

UNITED NATIONS ECONOMIC AND SOCIAL COUNCIL



51528

Distr.
LIMITED



E/CN.14/INR/126
23 September 1966
Original: ENGLISH

ECONOMIC COMMISSION FOR AFRICA
Sub-regional Meeting on Economic
Co-operation in West Africa
Niamey, 10 - 22 October 1966

THE DEVELOPMENT OF THE ENGINEERING INDUSTRIES IN WEST AFRICA

CONTENTS

CHAPTER		<u>Paragraphs</u>
I	INTRODUCTION	1 - 2
II	PRESENT CONSUMPTION OF ENGINEERING PRODUCTS....	3 - 4
III	THE PRESENT SITUATION OF THE ENGINEERING INDUSTRIES IN WEST AFRICA	5 - 21
IV	DEMAND PROJECTIONS	22 - 24
V	THE TYPE, SIZE AND LOCATION OF ENGINEERING WORKS	25 - 29
VI	PROPOSED FACTORIES	30
	(a) Manufacturing division	31 - 39
	(b) Non-electrical machinery	40 - 47
	(c) Electrical Machinery	48 - 51
	(d) Transport equipment	52 - 53
VII	CONCLUSION AND SUMMARY	54 - 58

ANNEXES

I	Present Consumption of Engineering Products in West Africa
II	Demand Projection of Engineering Goods 1970 and 1980
III	Demand Projection of Engineering Goods 1980
IV	Basic Information Regarding Minimum Economic Size of Plants for various branches of industry, investment needs, labour force, etc.
V	Proposed Engineering Works
VI	Proposed Engineering Works Gross Output
VII	Proposed Engineering Works Value Added
VIII	Proposed Engineering Works Employment
IX	Proposed Engineering Works Fixed Capital
X	Summary of Proposed New Engineering Factories in the West African Sub-region.
XI	Alternative Demand Projection
XII	Note on further Industrial Possibilities

THE DEVELOPMENT OF THE ENGINEERING INDUSTRIES IN WEST AFRICA

I. INTRODUCTION

1. This report deals primarily with the consumption and production of engineering goods in West Africa and the prospects for the development of the mechanical and electric engineering industries. These industries include four main divisions; first, the production of metal goods such as building components and household equipment, secondly, electrical machinery and apparatus, thirdly, non-electrical machinery and, fourthly, transport equipment. For further analysis, these divisions are divided into sub-groups according to the Standard International Trade Classification as follows:

69. Manufacture of metal

Finished structural parts and structures
 Metal containers for storage and transport
 Wire products (excluding electric) and fencing grills
 Nails, screws, nuts, bolts, rivets and similar articles
 of iron, steel or of copper
 Tools for use in the hand or in machines
 Cutlery
 Household equipment of base metals
 Manufactures of metal, n.e.s.

71. Machinery other than electrical

Power generating machinery
 Agricultural machinery and implements
 Office machines
 Metalworking machinery
 Textile and leather machinery
 Machines for special industries
 Machinery and appliances (other than electrical) and
 machine parts, n.e.s.

72. Electrical machinery and apparatus

Electric power machinery
 Machinery for distributing electricity
 Telecommunications apparatus
 Domestic electrical equipment
 Electrical apparatus for medical purposes
 Other electrical machinery and apparatus

73. Transport equipment

Railway vehicles
Road motor vehicles
Road vehicles other than motor vehicles
Aircraft
Ships and boats

2. In the electrical machinery and apparatus sub-group (Division 72) a separate report is being prepared on the electronics industry which will include such products as radios, some telecommunications apparatus, electrical condensers and electro-medical apparatus.

In the transport equipment sub-group (Division 73) separate reports are being prepared on road motor vehicles and on river craft.

The above items are consequently omitted from the present report as far as proposed factories are concerned.

II. PRESENT CONSUMPTION OF ENGINEERING PRODUCTS

3. The level of consumption of engineering products in West African countries has been estimated for the base year 1963 by an examination of data on production, imports and exports over a number of years ranging from 1958 to 1965, according to the availability of the statistics in each country.

In the course of this examination the figures for certain large import items occurring in particular years, such as rails into Mauritania and construction material into Liberia, have been replaced by an average figure spread over the life of the asset; ten years for rails and 25 years for construction material.

The resulting estimates are presented in Annex I. It should be noted that the steel content of domestic production of engineering goods has been subtracted from steel consumption (Division 69) so that the figures given in that Division relate primarily to steel used for construction together with some repair work. The total engineering goods consumption or total direct and indirect consumption of iron and steel obtained by adding the figures for all the divisions includes some items, especially in the electrical division, which contain material other than iron and steel and to this extent the total demand is exaggerated. On the other hand, certain items which contain steel, e.g., imports of canned goods, are not taken into account and neither is the loss involved in fabricating metal goods from steel.

4. On this basis total direct and indirect steel consumption during 1963 amounted to 935,000 tons, of which about 495,000 was iron and steel including about 4 per cent non-ferrous metals. The largest consuming country was Nigeria (423,000), and the smallest Gambia (3,000).

As shown in the following table, total consumption per head ranged from 2 to 48 Kilogrammes.

Consumption per head of all engineering products
in West African countries in 1963

<u>Country</u>	<u>Kilogrammes</u>
Niger	2.1
Upper Volta	2.2
Mali	2.9
Dahomey	5.8
Guinea	7.0
Nigeria	7.7
Togo	7.9
Gambia	9.0
Mauritania	11.4
Senegal	17.1
Sierra Leone	18.4
Ivory Coast	20.2
Ghana	26.7
Liberia	48.0
Sub-region	10.1

In comparison with these figures, consumption per head in other countries of the world ranges from about 10 kilogrammes in Pakistan and India to from 400-500 kilogrammes in USA, Czechoslovakia, Germany and Sweden.

Distribution of consumption per head of engineering
products - 1959/60

Low	10- 20 kg.	India, Turkey, Pakistan
	20- 50 kg.	China, Portugal and Greece
Medium	130-210 kg.	South Africa, Finland, Israel, Poland, Austria, Italy
High	250-500 kg.	Belgium, United Kingdom, Germany, Sweden, Czechoslovakia, United States of America, Canada, Union of Soviet Republics.

III. THE PRESENT SITUATION OF THE ENGINEERING INDUSTRIES IN WEST AFRICA

5. A large part, more than half, of the activities carried on in African engineering establishments at the present time, consists of repair work, i.e. motor vehicle repair, blacksmithing, etc. In estimating the output of the domestic engineering industry in terms of its consumption of steel it is therefore necessary to allow for the fact that the steel content of repair work is low compared with that of normal manufacturing operations. Similarly, a substantial part of engineering consists of assembly work based on imported parts and using virtually no steel. In the following description of the present state of the engineering industries in each of the West African countries, estimates have been made of current steel consumption taking these considerations into account. In doing so, it has usually been necessary to estimate the quantity of output from value figures using the conversion factors given below. The repair of railway rolling stock is not included in the survey.

NIGERIA: Industrial Survey, 1963

	No. of estab- lish- ments	No. Employed	Wages and Salaries \$1000	Gross- out- put \$1000	Indus- trial costs \$1000	Value Added \$1000	Gross Output tons
Metal products	28	3804	2030	16300	9500	6800	47000
Electrical equipment	7	238	126	695	383	312	70
Boat building and repair	3	524	342	860	270	590	820
Motor vehicle and bicycle assembly and body building	14	1522	1030	26500	24700	1800	12000
Motor vehicle repairs	87	6675	4730	49000	34800	14200	6000
Total	139	12703	8260	93355	69653	23702	59890

The metal goods industry

6. There were 28 establishments in this industry in 1963. Fifteen of these operated in large mechanized factories employing over 100 persons, and their output in terms of value accounted for 94 per cent of the total output of the industry. Total output (sales) amounted to £6.2 million (\$17.5 million) and included a wide range of products. Owing to the limited number of establishments producing some of the products, it is not possible to specify all the products of the industry in the table below. The quantity (weight) of goods produced has been estimated from the figures of average value per ton given in the last column.

Analysis of sales, 1963

Product	Value US\$1000	Quantity Tons	Value \$ per ton
Metal doors and windows	1770	3550	500
Aluminiumware	1010	1260	800
Brassware	1660	900	2000
Enamelware	2900	7250	400
Cans, steel drums and tanks	3660	7300	500
Corrugated roofing sheets	2770	13850	200
Other metal products	3720	7450	500
Total	17490	47460	540

7. From the above tables it may be seen that annual output per person employed amounted to 11 tons in terms of steel consumption, and to \$4300 in terms of value. In terms of value added, annual output per person employed amounted to \$1780. With the exception of exports of metal containers to neighbouring African countries which, in 1963, was valued at \$27,000 (\$75,000 and 150 tons) all the products of the industry were for domestic consumption. About two-thirds of the domestic market was supplied by imports and the main items imported in 1963 are given below.

Import of Selected Metal Products, 1963

Product	Value US\$1000	Quantity Tons
Corrugated roofing sheets	8,900	44,500
Enamel household utensils	6,000	15,000
Aluminium household utensils	151	190
Other household utensils	865	1,000
Metal containers	2,670	5,300
Steel doors and windows	1,370	2,600
Other steel structural parts	2,420	4,800
Wire fencing	720	2,900
Wire nails	860	4,300
Total	23,956	80,590

Total expenditure on material consumed by the industry was \$10.4 million, of which \$9.5 million was metal.

Electrical equipment industry

8. This industry comprised two manufacturers of gramophone records, two factories assembling radio receivers and three electrical repair plants. Employment in 1963 amounted to 238 persons. Total sales, including a small amount of repair work, amounted to \$680,000, and the cost of material used by the industry, all of which was imported, accounted for 58 per cent of total costs.

The boat building and repairing industry

9. Of the three establishments included in this industry in 1963, one was engaged mainly in marine engineering, while two were owned by regional development corporations and undertook, in addition, boat building. The total value of work done was \$731,000 of which 216,000 came from the sale of boats. Total employment in the industry was 524 persons, 267 being employed by the two plants owned by statutory corporations.

	Value US\$1000	Quantity Tons
Boats	216	220
Marine engineering	515	600
Total	731	820

The motor vehicle and bicycle assembly industry

10. Of the 14 establishments in this industry in 1963, four were bicycle assembly plants, four assembled trucks from imported parts and six were motor vehicle body builders. The industry employed 1522 persons, of which 1146 were in the assembly plants. The total value of work done by the industry amounted to \$17.8 million, sales of assembled vehicles accounting for 83 per cent of the total. In addition, repair work to a value of about \$9 million was carried out.

The motor vehicle repair industry

11. The motor vehicle repair industry is an important industry in Nigeria. It is the third largest employer of labour, with a total employment in 1963 of 6,675. The industry is mainly in the hands of a few motor dealers controlling establishments operating in most towns in the country. There are also a number of small-scale vehicle repairers who set up shop on the roadside, but most of these fall outside the scope of the survey. For the larger establishments in the industry, retail trade in motor vehicles and parts constitutes the main activity, sales amounting in 1963 to \$39.7 million while receipts for repair work yielded \$5.6 million. Total expenditure on materials amounted to \$1.2 million. As shown in the following table, this industry paid the highest average wage and gave the highest added value per employee.

