

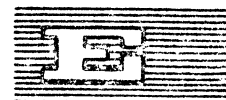
50457

A0038

UNITED NATIONS  
ECONOMIC  
AND  
SOCIAL COUNCIL



Distr.  
LIMITED

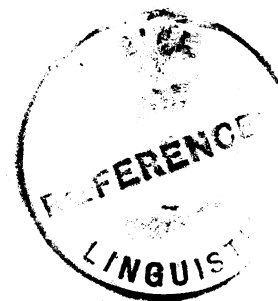


E/CN.14/IS/3  
22 June 1965

† COM. 1

Original: ENGLISH

ECONOMIC COMMISSION FOR AFRICA  
West African Meeting on Iron and Steel  
Monrovia, 2 - 7 August 1965



SUMMARY OF IRON AND STEEL INVESTIGATIONS  
IN WEST AFRICA

SUMMARY OF IRON AND STEEL INVESTIGATIONS  
IN WEST AFRICA

1. In recent years a number of investigations into the possibility of establishing Iron and Steel Works in West Africa have been commissioned by ECA and also directly by certain West African Governments. The following report first of all summarises the scope and recommendations appertaining to these investigations and, secondly presents an analysis of the supply and market situation for steel products in West Africa based on these studies and on other sources.

PART I - SUMMARY

2. The standing Committee on Industry and Natural Resources of the Economic Commission for Africa at its first session, held in Addis Ababa in December 1962, recommended that the secretariat should undertake a study of the possibility of establishing and developing modern iron and steel plants in Africa on a sub-regional basis. This recommendation was endorsed by the Economic Commission for Africa at its Fifth Session in February 1963.

A small team accordingly visited a number of countries in the West African sub-region in the first half of 1963 and made a preliminary examination of the main features governing the possible location of an integrated steel works.

The West African sub-region was chosen first because of its rich iron ore resources and its compactness from a geographical and transport point of view.<sup>1/</sup>

Their report (E/CN.14/IS/2;5 Sept.1963) embraces a study of the prospective demand for steel in the sub-region and of the available raw materials and fuels. It discusses the problems involved in establishing steel works including size, location, alternative processes available, labour and transport, customs duties, means of payment, capital structure and administration. The conclusions are as follows:

---

<sup>1/</sup> At this time the sub-region included, Cameroun, Central African Republic, Chad, Congo (Brazzaville) and Gabon which have since together with Congo (Leopoldville) been included in a new Central African sub-region.

- (a) It will be many years before the West African market is large enough to justify a number of national steel plants and if modern iron and steel making is to be developed at an early stage there is room for only one integrated plant. The operation of small re-rolling plants, however, is feasible.
- (b) The plant should make light rolled products (150,000 t.p.a. bar, 100,000 sections and 100,000 billets) using a conventional blast furnace for iron making, LD for steel making and continuous casting of Semis.
- (c) The plant should be on a coastal site to facilitate the assembly of raw materials and distribution of the finished products.
- (e) A further study is necessary to select the most economic location.

3. This report was submitted to a meeting of experts held in Monrovia from the 14th to the 18th of October 1963. It was generally agreed (Report of the Doc.E/CN.14/INR 26; 23rd October 1963) that only one integrated plant should be established at this stage and that preferably this should be at a coastal site. In view of the high transport costs involved, however, the desirability of setting up small plants at interior sites was recognized.

The meeting, recognizing the absolute necessity for a sizeable West African steel plant to have open access to the West African Market, recommended that arrangements should be made so that West African Governments gave priority in their purchases of steel products to the integrated plant, subject to the economic measures which might be taken later on in the reciprocal interest of the parties concerned. Consideration would also have to be given to limited tariff protection

during the initial period of operation of the plant. It was also recognized that the availability of finished steel within West Africa would require study of new patterns of exchange, with a view to ensuring payment for the steel. Common ownership and management of the plant would also facilitate this process. In view of the complex nature of these problems a further study by the ECA secretariat was recommended.

The meeting also considered that the setting up of an integrated iron and steel plan in West Africa should be regarded as part of a programme of establishing and sharing modern industries on a sub-regional and eventually an all-African basis.

