigia in Guinea with capacity of 700 thousands M/t per year. Total production of this refinery is mainly exported outside Africa except 100-160 T M/T goes to Cameroon for producing 88 thousands M/t of aluminium.

3. Aluminium

Smelting capacity in Africa is concentrated in four smelters, one in Egypt with capacity 180 TH. MT/year and planed to be increased to 240 TH. MT/year by 1996 with there own technology, the sconed in South Africa with capacity 170 TH. MT/year and planed to construct new smelter with capacity 440 TH. MT/year Pecheny technology, the other two smelters are at the Western part of Africa, one in Cameroon with 88TH.MT/year and the another in Ghana with 170 TH. MT/year.

Moreover there is a smelter in Algeria with planed capacity 140 TH. MT/year planed to start construction in 1995.

The current production of primary aluminum in Africa reaches about 600-640 TH. MT/year. The major part of this quantities is exported outside Africa, the local consumption in the producing countries is negligible with the exemption of Egypt which consumes about 80 TH. MT/year from its smelting capacity, and South Africa with about 70 TH. MT/year, Cameroon with about 18 TH. MT/year from its smelting capacity.

In this concern more practical steps should be taken to increase the INTER AFRICAN cooperation in both industry and trade issues. We see that the proposed consultative meeting of key Africa aluminium industry executives as well as the other recommendations coming below can asset very much in this concern.

CONCLUDING REMARKS AND RECOMMENDATIONS

* **While Africa has huge bauxite production and deposits, about 19 million tones, the continent remains just exporter for this important ore. The only refinery is in Guinea with capacity of just 700 thousands tone of alumina mainly exported outside Africa except the small portion going tc CAMERON.**

* **In aluminium industry either in smelting or fabricating the continent has a minor role. There are just four countries producing aluminium and some plans for new projects and expansions, Fabrication and metal utilization are very limited in the African countries except in Egypt, Cameroon and South Africa and to some extent in Algeria, Tanzania and Tunisia.**

* **The African aluminium industry is disjointed, uncoordinated, weak and underdeveloped. There are no countries in Africa with vertically integrated aluminium industries (bauxite mining, alumina refining, aluminium production and metal fabrication combined). Overall, African bauxite producers export bauxite to markets outside the African region; aluminium metal producers in the continent import alumina from sources outside the African region; a large portion of the aluminium produced in Africa is exported to markets outside the region; many of Africa's metal fabricators operate at low capacity utilization because of shortages of metal inputs. These realities result from such factors as the past economic policies of the African governments, and the ownership and management control of the aluminium industries in the region.**

* **Moreover, indigenous African aluminium industry experts are not coordinated in their perceptions, strategies and actions in advancing a regionally integrated development and utilization of the metal. In this respect, it is inspiring to note that in a few countries close collaboration and coordination among government policy makers, aluminium industry executives (who take decisions on purely commercial basis without political interference even where the relevant industry happens to be a public corporation), the universities and other research institutions, and local communities on matters related to the development of the industry at the national level exists.**
  Opportunities for the exchange of experience among executives of the African aluminium industry should thus be created to enable countries to benefit from the experience of other countries.

* **Shortage or improper use of indigenous technical expertise for the management of the African aluminium industry were mentioned by some observers as factor which call for collaboration among governments and/or industries in training the recognition and proper use of indigenous experts by policy makers , short-term exchange of experts among different or similar industries, and regular consultative meetings among African aluminium operators, for exchanges of technical and commercial information and experiences related to the effective management of the African aluminium industry.**

* **The unavailability of foreign exchange to import is reported to be one of the factors retarding inter-African trade in aluminium metal and its products. While the ongoing foreign currency liberalization measures by African countries will lessen this obstacle to African development, African chambers of commerce and governments are further urged to identify possibilities of at least partner trading among member states in order to accelerate the growth of inter-African trade and African economic development.**

* **It is recognized that the increased production of aluminium metal in the African region will require the expansion of electricity production by utilizing the region's coal, hydro and natural gas resources, energy availability is the main factor. African governments of countries with these natural resources should therefore vigorously promote, individually and in collaboration with other parties, the development of these energy resources without which the industrialization of the continent could not be achieved.**

* Lack of information on the region's industrial products and needs of African countries, poor communications (telecommunications, roads, railways, shipping, and airways), high transport costs partly resulting from poor communications ... are some of the factors restricting itra-regional trade in aluminium commodities and products in Africa. The building of continent's transport and communications infrastructure should thus be given the highest priority by African governments.

* It is encouraging to note that trading restrictions within sub-regional economic groupings in the African region (the Arab Magreb Union (AMU), the economic Community of Central African States (ECCAS), the Economic Community of West African States (ECOWAS), the Preferential Trade Area for the Eastern and Southern African States (PTA) and the Southern African Development Community (SADCC) is gradually being removed. In the same spirit and within the content of the Abuja Treaty establishing the African Economic Community, sub-regional economic groupings should harmonize their trading policies with a view to removing trade restrictions among the different sub-regions.

* It is noted that the Sixth Arab International Aluminium Conference (ARABAL'93) will be held in Cairo, Egypt from 11 to 14 December 1993. The role of a similar mechanism within Africa for the promotion of the region's aluminium industry is considered overdue. Consideration should thus be given on the possibility of establishing an association of African aluminium producers (including bauxite, alumina and metal producers) and consumers (fabricators)to periodically determine ways and means of accelerating the growth of the African aluminium industry. Towards this end, the secretariats of ECA and UNIDO, in collaboration with interested African aluminium producers and consumers may consider the possibility of convening a consultative meeting of key African Aluminium Industry executives to exchange views on the possible establishment of the proposed association, including the modalities for its operation .

* Another factor that would facilitate the development of the African Aluminium industry is the possible establishment of jointly owned production institutions and the encouragement of cross border investment. A body like the earlier proposed association of African aluminium producers and fabricators might be the proper organ for commissioning feasibility studies for African joint venture projects in the region's aluminium industry.

* Reform and restructuring policies which the majority of the African countries follow in all sectors will help in improving investment climate including stable tax environment, encourage saving and improve financial conditions will encourage investments to sustain industrial development.

* **Beside the lack of information and communication, there is also a lack of promotion in both industrial and trade side. We see that encouraging trade and industrial fairs, trade and industrial missions also seminars are very important in this concern.**

The Status of the World Aluminium Industry Relative to the African Aluminium Industry

Scale of production and uses of aluminium :

With the notable exception of pig iron most of which is used in the production of steel, aluminium is the most important primary metal currently produced in the world in terms of weight. The estimated primary productions of the three most important metals in the world in 1991 in terms of weight were 537 million tons of pig iron, 18.5 million tons of aluminium and 9.1 million tons of copper.

As mentioned before Aluminium is a strong light metal that is corrosion resistant, good conductor of electricity and heat and a good reflector. It is non-magnetic and non-toxic and is used in an enormous range of applications in building and construction, the electrical industry, consumer goods, the transport industry, packaging, machinery and communications. In general it is not used in its pure form (except for electrical applications), usually being alloyed with small quantities of other metals (copper, zinc or magnesium) to give it special quality.

Global distribution of aluminium resources :

Bauxite is the principal commercial raw material for aluminium production, and consists of hydrated aluminium oxide ("alumina") mixed with impurities in the form of iron oxide, silica, titan and other elements. Although aluminium containing minerals are widely distributed in the world, high quality bauxite which contains upwards of 40 per cent aluminium oxide is heavily concentrated in tropical regions.

Within Africa, bauxite reserves are enormous although they are particularly concentrated in the West African sub region (Guinea, Ghana, and Sierra Leone), and to a relatively lesser extent the Central African sub region (Cameroon). Exploration for bauxite continues with differing intensities in all geological favorable areas of the continent.

World production of primary aluminium :

There are three stages in the production of primary aluminium. Firstly, the bauxite is mined, usually by the open cast method. It is then crushed and beneficiated at the mine site in preparation for the refining process.

In the second stage, alumina is refined through a chemical process which separates the aluminium oxide or alumina from the impurities in the bauxite. In the third or smelting stage, aluminium metal is produced from alumina through electrolysis. Generally, with present average ore grades, to produce one ton of primary aluminium requires 2 tons of alumina or about 5 tons of bauxite currently. Africa produces annually an estimated 19.3 million tons of bauxite or 17.5% of western world output, 0.7 million tons of alumina or 1.9% of western world alumina total and 0.6 million tons of primary aluminium or 4.2% of the western world primary aluminium production .
African production of bauxite is concentrated in Guinea and to a relatively smaller extent in Ghana and Sierra Leone; production of alumina is solely based in Guinea; production of aluminium takes place in Cameroon, Egypt, Ghana and South Africa.

International trade and marketing arrangements for aluminum commodities(bauxite, alumina and aluminum):

Historically, bauxite and alumina moved within vertically integrated aluminium producers with six companies and their associates dominating the stage: Alcan (Canada), Alcoa (United States of America), Alussisse (Switzerland), Kaiser (United States of America), Reynolds (United States of America), and Pechiney (France). The diminishing importance of the integrated company since the early 1970s (resulting largely through government participation in bauxite mining and the rise of independent smelters in energy rich nations of the third world and Oceania and fundamental changes in the economic environment have resulted in more bauxite and alumina moving under long term supply contracts, although a large proportion of bauxite/alumina sales are still within integrated producers . Spot purchases became more common in the alumina market from the mid 1980s mainly because of oversupply.

National bauxite levies and freight charges are major components of bauxite and alumina prices. Prices of both bauxite and alumina are increasingly related to aluminium prices by percentage formulae. Prior to the late 1970s, aluminium pricing was dominated by long term producer contracts.

Today, a combination of flexible producer contracts and dealer-controlled spot market exists, with London Metal Exchange (LME) pricing predominant. Producer contracts are short to medium term for fixed tonnages but with frequent price negotiations, linked to terminal market prices. Energy costs exert a strong influence on aluminium prices.

Prices of aluminium commodities.

As is normally the case with other metals, prices of aluminium commodities (bauxite, alumina and aluminium metal) are influenced by such factors as demand and supply, trends in the intensity use of aluminium, technology changes, recycling, and materials substitution. As an indication of actual prices, the LME cash settlement average price for primary aluminium ingot in 1991 was (nominal) US$ 1302 per tone and this declined to US$ 1209 in 1992.

Contract prices for alumina were estimated currently at US$ 179 per tone in 1991 and this declined to US$ 137 in 1992 . The collapse of the Comecon and the Soviet Union has brought new influences in the world markets. Exports from the former Soviet Union rose considerably in 1991, with these exports seem likely to persist at high rates, mainly through traders. The new projects that started at high aluminum price adding new smelting capacities in Europe, Canada and Arabic Gulf area helped depress aluminium prices.

World aluminium consumption

Largely because of saturation and other trends reducing the intensity of use of several metals in the developed countries, minerals use is now growing faster in some developing countries than in the wealthier nations. Significant increases in the consumption of metals and other minerals are heavily concentrated in countries such as Brazil, Chile, Mexico and Peru in Latin America; and China, India, and the newly industrializing countries (NICs) of South-East Asia. Thus the future for the mineral industries, including that of aluminium lies with the developing countries of the world, and in particular Africa where the consumption of minerals remains minimal in the majority of the countries.

SUMMARIES OF NATIONAL REVIEWS OF THE ALUMINIUM INDUSTRIES OF SOME AFRICAN COUNTRIES

ALGERIA

Country Location :

Algeria is located in North Africa between latitudes 19 and 36 degrees North, and longitudes 9 degrees West and 9 degrees East, covering an area of 2 381 740 sq. km. The country borders Morocco and Mauritania on the West, Mali and Niger on the South, Tunisia and Libya on the East, and the Mediterranean Sea on the North.