	Wage US \$	Value added per person employed US \$
Metal products	535	1,780
Electrical equipment	530	1,340
Boat building and repair	655	1,130
Motor vehicle and bicycle assembly	675	1,180
Motor vehicle repairs	715	2,150

Estimate of domestic production

12. The coverage of the 1963 survey was restricted to establishments primarily engaged in manufacturing, employing ten or more persons and with a minimum annual value of production of £100 (\$280). In engineering industry in the majority of developing countries as will be illustrated below, between 50 and 60 per cent of total employment is in small establishments employing less than ten persons. Assuming this to be true of Nigeria, then employment in small engineering factories is estimated at about 15,000. These factories are mainly engaged in repair work on motor vehicles, bicycles, radios, etc., and in blacksmithing and the consumption of steel per person employed is estimated at about 1.3 tons per annum, compared with about 5.4 tons per annum in the larger establishments.

	Small establishments (under 10 persons)	Larger establishments (10 persons & above)	T o t a l
Employment	15,000	13,000	28,000
Gross output	\$40 million	\$95 million	\$135 million
Value added	\$15 million	\$24 million	\$ 39 million
Steel content	20,000 tons	60,000 tons	80,000 tons

GHANA

13. In the case of Ghana, figures are available for all establishments and as they are probably typical of African enterprises in general, are significant as showing the importance of small establishments employing less than ten persons. As shown in the table overleaf 51 per cent of employment in the engineering industry is contributed by factories employing less than ten persons and excluding establishments engaged in the repair of motor vehicles which in this case is carried on mainly in large factories, the proportion rises to 73 per cent. Total employment in 1962 about 29,200, of which about 15,000 were engaged in small repairing shops employing less than ten persons and about 10,000 in the larger establishments of the motor vehicle repairing industry.

Only about 4,200 people were employed in manufacturing as normally understood. The value and quantity of output is estimated in the following table.

Type of Establishment	Employment	Output \$ mil.	Value added \$ mil.	Steel Consumed (Tons)	
				Total	Per head
Employing 10 persons or more	4,200	18	9	42,000	10
Employing less than 10 persons	15,000	40	15	19,500	1.3
Larger motor vehicle repairing	10,000	70	21	10,000	1.0
Total	29,200	128	45	71,500	2.4

SENEGAL

14. There were 25 establishments employing 820 persons in the metal-working industry in Senegal in 1962, of which five employing more than 50 persons accounted for 500. Transport equipment manufacturing contributed an additional 656, of which a truck assembly factory accounted for 200 and two ship building establishments for 420. Total employment was estimated at 1476 and the quantity of output in terms of steel consumption at 13.5 thousand tons. Estimating the number employed in small establishments at about 1500 with an annual production of 2,000 tons, the following totals are obtained.

Type of establishments	Employment	Output \$ mil.	Value added \$ mil.	Steel Consumed (Tons)	
				Total	Per head
Employing 10 persons or more	1,480	9.5	2.8	13,500	9.1
Employing less than 10 persons	1,500	4.0	1.5	2,000	1.3
Total	2,980	13.5	4.3	15,500	5.2

CHINA - 1962 INDUSTRIAL CENSUS REPORT

CHINA - BOULEVARD INDUSTRIEL DE 1962

	Total No. of plants	Total No. of empl.	Total Capacity in power appar.	SIZE OF ESTABLISHMENT (PERSONS ENGAGED)												ESTIMATE	
				TAILLE DES ENTREPRISES (NOMBRE DE PERSONNES EMPLOYES)												ESTIMATION	
				1	2-4	5-9	10-19	20-29	30-49	50-99	100-199	200-499	500 or more	No. of plants	No. of empl.	Gr. O.	V.A.
Iron and steel foundry Fonderies de fer et d'acier	1	2	-	-	1	2											
Nail factory Fabriques de clous	2	113	2	699				1	25							390	190
Other iron and steel industries Autres indust. metallurgiques	7	115	3	90	2	6	3	19								400	200
Aluminum melting Fonderies d'aluminium	9	69	-	-	4	4	4	13								300	140
Other non-ferrous metals Autres metaux non ferreux	7	12	-	-	3	3	4	9									
Aluminum ware Produits en aluminium	83	614	9	587	45	45	22	56	11	61	1	12	1	27		2,000	900
Spanners, wrenches & workshop tools (cont.) Fabr. de clés de serrage, de clés à serres et d'outillage d'atelier	1	3			1	1	3									9	4
Machinething Forges	3,913	8,125	13	9	1,879	1,879	1,780	4,540	232	1,376	19	224	2	42		8,000	4,000
Water-storing tanks Reservoirs à eau	8	105	1	56	5	5	1	3	1	7						250	160
Manuf. of other metal products except machine & transport equipments Fabr. d'autres produits metalliques à l'except. des equip. de mach. & transp.	598	1,745	13	2,816	441	441	115	293	25	159	7	105	5	123	1	112	334
Hire drawing Tréfilerie	2	3			1	1	1	2									
Typewriter repairing Réparat. des machines à écrire	13	25	-		7	7	6	18									
Manuf. or repair of other machines except electrical machines Fabr. ou réparat. des autres machines à l'except. des mach. électriques	938		42	4,601	43	43	51	142	23	140	8	112	1	25		3,000	1,500
Starter battery plant Fabr. de batteries d'accumulateurs	127	659	82	2,739	17	17	57	166	40	252	10	125	1	22	2	77	
Radio & electr. repairing Réparat. d'app. de radio et d'app. élec.	170	611	31	460	43	43	83	229	32	196	12	143					
Manuf. or repair of other elec. machinery Fabr. ou réparat. d'autres mach. élect.	44	368	20	623	7	7	13	35	11	63	7	97	3	68	3	98	
Boat building & repairing Constructions & réparat. navales	12	632	4	220	2	2	5	12	1	6	1	10					
Other ship building & repairing Autres construct. & réparat. de bateaux	1	56	1	27													
Repair of motor vehicles Réparation de véhicules automobiles	1,301	14,017	161	10,606	223	223	408	1,229	358	2,335	202	2,642	50	1,280	26	973	16
Manuf. & repair of motorcycl. & bicycl. Fabr. & répar. de motocycl. & bicycl.	432	960	9	71	239	239	164	403	21	126	3	39	3	83	2	70	
Manuf. of transport equipment n.e.s. Fabr. de matériel de transport n.d.a.	2	6			2	6											
TOTAL	6,862	29,178	391	23,564													
TOTAL, exclud. repair of motor vehicles TOTAL, à l'exception de la réparation des véhicules automobiles	5,561	15,161	230	18,958	-	2,959	-	7,167		4,740				14,865		-	51 % of the total du total

IVORY COAST

15. Employment and output in the engineering industry of the Ivory Coast in 1963 is estimated as follows:

Larger establishments	Production tons	Output \$ 1000	Value added \$1000	Employment
Finished structural parts, structures	2,400	1,200	600	280
Drums and tanks	2,200	1,100	500	240
Cans, tins, boxes	1,400	860	400	43
Household utensils	600	600	350	74
Metal furniture	1,100	600	350	120
Repair of motor vehicles	2,000	5,000	3,000	2,000
Sub-total	9,700	9,360	5,100	2,757
Small establishments (estimated)	2,700	5,000	2,500	2,500
Total	12,400	14,360	7,600	5,257

16. The table overleaf presents in summary form the present state of engineering activity in the countries of the West African sub-region. Total production in terms of steel content is estimated at 207,300 tons of 22 per cent of consumption. The proportion is highest in Ghana at 36 per cent, falling to 27 per cent in Senegal, 19 per cent in Nigeria, 17 per cent in Ivory Coast and 15 per cent in other countries. With the development of the economy, the demand for engineering products becomes steadily more important and engineering goods (excluding iron and steel) account for over one-third of total imports into most countries including Ghana which already has a substantial engineering industry.

17. The most developed sector in all countries is the fabrication of metal products for building and household purposes, accounting for about one-fourth to one-half of total engineering output in terms of value added, but from one-half to two-thirds in terms of steel consumed.

Summary of the Present Engineering Industry Activities in
the West African Sub-region

Popula- tion	GDP Cap.	EG con- sump- tion	EG Pro- duct	Empl. in Gr. O. Engin- eering Industry	Gr. O. of Eng. Indus.	V. A. of Eng. Ind.	V. A. GDP	Empl. Popul.	EG Prod. EG. Con	Gr. O. Per Empl.	V. A. per Empl.	EG Prod./Empl		
												All	Large Ests.	
thous.	mill. US\$	thous. people	thous. people	mill. US\$	mill. US\$	mill. US\$	mill. US\$	%	%	US\$	US\$	t	t	
Ghana	7341	1470	200	195825	71500	30.0	128.0	45.0	3.06	0.4	36	4.25	1.5	10.0
Nigeria	54590	3880	71	422740	80000	28.0	135.0	39.0	1.00	0.05	19	4.8	1.4	9.5
Senegal	3312	643	195	56643	15500	3.0	13.5	4.3	0.67	0.1	27	4.5	1.4	9.1
Ivory Coast	3662	790	216	73816	12400	5.3	14.4	7.6	0.96	0.15	17	2.8	1.4	9.7
Rest of the sub-region	23740	1617	69	186028	27900	12.0	24.0	16.8	1.04	0.05	15	2.0	1.4	2.0
Total sub-region	92652	8400	91	935052	207300	78.2	314.9	112.7	1.34	0.09	22.2	4.0	1.4	2.6

Light building components are fabricated in structural engineering works in all countries but because of the handling facilities, sawing, and welding techniques required the heaviest structures are made only in Nigeria, Ghana and Senegal. The structural engineering works often include in their activities the manufacture of window and door frames and metal furniture generally. Most countries have also factories manufacturing hollow ware for domestic use. Metal containers for commercial purposes are less generally manufactured, depending in the case of cans, for example, on the availability of exportable agricultural produce.

Wire and wire products are made mainly in Nigeria, Ghana and Dahomey.

18. The next most important activity in terms of steel consumed is the manufacture and repair of transport equipment, accounting on the average for about one-third of steel consumption and two-thirds of value added by the engineering industry. The repair of road vehicles, railway rolling stock and ships is a most valuable introduction to engineering in underdeveloped countries since it is easily embarked upon and is free from competition from abroad, as repairs are necessarily undertaken in the country where the vehicles are used. Production of new road vehicles falls into the two main categories of complete assembly and partial manufacture. Light commercial vehicles are assembled from imported parts, the method of assembly often being the same as in Europe. Notable examples are the Bedford assembly plant in Nigeria and the Berliet assembly plant in Senegal.

19. The railway repair shop in many African countries is usually the largest engineering establishment. In the main shops, rolling stock, including locomotive wagons and carriages, are maintained and repaired according to a regular schedule, and the more rapidly wearing parts such as brake blocks, axle boxes, springs and many other components are manufactured in the foundry, forge and machine shops of the works. In some countries, e.g., Mauritania and Dahomey, the manufacture of wagons and carriages using imported wheels and axles is undertaken. Dry dock and slipway facilities for ship repairing and building exist in Ghana (Tema), Senegal (Dakar) and Nigeria, and ships up to about 500 tons are built, although capacity is much greater.