The Executive Secretary was requested to carry out with the aid of expert consultants, as a matter of urgency, further studies as follows:-

- a) On the basis of information provided by Gabon, Ghana, Liberia and Nigeria, a comparative analysis of the prospective cost of production of integrated plants in these countries, assuming alternative capacities of 400,000 tons and 700,000 tons;
- b) Transport charges between plants located at the possible sites and the principal markets in West Africa;
- c) Commercial arrangements for ensuring the maximum demand in West African countries for the products of the integrated plant, including the elements of a trading frame-work to ensure suitable exchanges in payment for the finished steel;
- d) Possibilities of freight absorption in the pricing system;

- e) Possible arrangements for joint financing, control and management of the integrated plant:
- f) The possibility of setting up a second plant far from the coastal plant, within the framework of the programme of work on iron and steel already established by the ECA.

4. These conclusions were adopted by the Lagos Conference on the Harmonization of Industrial Development Programmes in West Africa, which met on the 29th and 30th November 1963. This conference was the third of a series of meetings of African countries convened on the initiative of the President of the Republic of Niger with the object of promoting industrial co-ordination in the sub-region. They were serviced by experts - the de Bernis Working Group and this meeting dealt particularly with Iron and Steel. The conference (E/CN.14/INR/51; 5 December 1963) adopted the conclusions of the two preceding conferences held at Niamey, including the principle that the siting of a steel industry inland was in the general interest and asked for further technical and location studies to be undertaken in preparation for the next meeting at Bamako.

5. The recommendations of the Monrovia and Lagos Conferences relating to further studies and the intention to discuss these at a meeting in Bamako were endorsed at the Second Session of the standing committee on industry natural resources and transport held from 3-13 December 1963 (E/CN.14/INR/54). This committee also examined a study on the development of iron and steel in Africa (E/CN.14/INR/27).

6. In accordance with the preceding recommendations two studies were prepared for submission to the proposed Bamako conference entitled. Iron and Steel and First Stage of Transformation (E/CN.14/INR/72) Vols.I & II 21 July 1964).

Vol.I prepared by Setec relates to the siting of a coastal iron and steel plant and in accordance with the wishes of the Monrovia

Conference the relative advantages of four countries, namely Gabon, Ghana, Liberia and Nigeria are compared. The comparison is made by estimating the total cost of producing and distributing steel at a selected coastal site in each country using local (or West African) iron ore and imported coke. The lowest cost location is a site in Liberia at Buchanan.

Volume II prepared by the de Bernis group relates to the siting of an inland steel works. The recommendation is for an electric steel plant sited at Gouina with an initial capacity of about 200,000 tons per annum based on local ore, imported coke, and electricity from the proposed Gouina Hydro-electric scheme. As this hydro-electric development will not be completed until 1974 three smaller temporary units (relay units) are proposed. The report envisages ultimately two steel centres one on the coast of 400-500 thousand tons capacity and the other inland of 200,000 tons capacity. It is recommended that flats are rolled at the coastal centre and shapes at both centres with a possibility of specializing on heavier sections at the coastal plant.

7. The above studies were reviewed at the conference on Industrial Co-ordination in West Africa held at Bamako 5-15 October 1964. In the course of this review the conference was advised of the fact that the suitability of Guinea and Mauritania as sites for a coastal steel works had not been investigated in the same way as other countries and also that the Nigerian Government intended to proceed with a steel industry project on which they had already incurred considerable expense.

Having taken notice of these facts and having examined the reports, the conference; (E/CN.14/INR/78)

- 1) Accepted the necessity of setting up an iron and steel works in the interior. For this works, the conference considered Gouina (Mali) as the site and requested that all steps should be taken towards the setting up of a relay works as quickly as possible subject to this

being technically and economically feasible.

2. Accepted the recommendations of the consultants for the choice of Lower Buchanan as the most favourable coastal site taking into account the estimated output of the Nigerian plant, the forecast of steel demand in West Africa and subject to the possible conclusions of the investigations to be undertaken in other coastal countries,
3. Affirmed the principle that the manufactured products of each iron and steel plant in the Sub-region would be allowed to flow competitively throughout the sub-region and that the iron and steel plants accept responsibility for meeting the demands of the sub-region,
4. Requested the ECA to carry out technical and economic investigations to determine whether other states on the coast have comparable advantages to Liberia for siting of an iron and steel plant,
5. Requested the Executive Secretary to enter into consultations with interested governments and to take all the steps required for financing these projects and establishing the necessary institutional framework for the execution of the projects.
8. In preparation for the Bamako Conference the Liberian Government commissioned VOEST to prepare feasibility studies for Iron and Steel Works sited at Monrovia and at Buchanan, based on an annual output of 400,000 and 700,000 tons of crude steel. Their report establishes the fact that either plant would be profitable even if steel were sold at 10 per cent below world prices. A market analysis, a project and sales programme, a process description, a manning table and an investment scheme are provided. Production figures are based on sales of finished and

