



53347

**UNITED NATIONS**  
**ECONOMIC COMMISSION FOR AFRICA**

*Industry & Human Settlements Division*

**ECA/IHSD/MET/004/91**

**16 March 1991**

**Original: ENGLISH**

**Distr. LIMITED**

*Meeting of the Inter-Governmental  
Committee of Officials/Experts for  
the Niamey MULPOC*

*Niamey, Niger, 27-30 March 1991*

**REPORT TO THE COUNCIL OF MINISTERS OF THE NIAMEY-BASED MULPOC  
ON THE POTENTIAL DEVELOPMENT OF THE MANUFACTURE OF ALUMINIUM PRODUCTS IN WEST  
AFRICA**

**(Output 2.3 (ii) (b))**

Table of contents

	<u>Page</u>
I. INTRODUCTION	1-2
A. Objective of the report	1
B. Scope and coverage of the report	1
C. The world aluminium industry	1-2
II. THE ALUMINIUM INDUSTRY IN WEST AFRICA	3
A. Bauxite mining and production of alumina	3-5
B. Production of primary aluminium	5-6
III. POTENTIAL DEVELOPMENT OF THE MANUFACTURE OF ALUMINIUM PRODUCTS IN WEST AFRICA	6-8
A. End-use of finished aluminium products	6
B. Fabrication of aluminium products in West Africa	7
IV. SUB-REGIONAL COOPERATION	8-9
A. Downstream processing of aluminium	8
B. Conclusions and recommendations	8-9
ANNEX I	
ANNEX II	

## I. INTRODUCTION

### A. Objective of the report

1. The report on the potential development of the manufacture of aluminium products in West Africa (1990-1991 Biennial Work Programme; Output 2.3 (ii) (b); Development of the metal industry) has been prepared for consideration by the Meeting of the Inter-Governmental Committee of Officials/Experts for the Niamey-based MULPOC (Niamey, Niger, 27-30 March 1991).

2. The report aims at promoting the integrated development of the aluminium industry in West Africa taking into account subregional cooperation in exploiting bauxite resources (mining, extraction of alumina, and the smelting of primary aluminium) followed by fabrication of final products.

### B. Scope and coverage of the report

3. This introductory chapter is followed (in chapter II) by a review of the aluminium industry in West Africa which gives details of bauxite resources in Africa as a whole and West Africa in particular, mining of bauxite, and smelting of primary aluminium in the subregion. Chapter III evaluates the potential development of the manufacture of aluminium products in the subregion. Chapter IV makes proposals on identified projects, including conclusions and recommendations pertaining to subregional cooperation in the development of an integrated aluminium industry

### C. The world aluminium industry

4. In August 1988, the world aluminium industry celebrated the 100th anniversary of the patent for the Bayer process that made it possible to extract aluminium from alumina. The year coincided with the an increase in the demand for aluminium. From 1985 to 1989, production of bauxite and of alumina increased significantly in response to the recovery of the aluminium industry.

5. As a commodity, bauxite is sold as crude or dried metallurgical grade for the production of alumina or as calcined refractory and abrasive grades. Major consumers of bauxite are the metallurgical (90 percent) and the chemical industries (10 percent). Tables 1-3 in Annex II summarize the world production and installed capacity for bauxite, alumina and aluminium and Africa's share of world production is shown in Graphs 1-3 in Annex III.

6. Aluminium is a strategic material. It is second to steel as the most widely used metal, in fact, more aluminium is used than all the other non-ferrous metals combined. In spite of this, it is one of the most high energy intensive materials to produce. Abundant, cheap and uninterrupted electrical supply is a desirable criterion for feasibility for an aluminium development project.

Because of the high energy requirements and its demand for enormous capital, aluminium smelting is ranked as a high risk business. In fact from the date of inception of an aluminium project to the commencement of production it takes at least five years.

7. On a global level, potential sources of aluminium are adequate for the foreseeable future with a very little assessed risk of bauxite the International Bauxite Association becoming the type of producer cartels formed by tin and copper producers. In the context of the problem addressed by this report, aluminium resources are found in very remote locations vis-avis existing potential markets and relies on very long term potential returns. The nature of business risk involved in the aluminium industry has meant that smelting companies have so far been forced to venture into semi-fabrication by themselves in order to achieve market penetration at the application end. For the African continent this is an essential lesson, because the meaningful integration of the African aluminium industry will require the bauxite producers to have access to facilities for fabrication of sheets, extrusions, and castings followed by production of finished products themselves.