Summary of the Present Engineering Industry Activities in
the West African Sub-region

Popula- tion	GDP Cap.	EG con- sump- tion	EG Pro- duct	Empl. in Gr. O. Engi- neering of Eng. Industry	V. A. of Eng. Indus.	V. A. GDP	Empl. Popul.	EG Prod./ EG Con	Gr.O. Per Empl.	V.A. per Empl.	EG Prod/Empl All Large Ests.				
												thous. Mill. people US\$	thous. thous. people US\$	%	%
Ghana	7241	1470	200	195825	71500	30.0	123.0	45.0	3.06	0.4	36	4.25	1.5	2.4	10.0
Nigeria	54590	3880	71	422740	80000	28.0	135.0	39.0	1.00	0.05	19	4.8	1.4	2.0	9.5
Senegal	3310	643	195	56643	15500	3.0	13.5	4.3	0.67	0.1	27	4.5	1.4	5.0	9.1
Ivory Coast	3662	790	216	73816	12400	5.3	14.4	7.6	0.96	0.15	17	2.8	1.4	2.0	9.7
Rest of the sub-region	23740	1617	69	186028	27900	12.0	24.0	16.8	1.04	0.05	15	2.0	1.4	2.0	-
Total sub-region	92652	8400	91	935052	207300	78.2	314.9	112.7	1.34	0.09	22.2	4.0	1.4	2.6	-

Light building components are fabricated in structural engineering works in all countries but because of the handling facilities, sawing, and welding techniques required the heaviest structures are made only in Nigeria, Ghana and Senegal. The structural engineering works often include in their activities the manufacture of window and door frames and metal furniture generally. Most countries have also factories manufacturing hollow ware for domestic use. Metal containers for commercial purposes are less generally manufactured, depending in the case of cans, for example, on the availability of exportable agricultural produce. Wire and wire products are made mainly in Nigeria, Ghana and Dahomey.

18. The next most important activity in terms of steel consumed is the manufacture and repair of transport equipment, accounting on the average for about one-third of steel consumption and two-thirds of value added by the engineering industry. The repair of road vehicles, railway rolling stock and ships is a most valuable introduction to engineering in underdeveloped countries since it is easily embarked upon and is free from competition from abroad, as repairs are necessarily undertaken in the country where the vehicles are used. Production of new road vehicles falls into the two main categories of complete assembly and partial manufacture. Light commercial vehicles are assembled from imported parts, the method of assembly often being the same as in Europe. Notable examples are the Bedford assembly plant in Nigeria and the Berliet assembly plant in Senegal.

19. The railway repair shop in many African countries is usually the largest engineering establishment. In the main shops, rolling stock, including locomotive wagons and carriages, are maintained and repaired according to a regular schedule, and the more rapidly wearing parts such as brake blocks, axle boxes, springs and many other components are manufactured in the foundry, forge and machine shops of the works. In some countries, e.g., Mauritania and Dahomey, the manufacture of wagons and carriages using imported wheels and axles is undertaken. Dry dock and slipway facilities for ship repairing and building exist in Ghana (Tema), Senegal (Dakar) and Nigeria, and ships up to about 500 tons are built, although capacity is much greater.

20. The production of machinery is the least developed of the engineering industries and most of the output consists of repairing imported machines. While the national market is not large enough to justify the production of specialized machines, there is often a sufficiently large market for the manufacture of accessories in general use, such as valves and pumps and equipment for the basic industries, i.e., grinding equipment for the mines, milling equipment for the processing of agricultural produce and agricultural implements. Apart from such examples as the manufacture of light plows in Senegal and pump assembly in Nigeria, very little exists, however, at present.

21. As shown in the table above, output per head in the larger establishments measured in terms of steel content is between nine and ten tons per annum. This is about one-third of the productivity in European plants which are, however, usually much larger. For plants of a comparable size, it is estimated that productivity in African factories would be about two thirds of that in European factories. In terms of value added, the output per head in the smaller establishments employing less than ten persons is only about half that in the larger ones.

IV. DEMAND PROJECTIONS

22. Since engineering goods, either directly in the form of steel for construction, or indirectly in the form of machinery and vehicles, enter into all sectors of the economy, it is reasonable to relate their consumption to the development of the economy as measured by the gross domestic product. The following table shows the level of GDP per head in the various West African countries in 1963 and the corresponding level of total engineering goods consumption.

Engineering goods consumption and GDP

Country	GDP/capita US\$	EGC/capita kg
Upper Volta	45	2.2
Dahomey	69	5.8
Mali	70	2.9
Nigeria	71	7.7
Gambia	71	9.0
Sierra Leone	79	18.4
Niger	82	2.1
Togo	85	7.9
Mauritania	157	11.7
Senegal	195	17.1
Ghana	200	26.7
Ivory Coast	216	20.2
Liberia	218	48.0

A regression line (see chart) fitted to the above data gives an elasticity of 1.426 for increases of steel consumption per head in relation to increases in GDP per head. This compares with a figure of 1.145 for the countries of the East African sub-region (Document E/CN.14/INR/90). For projection purposes an elasticity of 1.45 has been assumed so that for the sub-region as a whole corresponding to

the expected increase in GDP per head of 3.1 per cent from 1963 to 1970, that of engineering goods should increase by 4.8 per cent. After taking account of expected population increases, this gives a total of 7 per cent per annum.

This elasticity will not continue indefinitely and in fact for developed countries the figure is usually fairly close to unity. The available evidence suggests, however, that it may continue over a period of about 20 year, and increases of this magnitude as the following table shows have in fact been obtained during the last twenty years in many countries where consumption, as in Africa, was initially at a low level. The table shows increases in consumption of engineering goods per head in the twenty years subsequent to 1936/38 in a number of countries with an initial consumption below 50 kilogrammes per head. The rate of increase of GDP in these countries during the period was between 6 and 10 per cent per annum. Only in the case of Portugal, Turkey, Greece and UAR has the increase in consumption been relatively small, and in the UAR during the last five years of the period an increase in consumption per head of 75 per cent was achieved.

Increase in consumption of engineering goods
1936/8 to 1956/8

	EGG/cap 1936/8 kg	EGG/cap 1956/8 kg	Per cent increase
Brazil	11	37	340
Yugoslavia	17	78	460
Italy	52	143	300
Israel	42	145	350
Poland	30	195	650
China	3	20	670
Venezuela	37	105	285
Hungary	50	174	350
Roumania	22	124	560
Spain	15	70	465
Portugal	23	41	180
Turkey	10	14	140
Greece	24	33	140
UAR	15	22	150

Rapport entre la consommation (par habitant) des produits des industries mécaniques et électriques et le PIB (par habitant).

Relation Between Engineering Goods Consumption per head and GDP per head

- | | |
|-------------------|--------------|
| 1. HAUTE VOLTA | UPPER VOLTA |
| 2. MALI | MALI |
| 3. NIGER | NIGER |
| 4. NIGERIE | NIGERIA |
| 5. GAMBIE | GAMBIA |
| 6. DAHOMEY | DAHOMEY |
| 7. SIERRA LEONE | SIERRA LEONE |
| 8. TOGO | TOGO |
| 9. MAURITANIE | MAURITANIA |
| 10. LIBERIE | LIBERIA |
| 11. COTE D'IVOIRE | IVORY COAST |
| 12. SENEGAL | SENEGAL |
| 13. GHANA | GHANA |

Cons. de prod. des ind. méc. et él. (en kg), par habitant

PC EGC kg

$$\log Y = 1.426 \log X - 1.91$$

PC GDP US \$
PIB par habitant en dollars des Etats Unis

Litho UNECA 066-361

23. The above relation between increases in GDP and increases in total engineering goods consumption has been used to make demand projections for each country in 1970, and 1980 as shown in Annex II. In doing so, the actual consumption for each country in 1963 has been taken as the base figure, rather than the theoretical consumption corresponding to its gross domestic product. This is because the actual level of consumption reflects, in addition to the level of GDP, certain features special to each country, e.g., the economy of mining countries such as Liberia and Mauritania is more steel intensive than that of non-mining countries and in the preceding chart the points for these countries lie about the trend line.

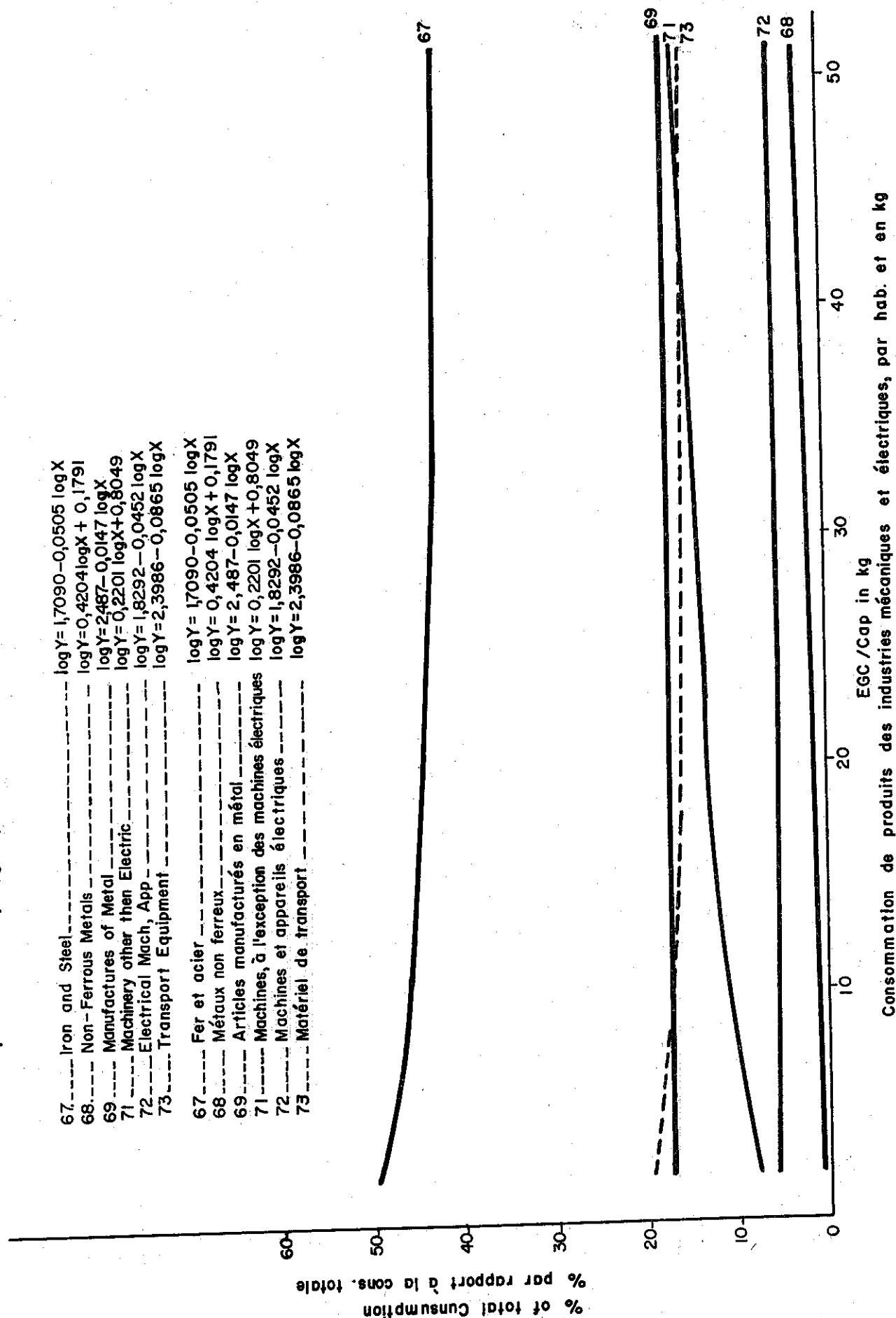
24. Total consumption in the sub-region is expected to increase from the 1963 level of 935,000 tons to 3,300,000 by 1980, i.e., about 3.5 times, and consumption per head from 10 kilogrammes to 22 kilogrammes, i.e., by 2.2 times, which is realistic having regard to the experience of other countries. Within these increases, changes are expected in the relative importance of the various groups and categories of engineering products and a study has been made of the relation between increases in total consumption per head and the percentage which each group forms of this total. The results are shown in the following charts. With increasing consumption per head of engineering products, the proportion consumed directly as iron and steel for construction purposes steadily declines, namely from 47.5 per cent when total consumption is 5 kilogrammes per head to 42 per cent when consumption reaches 50 kilogrammes per head. At the same time, the proportion consumed in the form of mechanical engineering products rises from about 10 per cent to 15 per cent. These trends have been used in making the projections by category given in Annex III. In doing so, the trend is taken in relation to the actual pattern of consumption in each country in 1963 which reflects local conditions. For example, in the mining countries, Mauritania and Liberia, the proportion of steel used in construction amounted in 1963 to 34 per cent and 29 per cent, respectively, compared with 54 per cent and 60 per cent in Nigeria and Senegal, while that of mechanical engineering products amounted to 19 and 15 per cent, respectively, compared with 9 per cent in Nigeria and Senegal.