Primary Aluminium Production :

Although no bauxite resources have been discovered in the country, plans for the establishment of an aluminium smelter to utilize indigenous natural gas as an energy source have been entrained for a number of years. During the late 1970s, the country planned to build a 125,000 tpy smelter at M'Sila with the technical and financial assistance of the USSR but the project was abandoned in 1981. In 1984, it was reported that a US$ 84 million had been awarded to C. Itoh and Ube Industries for the construction of a 140,000 MT/year smelter at the same site but the plan did not materialized.

During late 1989, the Algerian Public National Enterprise in conjunction with the Industrial Development of Dubai was reported to have announced plans for the establishment of the Medial smelter, to be supplied with electricity by a gas-fired power station, on the West Coast of the country. Other interested parties in the project included the Wimpey smelter construction group, Asea Brown Boveri, Caradel Investments and the Marc Rich Organisation. The estimated cost of the project was US$ 1.0 billion, commencing with an initial 220,000 MT/y and option of expansion to 330,000 MT/Y Alumina for the project would have been imported by Marc Rich which would also have handled the exports of the aluminium produced, though some of the metal would have supplied the demand for the local market.

The non-implementation of the project, which was scheduled to have been completed in three years, is said to have been caused by delays in the enactment of a law to permit the formation of joint ventures including foreign participation. This delay appears to have continued through the 1990s, since the International Primary Aluminium Institute (IPAI) estimates of smelter capacity in Africa by mid-1993 show no allowance for the start-up of production of any such amount of new smelter capacity anywhere in Africa.

Metal Fabrication :

There are several aluminium fabricators in the country but they operate much below their designed capacities due to restrictive government policies and economic/fiscal controls. For example, the state-owned "National Enterprise of Industrial Cables" (ENICAB) which commenced operations in 1974 for the production of aluminium and copper cables operates at 45% of installed capacity of 56,000 tpy. The plant produces about 10,000 tons of aluminium cables depending on the availability of imported 9.5 mm aluminium rod.

Another plant is the state-owned "National Enterprise of Metallurgical Transformation of Non-Ferrous Metals" (METANOF) which commenced operations in 1985; its product mix includes aluminium profiles, zinc cadmium alloys, and copper metal and alloys. For aluminium fabrication, the plant has two (1600 and 2500 tons respectively) UBE Japanese made presses and two anodizing tanks. METANOF operates with a Japanese cast house for scrap recycling composed of two melting and holding stationary furnaces of 5 tons' capacity each connected with conventional D.C. casting machine with 12 strands 3.1 meters long.

The third metal fabricator is the state-owned "National Enterprise of Metal Packaging" (EMB) whose product mix includes aluminium castings, aluminium utensils and aluminium extrusions; imported aluminium metal and alloys are used by the plant. The plant has three units: the die casting unit, the utensils fabricating unit and an extrusion unit. The gravity dies casting unit has a tilting melting furnace that supplies two automatic die casting machines and Three station for die casting manual units the modernization of the unit was completed in 1993 and now has a capacity of 500 tpy.

CAMEROON

Country Location :

Cameroon is located on the West Coast of Africa between latitudes 2 and 13 degrees North, and longitudes 9 and 16 degrees East. The country has an area of 75,442 sq. km. It is bordered by the Atlantic Ocean in the West, Equatorial Guinea, Gabon and the Congo in the South, the Central African Republic in the East, and Chad and Nigeria in the North.

Primary Aluminium Production :

The main natural resources that exist in the country that are relevant to the aluminium industry include natural gas, hydroelectric potential and bauxite. Currently, oil exports account for most of the country's export earnings.

The proven bauxite reserves in Cameroon are estimated at 980 million tons while the geological resource base is estimated at 1,500 million tons . The bauxite reserves are located at Minim-Martap, Ngaoundal, Fongo-Tongo and other areas. The reserves grade about 47% bauxite.

The Minim-Martap and Ngaoundal deposits with a combined total bauxite reserves of 680 million tons have been explored in detail by Le Bureau Minier de la France d'Outer-Mer (BUMIFOM) and the French Office for Geological and Mineral Research (BRGM). These two deposits are located about 500 km. north-east of Douala, the main sea port of Cameroon and the commercial and industrial centre of the country. The development of these bauxite reserves is reported to be hampered by inadequate rail road facilities.

Conversely, the Fongo-Tongo deposit with bauxite reserves of 46 million tons is reported to be scheduled for development by Societe d'Etudes des Bauxites du Cameroon (SEBACAM) which is owned jointly by the government (40%, Pechiney of France (45%),(VAW) of Germany (10%) and Kaiser of the USA (5%), at a proposed operating rate of between one and two million tons per year of bauxite production. However, althogh this project was planned to have come on stream in the 1990s, its implementation has not yet commenced due to lack of transport infrastructure (roads, railways and suitable ports for shipments). Moreover, the high population density in the area could entail potential land use conflicts in future bauxite mining.

Primary aluminium produced in Cameroon has been based on the use of imported alumina, flourides, petroleum coke and pitch. The alumina is imported from the Frigia plant in Guinea via Douala port. The existing ALUCAM-owned Edea Aluminium Smelter (with a capacity of 88,000 tpy of a mixture of ingot, T-bar and slab products) situated 40 km. from Douala, commenced operations in 1957 close to the Sanaga water falls where a 670 M.W. hydroelectric power plant provides the electricity for aluminium production. The ALUCAM smelter consumes about 25% of the installed capacity of the Sanaga power station. The current efficiency of the smelter is reported to be 87% while power consumption per ton of aluminium produced is about 14,600 K.W.H.

The plant originally used the Pechiney 100 K.A. Soderberg pots end to end technology that was modified in 1980 to prebaked 120 K.A. end to end hooded pots with dry scrubbing system. The plant consists of 4 lines with 55 pots and added 2 lines with 27 pots 1980.

ALUCAM cast house composed of three groups, the first three furnaces 25 ton tilting type, oil fired, serve two ingot casting machines. The second group ,two tilting 25 ton furnaces with one tandish to D.C casting machines, which casting rolling slabs and T.bars, third group composed of one furnace 25 ton tilting , oil fired, the sconed, stationary furnace 35 ton ,oil fired used for remelting tailing and returned scrap.

ALUCAM plans to invest some CFA 5 billion in the next five years commencing 1993 to modernize the smelter. Studies have also been undertaken with a view to increase the capacity of the plant to about 160,000 tpy but problems of financing, energy supply and the unfavorable world aluminium market have hindered the realization of the expansion.

Metal Fabrication :

(A) Socatrel :

Socatrel is a subsidiary of ALUCAM operates a hot and cold rolling plant established at Edea in 1961, with a capacity of 19,000 tpy product mix of aluminium sheet, coil, plates and corrugated sheets. The plant was expanded in 1983 to a capacity of 38,000 tpy of rolled products of the following mix: 11,000 sheet coil for export, 22,000 tons corrugated sheet (for local consumption) and 5,000 tons of disks for utensils (for local consumption). However, Socatrel's production in 1992 amounted to only 19,000 tons of products. The ownership of Socatrel is as follows: Aluminium Pechiney 45.58%, the government of Cameroon 38.65%, Sni 6.93% and others' 8.84%.

The hot mill was supplied by Spidem with two high mill with 1040 MM barrel length. The cold mill includes 4 high unreversable mill with 1000 MM barrel length from the same supplier.

1) Metalu

This plant serves the construction field by fabricating the profile and the corrugated sheets for roofing also plates for facing. The annual capacity of the plant is 400 M/T as finished products. It imports the profiles and steel sheets but the corrugated sheets come from Socatrel.

(C) Alubassa

It is a utensil's fabricator with annual capacity 1500 tons. In 1992 the actual production was 600 tons only. The raw material needed is received from Socatral.

(D) Camal Cab

It is a cable plant fabricating aluminium and copper cables with annual capacity 220 tons, all the aluminium wire rod and copper are imported.

The Cameroon domestic market is a gorwing market although it faced some difficulties during the economic reconstruction of the country in the last three years. The local consumption in 1992 was about 35000 tons of aluminium and the balance of the aluminium production was exported.

Cameroon is considered the second country in Africa after Egypt regarding the local consumption as it consumes about 27% of its aluminium production compared with about 55% in Egypt.

COTE D'IVIORE

Ivory coast lies on the West Coast of Africa covering 322500 sq. km. It has common border with eight countries -- Angola in the West, Zaire and Tanzania in the North, Malawi in the East, Mozambique and Zimbabwe in the South East and Botswana and Namibia in the South West.

Natural Resources in Ivory Coast

Mainly plant products for export, well-developed industrial sector for agro-foodstuffs, oil, processing and fishing mineral resources as gold, diamonds are of little importance in the economic activities.

Bauxite and Aluminium

There is no bauxite or aluminium smelter in the country. In this field there are some factories for windows and doors that depend on the imported profiles mainly from France.
Other aluminium industries like cables and utinsels are not noticeable, the economy of the country is dominated by plant products for export. The industrial sector is mainly agro-foodstuffs, oil processing and fishing which account for 20% of GND, 30% agriculture and 50% for service.

Metal fabricator

There are some aluminium integrated factories in Ivory Coast, the major one is:

Conpagnie Ivorienne de L'Aluminium (IVOIRAL)

The current production of this company is about 1800 M/T per year of utinsels, fittings and cans for food stuffs and tooth paste. It imports 1000 M/T of sheets 1 mm thickness, 1000 M/T of circles in different thickness, 150 M/T of slugs and about 10/20 M/T of aluminium rods. The production is mainly for export to the Neighboring countries.

EGYPT

Egypt is located in North of Africa covering 1001449 sq. km. The country shares borders with Sudan in the South, with Libya in the West and Israel in the East, Med. Sea from the North.

Natural Resources in Egypt

In Egypt agriculture are one of the main natural resources (food crops and cotton) also oils, iron ore, phosphate rocks, gypsum, sulfur, tourism, revenues from Suez Canal and water falls (High Dam) which is the main source of energy for the industrial sector.

Bauxite

There is no known deposits of bauxite in Egypt, but Nepheline deposits are available at the Red Sea area, these deposits still need more studies to develop Nepheline refining to alumina (USSR technology) as it is known that Nepheline is aluminium bearing mineral for the production of metallurgical alumina. Until now the matter is still not developed and the cost of producing alumina from nepheline is not economic compared with the current price of the alumina in the international market. For this alumina is still imported to cover the requirements of Nag Hammady smelter (350 thousands M/T per year).

Aluminium

There is only one smelter in Egypt located at Nag Hammady 600 km south Cairo near Luxor.

Name	**Aluminium Co. of Egypt (EGYPTALUM)**
Start-up	**1975**
Capacity	**180 thousands M/T per year and arranging to reach 240 thousands M/T by 1996 (changing tech. to prebake anode at 200 KA rating).**
Share Holder	**100% governmental**
Energy Supply	**Hydro power from Aswan High Dam**
Number of Pots and Lines	**460 in 10 potlines.**
Cast House	**There are two cast houses producing billets, slabs, wire rods, foundry alloys and sheets, according to the international updated systems such as hot top, air-slip and electro magnetic casting (E.M.C)**

Anode Plant

With capacity of 85 TH. MT/ year for producing anode paste to feed the cells of aluminium for Suderberg method of production.

Calciner

With capacity 150 TH. MT/year rotary hearth Marathon Wise Technology it starts at 1983 with 50% of its capacity, from beginning of 1993 with 100%

Research and Development Center

Since early 1985's EGYPTALUM has started R&D activities relying mainly on national and international institutions, aiming to the expansion of the aluminium industry in EGYPT and also in the African and Arab Countries.