8. The world aluminum industry has always been deemed to be:
- relatively unprofitable in comparison to other non-ferrous industries such as the copper industry
  - relatively integrated to the extent that over half of the primary aluminum metal produced in the western world is semi-fabricated and processed into finished products by the subsidiaries of the smelting enterprise itself
  - a very high risk business venture in usually high risk political environments, with a need for large capital but requiring a relatively long time horizon for realization of return on investment
  - very concentrated at bauxite and alumina production stages
  - Dominated by six multinational corporations at subsector level

9. During the period 1975-79, the industry experienced low levels of new investments leading to a short-term shortage of aluminium which made borrowing favourable and eventually made it possible for a modest expansion in new capacity in the 1980s. The biggest problem of the industry has always been the difficulty to predict future consumption trends. This at times resulted in a large degree of over-capacity during periods of stagnant demand and shortages at times of high demand.

10. Aluminum producers in the USA, Japan, UK, and Europe normally publish an official price of unwrought ingots or sows at a minimum purity of 99.5 percent. A growing free market in aluminium began to develop in October 1978 when the London Metal Exchange (LME) introduced a system of futures contracts.

## II. THE ALUMINIUM INDUSTRY IN WEST AFRICA

### A. Bauxite mining and production of alumina

11. Total world bauxite reserve are estimated at about 25 billion tons. In addition, vast deposits of low-grade bauxite resources and other non-bauxite sources of alumina such as argillite, china clay and shale are known to exist. As such, the possibility of scarcity can only be attributed to political factors rather than resource constraints. Bauxite deposits considered economic tends to have an alumina content of 40 - 55 percent on the average with a ratio of bauxite to alumina of 2:1 and alumina to aluminium also of 2:1. Bauxite mining is considered to be an earth moving operation with less capital mining costs in comparison to the mining of other non-ferrous metals.

12. Although an International Bauxite Association was formed in 1974, bauxite production is highly concentrated between Australia, Jamaica and Guinea hence not as cartelized as to the extent of petroleum or copper. At the level of bauxite processing into alumina, there are about 80 enterprises in the world. The transformation of alumina into primary aluminium is less concentrated with about 175 smelting enterprises in the world. At the sub-sectoral level, the aluminium industry is dominated by six large multinationals.

13. Alumina plants have in the past been located in the major aluminium consuming countries. Plants are usually located at deep sea ports. In cases where good quality bauxite is located in the interior as in the case of Guinea, alumina processing on site has proved a useful means of reducing freight costs.

#### 1. Bauxite resources in West African countries

14. Total *in situ* bauxite resources in African countries (amounting to about 18 billion tons compared to world bauxite resources of about 25 billion tons) are summarised in Table 1 of Annex I. Out of the 25 African countries with bauxite resources, 13 are found in the West African region. About 16 billion tons, representing 90 percent of Africa's bauxite resources are found in the West African subregion. Countries with a large share of commercially exploitable bauxite reserve are shown in Table 2 on page 4 of Annex I. and on Graph 10 in Annex III.

#### 2. Ghana

15. Ghana is endowed with huge quantities of good quality bauxite. There are 13 deposits of economic value (in Sefwi, Nyinahin in Ashanti, Kibi in the Eastern Province, Awaso in the Western Province and Mount Ejuamena) all are found within a belt in the southern part of Ghana as shown in Table 1 in Annex I.

Exploitable reserves are estimated at about 480 - 580 million tons with up to 1,200 million tons of subeconomic, speculative and potential resources.

16. Bauxite has been mined from the Awaso deposits for export since 1943 by the British Aluminium Company. The Ghana Bauxite Company in which the Government has 51 percent shares has up to date been operating the mine. A prefeasibility study of the exploitation of the deposits of the Nyinahin Group including the construction of an alumina plant was conducted in 1974 by Chemokomplex of Hungary.

17. The Kibi deposit has been studied for an integrated aluminium production complex capacity of 600,000 - 1 million tons of alumina. The deposit was re-evaluated in 1982 by Brown & Root Inc in conjunction with Granges International Mining AB and Alusuisse for an 600,000 tons alumina plant.

18. Bauxite production in Ghana is summarised in Table 1 on page 2 of Annex II. Bauxite is currently mined at Bui. There are plans to open up mining at Kibi in the Atewa Hills northwest of Accra. A feasibility study undertaken by a USSR team in 1986 proved that it was viable to construct a bauxite mine combined with an alumina processing complex near the mine.