V. THE TYPE, SIZE AND LOCATION OF ENGINEERING WORKS

25. From the purely economic point of view, metal processing works like other factories should be located at the point of lowest cost, including the cost of manufacturing at the site and the cost of assembling raw materials and delivering the finished products to the market. In general, in metal processing, raw material (metal) losses are relatively small and since the cost of transporting finished products per ton mile is from two to six times as high as the cost of transporting raw material (steel sheets or sections) factories are located near the market which also tends to be a local or national market. This tendency is stronger, for example, in the foundry industry where processing losses are high, raw material (scrap) is locally available and where there is also a local market for repair work and construction. Similarly, in the canning industry where the transport cost of tins is about eight times as high as on tin plate, production of cans is located in the agricultural areas which also saves the cost of transporting the produce.
26. The location and accessibility of the market is determined by the transport system and the distribution of population. The population in the larger towns are located mainly on the coast, in fact with the exception of Nigeria and one town in Ghana (Kumasi) there are no towns with a population of over 50,000 in the interior apart from the capitals. In Nigeria, however, there are many large towns in the Western Region between Illorin and Lagos, in the Eastern Region between Onitsha and Port Harcourt and in the Northern Region between Kaduna and Kano, and the density of population is generally greater than in the other West African countries. The road and railway system operates mainly from the coast to the interior. East-west communications are less developed, there are no railways although the railway system of Nigeria itself is fairly well developed. The general market division of the sub-region in the interior is therefore around the capitals together with the Northern Region of Nigeria and on the coast around the capitals together with the Takoradi region in Ghana and the Port Harcourt

Relation between increases in total consumption per head and the percentage which each group forms of this total.

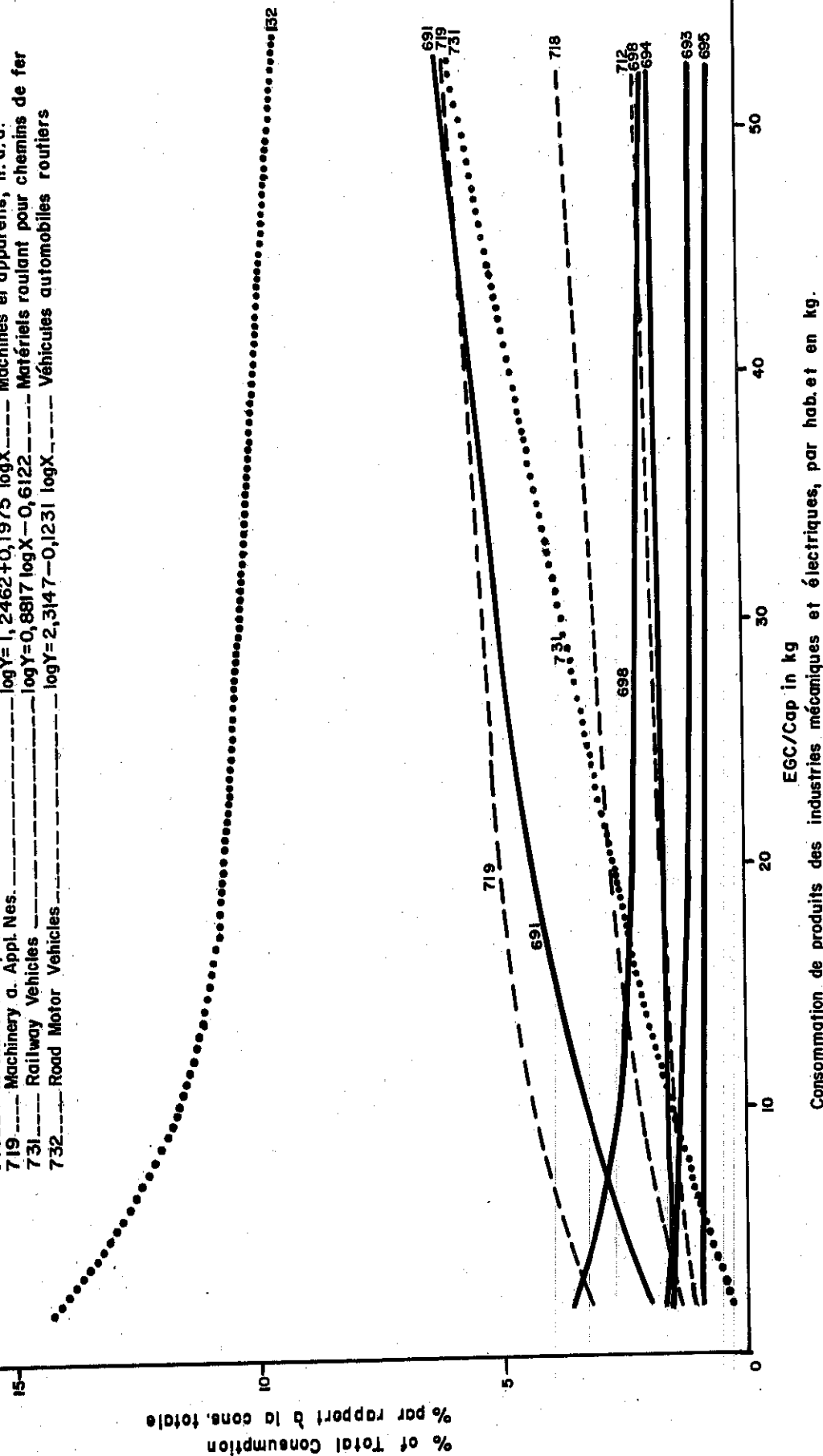
L'accroissement de la consommation totale par habitant et le pourcentage que représente chaque groupe par rapport à cette consommation totale.



Relation between increases in total consumption per head and the percentage which some Commodities form of this total.

L'accroissement de la consommation totale par habitant et le pourcentage que représentent certains produits par rapport à cette consommation totale.

691	Finished Str. Parts a Structures	$\log Y = 0,3594 \log X + 0,8093$	Eléments de construction finis et constructions
693	Wire prod. a Fencing Grills	$\log Y = 1,4472 - 0,1683 \log X$	Câbles en fils et leurs produits et grillages
694	Nails, Screws, Bolts, Rivets	$\log Y = 0,0466 \log X + 1,1216$	Clous, boulons, écrous, rondelles rivets, vis
695	Tools for use in hand or Mach.	$\log Y = 0,9697 - 0,0162 \log X$	Outils à main et outils pour machines
698	Manufact. of Met. (Locksmiths W.)	$\log Y = 0,6180 - 0,1978 \log X$	Articles manufacturés en métal (art. de serrurerie)
712	Agricultural Mech. a. Impl.	$\log Y = 0,7603 + 0,2041 \log X$	Machines et appareils agricoles
718	Machines for Special Industries	$\log Y = 0,7469 + 0,2984 \log X$	Machines pour industries spécialisées
719	Machinery a. Appl. Nes.	$\log Y = 1,2462 + 0,1975 \log X$	Machines et appareils, n.d.a.
731	Railway Vehicles	$\log Y = 0,8817 \log X - 0,6122$	Matériels roulant pour chemins de fer
732	Road Motor Vehicles	$\log Y = 2,3147 - 0,1231 \log X$	Véhicules automobiles routiers



Relation between Increases in Total Consumption of Eng. Prod. per Head
and the Percentage which Each Group and some Commodities form of this Total