The center has remarkable facilities for engineering and research services.

Alumina Supply

The company imports about 350 thousands MT/ year of alumina mainly from Australia covered by five years contract with price linked to L.M.E aluminium price.

Technology Operations

Egyptalum started 1975 with VAMI end to end Suderberg pots Technology, 150 KA current ratting, the smelter modified in the first time at 1984 by introducing computer process control system, HITACHI hardware, SHOWA aluminum software and know how. Power consumption reduced from 16.4 KWH/KG to 15.5 KWH/KG current efficiency from 83.% to 88%.

Egyptalum R&D center supported by CAIRO UNIVERSITY Faculty of Engineering started rehabilitate plan to change the existing Suderberg 150 KA pots, too prebaced 200 KA pots. The first 6 experimental pots already started at November 1991, with successful results, 93.8% current efficiency, 13.8 KWH/KG and 420 KG flourides per ton.

In June 1993 three experimental side by side 200 KA current. The all 9 prototype pots are hooded with point feeding, controlled by VAW software and Semins hardware.

According to the results of the prototype pots the plant will rehabilitate, to reach 240 TH MT/year.

Rolling Mill

EGYPTALUM started to build combined hot and cold aluminium rolling mill in the same smelter site with annual capacity of 60 thousands M/T per year. Equipment from CLECIM and Technology and know-how from Pechiney. The project is expected to come into operation in 1995 for producing wide range of flats as plates, sheets and foils stock mainly for export and, the project study estimated an increase in domestic market from rolled product, about 25 TH. MT/year.

Workshop

Beside the main activity of the company it has succeeded to utilize the workshop and the design office for spare part's fabrication to cover the company requirements ,and other companies in aluminum, copper and steel industries as well as other fields. Also designs and fabricate equipments for aluminum industry in Egypt .

Metal fabrication:

Egypt is considered the first country in Africa which benefited of its primary aluminium production, as out of the 180 thousands M/T primary aluminium produced by the Aluminium Company of Egypt about 75 thousands M/T are yearly consumed in the local market. The fabrication industry in Egypt consists of :

* **Four public sector companies.**
* **Three joint sector companies.**
* **Some private sector factories.**

The Public Sector

(1) Egyptian Copper Works Company (ECW) :

The company is located in Alexandria and has cold rolling mill supplied by Cliciem 1600 MM sheet width, the cold mill supplied by aluminum coils from three Hunter sheet casters, the main products of ECW are discs for utensils, coil sheet for construction work, foil stock which converted to foil in old ' Former East Germany" foil mill, aluminum profiles are extruded by old USSR press. ECW product mix, 7500 ton as sheet, strips and circles, 2000 ton foil, and 500 ton extruded profile and pipes.

The annual capacity is about 20TH. MT, from this quantity 3000 ton for export. All raw material from Egyptallum as cast sheets and ingots.

(2) General Metals Company (G.M.C) :

It is located in Cairo and has facilities of continuous and DC casting, hot and cold rolling combined mill supplied from Krupp 1000 MM width. Its product mix is rolled aluminium coils, as cast coils, sheets and circles. The annual capacity is 12 thousands M/T, with product mix 10000 ton sheet, circles and sludge, 300 ton engineering parts by pressure and gravity die casting. General metal started new machine for refrigerator condenser up to 1000000 pieces yearly. It covers the raw material from Egyptalum. The production is mainly for local consumption, except 1500 ton for export to Africa and Meddle East Countries.

(3) The Egyptian Cables Company :

It is located in Cairo area and has the facilities of drawing the wire rods and producing cables for all electrical purposes as low, medium and high voltage electric cables, aerial cables, telephone cables and wire, also indoor wires. The raw material in shape of electric conductors and alloyed conductors 9.5 MM diameter rods is supplied by Egyptalum. The annual capacity is 44 thousands M/T for both aluminium and copper . the used capacity is around 80%, the production is for the local market and for export to the other countries in the area.

(4) Helwan Company for Non-ferrous Industries (MF 63) :

It is located in Cairo, Helwan area and has facilities of two stand hot mill and cold mill , foil shop, facilities of producing over head conductors, and irrigation tubes. It covers the raw material mainly from Egyptalum. The plants fabricate 20000 MT/year.

(5) Egyptian Aluminium Company (Alumisr) :

It is located in Cairo area. It has extrusion facilities with annual capacity of 12 thousands M/T. The main production is profiles for all purposes, anodized and coloured. Also, any tailored profiles 70% of the production is for the local market. The raw material is covered from Egyptalum.

(6) Al -Saad Aluminium Company :

Also located in Cairo area. It is extrusion company with annual capacity of 12 thousands M/T. It produces profiles for all purposes and standard aluminium sections (rods, bar, tubes) anodized and electro coloured. The raw material is from Egyptalum. The annual sales are 60% for the local market and 40% for export.

(7) Arab Aluminium Company (ARABAL) :

It is located at El-Esmaeilia. It has extrusion facilities of 12 thousands M/T per year. It produces the same products as the other two above mentioned companies also the raw material covered from Egyptalum and the production is mainly for the local market about 75%.

(8) Arab Cables and Electrical Industries

The major factory in this sector is Arab Cables and Electrical Industries (El-Sewedy) factory for cable's production. It produces wide range of cables for all electrical purposes, low, medium and high voltage electric cables. The raw material is covered from Egyptalum in shape of electric conductors and alloyed conductors wire rod. The annual capacity is 7500 M/T the production of the factory is 75% for local market and 25% for export. There are plans to increase the capacity to 12000 M/T during 1994.

GHANA

Ghana located on the West coast of Africa covering 238537 km. Sq. between 5-11 degree latitude North and from 1 degree East to 3 degree West longitude. Ghana South Coast lay on the Atlantic Ocean, from East Togo, from North Upper Volta and from West Ivory Coast.

Natural Resources in Ghana :

As one of the countries on the golden coast of Africa, has good natural resources from wood, cocoa and coffee beside rich mineral such like gold, diamond manganese, limestone and bauxite which is very important resource in Ghana.

Bauxite in Ghana :

The first country that started to export bauxite to Europe and America was Ghana during the second war. Ghana exports yearly about 400,000 tons of bauxite to USA..

Ghana possesses considerable bauxite reserves at five locations scattered across the country. The deposits of bauxite in Ghana are lateritic and associated with the Birrimian system of rocks of the proterozoic age, the reserves and alumina content of these deposits are shown below,

	Reserves (B.T)	*SiO2*	*Al2O3, %*	*Fe2O3*
1) Nyinahin	**350**	**2.3-44**	**44-50**	**23**
2) Kibi-Atewa	**120-150**	**3.2**	**42-45**	**26**
3) Awaso	**20**	**3.3**	**49**	**18**
4) Asafo	**25-50**	**2.3**	**49-52**	**23**
5) Ejuanema	**4**	**1.42**	**60-55**	**9.2**

However, although feasibility studies have been carried out on the Kibi and Nyinahin deposits, currently only the Awaso deposit is mined. The mine is operated by the Ghana Bauxite Company, which is owned by the government (55%) and British Alcan Aluminium Co. (45%).

The Ichiniso mine is a part of the Aswaso deposit located in the Western region. The broken ore then trucked to the crushing plant where the ore is crushed, washed and screened. The washed bauxite shipped by train to the port at Takoradi.

During the 1970s, the capacity of the mine was 400,000 tons/yearly until 1975 production averaged 350,000/yearly of metallurgical grade bauxite. However, as the equipment aged capacity was reduced and production was further affected. Production suffered to such an extent that out put fell to a low of 49,000 tons in 1984. In 1988 the Ghana bauxite Co. negotiated a loan of about US $ three Million to upgrade its mining to reach production capacity of 500,000 tons.

In 1985 Kaiser and several Japanese Aluminium companies were supposed to develop a mine at the Kibi deposit and an alumina refinery, but nothing had come of these plans. However, in the same year the USSR signed an agreement to assist in developing the deposit with plan for an open pit mine with a capacity of 3 millions ton yearly of which 1.2 million tons would be for export and 1.8 million tons will be refined to alumina to produce 800,000 tons yearly, but so far no dates have been announced for starting.

Aluminium

In Tema 60 km. in North of Accra and closer to Akosombo Dam Volta Aluminium Company Ltd. "VALCO" was founded in 1964 and started the first three pot lines in 1967. The pot line number four was added in 1972 and pot line five followed in 1976.The smelter needs about 370 M.W. from the Volta River Authority (Akosombo Dam).

The company shareholders :

Kaiser Group Inc.	**78.3%**
Reynolds Metals	**10.0%**
Private Shareholders	**11.7%**

Kaiser Aluminium intends to sell its part in the smelter and is looking for purchasing bids. At the currently the smelter can be operated only with difficulties in energy supply, Comalco (UK) Ltd. and Hoogoverns Aluminium Huttenwerk GmbH (formerly Kaiser Aluminium Europe, Huttenwerk Voerde) has announced that agency activities which carried out by Kaiser Aluminium Voerde for Volta Aluminium Company Ltd. had, with effect from January 1.1988, been transferred to Comalco (UK) Ltd. Kaiser Technology was sold to the US holding Maxxam Group Inc., active in real estate business and lumber products for a transfer sum of US$ 708 M in October 1988. Only four out of five pot lines are in operation. The Maxxam Group is said to sell its 90% stake in the smelter.

The smelter composed of 5 pot lines with 52% pots with 150 K.A. current rating with annual production capacity 200,000 tons with Kaiser technology, at 1983 the smelter stopped due to lack of power "drought-affected". By third quarter of 1986 four of the smelter's five pot lines had been restarted. Pot line five started at 1987 to return to its full capacity 200,000 tons.

The pots are center worked prebaked side by side hooded pots, the technology applied is Kaiser-technology Western engineering and Manufacturing Co., Los Angeles, USA, which supplied also the ventilation system for the pot rooms engineering and construction: Kaiser Engineers International.

Products mix are ingots, extrusion billets, rolling slabs and sows. There are 3 bays in the metal service area. In the first bay are 7 metallurgical furnaces that can hold molten metal. The ingot casting convcyors are in the middle of they bay. There are molds for 13.6 kg and 22.2 kg ingots.

Three rectangular holding furnaces with a capacity of 40.8 t each prepare the metal before casting into extrusion billets or in large rolling slabs. From the casting pit extrusion billets are taken to homogenizing furnaces. The third bay is the storage area. Loma Machine, New Rochelle, New York supplied the 3 semi-continuous casting installations and one SL-60 sliding saw installation in 1966. The products are shipped to South America, USA, Europe and Far East. Kaiser is the supplier of alumina from Australia and USA.

Metal fabrication:

(A) Aluwork :

Aluwork is the biggest integrated plant in Ghana with cold mill and sheet caster supplied with Hunter Engineering technology with designed capacity 20,000 tons yearly, in 1992 the annual production was 15,000 tons 70% for domestic the rest for export. The products mix of the plant is corrugated sheets, circles, coils, and sheets.

(B) "AEL" Aluminium Enterprise :

AEL is secondary aluminium smelting plant, which produces secondary ingots. The plant capacity is fluctuated, the plant production is directed to export with about 8,000-10,000 tons yearly.

It is clear from the aluminium industry pattern in Ghana, that the country has good bauxite deposits, quantity and quality wise, the bauxite exported to USA and UK, no alumina refinery is available inspite of the existing study of a project for aluminium refining .no steps has been taken to implement this study.

In the same time the aluminium smelter with capacity 200,000 tons yearly is importing its alumina, fluoride, petroleum coke and cool tar pitch form abroad, in the same time export about 180,000 to 190,000 tons of aluminium product, with very weak domestic market in aluminium.