### 3. Guinea

19. Major commercial bauxite resources of Guinea (see Table 1 on page 2 of Annex I) are found in 15 locations of which Boke-Gaoul, Koumbia, Paraou-Yama, Hore-Herenco, Dabola and Tougue are the most significant. Total resources are estimated at 20 billion tons out of which 10 billion tons are considered exploitable with a quality of more than 40 percent alumina and less than 4 percent silica. Guinea is the only country in Africa which processes bauxite into alumina and has been producing alumina for 30 years since 1960.

20. The bauxite zones of Boke, Geonal, Fria, Kindia, Dabola, and Tougue were prospected by Pechney in the 1940s. At the moment Guinea is the second largest bauxite and alumina producer in the world from the mine and plant facilities of C.B.G at Sangaredi, FRIGUIA at Badi-Konkoure and O.B.K at Debele.

21. Office des Bauxite de Kindia (OBK) operates a bauxite mine at the Debele deposit. It is wholly owned by the Guinea government but the USSR with whose collaboration the mine was established has guaranteed importation of all production from the mine. Infrastructure includes a highway and railway to Conakry

22. CBG Enterprise Mixte operates a deposit at Boke-Sangaredi as a joint venture between the Guinea government (49 percent) and HALCO Mining Inc (51 percent). This facility produces 11 million

tons per year of partially calcinated bauxite. This production represents 20 percent of world bauxite production. The bauxite deposit at Sangaredi is nearly exhausted but a new deposit south of Sangaredi will be opened though its alumina content (52 percent alumina) is lower than the current one (59 percent alumina).

23. FRIGUIA Societe d'Economie mixte was established 30 years ago in 1960 as a joint venture between the Guinea government (49 percent) and private foreign investor through FRIALCO (51 percent). The company operates a mine at the bauxite deposit of Badi-Konkoure and alumina processing plant at Kimbo near Fria. It is the only plant in Africa that processes bauxite into alumina. Its current production capacity is 600,000 tons per year. The area is served with a railway line and a major road to Conakry with a social infrastructure around the mine and alumina processing plant.

24. New projects for opening up bauxite deposits include that of Aye-Koye in the Boke region with Arab financing through the Societe Guinean-Arabe d'Alumine et d'aluminium (ALUGUI). Depending on the availability of electrical energy, the proposed project will produce five million tons of bauxite and one million tons of alumina. the proposed investment is US\$2.4 billion.

#### B. Production of primary aluminium

25. Location of aluminium smelting facilities is always determined by the availability of cheap, reliable electric power. In Africa hydroelectric potential in Ghana was a determining factor in locating the VALCO smelter. In the Middle East, availability of thermal electric power from flared natural gas and waste gas determined the location of the smelters in Abu Dhabi, and Bahrain. The cost of energy as a component of the overall conversion and processing costs is in the wide range of US\$50 - US\$550 per ton of smelted aluminium metal depending on the location of the smelter.

26. Cameroon, Egypt, Ghana and RSA are the four primary producers of aluminium in Africa as shown in Table 3 of Annex II and Graphs 6 and 7 in Annex III. Installed capacities of primary aluminium smelting plants in Africa are shown in the World Summary of Table 3 on page 3 of Annex II.

27. Volta Aluminium Company Limited (VALCO) in Ghana (the only aluminium smelter in West Africa) is the largest aluminium smelter in Africa (and one of the largest in the world outside North America). It is a private company whose shares are held by Kaiser Aluminium & Chemical Corporation (90 percent) and Reynolds Metals Company (10 percent). It produces aluminium from imported alumina and exports a major part of its 200,000 tons of aluminium billets, ingots, pigs and sows. The only major local customer is ALUWORKS which is described below. VALCO has no immediate plans to start local fabrication of aluminium.

28. The VALCO plant is one of the world's most efficient and modern aluminium smelting plants. It started operations in late 1966. Currently it employs approximately 2,200 employees. VALCO has invested US\$210 million in Ghana including US\$65 million for the construction of a fifth pot line completed in 1977. The Volta River Project aimed at providing Ghana with bountiful supply of electrical power gave rise to the VALCO project which agreed to purchase electric power on a long-term basis. This arrangement guaranteed the availability of foreign exchange with which to finance the hydro-electric project.