	Y67	Y68	Y69	Y691	Y693	Y694	Y695	Y698	Y71	Y712	Y715	Y718	Y719	Y72	Y722	Y725	Y73	Y731	Y732	Y733
2,1	37,6	1,0	24,7	4,3	2,5	1,2	0,7	4,6	8,0	1,5	0,1	1,7	3,0	8,0	1,4	0,8	20,7	0,2	18,4	2,1
2,2	43,2	0,8	20,4	2,5	2,4	1,6	2,0	5,5	7,4	1,3	0,1	2,0	2,5	7,2	0,9	0,4	21,0	0,2	14,8	6,0
2,3	52,3	0,6	15,8	1,3	0,8	1,6	1,2	3,5	9,0	3,1	0,2	0,9	3,1	6,5	1,2	0,2	15,8	0,2	13,2	2,3
2,4	58,3	0,7	15,6	1,5	1,1	2,4	0,7	3,0	5,9	0,6	0,1	1,4	2,4	3,7	0,5	0,4	15,8	2,1	11,4	1,4
2,5	54,0	1,0	15,0	6,1	1,3	1,7	0,5	1,6	8,0	0,7	0,1	2,6	3,8	4,0	0,9	0,1	18,0	1,7	13,0	2,2
2,6	54,1	2,1	15,8	2,8	1,7	1,6	0,5	2,8	9,3	0,7	0,4	2,1	4,7	4,0	0,8	0,7	14,7	1,4	9,5	1,4
2,7	47,7	0,8	13,8	0,7	0,7	2,7	1,2	4,1	13,7	1,2	0,2	4,5	6,5	5,1	1,2	0,2	18,9	2,4	11,4	2,3
2,8	45,8	0,4	18,4	4,3	2,4	2,8	0,7	1,4	11,7	2,1	0,1	0,4	8,0	5,6	0,3	0,2	18,1	0,2	15,9	1,1
2,9	33,7	0,3	12,4	7,3	1,5	0,5	0,6	1,2	19,0	1,2	1,0	6,1	9,7	4,8	2,4	0,2	29,8	19,5	9,7	0,3
3,0	60,0	0,9	13,6	0,9	1,4	0,9	0,5	3,7	9,2	2,3	0,2	1,7	3,5	5,6	0,8	0,5	10,7	0,7	8,5	1,1
3,1	43,5	1,7	20,9	7,9	1,7	2,1	1,0	1,2	14,6	0,9	0,1	4,8	3,5	6,6	1,6	0,2	12,7	2,3	8,3	0,4
3,2	41,0	0,7	24,2	7,5	1,3	2,4	2,0	3,1	9,9	2,0	0,2	2,0	3,8	5,8	1,0	0,4	18,4	2,0	13,5	2,0
3,3	53,1	2,5	12,8	4,1	0,2	0,9	0,7	2,8	14,0	1,5	0,2	2,6	7,7	6,9	1,0	0,3	10,7	1,8	7,7	0,7
3,4	29,2	6,2	23,5	9,2	2,4	3,1	1,3	3,1	15,4	5,3	0,4	4,1	4,1	5,2	0,8	0,3	20,5	3,1	16,3	1,0

log Y67 = 1,7090 - 0,0505 log X	log Y68 = 0,4204 log X + 0,1791	log Y69 = 1,2487 - 0,01473 log X	log Y691 = 0,3594 log X + 0,8093	log Y693 = 1,4472 - 0,1683 log X	log Y694 = 0,0466 log X + 1,1216	log Y695 = 0,9697 - 0,0162 log X	log Y698 = 0,6180 - 0,1978 log X	log Y71 = 0,8049 + 0,2261 log X	log Y712 = 0,7603 + 0,2041 log X	log Y715 = 0,3014 log X - 0,3262	log Y718 = 0,7469 + 0,2984 log X	log Y719 = 1,2462 + 0,1975 log X	log Y72 = 1,8292 - 0,0452 log X	log Y722 = 1,0106 - 0,0170 log X	log Y725 = 0,6892 - 0,0999 log X	log Y73 = 2,3986 - 0,0865 log X	log Y731 = - 0,6122 + 0,8817 log X	log Y732 = 2,3147 - 0,1231 log X	log Y733 = 2,1382 - 0,5160 log X
---------------------------------	---------------------------------	----------------------------------	----------------------------------	----------------------------------	----------------------------------	----------------------------------	----------------------------------	---------------------------------	----------------------------------	----------------------------------	----------------------------------	----------------------------------	---------------------------------	----------------------------------	----------------------------------	---------------------------------	------------------------------------	----------------------------------	----------------------------------

X... EGC/cap in kg.
X... % of total consumption.

region in Nigeria. It will be realized that as the Nigerian market accounts for about 45 per cent of engineering goods consumption and has a relatively well developed transport system as well as a high density of population it is a favourable area for industrial development. For the same reason the small markets of the interior are relatively unfavourably situated.

27. These market divisions are less significant for high valued products; engineering products costing US\$1,900 to 2,500 per ton will be more efficiently manufactured and transported on a sub-regional scale than structures or castings costing \$250 to \$500 per ton, for which transport charges over a distance of 500 miles will amount to \$16 to \$50 per ton according to loadability. It would be possible therefore, without too great loss to establish in the interim sub-regional or multi-national factories manufacturing high valued products.

28. Off-setting the tendency towards a number of local or national factories are the economies of scale and lower manufacturing costs which can be obtained by producing on a large scale for a sub-regional market. These economies consist, first of all, of superior processing methods, e.g., the use of more powerful machines which work faster and shape metal more quickly; the shaping of metal by pressing instead of cutting, the use of special tools in presses, etc. In some cases, e.g., the pressing of car bodies for passenger cars and the manufacture of some components for engines, these economies are decisive. The second economy of scale comes from the possibility of a greater division of labour allowing the operatives to specialize on particular jobs. This is important under African conditions since the efficiency of African labour is much higher on repetitive work. The third economy arises when the scale of operation is sufficient to use to the full the minimum managerial and technical staff necessary for the process in question and to secure full time operation of plant and machinery by being able to switch production when necessary and so operate on a three-shift basis. In the short-term, this is probably the most important economy of scale since technical staff and machines are both very expensive

in relation to the level of African wages and to achieve it many establishments make a variety of products and sacrifice the first two economies. The fourth economy derives from the fact that, in general, the capital investment per unit of production is smaller in a large factory than in a small one. This economy must be linked, of course, with the possibility of working as closely as possible to a three-shift continuous basis.

29. On the basis of a consideration of manufacturing operations in Europe and the United States, a minimum size has been established for typical plants in each group of engineering activities (Annex IV). Under African conditions it may be assumed that the labour force will be about half as large again as in Europe, i.e., that productivity will be two-thirds of European productivity, and one-third of productivity in United States small plants, and the investment per unit about one-third higher. It will be seen (Annex IV) that these plants usually lie in the range of 200 to 500 persons employed under European conditions. Below this figure, and even assuming that the market is available it is doubtful whether plant and skilled personnel can be fully employed, and productivity will fall, while above this figure there may be distribution and managerial difficulties.

VI. PROPOSED FACTORIES

30. Since it may be considered that it takes about one year to project a factory, one or two years to construct it, and another year for training and running-in, many of the factories proposed below are not likely to come into production until the 1970's, so that the following proposals relate to the demand projection for 1980. A further reason for choosing this later year is that many of the factories proposed will begin on an assembly basis and will only subsequently undertake substantial manufacturing operations, and the plants proposed below are, in general, manufacturing plants rather than assembly plants.

31. The first group in the metal manufacturing division is 691, i.e., finished structural parts and structures, and consumption in this group is estimated by 1980 to amount to about 160,000 per annum, of which 47,000 in Nigeria. The products of this group are used by the construction engineers who operate in every country, although the extent to which they rely on their own or locally produced materials or imported structures varies from country to country and from product to product. The main items required are:

70 per cent	light steel structures
15 per cent	heavy steel structures, including Bridgework
10 per cent	scaffold materials
5 per cent	windows and doors.

The consumption of heavy structures at about 24,000 tons per annum justifies from a technical point of view three factories for the whole sub-region, and in accordance with the distribution of demand (Annex III) they should be located as follows: one of 10,000 tons per annum capacity in Lagos in addition to existing factories to supply Nigeria, Ghana and Ivory Coast; one of 10,000 tons per annum capacity in Freetown to supply Liberia, Sierra Leone and Guinea, and one of 5,000 tons per annum capacity in Dakar to supply Senegal, Mauritania, and Mali.

32. The demand for light structures is much greater and would be further increased up to 120,000 tons by including metal furniture, e.g., chairs and bedsteads, the consumption of which is comparable to that of windows and doors. As the economic size of the plant is about the same as for heavy structures, it is possible to consider a factory operating in most countries which, in fact, is the position at the present time, except that in the smaller markets, output is only maintained by producing a great variety of products more or less on a jobbing basis rather than on mass production lines. Such a diversification is necessary in the initial stages and a large proportion of metal products such as tanks window frames, bedsteads, commercial motor bodies, are made by the same processes of cutting, bending, drilling and welding as the construction engineer employs. In Mauritania, Gambia, Togo, Dahomey, Niger, Upper Volta and Mali, only such highly diversified plants can exist with a capacity of from 1,000 to 3,000 tons per annum, and the present smaller plants can expand to this level. In the larger markets, new factories of an economic size can be established for light structures and there are possibilities of specialization, e.g., in the case of Nigeria window and door frames (3,000 tons), metal furniture (3,000 tons), pylons, etc. (6,000 tons), together with factories on general light structures, i.e., roof trusses, etc., in each of the three centres, i.e., Lagos, Port Harcourt, Kano/Kaduna.

33. The consumption of metal containers (692) in 1980 at 48,000 tons is estimated to consist of:

- | | |
|-------------|--|
| 50 per cent | tanks and vats |
| 15 per cent | gas cylinders |
| 30 per cent | metal boxes and cans and pliable metal tubes |
| 5 per cent | drums for milk, petrol, paint, etc. |

Some of the tanks and vats are essentially structural products falling within the province of the construction engineer and can be made in every country. They are easy to produce and difficult to transport.

In the smaller countries these are included with light structures, but in the larger markets specialized plants are desirable, e.g., one of 5,000 tons per annum capacity in Nigeria. Other products from flat steel include boilers and gas cylinders bent and pressed. Two plants are proposed, one of 12,000 tons per annum capacity including 5,000 tons for gas cylinders, located in Ivory Coast (Abidjan) and supplying the sub-region except for Nigeria. The other of 8,000 tons per annum capacity, including 3,000 tons for gas cylinders, should be located in Nigeria to supply local requirements.

With regard to cans and metal boxes, there is, as stated above, a strong tendency because of transport costs to manufacture these where they are used for canning operations, e.g., for the export of meat, fish, vegetables and fruit, and such plants are normally established where the export market reaches about \$250,000 per annum. Present capacity will at least double by 1980; location depends on developments in agriculture but present indications are for new factories or extensions in all countries except Mauritania, Gambia, Togo and Dahomey.

34. The consumption of wire products (693) at about 47,000 tons per annum in 1980, is one of the largest metal product groups and is estimated to consist of:

50 per cent	wire rope and cables
20 per cent	wire gauze and netting
10-15 per cent	fencing wire.

To this should be added the consumption of drawn wire in the form of nails, etc. (see below) amounting to 20,000 tons. Two wire drawing works should be established; one drawing fine and high tensile wire for cables and rope with a capacity of from 20,000 to 30,000 tons per annum; and another drawing mild steel wire for fencing, etc., with a capacity of 40,000 tons per annum. Economics would be derived by locating these plants alongside the steel works manufacturing wire rod, e.g., as proposed in Liberia.

Two factories each with annual capacity of 10,000 - 15,000 tons are proposed for the manufacture of wire rope and cables: one in Nigeria and one in Liberia.

One factory is proposed for the manufacture of wire gauze and netting, with a capacity of 10,000 tons per annum, and located either in Ivory Coast or Sierra Leone. A factory already exists in Nigeria.

The manufacture of wire fencing for general purposes including building should be undertaken in one factory with a capacity of 5,000 to 7,000 tons per annum serving the whole sub-region, and can be met by expanding the existing factory in Nigeria.

35. The total consumption of nails, screws, bolts, etc., (the group 694), in 1980 will be between 55,000 and 60,000 tons per annum. The minimum scale of output is relatively low and each country could produce these articles, but having regard to the high level of automation of presses, it would be desirable for the various countries to agree to specialize on different size ranges and as far as possible to undertake production on a larger scale. The principal consumers are Nigeria with nearly 50 per cent of the total consumption of the sub-region, Liberia, Ivory Coast, Ghana, Sierra Leone and Senegal but a more detailed study of the market and present production is required before recommendations can be made on location, capacity and types, as well as extension of existing capacities for nails, for example in Nigeria, Senegal and Dahomey.