semi-finished steel to the other West African countries. The production figure of 400,000 tons includes sales of finished products, i.e. reinforcing rounds (170,000), wire rod (40,000), skelp (80,000) sections (30,000) amounting to 320,000 tons and sales of re-rolling billets of 50,000 tons. The higher production figure of 700,000 tons includes 150,000 tons of billets and 200,000 tons of sheet bars for re-rolling in other West African countries. Feasibility studies have also been commissioned by the Nigerian Government but no information has been made available on them.

9. In accordance with the request of the Bamako Conference, a mission was sent to Mauritania and Guinea to ascertain in the same way as for the other West African Countries, their comparative advantages for locating a coastal iron and steel works. In the case of Guinea, however, insufficient information was made available to the mission for this assessment to be made. In the case of Mauritania, the advantages of a site near Port Etienne were investigated and it was established, largely because of the cost of fuel for the desalination of water and the generation of electricity but also because of the higher cost of delivering finished steel to the West African market, that total steel costs would be some 25 per cent above those at Buchanan.

#### PART II - Analysis

10. The subjects covered in the following analysis are the market for steel in West Africa, the size and location of plants and the costs of production and distribution of steel, based on all the studies referred to above.

##### Market

11. Market estimates for steel products in West Africa in 1970 and later years were given in E/CN.14/IS/2. They were derived from actual figures of consumption (1960/62 in most cases) assuming an average rate of growth (for products other than rails) of 9 per cent per annum. Allowance was made for the fact that the consumption of flat products normally increases more rapidly than that of other products e.g. bars,



partly because with rising income, expenditure on durable goods made of steel increases more than proportionately and partly because with the development of a domestic metal processing industry imports of metal goods (mainly of sheet) are reduced in favour of local products. On the other hand consumption of galvanized sheet increases at only about half the average rate because of competition from other products such as asbestos cement. Similarly consumption of tubes would normally increase at less than the average rate because of competition from asbestos cement pipes plastic (P.V.C.) pipes etc., but in the case of West Africa this is likely to be offset by the large increase in total demand arising from the development of the petroleum industry.

The average rate of increase per annum of 9 per cent implies that total consumption of steel will double from 1962 to 1970. The estimated ratios between consumption in 1970 and in 1962 for the various products are as follows:-

Consumption 1970 as estimated  
by Consumption 1962

	<u>E.C.A.</u>	<u>VOEST</u>
Rails	1.1	0.9
<u>All other products</u>	<u>2.0</u>	<u>2.0</u>
Bar and rod	1.8	2.1
Wire rod	3.0	-
Sections	2.0	2.1
Plate and Sheet	2.0	1.7
Plate	2.0	-
Plain sheet	3.0	-
Coated sheet	1.6	-
Tin plate	2.0	-
Tubes	2.0	2.1
Strip	3.0	-

The detailed estimates by countries made by ECA are given in the table overleaf. (It should be recognized, however, that the greater the detail given in these estimates the greater the error attaching to any particular figure). The total figures given in the table are different from those estimated in E/CN.14/IS/2 since countries now in the Central African Sub-Region are excluded. The total figure for rails including sleepers corresponds to requirements for new rails and renewals as at present foreseen but the allocation by countries is simply in proportion to total steel consumption since it is uncertain which of the various new railway projects will eventually be adopted. The figures for tubes should be broken down into seamless and welded corresponding to the demand for tubes rounds and skelp, but these figures are available. It is probable that most of the petroleum tubing is seamless and most other types welded.