### III. POTENTIAL DEVELOPMENT OF THE MANUFACTURE OF ALUMINIUM PRODUCTS IN WEST AFRICA

#### A. End-use of finished aluminium products

29. The bulk of unwrought aluminium is produced in the form of ingots weighing about 22 kilograms with a minimum purity of 99.7 percent with an iron content of below 0.2 percent and silicon content of below 0.1 percent. Many other shapes and grades are produced including: T-bars up to 1000 kilograms each, sows, 200 - 500 kilograms each as well as extrusion billets, rolling slabs and wire rods.

30. Aluminium has a high thermal and electrical conductivity particularly when alloyed with silicon and manganese. It is extremely ductile and has found a diverse range of uses: sheet, foil, and complex shapes. Its resistance to corrosion and its attractive appearance makes it suitable for many applications in the construction industry. Its lightness (less than half as heavy as steel) makes it the most important material in the aircraft industry. It competes with many other materials in applications: with copper as a conductor of electricity, with steel in construction, with zinc in die-castings, and with stainless steel in corrosion resistance applications. In metallurgical industries, aluminium is used as a deoxidizing agent to remove oxygen from molten iron and steel.

31. Tables 4 and 5 in Annex II and Graphs 8 and 9 in Annex III illustrate the pattern of end-uses of aluminium products based on the developed economy of the USA. Container, transportation, and construction end-uses represent over 60 percent of aluminium end-use applications.

32. In the case of the West African subregion, end-use applications of aluminium are predominantly roofing sheets, cans, cooking utensils, foils, tubes and sections as shown in Table 10 in Annex II.



## **B. Fabrication of aluminium products in West Africa**

### **a. Ghana**

33. Aluminium fabrication industries are well established in Ghana with about 14 aluminium fabrication enterprises. The Ghana Aluminium Rolling Mill (ALUWORKS) at Tema Port City is a large-scale producer of semi-finished flat products. ALUWORKS is a joint venture (Ghana government: 63 percent, private investors: 37 percent). The plant was commissioned in 1985 with an invested capital of US\$23.1 million. The plant has a capacity to produce 10,000 tons per year coils (using a Hunter continuous strip mill) from remelted cast sows bought from VALCO through the Minerals Commission. 14 local clients buy strips or circles for further fabrication. The company also exports coils to Britain, Cuba, Germany, USA. An expansion programme is currently in progress to expand the plant to 20,000 tons. The additional 10,000 tons will be for export.

34. ALUWORKS has been assessing the African market for aluminum products and have conducted several export promotion missions to a number of African countries. Their problem has been to arrive at commercial arrangements to facilitate the export trade. It is not just the foreign currency which has hampered the export trade, but the entire procurement and delivery arrangements that should be made in order to sustain trade.

35. Aluminium Enterprises Limited (AEL) is owned by a Ghanaian entrepreneur. The company remelts scrap and dross into aluminium and exports the cast sows. A feasibility study has proved the viability of constructing an extrusion plant. The company is currently soliciting financing for the project.

### **b. Cote d'Ivoire**

36. In Cote d'Ivoire, about 10 enterprises are engaged in aluminium fabrication. Ivoirail, one of the larger enterprises, imports 2,400 tons of aluminium semis from Cameroon to produce 700 tons of domestic utensils of which 650 tons are for domestic consumption and the balance for export. The balance of imported aluminium is used for the production of profiles and packing materials.

37. MIAM imports 4,000 tons of steel sheets from France, 5 tons of metallic colouring, 1,000 tons of enamel powder and 200 tons of zinc products from EEC countries and Hong Kong to produce domestic utensils and galvanized products. Tole Ivoire produces metal containers, and galvanized and corrugated sheets. It imports 10,000 tons of black steel sheets, and 3,000 tons of zinc. Metal Ivoire also produces corrugated, clad, lacquered aluminium and galvanized sheets.

**c. Other countries in the sub-region**

38. The present activities of Guinea in the aluminium sector are restricted to the mining, processing of bauxite and a limited conversion of the bauxite into alumina. The structural discontinuity that exists between bauxite processing and the production of finished aluminium goods has been recognised by the government. Current sectoral studies being conducted are aimed at identify opportunities for the production of semi-finished aluminium products.

39. The capacity for the production of finished aluminium products in Guinea is about 15,590 tons with an actual production of 6,655 tons per year. See Tables 1 and 2 in Annex I and Graphs 3 and 4 in Annex III. Two of the enterprises involved in aluminium fabrication are: Solipac and Solifaba.