36. The estimated consumption of group 695 (tools for use in the hand and with machines), in 1980 is about 25,000 tons of which between 40 and 50 per cent will consist of hand tools used in agriculture and forestry, i.e., spades, forks, hoes, etc., and 50 - 60 per cent of other tools for use in the hand or with machines, i.e. hammers, pliers, pincers, spanners, metal cutting shears, etc. It will be assumed that about 80 per cent is produced in the sub-region and the rest, mainly tools for use with machines are imported.

The minimum economic capacity for such factories is about 600 tons per annum and the consumption would allow of factories with the following capacities:

Nigeria, 3,000 tons of agricultural hand tools per annum and 3,500 tons per annum capacity of other hand tools for local use and partly for export (Togo, Dahomey); Ghana 1,300 tons of agricultural hand tools and 2,000 tons of other tools for local use; Ivory Coast 1,300 tons of agricultural hand tools and 1,700 tons of other tools for own use; Sierra Leone 700 tons of agricultural tools and 900 tons of others for local use; Liberia 800 tons of agricultural tools and 1,200 of others for local use; Mali 800 tons of agricultural tools and 1,000 tons of other hand tools for local use and export (Senegal, Mauritania, Guinea, Gambia); Upper Volta or Niger 600 tons of agricultural tools and 800 tons of other tools for local use and export (Togo, Dahomey).

37. The demand for cutlery in 1980 is estimated at about 8,500 tons per annum, and the local industry should be able to cover between 40 to 50 per cent of consumption. Cast cutlery, pressed cutlery including knives with blades of stainless steel, table-spoons, forks, tea-spoons, razor blades and some kinds of scissors should be produced. The basic materials are aluminium silicone alloys and stainless steel, of which import of stainless steel will be required. Factories with annual capacity ranging from 20 to 400 tons (see Annex V) can be established in the various countries to meet domestic requirements.

38. The demand for household equipment in 1980 will amount to about 143,000 tons per annum, of which about 60 per cent will consist of domestic utensils like holloware and enamelware, 20 to 25 per cent of domestic stores, boilers, cookers, etc. (non-electric) and the remaining percentage in other household equipment.

The total demand of holloware, about 85,000 tons, will consist of aluminium holloware amounting to about 8,000 tons and enamelware of about 75,000 tons. Almost the whole consumption of aluminium

holloware in the sub-region could be covered by domestic production in existing or new factories in Ivory Coast, Guinea, Ghana and Nigeria. As for enamelware, the local industry should be able to cover about 80 per cent of consumption and factories with a capacity of between 2,000 and 6,000 tons per annum can be located or existing capacity expanded in Ivory Coast, Senegal, Sierra Leone, Liberia, Ghana and Nigeria.

The demand for stoves, boilers, cookers, etc., will be in the range of about 30,000 to 35,000 tons per annum and will consist partly of simple stoves burning wood and coal (about 10,000 to 15,000 tons) and partly of domestic gas appliances, like kitchen and cooking ranges, boilers, water heaters, oil stoves, etc. (about 15,000 to 20,000 tons).

By supplying the market with about 60 per cent of demand by domestic production, there will be room for four to five factories for the manufacture of stoves each with an annual capacity ranging from 1 to 3 thousand tons, and three factories for domestic gas appliances, each with annual capacity from 3 to 6 thousand tons. The main markets for these goods will be Nigeria, Ghana, Ivory Coast, Sierra Leone, and Senegal, in order of importance, and the factories could be located in these countries.

39. Group 698, consisting of miscellaneous manufacture of metal, is a large one with an estimated consumption of about 90,000 tons in 1980. About 50 per cent of the total consumption is taken up by different articles of iron and steel not elsewhere specified and most of them will be imported because of their speciality. Apart from this group of products, important categories are locksmith's wares, locks, padlocks and keys, hinges and catches, accounting for between 20 - 25 per cent of consumption, i.e., about 20,000 tons per annum, iron and steel chains for about 5 per cent or 4,500 tons, springs and leaves for springs for about 6 per cent or 5,400 tons, stoppers, crown corks, bottle caps, beads and spangles, soldering and welding rods, name and sign plates, etc., for about 6 - 8 per cent or 5,000 to 7,000 tons,

pins and needles and metal fittings of a kind commonly used for articles of apparel, travel goods, etc. for about 2 per cent or 1,800 tons, and safes and strong boxes for about 2,700 tons. Most of the articles are of high value (the average is about US\$ 1,500 per ton), requiring a small quantity of raw materials (mostly in form of rolled or drawn steel), small transport expenditures, and can be produced on small pressing lines. Due to these facts, location of the new establishments is advantageous for the countries in the interior where the construction of engineering industries demanding large quantities of materials is not possible or reasonable.

40. The next three divisions concern the manufacture of machinery, both non-electrical and electrical and transport equipment and give rise to factories in which a variety of components are manufactured and then assembled into complete machines or vehicles. At present, most of this work in African countries is assembly work based on imported components. For the 1980 projections given below, it is assumed, however, that the factories envisaged will be manufacturing most of their requirements, although they may begin with substantial imports of components. In many cases, the size of the market is sufficient for only one factory, but as the market increases there will be a possibility of either two factories, or of manufacturing components in specialized factories at a number of places in the sub-region. In any event, some more general components or accessories, e.g., starters and dynamos for internal combustion engines, electric accessories and accumulators for motor cars, disc wheels, etc., can be specialized in this way from the beginning. As many of these plants produce high value products, they can be located virtually anywhere.

A further point in connexion with the manufacture of machinery and transport equipment is the desirability of accepting some limitation on variety at an early stage so that the market for new equipment can be reduced to a manageable number of types and the production of replacement parts facilitated.

41. The first group in the machinery division is the manufacture of power generating machinery (711) for which the demand in 1980 will amount to 60,000 tons. Of this, 60 per cent will consist of internal combustion engines and 20 to 25 per cent of steam generating boilers.

If it is assumed that about half the requirements for internal combustion engines can be met by local production, say up to units of 50 h.p., then there is room for two factories each with an output of about 10,000 tons per annum or 15,000 to 20,000 engines. The main markets for these engines will be Nigeria, Sierra Leone and Ghana, in order of importance, and the factories might be located in Nigeria and Sierra Leone, or alternatively four smaller factories producing from 8,000 to 10,000 units per annum could be located in Nigeria, Ghana, Sierra Leone and Senegal.

Steam generating boilers should be produced in a sub-regional plant of 10,000 to 15,000 tons annual capacity. Because it is a big consumer of material in the form of pipes, plates, shapes, sections and cast iron, the factory should preferably be attached to the steel works in Liberia.

42. The consumption of the next group, agricultural machinery, etc., (712) is estimated at about 110,000 tons in 1980. Important categories are agricultural tractors and accessories accounting for between 50 and 60 per cent of consumption, i.e., 55,000 tons per annum, and agricultural machinery, and appliances for preparing and cultivating the soil, for harvesting, etc., accounting for 20 per cent, or about 20,000 tons per annum. The total consumption of tractors is estimated at between 30,000 and 40,000 units and between 27,000 and 32,000 of up to about 50 h.p. should be produced and the remainder imported. In this case a sub-regional market is necessary and Nigeria and Ghana probably offer the cheapest location for new plants.

It would be desirable to have close co-operation and co-ordination between the producers of types and accessories for locally produced tractors. Perhaps the production of smaller units, say, up to 25 h.p.

in Ghana with about 12,000 - 15,000 tractors per annum and production of units about 25 h.p. in Nigeria with about 15,000 - 17,000 tractors per annum would give a good result.

Of the market for agricultural machinery, about 6,000 to 8,000 tons per annum (about 6 to 7 per cent of the total consumption of the group 712), will consist of ploughs, both for use with tractors and with animals. The present capacities in Senegal and Niger accounting for about 600 to 700 tons will be sufficient to supply the domestic demand of these countries and the demands of Mauritania, Mali and Upper Volta. Important markets are Nigeria with a demand of about 3,500 to 4,000 tons per annum, and Ghana and Liberia, each with about 1,000 tons. One new plant in Nigeria with a capacity of 3,000 to 4,000 tons for local use, and two factories, each with a capacity of 1,500 to 2,000 tons per annum, in Ghana and Liberia are proposed.

The remaining agricultural machinery, i.e., harvesting, sowing, threshing, etc., equipment should be manufactured in two plants, each with a capacity of from 5,000 to 6,000 tons, located in Nigeria and Liberia.

43. In the office machinery category 714, with a total demand of about 5,800 tons in 1980, the main products required are typewriters with about 35 per cent of the total demand or 200,000 - 250,000 pieces, office machines mainly duplicating machines with 35 per cent or 40,000 - 60,000 pieces and calculating and accounting machines with about 20 per cent or 150,000 - 200,000 pieces. Between 60 to 70 per cent of the total demand should be produced in the sub-region. Three specialized sub-regional factories for the main groups mentioned are proposed with a location in the interior as follows:

A factory manufacturing typewriters with a capacity of 120,000 to 150,000 pieces located in Upper Volta, a factory manufacturing calculating machines with a capacity of 100,000 - 140,000 pieces in Mali and a factory manufacturing office duplicating machines with a capacity of 30,000 to 40,000 pieces in Niger.

44. In the metal working machinery group (715), demand by 1980 should reach between 11,000 and 12,000 tons and about half, say, 5,000 to 6,000 tons, will consist of a number of relatively simple machines which should be produced in specialized factories each catering for the whole sub-region. These factories would employ from 20 to 300 people (see Annex V) according to capacity and product and should be located as follows:

- (1) Vertical bench and hand drilling machines with an annual capacity of 1,500 tons or about 40,000 - 60,000 pieces in Senegal.
- (2) Hand-operated machines for sheet working, i.e., bending, rounding and flanging machines, shears and metal cutting saws with an annual capacity of 2,500 tons in Nigeria.
- (3) A special factory for the manufacture of simple lathes and shaping machines for repair shops with a capacity of about 2,000 tons in Ghana.
- (4) For the manufacture of tool grinding machines, five factories each of capacity 200 tons per annum may be constructed in Dahomey, Togo, Gambia, Guinea and Mali.

45. Total consumption of the textile and leather machinery group (717) will amount to 20,000 tons by 1980, of which from 12,000 to 15,000 tons will be textile machinery.

Owing to the necessity of using different kinds and sizes of highly specialized machines with very high level of automation, the local production of textile machines in the sub-region for the period until 1980 is not recommended.

The demand for sewing machines of all kinds will amount to about 15 to 20 per cent of the total consumption, i.e. about 3,000 to 4,000 tons of which about 100,000 units will be represented by domestic sewing machines. These should be manufactured in two factories employing about 500 people, one in Ghana and the other in Senegal.