We can say that the aluminium industry pattern in Ghana is very poor and in need of big efforts to be organized for creating integrated industries in the aluminium field specially the raw material is available.

GUINEA

Guinea located on the West coast of Africa, covering area of 245,857 kilometer square Atlantic Ocean represents the West Coast of Guinea, Sierra Leone and Liberia from the South, Ivory Coast and Mali located from the East and Senegal from the North.

Natural Resources in Guinea

Guinea is third largest producer of bauxite in the world. Guinea remains highly vulnerable to adverse trends in international bauxite and alumina markets, also Guinea has a good resources of diamond, gold and iron ore mainly in Mifergui Nimba closer to Guinea Liberia border.

Bauxite

Total production was about 16.8 million tons in 1989 with an increase of 42% from 1982 when output stopped at 11.8 million tons. It was the highest total ever achieved. Guinea has a total bauxite reserve estimated at 7,000 million tons the largest in the world according to the US. Bureau of Mines. Guinea posses the largest and most important of the numerous bauxite deposits found in West Africa. There are five main deposits, which are listed in the next Table. The largest is the Boke deposit exploited by Compagnie des Bauxites de Guinea (CBG). On the Sangaredi Plateau, thick sequences of bauxite rest on a clay floor and are irregularly capped by laterite. The bauxite succession is fragmented and conglomerates, with large bauxite clasts in a fine bauxite matrix. The major minerals are gibbsite and boehmite, usually as fine-grained inter growths with later coarse gibbsite filling interstices and cracks. The Sangaredi ore body produces ore with an unusually high Al_2O_3 content of around 60%, which compares with between 45% and 55% for the other ore bodies that are exploited.

Guinea Reserves and Average Alumina Content of Bauxite Deposits

Location	*Reserves (mill. ton)*	*Al2O3, %*
Boke	5,100	45-60
Dabola	670	43
Fria	26	45
Kindia	42	47
Tougue	1,162	48
Total	7,000	

Two other deposits are currently exploited; the Fria deposit is mined by Societe 'Economy Mixte Friguia, and the Kindia deposit is operated by Office des Bauxites de Kindia. Both the Dabola and Tougue deposits have been the subject of previsibility studies in the mid 1970s but no project has been decided yet. The Tougue deposit is 100% state owned but the Dabola deposit and that at Boke not exploited by CBG are for lease from the Republic of Guinea.

Bauxite production started in Guinea in 1961 when mining started at the Fria deposit, managed by Pechiney of France. During the 1960s and early 1970s, output averaged among 2 mill. Tpa and 2.5 mill. tpa. However, when production from the Kindia deposit began in 1974 at a level of 2.5 mill. Tpa and shipments started from the Sangaredi mine in 1973, output reached 7.7 mill. ton in 1975 and increased to 13.9 mill. ton in 1980. Since 1980, growth in output has been slower but production reached 16.8 mill. Ton in 1989, as shown in the following table.

Guinea Production of Bauxite, 1970 to 1989 (000 ton)

Year	*Production*	*Year*	*Production*	*Year*	*Production*
1970	2.490	1977	10.871	1984	14.738
1971	2.630	1978	11.648	1985	13.956
1972	2.650	1979	13.379	1986	14.835
1973	3.800	1980	13.911	1987	16.286
1974	7.600	1981	12.822	1988	16.834
1975	7.650	1982	11.827	1989	16.834
1976	11.316	1983	12.986		

Source : Table 4 (US BM Minerals Yearbooks 1970 to 1988

At present, around 66% of total Guanine bauxite production comes from the Sangaredi mine and the Kindia and Fria mines accounting for 19% and 15% respectively.

Compagnie des Bauxites de Guinea (CBG)

It was founded in 1965 to develop and operate the Sangaredi mine in the Boke region. The shareholders in CBG are the Guanine government (49%) and Hako (Mining) Inc. (51%). Halco is owned by Alcan and Alco (27% each), Pechiney and VAW (10% each), Camalco (8%) and Alumina spa, Billiton BV and Reynolds Metals Co. (6% each).

Billiton, Comalco and Reynolds acquired their shares in 1984 from Martin, Marietta, which had owned 20%. ACLU is the operators for the consortium, while Halco provides technical and administrative assistance to CBG through the Office D'Amenagement de Boke, an agency of the Guanine government. The participants have off take rights up to about 90% of the company's output.

The Sangaredi deposit consists of a solid plateau of bauxite; reserve's total around 125 mill. Ton with an alumina content as high as 60%. The total reserves within the Halco lease amount to around 500 mill. ton with an average alumina content of 55%. Capacity at the mine is now just over 11 mill. Tpa after an expansion in 1987 from 9.5 mill. tpa. The mine also has additional capacity for calcined abrasive grade bauxite of between 130,000 tpa and 140,000 tpa.

The ore is taken by train to a drying, crushing, calcining plant at the port of Kamsar. The plant produces high quality metallurgical grade and calcined bauxite. The table below shows the typical chemical analyses of the two grades of bauxite produced by CBG.

	Metallurgical Grade	*Calcined Abrasive Grade*
Al_2O_3	61	90
SiO2	1.3	1.2
Fe_2O_3	5.6	4
TiO_2	3.6	4
LOI	28.8	0.8

Source : Aluminium - Verlage GmbH

When the first shipments took place in 1973, production at the Sangaredi mine was around 3 mill/tpa. Since then output has increased steadily to 8.4 mill. ton in 1985 and an estimated 11.1 mill. ton in 1989. Output of calcined abrasive grade bauxite is around 135,000 tpa. The bauxite is exported from Kamsar, mainly to the USA, Canada and Western Europe.

In 1986 Halco signed a ten-year pricing agreement with the government, to take effect from 1988. The bauxite price is linked to those of alumina and aluminium and government bauxite levies as abolished and replaced with a variable corporate profit's tax. The expansion of capacity in 1987 was made possible by a US$ 12 mill. Loan from a group of French banks to buy French mining equipment.

CBG are developing a new mine at Bidi-Koum, South West of Sangaredi. There are reserves of around 80 mill. Ton with an average alumina content of 54%. A US $ 15 million . scheme is planned and production is due to start in early 1990s. As output from Bidi-Koum is phased in production at the Sangaredi mine. Will be gradually decreased until both mines account for equal shares of production. There are also 60 mill. Ton of reserves at Biundou-Ovande and more at N'Dangra. All these deposits are located near to the existing railway so their development would require little extra transport infrastructure.

Societe d'Economie Mixte Frigula :

Societe d'Economie Mixte Friguia is owned 49% by the Guanine government and 51% by Frialco. The shareholders in Frialco are Noranda (30%). Pechiney (30%), British Alcan (20%), and Hydro Aluminium (20%). Hydro acquired their stake in June 1989 and at the same time British Alcan increased their stack from 10% to 20%. This was made possible because Noranda reduced their share by 8.5% and Pechiney reduced theirs by 6.5 while Alusuisse and VAW sold their 10% and 5% shares. Pechiney is the operator for the consortium that mines bauxite at the Fria deposit, 145 km North of the capital Conakry.

The Fria deposit has proven reserves of 26 mill. ton of ore at an average grade of 45% alumina. The mine has a capacity of 2.4 mill. Tpa and the ore, once mined, is trucked to the refinery at Kimbo where it is crushed and then refined to alumina. The alumina refinery currently has a capacity of 700,000 tpa. Since the mine started production in the early 1960s, output has averaged around 2 mill. Tpa and production totaled approximately 2.2 mill. Ton in 1989. Out put of alumina reached a peak of 708,000 tons in 1980 and 1989 production was estimated at 626,000 tons. The 49% share of alumina production owned by the Guanine government is exported to Cameroon and to Eastern Europe while the 51% Frialco share goes to Western Europe.

Modernization of the plan is planned with the help of European Investment Bank Funding of around US $ 60 million . In particular Frigula hope to make the alumina more marketable by using a modified version of the Bayer process to produce a sandy type of alumina. There is also a plan to increase capacity of the plant to 1.3 mill. Tpa but no dates are nominated.

Frialco concluded a new pricing formula with the Guanine government in 1986 for the alumina that they take from the Kimbo refinery.

L'Office des Bauxites de Kindia "O.B.K."

L'Office des Bauxites de Kindia is 100% state-owned with technical assistance provided by the former USSR. The company mine a deposit in Kindia where total proved reserves are estimated at 42 mill. Ton with an average alumina content of 47%. The project was built by the Russians in the early 1970s and production started in 1974.

Capacity at the mine is just over 3 M. ton and production in 1988 was 3.1 mill. Ton. Output for 90/89 is estimated at 3 mill. Ton. The bauxite is taken by rail to the port of Conakry and then exported to Ukraine. The bauxite produced by the Kindia mine is suitable for CIS countries whose alumina refineries can tolerate lower-grade feeds (45% to 50% alumina).

The Soviet-run mine may soon be complemented by a Soviet-financed alumina refinery and possibly an aluminium smelter under the terms of an agreement signed by the two countries in early 1989. However, the project does not start yet.

Potential Projects

In addition to the operations out lined above, a number of organizations have been established with the intention of further development in the country's bauxite resources.

Societe Guinea-Arabe d'Alumine et d'Aluminium (ALUGUL), a consortium of petroleum producing countries (Egypt, Iraq, Kuwait, Libya, Nigeria and Saudi Arabia) and the Guanine government, are considering developing an integrated complex to exploit the Ayekoye deposits near Sangaredi. Reserves are estimated at 4.000 mill. Ton averaging 44% to 49% alumina. A feasibility study was undertaken by Alussisse in 1979: project is to be an integrated operation with capacities of mill. Tpa bauxite, 1.2 mill. tpa alumina and 150.000 tpa of primary aluminium. No work on the project is expected until the mid of 1990s. In connection with this project the Alusuisse group has carried out a feasibility study on a hydroelectric power scheme on the Konkoure river.

Societe Miners de Participation's Guinee-Alussuisse (Somiga) have carried out feasibility studies on 500 mill. ton ore reserve at Tougue. A joint venture between the government of Yugoslavia and Guinea has been considered for the 2.000 mill. Ton deposits at Dabola.

These two deposits are much further inland than the existing operations and would require considerable infrastructure to be developed, although Dabola is on an existing railway. The Ayekoye deposit is near to the existing operations at Sangaredi and would require less expenditure on this aspect. The inland deposits are unlikely to be developed for the future.

Trade

Excluding the bauxite produced by Friguia which is used to feed the Kimbo alumina refinery, Guinea exports all the bauxite production. In 1988, the International Bauxite Association estimated that exports totaled over 14.0 mill. Ton. The main destination is the USA that accounted for 32% of Guanine bauxite exports, followed by the Former USSR (24%), Ireland (12%) and Spain (9%). Other Western European countries and Canada account for the remaining export tonnage.

Similarly, all the alumina produced at the Kimbo refinery is exported. Of the 300,000 tons share of output owned by the government, 162,000 tons is exported to Cameroon, while the remainder is exported to Eastern Europe, particularly Poland. To settle bilateral clearing accounts. Frialco also takes a 300,000 ton share of alumina output. In 1988, 32% was exported to Italy, ?5% to the UK and 18% to Norway.

Alumina Production

There is only one alumina refinery in operation at Kimbo. The refinery is run by Friguia and is fed from the mine at Fria. The refinery has a capacity of 700,000 tpa, and during the 1980s, output remained between 500,000 tpa and 600,000 tpa, except for a peak production of 708,000 tons in 1980. Output for 1989 is estimated at 626,000 tons that was the same capacity of 1990 and in 1991 increased to 645,000 at 1992. All the output from the Kimbo refinery is for export.