40. A limited amount of fabrication of aluminium is carried out in Benin, Nigeria (Alcan), based on imports of semi-finished products from Ghana and cameroon.

**Subregional demand and fabrication of aluminium products**

41. The total market for fabricated aluminium products in West Africa is estimated at 15,000 tons to 20,000 tons. The major consuming countries are: Cote d'Ivoire, Ghana, Guinea, Nigeria and Senegal. The most important products consumed are: roofing sheets, architectural sections, collapsible tubes, foil, cables, household appliances and containers.

**IV. SUB-REGIONAL COOPERATION**

**A: Downstream processing of aluminium**

42. In Guinea, the government's concern is to achieve modernization, increase the production capacity for alumina beyond one million tons, and intensify efforts to ultimately convert bauxite to aluminium. In the long-term the Guinea government is focusing efforts on the establishment of aluminium smelting capacity at Fria. This project depends on the construction of a hydroelectric dam upstream on River Konkoure. Since 1982 studies made by Alcoa, Bechtel, and Alexander Gibbs for the Guinea government have all confirmed the feasibility of such a project.

**B. Conclusions and recommendations**

43. Fabrication of aluminium products in Guinea is currently being done at a small-scale. In view of Guinea being the largest producer of bauxite and alumina in Africa that country should play a leading role in the future development of an integrated aluminium

industry especially the production of semi-finished and final aluminium products.

44. In Ghana, encouragement should be given to Ghanaian entrepreneurs in the development of the aluminium fabrication subsectors. At the level of the Ministry of Industries, Science and Technology, a clear policy should be articulated on the direction which the aluminium fabrication subsector should take. This should be supported by a sectoral study which would identify growth areas for fabricated aluminium products.

45. ALUWORKS in Ghana has been making periodic feasibility studies intended to facilitate diversification. It may be desirable for ALUWORKS to share its studies with interested entrepreneurs in the West African subregion. The company could best contribute to the development of the aluminium fabrication industry in Ghana and the subregion by developing production lines for semi-manufactures of identified end use products in the local and subregional markets.

46. The capabilities and capacity of Cote d'Ivoire in the aluminium fabrication sector should be enhanced in view of the existing infrastructure and technical expertise in order to facilitated the fabrication of a wide range of aluminium-based goods. In this respect, Cote d'Ivoire and Ghana could find grounds for cooperation in implementing the project for the production of 180 million cans per year currently under review at ALUWORKS in Ghana. This project would greatly benefit the fishing industry of West African countries.



ANNEX 1

Table 1: Bauxite resources in Africa

Table 2: World commercially exploitable bauxite resources

Sources :

1. World Metal Statistics Year Books: 1988; July 1990; World Bureau of Metal Statistics.
2. Minerals Yearbook: Volume I, 1988 metals and minerals; Volume III 1986: Area reports; International; US Bureau of Mines.



## ANNEX I

Table 1 : Bauxite resources in Africa

LOCATION	NAME OF THE DEPOSIT	RESERVES (Million Tons)	ALUMINA OXIDE (Percent)	SILICA OXIDE (Percent)
NORTH AFRICA:				
Egypt:				
	Eastern desert Kahfa, Nagrat			

Table 1 : Bauxite resources in Africa

LOCATION	NAME OF THE DEPOSIT	RESERVES (Million Tons)	ALUMINA OXIDE (Percent)	SILICA OXIDE (Percent)
WEST AFRICA:				
Benin:	Kandji area Bojecali			
Chad:	Koro	4,50	50,00	
Cote d'Ivoire:	Bongouanou:			
	Benene	10,70	53,20	
	Elinzue	1,30	43,60	
	Gueto	0,75	50,00	
	Dimbokio Ngouinou	1,30	55,00	
	Yaoure Plateau		40,00	
	Orumbo-Boka		45,00	
Ghana:	Sefwi Hills Ichinoso Hill	30,00	49,00	
	Nyinahin Group:			
	Nyinahin	100,00	44,40	
	Southern Aya	32,00	47,00	
	Aya Bepo	51,30	49,30	
	Mpesaso	67,70	50,00	
	Abrantiakrom	21,80	50,00	
	Kibi Group Atewa Range:			
	Atiwiredu Hill	30,00	44,90	
	Asiakwa South	16,00	43,90	
	Asiakwa North	34,00	42,50	
	Basool Area	14,00		
	Ejuanema Group	4,00	47,70	
Guinea (Conakry):	Boke	2.100,00		
	Fria	500,00		
	Kindia	200,00		
	Tougue	4.000,00		
	Dabola	1.000,00		
	Pita	200,00		
	Gaoual	200,00		
	Dinguiraye	60,00		
	Siguiro	30,00		
	Fore Careah	10,00		
	Sub-total	8.719,35		