46. The group machinery for special industries (718) is a group with a demand expected to exceed 120,000 tons per annum in 1980. It includes more specialized items such as paper making machinery, glass working machinery and printing machinery, but it also includes machinery generally required in the sub-region for milling and food processing, mineral crushing, road making, etc. The distribution of machines required is estimated at:

20 per cent	food processing
60 per cent	excavators for mining and road making
5 to 10 per cent	mineral crushing and sorting

About half of the total demand for food processing machines should be produced locally and three new factories are suggested:

For milling, grinding and sifting machines with a capacity of about 5,000 tons located in Liberia;

For manufacture of industrial washing machines and peeling machines for fruit and vegetables with a capacity of about 2,000 tons per annum located in Guinea; for cutting, mincing and mixing machines for food and sawing machines for butchery with a capacity of about 4,000 tons, located in Ghana or Nigeria.

As for the excavators, the specialized types for the mining industries in the sub-region will have to be imported for the foreseeable future, but it should be possible to produce locally smaller sizes and types of excavators for clay, sand and different kinds for construction works. Three or four new factories are proposed, each with an annual capacity of 5,000 to 6,000 tons and located in Nigeria, Ghana, Sierra Leone and Senegal.

A sub-regional plant for the manufacture of stone and mineral crushing and sorting equipment with a capacity of 6,000 to 10,000 tons should be located in Liberia.

47. The market for machinery and appliances (719) is the largest machinery group with a demand expected to exceed 200,000 tons per annum in 1980 manufactures and will include the following main types of machines:

10 - 15 per cent	Pumps and centrifuges
5 per cent	Valves and similar appliances
20 per cent	Lifting and loading machinery
10 per cent	Weighing machines

It will be possible to construct plants for each of these types and to cover about a half of the total demand. For the manufacture of valves, cocks, etc., (from bronze and other copper alloys) a sub-regional plant is proposed with a capacity of 3,000 to 5,000 tons per annum and located in Mauritania. For light pumps and centrifuges two or three plants with 2,000 to 3,000 tons capacity and for medium pumps two or three of 3,000 - 4,000 tons. Two or three plants of 3,000 to 4,000 tons annual capacity would meet requirements for weighing machines, two of 4,000 to 5,000 tons could provide winches and hoisting equipment and four or six of 1,500 to 2,000 tons could produce belt and lath conveyors. These plants would be located in the principal consuming countries, i.e., Nigeria, Ghana, Ivory Coast, Liberia, Senegal, Sierra Leone.

48. The second division of engineering goods consumption consists of electrical machinery, apparatus and appliances. The demand for electric power machinery and switchgear (722) will amount to 32,000 tons by 1980 and 70 to 75 per cent will consist of generators, motors and transformers and the rest of switchgears, resistors, relays, etc. It is assumed that about half the requirement of this power machinery and apparatus can be met by local production, say up to units of 200 kW in electro-motors, up to 25 kVA in transformers and up to 3,000 A in switchgears.

There is then room for factories as follows:

- (1) Five factories producing electro-motors up to 5 kW, each with a capacity of about 300 tons per annum, located in Dahomey, Togo, Mali, Upper Volta and Niger.

- (2) Two factories for electro-motors from 5 to 10 kW, each with an annual capacity of 1,500 tons, located in Ghana and Senegal.
- (3) One factory manufacturing electro-motors and generators above 10 W with an annual capacity of about 3,000 tons, located in Nigeria.
- (4) Two factories producing transformers up to 5 kVA each with a capacity of about 500 tons per annum, located in Ivory Coast and Sierra Leone.
- (5) Two factories producing regulating transformers up to 25 kVA each with a capacity of about 500 to 700 tons, located in Liberia or Ghana and Guinea.
- (6) One sub-regional factory manufacturing switchgears up to 3,000 A, with an annual capacity of about 2,000 tons, located in Liberia.
- (7) Five factories for switches and electrical accessories such as sockets, socket plugs, etc., each with a capacity of 20 tons per annum, located in Nigeria, Ghana, Sierra Leone, Senegal and Ivory Coast.

49. The demand for equipment for distributing electricity - Group 723, is estimated at about 44,000 tons in 1980. Almost 80 per cent of the total consumption will consist of insulated wire and cable. About 8,000 to 10,000 tons of copper wire and cable up to 20 mm in diameter could be produced in a sub-regional plant located in Mauritania and the whole demand of about 10,000 tons of aluminium wire and cable could be covered by production of two factories, each with a capacity of about 5,000 tons, located in Guinea and Ghana.

50. Consumption in the next group of domestic electrical equipment (725) is estimated at about 16,000 to 17,000 tons in 1980. Important categories are domestic refrigerators and air conditioners accounting for between 3,200 to 3,400 tons, i.e., 20,000 to 25,000 units, domestic washing machines of about 1,500 tons, or 18,000 - 20,000 units, electro-mechanical domestic appliances (coffee mills, fans, mixers, polishers, etc.)

of about 3,200 tons of which about 1,700 tons will consist of domestic fans; about 3,200 tons will be taken up by electrical spare heating equipment, such as water boilers, cooking apparatus, electrical ovens and stoves, etc.

The following specialized factories are proposed in the sub-region:

- (1) One plant manufacturing air-conditioners and refrigerators with an annual capacity of 8,000 - 10,000 units (1,000 - 1,500 tons) in Ivory Coast.
- (2) One plant with an annual capacity of 10,000 - 15,000 pieces (1,000 - 1,200 tons) of domestic washing machines, located in Ghana;
- (3) One plant producing different kinds of electro-mechanical domestic appliances with a capacity of 1,000 to 1,500 tons in Nigeria;
- (4) Ten establishments manufacturing fans, each with a capacity of about 10,000 units (100 tons), located in Dahomey, Togo, Mali, Upper Volta, Niger, Senegal, Ivory Coast, Ghana, Liberia and Guinea.
- (5) For electric space heaters, boilers, electric stoves, etc., one factory with an annual capacity of about 25,000 heaters (1,500 - 2,000 tons), located in Nigeria.

51. Group 729 is the largest in the division of electrical machinery, apparatus and appliances with a total demand of about 72,000 to 73,000 tons in 1980. The major products are batteries and accumulators, for which the market will exceed 50,000 tons per annum. Total consumption of electric accumulators (lead acid batteries) of all kinds will amount to between 600,000 and 700,000 units or about 10,000 tons. It is suggested that present capacity in accumulators in Ghana, Senegal and Nigeria (of about 130,000 units) could be expanded and new factories and assemblies erected, to achieve a total domestic

production of about 500 to 600 thousand accumulators. In one of the new factories, which might be located in Ghana as a main consumer, an injection press for production of battery cases from polyvinyl or polystyrene should be installed to cover the whole sub-regional demand.

The demand for primary torchlight batteries in the sub-region will amount to about 35,000 - 40,000 tons or about 400 to 450 million units in 1980. The main consumer will be Ghana with about 110 - 120 million units, Nigeria with 100 - 110 million, Ivory Coast 48 - 50 million, Liberia 40 - 45 million and Senegal 25 - 27 million. The minimum economic capacity of a semi-automated plant is 12 to 16 million units and new factories with an annual capacity of 20 or more million units should be located in the above mentioned countries, to cover at least 50 per cent of the total demand.

The consumption of automotive electrical equipment, i.e. starting and ignition equipment for internal combustion engines, lighting equipment for vehicles, etc., will be about 3,500 to 4,000 tons per annum. For internal combustion engines, which are expected to be produced in the sub-region, the demand of starter motors will amount to between 30,000 and 40,000 units and for tractors another 30 to 35 thousand units.

The demand for dynamos for internal combustion engines will exceed 60,000 units.

The principal consumers will be the countries producing internal combustion engines, tractors, and automobiles but a more detailed study of the market and co-ordination is required before recommendations can be made on location, capacity and types.

52. The third division of engineering goods consists of transport equipment. The demand for railway rolling stock (731) will amount to between 65 and 70 thousand tons by 1980, and about half of this will consist of freight cars. It would be economical to meet this demand by expanding facilities for production in present railway repairing

shops for example in Mauritania, Dahomey and Senegal and by constructing two new factories, each with a capacity of 1,000 cars per annum of 15 tons average weight. These factories should be located in Nigeria and Liberia. They could be supplied with plates and sections either imported or from the proposed steel works and with wheels and axles from a factory of 8,000 - 10,000 tons annual capacity which would also supply replacements. The factory would be attached to the steel works in Liberia.

53. Group 733 with an annual consumption by 1980 of about 40 to 45 thousand tons consists mainly of bicycles - about 40 per cent, and trailers - about 45 - 50 per cent.

The tonnage for bicycles is equivalent to an annual demand of from 1 to $1\frac{1}{2}$ million units and since it is economical to produce on a scale of from 15 to 20 thousand units per annum, a number of factories can be established and in fact one could be established if necessary in each country.

With regard to trailers, the whole quantity of trailers for agricultural use could be produced in the sub-region and five factories are proposed, each producing some 15,000 - 20,000 units per annum and located in Nigeria, Ivory Coast, Ghana, Upper Volta and Senegal.

VII. CONCLUSIONS AND SUMMARY

54. The total market for engineering products, including iron and steel for construction, is expected to increase from the present level of 935,000 tons to 3,387,000 in 1980, a per capita increase of from 10.1 kg. to 22.1 kg. Within this total the consumption of steel for construction will rise from 495,000 to 1640,000 tons i.e. 3.2 times while that for manufactured goods will rise from 440,000 to 1783,000 i.e. 4.1 times, and at constant prices in value from US\$519 million to \$2,200 million.

55. The domestic engineering industry has at present an annual output of 207 thousand tons supplying therefore about 47 per cent of the market. About one-third of the persons employed in the industry are in small factories employing less than 10 persons and engaged in repair work and work involving the use of high value material so that in terms of value the local industry supplies about 60 per cent of the market for engineering goods, i.e. US \$315 million out of \$519 million. The new factories proposed are larger and more efficient than the existing factories and will be engaged entirely on manufacturing operations. Productivity as measured in terms of value added per head at new factories at \$3,690 will be $2\frac{1}{2}$ times as great as at existing factories (\$1,430). Measured by the weight of steel used per head it will be much higher still at 7.4 kg. as compared with 2.6 kg. at existing factories, but the gross value of output per head in the new factories will only be about \$7,000 as compared with \$4,000 in existing factories because of the high valued components used in the latter. The share of the market estimated to be supplied in 1980 by the new factories and the existing factories is estimated at about 57 per cent, i.e. 994,000 tons out of 1,783 thousand. There will also be some increase in the output of small factories - perhaps a three-fold increase as compared with a six-fold increase of large factories - so that in total the local industry may supply about two-thirds of the market.

56. By types the domestic industry is expected to supply 82 per cent of the market for structures and at least two-thirds of the market for each product in this range. In the mechanical engineering sector it is considered that the domestic industry will make no contribution to the demand for certain groups, e.g. machines for special industries amounting to about

one-third of total demand. In other groups the local industry will supply on the average about half of the market - a much higher proportion in agricultural machinery and a much lower proportion in excavating machinery. In total the domestic industry will supply 34.5 per cent of the market. In the electrical engineering sector radio receivers, etc., have been excluded from this survey so that the share of the market supplied by local industry will be somewhat higher than the 33.7 per cent covered by the factories proposed in this paper. Otherwise the position will be very similar to that of mechanical engineering, namely, that the industry will supply about half the products within a range covering two-thirds of total demand. In the case of transport equipment the whole of the road vehicles sector accounting about 80 per cent of the demand is dealt with in another document. Within the range covered in this paper the domestic industry will supply three-quarters of the demand.