Guinea : Alumina production, 1975 to 1992 (000 ton)

Year	*Production*	*Year*	*Production*	*Year*	*Production*
1975	643	1982	549	1989	626
1976	560	1983	583	1990	630
1977	562	1984	538	1991	631
1978	610	1985	572	1992	640
1979	660	1986	572		
1980	708	1987	543		
1981	608	1988	590		

With plant capacity 700,000 ton/yearly; plans to expand the plant present capacities to 1,230,000 ton/yearly, by the early 90s have been reported.

The plant use bauxite 2,000,000 ton/yearly. With composition of total Al_2O_3 40%, total SiO_2 2.5%, reactive SiO_2 0.8%, Fe_2O_3 7.1%, TiO_2 3.5%, Ca approx. 0.003%, LOI 9-12%. The ore body currently mined is located 7.5 km. from the plant, With chemical composition and refined using Pechiney technology, they drain red mud : SiO_2 4.72%, Al_2O_3 21.21%, Fe_2O_3 51.73%, CaO 2.2%, MgO 0.43%, K_2O 0.65%, Na_2O 3.24%, TiO_2 1.46%, LOI 14.36%.

Sulfurization sintering of red mud with sulfuric acid is implemented. The production obtained at stoichiometric amount sulfuric acid 100% sintering temperature 550°C, sintering time i20 minutes, coagulation modules > 330. This product possesses very good qualities as a mixed mineral coagulant and can be used effectively for industrial and municipal waste water purification.

In 1983 the specific production costs per tone alumina produced were USS 215.6 (bauxite 26.7, other raw materials 8.9, energy 92.7, labor and maintenance 47.8, variable costs' 176.1, capital costs' 39.6).

The Alumina Quality

Is Floury with chemical composition: Na_2O 0.5%, SiO_2 0.015%, Fe_2O_3 0.02%, impurities: V 0.0015%, Ti 0.003%, Physical properties: BE: 60 M^2/g, attrition index: 35-40%, fines - 43 microns: 8% suitable for all pot types and dry scrubber.

Alumina Shipments:

Sales go to Cameroon (EDEA): 164,000 ton/yearly, Pechiney: 55,000 ton/year, New Madrid: 230,000 tons/year, Alusuisse: 61,000 ton/year, VAW: 30,000 ton/year, spot market for government: 100,000 ton/year.

Shareholders:

49% government,
51% FRIALCO (30.0% Noranda, 30.0% Pechiney 20% Alcan 20% Hydro Aluminium) Suisse, 10% British Alcan, 5% VAW)

Pechiney is responsible for the management of the plant; output in 1986: 600,000 ton/yearly, the refinery was retrofitted in 1986 after the new decomposition process practiced by Alusuisse.

The Compagnie de Bauxite de Guinee (CBG), controlled by Alcoa, Alcan and Pechiney is the sole marketing company for Guinea's bauxite. Guinea has reserves of almost 5.5 Billion tons of bauxite, re-presenting about 26% of the world's total, and an alumina content of 60% currently Guinea produces about 12 MT./year, of bauxite providing over 90% of the country's foreign exchange.

The Guanine authorities reportedly are seeking a fair price for bauxite exported to the Former USSR settlement of debates due to them. Guinea annually ships three M. tones of bauxite equivalent to almost the entire production of The kindia mines to service it's Former USSR debit of USSR 500 M. The European Investment Bank grants a credit worth ECU 13 m for the modernization of the refinery. Alusuisse and VAW sold their 10 and 5% share respectively and Noranda reduced its holding by 8.5% and Pechiney by 6.5%.

Aluminium :

In Guinea there is no aluminium smelter or aluminium fabricator except only one aluminium profile fabricator depending on the imported profile two studies was done on Dian Dian project, one by "ALUGUL" Societe Guinee-Arabe d'Alumine d'Aluminium and the second by the former USSR but both are still in the studying stage .

KENYA

Kenya lies on the Eastern Coast of Africa, with a coastline of about 1000 km along the Indian Ocean. The country is bordered to the North East by Somalia, to the North by Ethiopia and Sudan, to the West by Uganda and to the South West by Tanzania. It covers 582647 Sq. km.

Natural Resources in Kenya :

In Kenya agriculture is the major activity. The main crops are coffee, tea, sisal, pyrethrum, cotton, maize, wheat and sugarcane. Also tourism industry is very important in Kenya. This is besides some mineral production as limestone, salt, and soda ash ...etc.

Bauxite , Aluminium :

There is no bauxite deposits or aluminium smelter in Kenya also no major aluminium industry except some factories producing discs, sheets, profiles and utinsels. The raw material is imported from Europe Gulf Area and India. Total Capacity of these factories estimated to be around 20 Th M/T per year. The majority of the production consumed in the local market with few quantities for export to the other countries in the area.

Metal fabrication :

Booth Manufacturing Africa Ltd. (Nairobi) :

The factory was established in 1964 owned 99% by Kenyan shareholders. There is 450 labor and employee including management staff the current annual production is 4200 M/T of aluminium, sheets' circles, utensils and also Al panels, door, windows and partitions. The factory is considered one of the biggest utensil producer in Kenya.

Narcol Aluminium, Rolling Mill Ltd. :

It is a rolling mill located in Mombassa for producing sheets, circles and also utinsels. Annual production is 12000 M/T. The company is considered investment company owned 50% by Kenyan shareholders. The company plans to produce hot rolled bar, rods and square angles.

Kaluworks Ltd. :

The company located in Mombassa and owned 100% by Kenya shareholders. The current capacity is 1800 M/T per year. The main production is Al hollow ware for the domestic market. It imports the circles that are the main raw materials the labor force about 600 employees and the majority are Kenyan.

Aluminium Extruders Ltd. :

The plant located in Mombassa and owned 100% by Kenyan shareholders. It produces Aluminum sections. The current production is 1000/2000 M/T per year for the local market.

Aluminium Enterprises Ltd. :

Located in Nairobi and owned 80% by Kenyan shareholders. The current production is 300/350 M/T per year of aluminium hollowware. It imports the raw material in shape of aluminium ingots and scrap.

The above mentioned plants are the main in Kenya, most of them are not working with full capacity due to shortage in foreign exchange for importing the raw material .

MOROCCO

Morocco located on the West North of Africa covering area of 710 850 km. Sq. between 28 to 35 degree Latitude North and from 12 to 1 degree Longitude South.

Morocco bordered by the Atlantic Ocean from the West, Spanish Sahara and Mauritania from South, Algeria from the East.

Natural Resources in Morocco :

Morocco is considered the first country in phosphate rocks' deposits in the world as it has about 3/4 of the world reserves also in production of phosphate it comes after USA and the former USSR. Beside this Morocco has a good deposit of copper ore, zinc, leads, silver and sulfur also exploring some deposits of coal for generating energy in Gread station.

Bauxite and Aluminium :

There is no bauxite or aluminium ore also no aluminium smelter in Morocco.

Metal fabrication :

There are mainly two plants, the first is an extrusion plant and small rolling mill with capacity of about 6000 M/T of profiles and utinsels for the local market.

The second is for cable production with capacity of 4000 M/T of several types of copper and aluminium cables. All the aluminum raw materials for these plants are imported, which reach about 10,000 M/T of billets, sheets, discs and aluminium rods.

SIERRA LEONE

Sierra Leone located on the West Cost of Africa covering 71,740 kilometer square among 3-10 degree Latitude North and from 10-13 degree longitude West Sierra Leone lies on the Atlantic Ocean from West. Guinea from North and East, and Liberia from South.

National Resources in Sierra Leone :

Sierra Leone is one of the West coast of Africa countries that has a good natural resource of iron ore, diamond, gold, rutile and bauxite, which represent the main income of Sierra Leone.

Bauxite in Sierra Leone :

Sierra Leone has several bauxite deposits located in different parts of the country, the total reserves are estimated at 280 mill. ton. However, at present, there is only one active mining operation. This is in the Mokanji hills, 229 km south east of the capital Freetown, which is operated by the Sierra Leone Ore and Metal Company (Sieromco).

Sieromco was incorporated in 1960 and granted a special exclusive prospecting license in 1961. Complementary agreements were subsequently signed in 1962, 1976, 1980 and 1987.

The Mokanji mine was exploited for 18 years but now is depleted and since 1982 mining operations are concentrated around Gondama in the same area. Total reserves are estimated at around 23 mill. Ton for the Gondama deposit and 68 mill. Ton in total for the deposits operated by Sieromco.

Ore is taken from the mine to the Gondama benefaction plant that has a capacity of 1.5 mill. Tpa. Mine capacity rose to around 1.5 mill. Tpa. From around

700,000 tpa following the expansion of 1984 washed bauxite is then transported to the port of Nitti where either stored for shipping or dried in a rotary kiln to reduce moisture to 5.5% and then stockpiled to be ready for shipping.Production has more than doubled from 747,000 ton in 1980 to 1.5 mill. ton in 1989 but it declined to 1.2 mill. ton in 1992. Average alumina content is 53%.

Sierra Leone : Production of Bauxite, 1970 to 1989 and Forecast to 1992 (000)

Year	*Production*	*Year*	*Production*	*Year*	*Production*
1970	449	1978	715	1986	*1.242*
1971	591	1979	687	1987	1.391
1972	694	1980	747	1988	1.403
1973	693	1981	606	1989	1.520
1974	672	1982	632	1990	1.400
1975	716	1983	785	1991	1.200
1976	651	1984	1.041	1992	1.200
1977	725	1985	1.185		

The Port Loko deposit, located 60 km north east of Freetown, has reserves estimated to total 200 mill. Tons of raw bauxite. Exploration and development have been undertaken by Sierra Leone Bauxite Company, on equal share joint venture between the government and Alusisse. The company has carried out a feasibility study for a mine, a benefaction plant at Yenkisa and possibly an alumina refinery at Pepel. However, no definite plans have been announced yet.

Three other deposits have been discovered at Krim Kapa, in the Freetown Peninsula, and in the Waia Sula mountains. However, reserves and quality are limited and no development plans are decided.

All production of bauxite from Sierra Leone is exported through Alussuisse. The two major destinations are Germany for about 48% and Canada for 20% of the exported quantities.

In Sierra Leone no alumina refinery and also no aluminium smelter. The government started in Hydro power station in two stages utilizing water fall on Bumbuna River, the first stage to generate 50 MW to supply Freetown the capital and its surrounding, the second stage to add 138 MW more to serve industrial requirement.

On the other hand there are no aluminium industries !!

TANZANIA

Tanzania lies on the Coast of East Africa covering an area of 947000 sq. km. on the main land plus the two small islands of Pemba and Zanzibar. It shares borders in the North with Uganda and Kenya. In the South with Malawi, Mozambique and Zambia and in West with Zaire, Rwanda and Burundi.

Natural Resources in Tanzania :

Agriculture is the major economic activity (food's crop, coffee, cotton, tobacco and tea). There are significant mineral resources as diamond, gold other precious metal and stones. The scenic landscape and wildlife are also tourist attraction for foreign exchange income.

Bauxite, Alumina and Aluminium :

Bauxite there is no definite information/statistics about the deposits but geological and climatic conditions gives a good chance for noticeable deposits formed by lateritical processes under the prevailing tropical/sub-tropical climate. More studies are required to review/decide about the existing deposits before going ahead to any investment.

Aluminium :

There is no smelter in Tanzania and the aluminium industry is concentrated in some factories for sheets, circles, utinsels and foils. The main producer for such products is the Aluminium Africa Ltd. (ALAF) which manages rolling mill of capacity of 9 Th M/T per year. The raw material is mainly imported. All the production is locally consumed with portion for export to the nearby countries.