Table 1 : Bauxite resources in Africa

LOCATION	NAME OF THE DEPOSIT	RESERVES (Million Tons)	ALUMINA OXIDE (Percent)	SILICA OXIDE (Percent)
WEST AFRICA:				
Guinea (Bissau):				
	Rio Corubal Boe Deposit	200,00	58,00	
Liberia:				
	Maryland cty Voinjama			
Mali:				
	Bamako Mandingue	800,00	42,50	
	Balea Kita	330,00	40,00	
	Kenieba	500,00	46,00	
	M'pebougou			
	Ouenkoro			
Niger:				
	Gaya			
Nigeria:				
	Oshogbo			
Sierra Leone:				
	Mokanji Hills	10,00	60,00	
Togo:				
	Palime Mount Agou			
Upper volta:				
	Kongoussi Kaya	5,00	69,00	
	Sub-total	197.415,00		

Table 1 : Bauxite resources in Africa

LOCATION	NAME OF THE DEPOSIT	RESERVES (Million Tons)	ALUMINA OXIDE (Percent)	SILICA OXIDE (Percent)
CENTRAL AFRICA:				
Burundi:	Mpinga			
Cameroon:				
	Adamaoua Mini-Martap	1.400,00	43,00	
	Adamaoua Ngaoundai	100,00	42,00	
	Dschang Founo-Togo	34,00	47,00	
	Bamboutos	4,00	46,00	
	Fokamezoun			
Congo:				
	Kouyi Plateau			
Gabon:				
	Mankongonio			
Zaire:				
	Tabela			
	Sub-total	1.538,00		

Table 1 : Bauxite resources in Africa

LOCATION	NAME OF THE DEPOSIT	RESERVES (Million Tons)	ALUMINA OXIDE (Percent)	SILICA OXIDE (Percent)
EASTERN AND SOUTHERN AFRICA:				
Angola:				
	Donde deposit	10,00	58,00	
Madagascar:				
	North Mananteniha	70,00	40,00	
	Marangaka Manakara group	40,00	38,00	
	Analaivory	40,00	54,00	
Malawi:				
	Mulanje Lichenya	60,00	43,90	
Mozambique:				
	Manica		62,30	
	Zambezi Mauzo		47,00	
RSA:				
	Natal Weza	20,00		
	Ngoma			
Tanzania:				
	Usambara Mombo		35,00	
	Uluguru			
	Tanga Amani		57,72	
Zimbabwe:				
	Penhalonga			
	Sub-total	240,00		

## ANNEX I

Page 6

Table 2: Commercially exploitable  
bauxite resources in 1985 in the world  
by countries with large resources

=====	
COUNTRY	MILLION TONS
=====	
Australia	4.440,00
Brazil	2.250,00
Guinea	5.600,00
Jamaica	2.000,00
India	1.000,00
All others	5.710,00
World total:	21.000,00

## ANNEX II :

Table 1 : Bauxite production in Africa and other regions of the world

Table 2 : Alumina production in Africa and other regions of the world

Table 3 : Primary aluminium production in Africa and other regions of the world

Table 4 : Sub-sectoral consumption of aluminium products in the USA in 1988

Table 5 : End-use of aluminium products in the USA in 1988

Table 6 : Prices of aluminium products in the USA in 1988

Table 7 : Consumption of aluminium scrap in the USA in 1988

Table 8 : Prices of bauxite and alumina in the USA in 1988

Table 9 : Prices of primary aluminium ingot (1980-1989).