12. A projection of demand for years subsequent to 1970 in the sub-region is as follows:-

	<u>1970</u>	<u>1975</u>	<u>1980</u>
Total	933	1397	2147
Rails etc.	139	160	180
<u>Other types</u>	<u>794</u>	<u>1237</u>	<u>1967</u>
Bar and rod	212	312	460
Sections	108	167	259
Wire rod	56	112	224
Wire	19	28	43
Strip	18	36	72
Sheet, plain	60	120	240
Coated	160	213	284
Tin plate	26	40	62
Plate	38	59	91
Tubes	97	150	232

ESTIMATED STEEL CONSUMPTION 1970

'000 tons

	Bar & rod	Wire rod	Wire	Strip	Sec- tions	Plate	Tin Plate	Plain Sheet	Galv. Sheet	Tubes	Rails	Total
Dahomey	3.5	0.7	0.3	0.3	2.5	1.3	0.9	1.1	4.8	1.3	2.0	18.7
Ghana	56.0	12.0	4.0	4.0	11.5	5.0	2.8	11.3	16.5	21.8	35.7	180.6
Ghana	13.6	3.6	1.3	1.3	13.0	1.8	1.3	1.6	7.0	5.5	8.9	58.9
Ivory Coast	15.5	3.6	1.5	1.5	15.3	3.3	2.4	3.2	12.9	8.1	9.6	76.9
Liberia	16.2	4.3	1.6	1.6	9.2	1.0	0.7	0.8	3.9	8.6	10.5	58.4
Mali	2.8	0.7	0.3	0.3	2.6	0.7	0.4	0.6	2.9	1.1	1.8	14.2
Mauritania	3.7	0.9	0.4	0.4	3.7	0.2	0.1	0.1	0.7	2.5	2.2	14.9
Niger	1.4	0.3	0.1	0.1	1.4	0.2	0.1	0.1	0.7	0.8	0.9	6.1
Nigeria	68.6	22.9	6.2	6.1	25.3	18.3	13.3	31.2	78.2	33.0	48.1	351.2
Senegal	18.2	4.4	1.5	1.5	18.0	3.0	2.1	2.7	11.5	9.0	11.4	83.3
S. Leone & Gambia	7.2	1.4	0.7	0.7	1.6	1.9	1.6	6.2	14.4	2.8	4.5	43.0
Togo	2.6	0.3	0.3	0.3	0.9	0.9	0.4	0.7	3.1	1.0	1.5	12.0
Upper Volta	3.0	0.7	0.3	0.3	2.9	0.7	0.4	0.6	2.9	1.2	1.8	14.8
<b>Total</b>	<b>212.3</b>	<b>55.8</b>	<b>18.5</b>	<b>18.4</b>	<b>107.9</b>	<b>38.3</b>	<b>26.5</b>	<b>60.2</b>	<b>159.5</b>	<b>96.7</b>	<b>138.9</b>	<b>933.0</b>

Size and location of plants

13. The various proposals now current for locating steel plants include:-

- a) The intention of the Nigerian Government to locate a plant or plants at inland sites in Nigeria;
- b) The recommendation of the Bamako Conference to locate a coastal plant at Buchanan;
- c) The recommendation of the Bamako Conference to locate an inland plant at Gouina and possibly in the meantime one or more relay plants;
- d) The VOEST study of a coastal works at Buchanan and re-rolling works at coastal sites in West Africa.

In discussing these proposals the following points should be taken into consideration. First of all a number of plants of economic size can be more easily accommodated if more products are made, i.e. flat and tubes as well as bars and sections.

Secondly, every five years consumption will increase by about half. Third, there is less objection to a multiplicity of re-rolling works since economies of scale are less at this stage than in iron making. Fourth, it is desirable to use existing scrap before creating new iron making facilities.

In the table overleaf an attempt has been made in simple terms<sup>1/</sup> to illustrate the probable development of the iron and steel industry along these lines.

---

<sup>1/</sup> e.g. no allowance is made for the fact that while local steel industries could make all the varieties of reinforcing bar and galvanized sheet required, they will not be able to provide more than three fourths or so of the variety and quality required in sections, plain sheet, plate and tubes.

POSSIBLE IRON AND STEEL WORKS

	<u>Output '000 tons</u>	
	<u>1970</u>	<u>1975</u>
Nigeria Works (integrated)		
R. Bar for Nigeria	69	100
Wire rod       "	23	43
Light sections "	18	28
Strip           "	6	11
Plate & sheet "	128	194
Tubes for W. Africa	97	150
Total	341	526
Ghana (Tema) Works - (Re-rolling & Scrap melting)		
R. Bar for Ghana	56	82
Wire rod       "	12	23
Light sections	7	11
Strip sections	4	8
Total	79	124
Mali (Gouina) & Relay Works (Integrated)		
R. bar to interior	50	73
Wire rod		14
Light Sections		18
Strip		5
Total	50	110
Liberia (Buchanan Works)(Integrated)		
R. bar (residual)	37	57
Wire rod (residual)	21	32
Light sections (residual)	47	54
Strip (residual)	8	12
Heavy sections	36	56
Billets	53	82
Sheet bar	130	196
Total	332	489
Other Works		
Plate & sheet (re-rolling)	130	196
Tin plate (tinnyng & re-rolling)	(26)	39
Rails (re-rolling)	139	160