Metal fabrication

Alco - Division of Aluminium Africa Ltd. :

The company is considered the biggest company working in this field in Tanzania. It is established in 1960. The ownership is 62.5% for the National Development Corp., and for English Finance Ltd. together with Clovis Ltd. of Berumuda 37.5% ALUCO has secondary ingots plant 10 tone melting furnace, (annual capacity 4500 M/T) using recycled scrap together with the purchased scrap and ingots.

It also has continuous casting machine (DC) for slabs with capacity of 1600 M/T per year and rolling mill for producing hot plate, cold sheet and foils. Total annual capacity of ALUCO is 9000M/T per year.

It has six division foundry treatment furnaces, hot rolling, cold rolling, semi-finished and finished products. The production of ALUCO varies from the sheets till the kitchen utensils. The current production is 5000 M/T finished product that is 70% for the local market and 30% for the export to the other African countries in the area.

Tanzania Cable Ltd. :

It is owned by National Develop Corporation 51%, Paper Products Ltd. 29%, Tanzania Develop Finance Co., Ltd. 10%, Tanesco 10%. It is the only company for producing cables, with capacity about 500 MT./year.

TUNISIA

Tunisia is located in North Africa covering 163610 sq. km. between Libya in the East and South, Algeria from the West and South, the Mediterranean Sea from the North.

Natural Resources :

Mainly agriculture, tourism, natural gas, phosphate rocks and the fishery.

Bauxite :

No bauxite deposit or alumina in Tunisia.

Aluminium :

No aluminium smelter in Tunisia.

Metal fabrication :

In Tunisia the main integrated production is for cables, profiles (doors, windows, panels and partitions), discs, utinsels and tubes.

The major companies in these fields are Trefilerie Profiles Reunis "T.P.R." Company as an extrusion company and also for tubes and utinsels. For cables there are Tunisia Cables and Shakira Company. The total capacity of these three companies is about 25 Th M/T per year. The annual production is about 15 Th M/T. Most of this production is for the local market about 2 to 3 thousands for export to the neighboring countries. As for the material is mainly imported from Egypt, France and Gulf Area.

The main three aluminum fabricating plants in Tunisia is:

* SHKERA cable plant, located in the capital, with capacity 12000 T/year aluminum and copper cable from which about 40% exported to Europe, as copper isolated wires mainly for automotive industry, 30% exported to neighboring countries as aluminum cables.

*TUNISIA CABLE plant, located also in capital, with capacity 6000 T/year, the plant produce aluminum cables only, low, medium and high tension isolated cables. The company export to African neighboring countries about 40% from its capacity the rest for local market.

* TREFILERIE PROFILES REUNIS" T.P.R " extrusion plant ,is located in the capital , with 8000 T/year as anodized and mill finished profile, mainly for domestic market , with about not more than 15% exported to Europe and neighboring African countries, the company erected additional Italian press the last year.

ZAMBIA

Zambia is located in Central Africa covering 752614 Sq. km. It has common border with eight countries – Angola in the West, Zaire and Tanzania at North, Malawi in the East, Mozambique and Zimbabwe in the South East, Botswana and Namibia in the South West.

Natural Resources in Zambia :

Zambia is one of Central African countries (east coast countries) which has a good natural resource of copper, cobalt, zinc, lead and sulphite ore.

Bauxite and Alumina :

Zambia does not produce any bauxite or alumina also no aluminium smelter. But in 1986 there was a discussion for setting up an aluminium smelter between an Indian delegations who visited Lusaka and the officials in Zambia. This as India was to have a surplus alumina by 1988, and for the electricity, it was to be supplied from the Koriba Hydroelectric Station, alumina was to be shipped from India to Daresalam in Tanzania and transported by railway to Zambia. Transportation, the dry seasons and funds kept the project with no advanced steps.

Metal fabrication :

Lus Africa Industries Ltd. :

The company is located in Lusaka. It produces windows, doors, panels and partitions from imported profiles. It consumes 400/500 tons of profiles per year.

Metal Fabricator of Zambia ltd. :

This company was established in 1971 in Lusaka. It produces a wide range of cables as communication cables, electric distribution power, building and control cables as well as copper conductors, aluminium conductors winding wire/magnet wire. The company has also division for billets' extrusions. Labor force is 450 employees and current production is around 1800 tons per year. All production mainly for the local market. The raw material is imported in shape of billets dia. 155 mm and wire rods from Zimbabwe and South Africa.

Zambia Aluminium Ltd. (ZABALU) :

It is located in Lusaka. The production is utinsels for the local market and the Neighboring countries. It imports around 100 M/T of sheets and same of ingot's purity 99.5 per year. The daily production is 500 pieces of kitchen utensils.

IFORMATION ABOUT OTHER COUNTRIES

NOT COVERED BY THE MISSION

ETHIOPIA

Country location

Ethiopia is located in East Middle of Africa, between Latitude 3 and 18 North, and Longitude 35 and 48 East, covering 122000 Sq. Km. .The country borders, Red Sea and Somalia on East, Kenia on South and Sudan on West.

There is no smelting capacity or Bauxite production. The country depends on importing all his needs of the Aluminum raw material as discs, profiles, sheets...etc. from the neighboring countries.

LIBYA

Country Location

Libya is located in North of Africa, between Latitude 21 and 32 North, and Longitude 11 and 25 East, covering 1760000 Sq. Km. .The country borders, Mediterranean Sea on North, Egypt on East, Chad and Niger on South and Tunisia and Algeria on West.

A project of building a primary aluminum smelter of 120000 MT/year was raised since 1970. It was planed to be located at Zuwarah on the Mediterranean coast between Tarabulus and the frontier with Tunisia. The US$ 2000 Mill. Project is include a smelter, port, petroleum cocking unit and a natural gas fired power station. At the time being there are no expectation for immediate start to construction. In the other hand ,there is no production of Bauxite or Alumina at present in Libya.

MALAWI

Country Location

Malawi is located in East of Africa, between Latitude 11 and 22 South, and Longitude 33 and 37 East, covering 11800 Sq. Km. . the country boarders, Tanzania on North , Mozambique on East and South and Zambia on West.

There is no smelter in Malawi . Bauxite discovered in South East in Mulanje, in 1968, resources at bauxite were estimated to around 60 Mill. Ton . There are studies for establishing Alumina and Aluminum industry based on the deposits of Bauxite mainly in Mulanje in Malawi and Manica in Mozambique.

MOZAMBIQUE

Country Location

Mozambique is located in East South of Africa, between Latitude 11 and 25 degrees South, and Longitude 31 and 42 degrees East, covering an area of 783000 Sq. Km. .The country borders, Malawi and Tanzania on North, Zimbabwe on the West, and Indian ocean on the East.

There is no aluminum smelting capacity in the country .Small Bauxite quantities are mined "about 10000 MT. Ton/ year" in highland region of Manica on the border with Zimbabwe and transported directly to be dried and pressed into Aluminum Sulphate. Considerable tonnage's of bauxite deposits are reported to exist in this area "about 6 Mill Ton ".

NIGERIA

Country Location

Nigeria is located in middle West of Africa, between Latitude 3 and 13 degrees North, and Longitude 4 and 13 degrees East, covering an area 924000 Sq. Km. .The country border, Niger and Chad on the North, Cameroon on East, Benin on West and Atlantic Ocean on South.

In Nigeria the construction of a smelter with capacity of 180000 MT./year had started in late 1990 with shareholders, 70% for the government of Nigeria and 30% by Ferosthal. the smelting technology is supplied by Reynolds who takes about 70% of the out put for the first 10 years at formula price linked to the L.M.E price for Aluminum

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SOUTH AFRICA

Country Location

South Africa is located in South end of Africa, between Latitude 23 and 34 degrees South ,and Longitude 21 and 35 degrees East, covering an area 1221000 Sq. Km. .The country borders, Botswana and Namibia on North, South and West Atlantic Ocean, and Indian Ocean on East

BAUXITE, ALUMINA AND ALUMINUM.

There is a smelter with capacity 170000 MT/ year. It was built in 1971 at Rechards Bay by ALUSAF LTD. With Alusuise technology. They add 40000 MT/ year capacity by changing to Prepaked system. Moreover to construct 466000 MT/ year smelter at the SAM site.

As for Bauxite and alumina ,there is a large Bauxite deposit at WEZA area of southern Natal where about 20 MILL. ton of high grade material was identified .
In 1977 the company of SOUTH AFRICA BAUXITE LTD was established to develop Bauxite production, but no plans have been announced yet.

Alumina for the aluminum smelter at RICHARD BAY still to be imported from Australia.

ALUSAF started extenuation program to add 440000 MT/year smelter with PECHENY technology, pots 280 KA .It is estimated to start at 1995, at the same moment ALUSAF bought Bulletin Aluminum refinery in Australia to secure alumina supply.

ZAIRE

Country Location :

Zaire is located in center of Africa between latitude north and 12 south and longitude 13 and 32 west country 2345000 . The country Sq. km. borders , Sudan and central Africa republic on north , Congo on west , Uganda on East , and Zambia and Angola on South.

There are a plan for building aluminium smelter at Banana on Zaire river with capacity of 210,000 M/T per tear . In 1979 the government of Zaire signed A contract with Alusuisse that was to lead an International consortium called Aluzaire . The planned location was at the port of Banana , By the river of Zaire , about 100 mills from the Ingo - Shaba Hydroelectric power station Which would supply The electricity for alumina it was planned to be supplied by Alusuisse from Australia . but some difficulties stopped these plans and the government are reported to be seeking A new partners.

In the other side there is no bauxite production in Zaire Although the availability of large deposits at Mayumbe region . It was estimated by about 130 Mill T of bauxite . There are plans to build on an Aluminium sulfate plant and bauxite mine at Mayumbe.

ZIMBABWE

Country Location :

Zimbabwe is located in center of Africa , between latitude 16 and 23 south , and longitude 25 and 33 East , country on area 391000 Sq. km, The country borders Mozambique on East , Angola on South , Botswana on West Zambia on North.

There is no Aluminium smelter in Zimbabwe and for bauxite it was mined until 1987 in the Penhalonga region in the eastern high lands, bordering Mozambique . Production was estimated to reach about 25000 M/T at that time . at the present time Zimbabwe imports A small quantities of bauxite from Mozambique for Aluminium sulphate Industry. In Staple ford and Sheba forest areas , Also in the Inyanga North areas about 3 - 4 Million M/T of ore grading 43% gibbsite are known - low grade and tonnage make Production not to be Economically Viable.

ANNEXES

Table no (1)

Forecasts of western world bauxite mining capacity, 1990-1993.