## ANNEXE II

Table 1 : Bauxite production in Africa (Thousand metric tons)

YEAR	1970	1975	1980	1985	1989
AFRICA:					
Ghana	342,00	325,20	196,90	170,00	381,20
Guinea	2.490,00	7.649,70	13.911,00	13.956,00	16.834,00
Mozambique	7,10	5,20	0,00	0,00	8,00
Sierra Leone	449,00	716,00	747,00	1.184,50	1.379,00
Zimbabwe	2,00	0,00	4,30	21,00	0,00
Africa total	3.290,10	8.696,10	14.859,20	15.331,50	18.602,20
WORLD:					
Africa	3.748,20	9.417,30	15.610,50	16.537,00	19.989,20
Asia	3.753,30	3.528,80	4.477,10	3.876,90	5.461,90
Australia	9.256,30	21.003,50	27.179,00	31.839,00	38.583,00
Europe	7.674,60	7.916,00	8.343,50	7.523,80	6.242,40
Sth America	24.797,80	22.424,50	25.143,30	18.029,60	23.394,30
USA	2.115,40	1.801,00	1.559,00	674,00	635,00
All others	8.698,00	11.068,50	11.500,00	12.305,00	12.156,40
Sub-total	56.295,40	67.742,30	78.201,90	74.248,30	86.473,00
WORLD TOTAL	59.585,50	76.438,40	93.061,10	89.579,80	105.075,20
WORLD SUMMARY:					
YEAR	1984	1985	1986	1987	1988
Production	87.177,00	84.189,00	87.755,00	93.969,00	98.859,00
Guinea	12.740,00	11.790,00	13.300,00	13.500,00	15.600,00

## ANNEX II

Page 2

Table 2 : Alumina production in Africa (Thousand metric tons)

YEAR	1970	1975	1980	1985	1989
AFRICA:					
Guinea		639,00	708,00	577,00	626,00
Total Africa		639,00	708,00	577,00	626,00
WORLD:					
Africa		639,00	708,00	577,00	626,00
Asia		2.182,00	2.947,00	2.000,00	2.493,00
Australia		5.107,00	7.254,00	8.804,00	12.589,00
Europe		611,00	4.508,00	4.868,00	5.006,00
Nth America		6.253,00	8.094,00	4.560,00	5.942,00
Sth America		3.966,00	4.595,00	4.734,00	6.647,00
Sub-total		18.119,00	27.398,00	24.966,00	32.677,00
Total		18.758,00	28.106,00	25.543,00	33.303,00
WORLD SUMMARY:					
YEAR	1984	1985	1986	1987	1988
Capacity: Totl			39.410,00	39.410,00	40.925,00
Guinea			700,00	700,00	700,00
Production:	33.712,00	32.230,00	32.935,00	34.794,00	37.372,00
Guinea	538,00	572,00	556,00	543,00	590,00



Table 3: Primary aluminium production in Africa (Thousand me

YEAR	1970	1975	1980	1985
AFRICA:				
Cameroon	52,40	51,90	43,00	81,60
Egypt	0,00	2,00	120,00	178,50
Ghana	113,00	143,30	187,70	48,50
RSA	0,00	75,90	86,60	164,60
Africa total	165,40	273,10	437,30	473,20
WORLD:				
Africa	165,40	349,00	523,90	637,80
Asia	932,80	1.409,90	1.567,20	1.152,30
Australasia	205,60	322,80	459,70	1.095,20
Nth America	4.569,60	4.397,20	5.728,10	4.782,00
Europe	2.018,70	3.233,70	3.758,70	3.598,60
South America	167,50	270,10	816,40	1.163,70
All others	2.151,10	2.820,60	3.267,90	3.249,50
Sub-total	10.045,30	12.454,30	15.598,00	15.041,30
WORLD TOTAL	10.210,70	12.727,40	16.035,30	15.514,50

WORLD SUMMARY:

YEAR	1984	1985	1986	1987
PRIMARY:				
Capacity			17.855,00	17.968,00
Cameroon			80,00	80,00
Egypt			170,00	170,00
Ghana			200,00	200,00
RSA			172,00	172,00
Africa Ttl:			622,00	622,00
Production	15.705,00	15.398,00	15.354,00	16.378,00
Africa	413,00	473,20	552,20	572,00
RECYCLED:				
Production	3.966,40	4.019,70	4.199,20	4.518,10
Africa	28,20	25,00	27,00	27,00

Table 4: Sub-sectoral consumption of aluminium products  
in the USA in 1988

=====	
Industry	Percent of total
-----	
Containers	27,40
Construction	17,80
Transportation	21,10
Electrical	9,10
Durable goods	8,00
Machinery	5,90
Others	10,70
-----	
Total	100,00
=====	