The first plants considered are those in Nigeria. It is assumed that Nigeria will endeavor to supply the bulk of its own requirements through an integrated works and possibly one or more rerolling works based on the integrated works. The market is large enough for this to be economic and the only exception suggested is that heavy sections, for which the market is fairly limited should be imported from Liberia. It is also proposed that since Nigeria, because of oil and gas reserves, will be the main market for tubes, the Nigerian plants should also supply the tube requirements for the rest of West Africa.

The Tema works in Ghana is already established and may be expected likewise to supply as far as possible the Ghana market. The plant will only be able to meet the total requirements for light products however provided additional scrap is imported or, as proposed here, billets are imported from Liberia.

The inland works (Mali) will initially consist of a small integrated relay unit with an output of 30,000 tons output per annum, and will grow to a moderate size when the Gouina scheme comes into operation in 1974.

The Liberian works will make finished steel products for the rest of the West African sub-region and semi-finished products for the proposed rerolling works. With regard to finished products, it will be seen that with Nigeria, Ghana, and Mali concentrating on light products, the market left to Liberia is small. It would be better for Nigeria and Ghana to give up sections altogether, because of the variety required or at least to produce only the most common varieties leaving the less common to Liberia. They might also consider giving up the production of wire rod and strip which can be undertaken on more efficient lines if production is concentrated. This would increase the market available to Liberia. Failing this, the bulk of the output of the Liberian works will be in semi-supplying billets to the Ghana rerolling works and sheet bar to the plate and sheet rerolling works which must be established for this purpose. There is no reason, however, why Liberia should not in due course expand its output by undertaking the manufacture of rails for the sub-region.

The market for sheet and plate is a large one and to begin with, in addition to a reversing (steckel) mill making sheet and plate in Nigeria, a second should be established elsewhere on the coast, and five years later the market will be large enough for a third. Possible sites in order of local consumption are Ghana, Sierra Leone, Ivory Coast and Senegal. By about 1975 the market will also be large enough to justify an electrolytic tinning line based on locally produced sheet.

#### Costs

14. The ex works cost of producing steel at the Buchanan site as calculated by VOEST is as follows:-

	Output of 400,000 t.p.a.	Output of 700,000 t.p.a.
	\$ per ton	
Billets	78	58
Sheet bar	--	58
Reinforcing bar	86	74
Wire rod	89	77
Skelp	88	76
Sections	89	77

The cost includes an allowance of about 10 per cent for interest and depreciation calculated on the original plant cost (but excludes extra cost incurred during the first five years when the plant is gradually coming into full production). Costs at the 400,000 ton scale of output are those of a 700,000 ton capacity plant producing at 4/7 of capacity and not those of a plant designed to produce 400,000 per annum and to this extent will be slightly exaggerated. On the other hand the costs at Buchanan calculated by the ECA consultants are still higher at an average of \$89 for

bar and billets so that the VOEST figures are confirmed.

These figures are lower than the cost of production at European works. The cost of producing reinforcing bar in a new works in the UK after allowing about 15 per cent on the investment is \$116 per ton compared on the same basis with \$81 at Buchanan at 700,000 t.p.a. capacity and \$98 at 400,000 tons capacity. The actual quotations from European works at any time depend on market conditions. Home trade prices for reinforcing bar in Italy have been as low as \$90 and export prices still lower but such export prices will include an element of dumping against which the Buchanan works should be protected.

The ex-works costs at other projected plants in West Africa are much higher. The cost of making crude steel at the Gouina plant was estimated at between \$70 and \$80 per ton compared with \$46 at Buchanan while that for making reinforcing bar at the proposed relay plant was \$200 per ton and at the proposed scrap melting plant at Dakar \$170 per ton. With transport costs at about \$20 per ton the Gouina plant could not compete with Buchanan even in the interior and would have no market. Similarly the Dakar plant could not compete and neither probably could the Nigeria plants certainly in deliveries to Lagos and Port Harcourt. It follows that some form of market sharing must be arrived at if all these projects are to go forward at the same time.