Country	*Mine*	*Proven Reserves Million t*	*Capacity ('000 tpy gross output)*			
			1990	*1991*	*1992*	*1993*
Ghana	**Awaso**	**12.0**	**400**	**400**	**400**	**400**
Guinea	**Boke**	**500.0**	**11900**	**11900**	**11900**	**11900**
	Fria	**26.0**	**2000**	**2000**	**2000**	**2000**
	OBK Debele	**42.0**	**3500**	**3500**	**3500**	**3500**
Sierra Leone	**Mokanji**	**60.0**	**1500**	**1500**	**1500**	**1500**
Mozambique	**Manica Province**	**na**	**8**	**8**	**8**	**8**
Zimbabwe	**Penhalonga**	**na**	**24**	**24**	**24**	**24**
Total Africa			**19332**	**19332**	**19332**	**19332**

Brazil	**Pocosde Caldos**	**20.0**	**505**	**485**		**485**
	Pocosde Caldos	**10.0**	**600**	**600**		**600**
	Pocosde Caldos	**1.2**	**750**	**600**		**0**
	Cataguases	**25.0**	**0**	**200**		**900**
	Pocosde Caldos	**na**	**75**	**75**		**75**
	Trombetas	**431.0**	**8000**	**8500**		**8500**
	Oxirimina	**600.0**	**0**	**0**		**0**
Dominican Rep.	**S. de Bahoruca**	**5.0**	**500**	**500**		**500**
	Assorted mines	**100.0**	**3400**	**3400**		**3400**
Guyana	**Aroima**	**na**	**0**	**600**		**2400**
	Alpart-Nain	**60.0**	**3000**	**3300**		**3300**
Jamaica	**Schwall/Kirkvine**	**110.0**		**3000**		**3000**
	Mocha	**77.0**	**2100**	**2100**		**2100**
	Discovery Bay	**177.0**	**5000**	**5000**		**5000**
	Onverdacht	**12.0**	**3000**	**3000**		**2000**
Surinam	**Moengo**	**5.0**	**1500**	**1000**		**0**
	Cormotibo	**na**	**0**	**500**		**1500**
	Accaribo	**na**	**0**	**0**		**1000**
Venezuela	**Los Pijiguaos**	**93.0**	**1000**	**1500**		**2000**
Total Latin America		-	**32430**	**34360**	**35660**	**36760**

(Continued)

Country	*Mine*	*Proven Reserves million t*	*Capacity ('000 tpy gross output)*			
			1990	*1991*	*1992*	*1993*
USA	Bauxite	na	800	0	0	0
	Chemical Grade	na				
	Mines	na	490	490	490	490
Total North America			1290	490	490	490
India	Balco	1.5	300	200	100	0
	Hindal-Bihar	7.0	800	800	800	800
	Belgaum-Indal	12.0	500	500	500	500
	Madal-Mettur	6.0	130	130	130	130
	Bihar-Indal		230	230	230	230
	Orissa	120.0	2400	2500	2600	2700
Indonesia	Bintan	30.0	1500	1500	1500	1500
Malaysia	Pengerang	4.0	800	800	800	800
	Sarawak					
Turkey	Bolkardag	na	800	800	800	800
Total Asia			7460	7460	7460	7460
Australia	Assorted Mines	750.0	2100	21000	21000	21600
	Weipa	326.0	11250	11250	11250	11250
	Gove	260.0	6000	6000	6000	6000
	Worsley	400.0	4900	5300	5500	5500
Total Oceania			43150	43550	43750	44350

France	**Pechiney/Sabap**	**na**	**700**	**0**	**0**	**0**
	Garrot-Chailac	**4**	**200**	**200**	**200**	**200**
Greece	**Parnassus**	**116.0**	**2000**	**2000**	**2000**	**2000**
	Distomon	**30.0**	**800**	**800**	**800**	**800**
	Levadia	**5.0**	**250**	**250**	**250**	**250**
	Eleusis	**12.0**	**300**	**300**	**300**	**300**
Italy	**Sarda**	**20**	**0**	**200**	**400**	**400**
	Assorted Mines	**na**	**17**	**17**	**17**	**17**
Total Europe			**4267**	**3767**	**3967**	**3967**
Western World			**107929**	**108959**	**110659**	**112359**

(1) Published capacity figure has been adjusted to gross production assuming 6% moisture content.

Figures exclude some minor bauxite mines in India.

(2) Source : CRU International Ltd.

Table no (2)

World Production of Aluminum
Area Analysis As Reported to IPAI

Period per Year	*1 Africa*	*2 North America*	*3 Latin America*	*4&5 East & S. Asia*	*6 Europe*	*7 Oceania*	*Total*	*Daily Average*
1989	**603**	**5587**	**1698**	**1093**	**3580**	**1501**	**14062**	**38.5**
1990	**602**	**5617**	**1790**	**1118**	**3561**	**1498**	**14186**	**38.9**
1991	**612**	**5947**	**1996**	**1223**	**3505**	**1495**	**14778**	**40.5**
1992	**617**	**6016***	**1949**	**1379**	**3319**	**1483**	**14763***	**40.3**

** = Revised Figure*

Source : IPAI.

Table no (3)

Cis Supply and Demand of Aluminium
(million metric tons)

	Dom. Prod.	Dom. Cons.	CIS Export to Socialist	CIS Export to West	CIS Export Total Export	Total Demand	Market Balance
1986	2.350		0.421	0.141	0.582		
1987	2.370		0.451	0.154	0.605		
1988	2.400		0.425	0.234	0.659		
1989	2.500		0.445	0.290	0.735		
1990	3.523		0.384	0.360	0.724		
1991	3.251	2.350	0.130	0.713	0.843	3.193	0.08
1992E	3.258	2.350	0.100	0.750	0.850	3.200	0.06
1993E	3.095	2.250	0.110	0.800	0.910	3.160	(0.06)
1994E	3.049	2.150	0.120	0.780	0.900	3.050	0.00
1995E	3.097	2.200	0.130	0.770	0.900	3.100	0.00
% CHG							
92/91	0.2%	0.0%	-23.1%	5.2%	0.8%	0.2%	
93/92	-5.0%	-4.3%	-5.0%	-5.0%	7.1%	-1.3%	
94/93	-1.5%	-4.4%	-2.5%	-2.5%	-1.1%	-3.5%	
95/94	1.66%	2.3%	2.5%	2.5%	0.0%	1.6%	

Notes : Source is VAMI from 1990 forward, prior to that WMS

Table no (4)

Capacity Utilisation in the Aluminium Industry, 1992('000 tpy)

Area	*Refinery*	*Capacity (000 tpy)*	*Estimated Operating Rate (%)*	*Estimated 1992 Output (000 tons)*
Africa	Friguia	700	86.1	603
Australia	Gove	1600	97.5	1560
	QAL	3300	96.8	3194
	Wagerup	840	95.2	800
	Prinjarra	2930	96.9	2840
	Kwinana	1700	100.0	1700
	Worsley	1500	105.0	1575
	Oceania	11870	98.3	11669
India	Orissa	800	91.3	730
	Korba	200	88.5	177
	Renukoot	300	91.3	274
	Belgium	200	84.0	168
	Muri Bihar	72	68.1	49
	Mettur	60	0.0	0
Turkey	Seydischir	200	93.0	186
Japan	Shimizu	514	60.3	310
	Yokohama	300	80.0	240
	Kikumoto	370	56.8	210
	Asia	3016	77.7	2344
Europe	Aughinish	1050	100.0	1050
	Gardanne	600	67.3	404
	Stade	700	103.6	725
	Schwandorf	130	47.7	62
	Bergheim	380	47.1	179
	Distomon	640	100.0	640
	Euralumina	840	91.7	770
	San Ciprian	1000	95.0	950
	Burnt Island	130	46.9	61
	Europe	5470	88.5	4841

Source : Cru International Ltd.

Capacity Utilisation in the Alumina Industry, 1992 ('000 tpy)
Continued

Area	*Refinery*	*Capacity (000 tpy)*	*Estimated Operating Rate (%)*	*Estimated 1992 Output (000 tons)*
Jamaica	**Clarendon**	**800**	**95.6**	**765**
	Ewarton	**566**	**79.5**	**450**
	Kirkvine	**558**	**98.6**	**550**
	Alpart	**1300**	**94.2**	**1225**
Brazil	**Pocosde Clados**	**265**	**100.0**	**265**
	Sorocaba	**450**	**91.1**	**410**
	Sao Luis	**1000**	**100.0**	**1000**
	Saramenha	**150**	**86.7**	**130**
Surinam	**Paranam**	**1600**	**100.0**	**1600**
Venezuela	**Interalumina**	**1750**	**732**	**1281**
	Latin America	**8439**	**91.0**	**7676**
Canada	**Arvida**	**1140**	**96.5**	**1100**
USA	**Point Comfort**		**103.9**	**1818**
	Gramercy	**1750**	**105.0**	**1050**
	Corpus	**1000**	**69.0**	**1173**
	Christi	**1700**	**1101.1**	**600**
	Burnside	**545**	**100.0**	**560**
	St Croix	**560**		
	North America	**6695**	**94.1**	**6301**
	TOTAL WESTERN WORLD	**36190**	**92.4**	**33434**

Source : IPAI, CRU Estimates.

Table no. (5)

World:installed capacity of bauxite mines,
1985 and 1991 and planned expansion

AFRICA	Capacity(000 T)		Planned Additional Capacity		
CAMEROON:	*1985*	*1991*	SCHEDULED	UNSCHEDULED	OWNERSHIP
SEBACAM:MINI-MARTAP	-	-	-	1500	Govenment 40% Pechiney vaw 10% Kaiser 5%
GHANA BAUXITE COMPANY:					
AWASO	300	400	-	-	Government 44%, BA45%
Kibi Beuxite Dev:Kibi	-	-	-	3000	Government/ USSR
GUINEA:					
Cie Des Bauxites de GUINEA:					
Sangaradi, Boke.	9500	11650	-	-	Government 49% Halco51%
Soc D"Economie Mixte Friguia:					
Fria,Kimbo	2400	2500	-	-	Government 49% Frialco 51%
L"OFFICE DES BAUXITE DE KINDIA:					
Debele. kindia	3000	3000	-	-	Government 100%
ALUGUI:Ayekoye, Sangaredi.	-	-	-	9000	Government/ 6Petroleum producing countries
SIERRA LEONE:					
SIERRA LEONE ORE&METAL COMPANY:					
MOKANJI	1200	1400	-	-	Alusuisse 100 %
TOTAL AFRICA	16400	18950	-	13500	

Table no. (6)

INSTALLED CAPACITY OF ALUMINA REFINERIES,1985&1991 &PLANED EXPANSIONS,

AFRICA	Capacity (000 T)	Planned Additional Capacity			
	1985	1991	Scheduled	Unscheduled	Ownership
GHANA Kibi Bauxite development: KIBI	-	-	-	800	
GUINEA SOC.D' ECONOMIE Mixte Friguia : FRIA	700	700	-	600	GOVERNMENT 49% FRIACO 51%
ALUGUI: AYEKOYE SANGAREDI	-	-	-	1,200	GOVERNMENT/6 PETROLEUM PRODUCING COUNTRIES
TOTAL AFRICA	700	700	-	2,600	

table no.(7)

CONTRACT PRICES FOR BAUXITE, 1991 (USS/T FOB)

COMPANY	COUNTRY	CONTRACT PRICE
COMALCO	AUSTRALIA	19,00
COMPAGNIE DE BAUXITE DE Guinee'	GUINEA	33.00
GU ANA BAUXITE MINING ENTERPRISE LTD	GUYANA	27.50
KAISER JAMAICA BAUXITE CO.	JAMAICA	26.58
Mineracao Rio DE NORTE	BRAZIL	28.50
Nalco PTY. LTD	AUSTRALIA	19.50
Sierra Leon ORE and Metal CO. LTD.	SIERRA LEAON	21.50

Source: Metal Bulletin (27 may 1991)

Table no.(8)

USA ,AVERAGE VALUE OF IMPORTS OF ALUMINUM OXIDE, 1973 TO 1991

YEAR	FROM AUSTRALIA	FROM JAMAICA	FROM SURINAM	TOTAL
1963	66.30	70.48	63.82	68.45
1974	78.29	91.78	73.56	92.51
1975	112.46	145.80	112.27	125.46
1976	122.17	149.36	101.07	131.11
1977	131.58	178.63	129.61	147.45
1978	139.44	187.81	162.60	156.42
1979	156.65	185.22	182.32	171.31
1980	188.10	185.14	236.21	182.30
1981	205.74	246.27	247.32	221.39
1982	241.28	291.52	242.77	262.13
1983	191.28	233.65	189.76	203.27
1984	207.16	226.84	193.81	217.47
1985	198.48	184.61	136.99	202.16
1986	161.79	147.49	130.92	169.61
1987	128.28	146.63	125.21	143.03
1988	159.25	238.26	184.95	183.83
1989	253.99	422.68	249.40	274.82
1990	278.14	582.44	262.57	311.86
1991	217.66	259.20	197.45	239.98