Table 5: End-use of aluminium products in the USA in 1988

=====		=====	
Product	Percent of	Product	Percent of
groups	total	groups	total
=====		=====	
FLAT PRODUCTS:			
Non-heat treat	56,10	Nonheat treat	56,10
Heat treatable	4,00	Heat treat	4,00
Foil	7,30	Foil	7,30
Sub-total	67,40	Extrd shapes	22,50
		Cables	5,40
EXTRUDED/DRAWN		Others	4,70
Rod/bars	1,40	-----	
Pipes/tube	2,30	Total	100,00
Extrd shapes	20,20	=====	
Sub-total	23,90		
ROD/WIRE/CABLE			
Rod/bar wire	1,00		
Cables	5,40		
Sub-total	6,40		
OTHERS			
Forgings	1,30		
Powder, flakes	1,00		
Sub-total	2,30		
-----			
Total	100,00		

Table 6: Prices of aluminium products in USA in 1988

=====		=====	
Products	Import prices (US\$/ton)	Products	Export prices (US\$/ton)
=====		=====	
SEMI-FINISHED:		SEMI-FINISHED:	
Crude metal	2.140,00	Crude metal	2.314,00
Crude alloys	2.140,00	Crude alloys	2.314,00
Circles/disks	2.783,00	Plate/sheets	2.978,00
Plate/sheets	2.624,00	Bars/rods	2.978,00
Bars/rods	2.370,00	Castings	6.554,00
Pipes/tubes	4.744,00	Forgings	6.554,00
Scrap	1.586,00	Other semis	5.445,00
Average	2.188,00	Scrap	1.592,00
		Average	2.291,00
MANUFACTURES:		MANUFACTURES:	
Foil/leaf	4.376,00	Foil/leaf	1.509,00
Powder/flakes	2.370,00	Powder/flake	4.381,00
Wire/cable	3.363,00	Wire/cable	3.804,00
Average	4.110,00	Average	1.875,00
-----		-----	
UNIT PRICE	2.236,00	UNIT PRICE	2.272,00
=====		=====	

ANNEXE II

Page 7

Table 7: Consumption of aluminium scrap in the USA in 1988

Type of scrap consumed	Tons (Thousand)
SMELTER SCRAP	
Solids	193,74
Borings	109,76
Dross	21,36
Others	85,19
Total new	410,05
Castings	266,29
Radiators	13,22
Cans	122,92
Pigs	41,87
Others	17,33
Total old	461,44
Smelter total	871,48

PRIMARY SCRAP	
Solids	508,86
Turnings	21,40
Dross	10,41
Others	144,71
Total new	685,38
Castings	118,37
Radiators	0,95
Cans	518,35
Pigs	24,80
Others	15,48
Total old	677,95
Primary total	1.363,33

Type scrap consumed	Tons (Thousand)
PRIMARY SCRAP	
Solids	508,86
Turnings	21,40
Dross	10,41
Others	144,71
Total new	685,38
Castings	118,37
Radiators	0,95
Cans	518,35
Pigs	24,80
Others	15,48
Total old	677,95
Primary total	1.363,33

SUMMARY:	Tons (Thousand)	Percent of total
Solids	702,60	31,44
Turnings	131,17	5,87
Dross	31,76	1,42
Castings	384,66	17,21
Radiators	14,17	0,63
Cans	641,27	28,69
Pigs	66,47	2,97
Others	262,71	11,76
TOTAL	2.234,81	100,00

Table 8: Prices of bauxite and alumina in USA in 1988

Product	Domestic mine or plant (f.o.b.) (US\$/ton)	Port of shipment (f.a.s.) (US\$/ton)	Delivered to to USA port (c.i.f.) (US\$/ton)
=====			
DOMESTIC			
Bauxite:			
Crude	15,00		
Calcined	183,00		
Alumina			
Calcined	175,00		
-----			
IMPORTED			
Bauxite:			
Australia		14,75	22,42
Brazil		25,55	33,72
Guinea		22,89	29,63
Jamaica		29,25	33,70
Average		23,90	30,34
Alumina:			
Average		181,00	193,00
=====			

Table 9: Prices for primary aluminium ingot in 1988

Year	Average US Producer prices (Cents/lb)	Average US Producer prices (US\$/ton)
1980	69,57	1.533,67
1981	76,00	1.675,51
1982	76,00	1.675,51
1983	77,67	1.712,26
1984	81,00	1.785,24
1985	81,00	1.785,74
1986	81,00	1.785,74
1987	89,00	1.962,11
1988	117,25	2.584,92
1989	101,00	2.226,67