Sources: Official trade statistics (to 1989) **Note:(1)US$ per ton fop**

Table no.(9)

World Real Output Growth (1)
(per cent)

	1986	*1987*	*1988*	*1989*	*1990*	*1991*
World	**3.1**	**3.5**	**4.4**	**3.3**	**2.2**	**0.9**
Industrial countries	**2.7**	**3.4**	**4.5**	**3 3**	**2.6**	**1.3**
United States	**2.7**	**3.4**	**4.5**	**2.5**	**1.0**	**-0.3**
Japan	**2.6**	**4.3**	**6.2**	**4.7**	**5.6**	**4.5**
Germany	**2.2**	**1.5**	**3.7**	**3.8**	**4.5**	**3.1**
Other Industrial Countries	**2.9**	**3.2**	**3.9**	**3.3**	**2.0**	**0.6**
Developing Countries[2]	**4.0**	**3.8**	**3.9**	**3.2**	**1.0**	**0.6**
Africa*	**1.2**	**1.0**	**4.4**	**3.7**	**3.5**	**2.4**
Asia	**6.8**	**-8.1**	**9.0**	**-5.4**	**5.5**	**5.0**
Europe	**3.6**	**2.8**	**4.3**	**1.9**	**-2.7**	**-9.6**
Middle East	**-0.2**	**1.6**	**-1.1**	**4.6**	**0.7**	**-4.0**
Latin America and Caribbean	**4.7**	**4.7**	**0.2**	**1.4**	**-0.9**	**1.2**
	3.3	**2.6**	**4.3**	**1.9**	**-3.6**	**-10.6**
Eastern Europe and U.S.S.R.	**3.3**	**1.7**	**1.2**	**-0.7**	**-7.9**	**-12.0**
of which, Eastern Europe						

Source : IMF, World Economic Outlook, October 1991, Washington, D.C.

Notes : ***Starting with 1988, the figures for Africa are ADB estimates.***

1. ***Real GDP. For a few industrial countries and, historically, for some Eastern European developing countries, total output is measured by real GNP and real Net Material Product (NMP), respectively.***
2. ***Includes former USSR and other countries of Eastern Europe.***

Table no (10)

Africa : Macroeconomic Indicators

	1988	*1989*	*1990*	*1991*
1. Real GDP growth (%)	4.4	3.7	3.5	2.4
2. Inflation (%)	17.3	17.5	14.6	17.0
3. Export growth (Vol. %)	1.0	6.1	7.0	3.2
4. Import growth (Vol. %)	1.6	2.2	2.1	2.3
5. Trade balance (US$ billion)	-12.0	-8.5	-1.9	-4.5
6. Current account balance (US$ billion)	-16.3	-11.8	-4.4	-8.5
7. Debit servicing ratio (% of exports)	31.0	28.0	26.0	28.0

Source :A D B estimates

Table no (11)

Area and Mid-Year Population Estimates.

Population in Million

Member Countries	*Area 000, km2*	*Years* 1986	1990
Algeria	2381.7	22.5	25.1
Cameroon	475.4	10.5	11.9
ote D'Ivoire	322.5	10.4	12.2
Egypt	1001.4	47.7	52.1
Ethiopia	1221.9	44.7	51.2
Ghana	238.5	13.1	14.9
Guinea	245.9	6.3	7.0
Kenya	582.6	21.0	24.4
Morocco	446.6	22.7	25.1
Nigeria	923.8	98.2	113
Sierra Leone	71.7	3.7	4.1
Tanzania	945.1	22.5	25.6
Tunisia	163.6	7.5	8.2
Zambia	752.6	7	8.1

Source : ADB estimates

Table no (12)

Per Capita GDP at Current Market Prices

In U.S. Dollars

Member Countries	*Years*		*Average Annual Groth Rate, % 1986-1990*
	1986	*1990*	
Algeria	**2803**	**2054**	**-7.5**
Cameroon	**1027**	**1029**	**0.1**
Cote D'Ivore	**905**	**858**	**-1.3**
Egypt	**753**	**678**	**-2.6**
Ethiopia	**118**	**119**	**0.2**
Ghana	**438**	**422**	**-1**
Guinea	**303**	**291**	**-1**
Kenya	**344**	**360**	**1.1**
Morocco	**749**	**1005**	**7.6**
Nigeria	**424**	**287**	**-9.3**
Sierra Leone	**382**	**217**	**-13.2**
Tanzania	**217**	**99**	**-17.8**
Tunisia	**1180**	**1519**	**6.5**
Zambia	**238**	**384**	**12.8**

Source : ADB estimates

Table no (13)

GDP by kind of economic activity at current factor cost.

In Million US$

Member Countries	*1990*			
	Agriculture (1)	*Industries (2)*	*Manufacture (2-1)*	*Service (3)*
Algeria	**7401**	**18102**	**5956**	**25951**
Cameroon	**3273**	**3416**	**1563**	**5601**
Cote D'Ivore	**3408**	**1919**	**1558**	**2562**
Egypt	**5771**	**9698**	**5188**	**17736**
Ethiopia	**2270**	**970**	**614**	**2312**
Ghana	**2980**	**987**	**575**	**2302**
Guinea	**630**	**595**	**65**	**791**
Kenya	**2137**	**1597**	**864**	**4044**
Morocco	**3963**	**8311**	**4596**	**12948**
Nigeria	**10493**	**13271**	**1779**	**8316**
Sierra Leone	**265**	**113**	**52**	**460**
Tanzania	**1202**	**221**	**105**	**771**
Tunisia	**1799**	**3501**	**1847**	**5676**
Zambia	**617**	**2026**	**1578**	**479**

Source : ADB estimates.

Table no (14)

Value of Imports

In Million U.S. dollars

Member Countries	*Years*		*Average Annual Growth Rate, % 1986-1990*
	1986	*1990*	
Algeria	**9228**	**9239**	**0**
Cameroon	**1704**	**1177**	**-8.8**
Cote D'Ivoire	**2055**	**2082**	**0.3**
Egypt	**8680**	**9216**	**-7.3**
Ethiopia	**1102**	**1081**	**-0.5**
Ghana	**783**	**1070**	**8.1**
Guinea	**343**	**664**	**17.9**
Kenya	**1613**	**2124**	**7.1**
Morocco	**3803**	**6800**	**15.6**
Nigeria	**4034**	**5688**	**9**
Sierra Leone	**132**	**146**	**2.6**
Tanzania	**868**	**1010**	**3.9**
Tunisia	**2891**	**5542**	**17.7**
Zambia	**648**	**1242**	**17.7**

Source : ADB estimates.

Table no (15)

Value of Exports

In Millions U.S. Dollars

Member Countries	*Years*		*Average Annual Growth Rate, % 1986-1990*
	1986	*1990*	
Algeria	**7429**	**12613**	**14.1**
Cameroon	**782**	**1553**	**18.7**
Cote D'Ivoire	**3354**	**3030**	**-2.5**
Egypt	**2214**	**2585**	**3.9**
Ethiopia	**455**	**298**	**-10.0**
Ghana	**863**	**1005**	**3.9**
Guinea	**450**	**602**	**7.6**
Kenya	**1200**	**1031**	**-3.7**
Morocco	**2454**	**4265**	**14.8**
Nigeria	**5155**	**13670**	**27.6**
Sierra Leone	**144**	**138**	**-1.1**
Tanzania	**343**	**424**	**5.4**
Tunisia	**1759**	**3526**	**19.0**
Zambia	**517**	**1292**	**25.7**

Source : ADB.

Table no (16)

Export as Percentage of Import

Member Countries	*Years* 1986	1990
Algeria	81	137
Cameroon	46	132
Cote D'Ivoire	163	145
Egypt	26	28
Ethiopia	41	28
Ghana	110	94
Guinea	131	91
Kenya	74	49
Morocco	98	73
Nigeria	128	240
Sierra Leone	109	95
Tanzania	40	42
Tunisia	61	64
Zambia	80	104

Source : ADB.

Table no (17)

Intra-African Exports as % Total Value of Exports

Member Countries	*Years*	
	1986	*1990*
Algeria	**0.6**	**1.1**
Cameroon	**18.0**	**12.4**
Cote D' Ivoire	**14.3**	**19.6**
Egypt	**0.8**	**0.8**
Ethiopia	**5.7**	**7.1**
Ghana	**3.3**	**3.9**
Guinea	**7.1**	**10.6**
Kenya	**22.2**	**21.7**
Morocco	**2.7**	**5.0**
Nigeria	**4.2**	**3.3**
Sierra Leone	**1.8**	**1.4**
Tanzania	**5.3**	**7.0**
Tunisia	**6.7**	**4.1**
Zambia	**8.0**	**8.9**

Source : ADB.

Table no (18)

Intra-African Exports As % of Total Value of Import

Member Countries	*Years*	
	1986	*1990*
Algeria	2.2	2.2
Cameroon	5.5	8.7
Cote D'Ivoire	21.0	21.1
Egypt	1.5	0.5
Ethiopia	1.2	1.2
Ghana	5.4	8.6
Guinea	3.9	3.8
Kenya	1.6	1.6
Morocco	2.2	2.3
Nigeria	1.2	1.3
Sierra Leone	38.0	30.2
Tanzania	5.9	4.1
Tunisia	4.0	3.8
Zambia	25.3	8.6

Source : ADB.

Table no (19)

Export - Import in Ratio (%)

Member Countries	*Years*	
	1986	*1990*
Algeria	41	28
Cameroon	40	42
Cote D'Ivoire	-	-
Egypt	81	137
Ethiopia	80	104
Ghana	109	95
Guinea	110	94
Kenya	131	91
Morocco	46	132
Nigeria	163	145
Sierra Leone	74	49
Tanzania	26	28
Tunisia	65	63
Zambia	128	240

Source : ADB.

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JOB DESCRIPTION
XP/RAF/90/156/11-51
J13210
****

POST TITLED : **mineralogist/technologist in Aluminium, teem leader.**

DURATION : **2 Months.**

DATE REQUIRED : **first half -FEBRUARY 1993.**

DUTY STATION : **ADDIS ABABA, with travel to other countries in AFRICA.**

PURPOSE OF PROJECT: **to undertake an assessment of prospects for inter-African manufacturing and trade in Copper and Aluminium-based products with a view to providing adequate technical and information on the existing structure of the Copper and Aluminium industry including inter-Alia current trade and marketing aspects.**

DUTIES : **the consultant will spend initially two days at UNIDO headquarters for briefing and gathering of information before proceeding to ECA ADDIS ABABA to discuss the exam work for undertaking the main activities together with technologist in Copper he will , in particular.**

1- **Hold consultation with the main intergovernmental organizations ministries of mines chambers of commerce industry and mines and other relevant authorities**

2- **Review and analyze government policies strategies plans and incentives for the development and manufacture of Aluminium-based products**

3- **Collect and analyze information on raw materials deposits and analyze technical implication of raw material and other inputs**

4- **Assess existing structure of the industries processing methods problems and constraints ,and evaluate existing or planned aluminium processing / fabricating facilities , prospects for sub regional trade and inter-African trade in Aluminium -based products.**

5- **Assess infrastructure capacities and capabilities ,applicable extraction, processing and fabrication technologies.**

6- **In co-operation with the economist / market analyst and the technologist in Copper (1) identify priority needs, including rehabilitation needs, training , R&D capabilities ,etc., and(11) on the bases of the above analysis, prepare a study on prospects for increased inter-African manufacturing and trade in Aluminium-based products with recommendations / project proposals on possible joint or multinational industrial enterprises.**

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