57. The contribution (value added) of the engineering industry to the gross domestic product of the sub-region is expected to rise from 1.3 per cent at present to 2.3 per cent in 1980, and the number of persons employed from 78,000 to 186,000 or from 0.09 per cent of the total population to 0.73 per cent. Fixed capital required will amount to \$328 million and working capital at \$118 million giving a capital output ratio of 1.13.

58. Details of the proposed new factories are given in Annexes V and X. Annexes V to IX give for each S.I.T.C. product and for each country the annual output, the gross output and value added, the employment and the fixed investment required for each factory proposed and a comparison with the present position. Annex X summarizes this for all factories and products. A number of factories, accounting for about 10 per cent of total investment and employment have not been allocated to four member countries. The corresponding capacity is listed as non-located. This is for two reasons. First that in some cases, e.g., screws further investigation is needed to allocate production by types. Secondly in other cases plants already exist in a number of countries and there is a choice between allocating the new capacity in a form of new factories or as an extension to existing factories.

59. The total production of the mechanical engineering factories proposed above would amount to 700,000 to 800,000 tons per annum, or about 50 - 60 per cent of the total consumption of mechanical engineering goods. Consumption of iron castings for this production would be about 120,000 tons per annum, of steel castings about 40,000 tons and of forgings and pressings (other than motor car bodies) 80,000 to 90,000 tons. About 80 per cent of these castings and forgings will be produced in the engineering factories themselves, and some 20 per cent will come from specialized foundries. In addition, foundries will be required for the electrical machinery industry and for certain building components and household equipment, e.g., manhole covers, siphons, cisterns, baths, pots, stoves and laundry irons, and for general repair work.

Every country should have at least one foundry, using local scrap and operating initially as part of the general engineering shop engaged primarily on repair work. A general foundry of this kind is required in Nigeria and existing facilities in Ghana, Senegal and Ivory Coast could be improved.

PRESENT CONSUMPTION OF ENGINEERING PRODUCTS IN WEST AFRICAN COUNTRIES

Q = Quantity in metric tons
Volume en tonnes

V = Value in US \$1,000
Valeur en millions de dollars des Etats-Unis.

ANNEX 1 (2)

PRESENT CONSUMPTION OF ENGINEERING PRODUCTS IN WEST AFRICAN COUNTRIES
CONSOMMATION ACTUELLE DE PRODUITS DES INDUSTRIES MECANQUES ET ELECTRIQUES DANS LES PAYS OUEST AFRICAINE

	MAURITANIA MAURITANIE	SENEGAL SENEGAL	GAMBIA GAMBIE	GUINEA GUINEE	SIERRA LEONE SIERRA LEONE	LIBERIA LIBERIA	IVORY COAST COTE D'IVOIRE	GHANA GHANA	TOGO TOGO	DAHOMEY DAHOMEY											
Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
71	MACHINERY, OTHER THAN ELECTRIC MACHINES, A L'EXCEPTION DES MACHINES ELECTRIQUES	1,563	3,645	5,210	9,730	324	432	1,840	3,500	6,988	9,220	7,530	13,850	7,300	13,300	27,470	39,700	1,687	2,393	778	1,580
711	Power generating machines Machines génératrices	80	400	480	1,700	22	60	150	350	2,400	1,600	650	1,300	1,000	2,600	2,400	6,000	140	270	150	400
712	Agricultural machines and impl. Machines et appareils agricoles	100	170	1,300	1,200	58	100	160	200	460	600	2,600	3,000	1,500	2,700	3,000	3,500	150	180	85	100
714	Office machines Machines de bureau	1	10	60	600	2	15	7	70	30	250	50	300	50	400	130	600	7	70	20	160
715	Metalworking machinery Machines pour le travail des métaux	80	160	100	230	3	7	25	70	40	120	180	350	150	200	340	800	20	35	9	20
717	Textile and leather machines Machines pour l'ind. textile & préparation et le travail des cuirs et peaux	2	5	270	600	5	10	20	60	58	150	50	100	300	600	1,600	2,800	20	38	14	30
718	Machines for specialized industries Machines pour industries spécialisées	500	1,000	1,000	1,400	10	20	600	1,000	2,300	3,500	2,000	3,800	1,500	1,900	5,000	6,000	550	800	180	270
719	Machinery and appliances n.e.s. Machines et appareils, n.d.a.	800	1,900	2,000	4,000	224	220	878	1,750	1,700	3,000	2,000	5,000	2,800	4,900	15,000	20,000	800	1,000	320	600
72	ELECTRICAL MACHINES, APPLIANCES.... MACHINES ET APPAREILS ELECTRIQUES	395	1,105	3,164	5,400	156	438	920	1,800	3,193	6,229	2,551	5,912	4,255	7,440	13,535	18,660	626	1,518	491	910
722	Electric power machines and switchgear Machines électriques génératrices et appareil. pour la coupe ou la connexion des circuits élec.	200	600	430	1,000	8	12	200	300	750	1,700	400	1,000	750	1,600	2,000	4,500	150	400	70	170
723	Equipment for distributing electricity Equipeant pour la distribution d'électricité	120	200	870	800	26	25	250	300	650	620	600	500	1,000	1,000	4,000	3,000	140	350	150	190
724	Telecommunications appliances Appareils de télécommunications	10	140	160	1,300	22	200	100	700	300	2,000	200	2,000	200	1,500	480	3,800	25	160	23	150
725	Domestic electrical equipment Appareils électriques à usage domestique	15	30	300	550	-	-	30	50	90	400	150	300	300	600	500	1,120	20	400	45	90
726	Electrical appliances for medical purposes.. Appareils électriques médicaux et de radiologie	5	5	4	50	1	1	-	3	9	1	1	12	5	40	55	240	1	8	3	10
729	Other electrical machines and apparatus Autres machines et appareils électriques	50	130	1,400	1,700	100	200	340	450	1,400	1,500	1,200	2,100	2,000	2,700	6,500	6,000	290	500	200	300
73	TRANSPORT EQUIPMENT MATERIEL DE TRANSPORT	2,446	2,760	6,223	9,766	500	535	4,140	5,000	6,110	8,050	10,060	11,290	13,610	19,300	20,800	32,300	2,330	2,660	2,080	3,060
731	Railway vehicles Matériel roulant pour chemins de fer	1,600	1,000	400	750	-	-	400	400	1,100	1,000	1,000	1,500	1,500	1,500	3,500	3,000	300	270	280	250
732	Road motor vehicles Véhicules automobiles routiers	800	1,700	5,000	8,000	440	480	3,000	4,000	4,000	6,000	8,000	9,000	10,000	15,000	15,000	24,000	1,400	1,800	1,500	2,500
733	Road vehicles other than motor vehicles Véhicules routiers autres que les veh. autom.	25	30	600	650	30	40	500	500	200	250	500	500	1,500	2,200	1,400	1,500	280	380	180	250
734	Aircraft Aéronefs	1	10	3	30	-	-	-	-	10	200	10	240	10	100	150	3,000	-	-	-	-
735	Ships and boats Navires et bateaux	20	20	220	336	30	15	240	100	800	600	50	50	600	500	750	800	350	210	120	60
	69 + 71 + 72 + 73	5,419	8,287	22,247	30,166	1,491	1,691	10,390	12,300	26,321	28,709	31,671	36,402	43,065	50,510	86,805	108,910	6,341	7,440	5,402	6,775
	TOTAL	8,217	8,872	56,643	35,999	2,771	1,974	23,000	14,450	48,029	32,252	48,971	40,872	73,816	56,550	195,825	129,120	12,311	8,616	13,185	8,513
	Population in thousands 1960-1965 Population en milliers d'habitants de 1960-1965	721		3,319		308	3,309	2,607		1,022		7,341		3,662				1,560		2,180	
	Kg/capita (US \$/capita) Kg par habitant (\$ EU par habitant)	11,4	12,3	17,1	10,8	9,0	6,4	7,0	4,4	18,4	12,4	48,0	40,3	20,2	15,4	26,7	17,6	7,9	5,5	6,0	3,9
	GNP/capita (US \$ 1963) PIB par habitant (\$ EU 1963)	137		179		72	71	80	80	210	210	190				203		80		74	

[illegible]

DEMAND PROTECTION OF ENGINEERING GOODS (IN METRIC TONS AND PERCENTAGES OF TOTAL DEMAND)

PROTECTION DE LA DEMANDE DE PRODUITS DES INDUSTRIES MECANQUES ET ELECTRIQUES (EN TONNES ET EN % DE LA DEMANDE GLOBALE)

	MAURITANIA MAURITANIE						SENEGAL SENEGAL			GAMBIA GAMBIE			GUINEA GUINEE			SIERRA LEONE SIERRA LEONE			LIBERIA LIBERIA			IVORY COAST COTE D'IVOIRE					
	Present (1963)	1970	1980	Present (1963)	1970	1980	Present (1963)	1970	1980	Present (1963)	1970	1980	Present (1963)	1970	1980	Present (1963)	1970	1980	Present (1963)	1970	1980	Present (1963)	1970	1980	Present (1963)	1970	1980
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21						
67 IRON AND STEEL FER ET ACIER	2,770	4,529	10,181	33,852	51,147	92,674	1,269	2,065	4,151	12,420	18,818	34,632	20,908	37,956	88,082	14,300	28,070	70,933	30,280	54,174	125,147						
% OF TOTAL SEC % DE LA CONSOMMATION TOTALE	33,7	32,0	31,0	60,0	55,0	48,0	45,8	45,0	43,0	54,0	50,0	45,0	43,5	43,0	42,0	29,2	29,0	28,0	41,0	41,0	40,0						
68 NON-FERROUS METALS METALLS NON FERREUX	28	141	394	544	930	2,703	11	46	96	230	565	1,539	800	1,764	5,033	3,300	5,807	15,200	471	1,321	5,319						
%	0,3	1,0	1,2	0,9	1,0	1,4	0,4	1,0	1,0	1,0	1,5	2,0	1,7	2,0	2,4	5,2	6,0	6,0	0,7	1,0	1,7						
69 MANUFACTURES OF METAL PRODUITS MANUFACTURES EN METAL	1,015	1,840	4,598	7,650	13,949	32,882	511	826	1,738	3,450	5,834	12,313	10,030	18,922	44,041	11,530	22,746	60,293	17,900	31,712	71,960						
%	12,4	13,0	14,0	13,6	15,0	17,0	18,4	18,0	18,0	15,0	15,5	16,0	20,9	21,0	21,0	23,5	23,5	23,8	24,2	24,0	23,0						
71 MACHINERY, OTHER THAN ELECTRICAL MACHINES, A L'EXCEPTION DES MACHINES ELEC.	1,563	2,830	6,897	5,210	12,089	34,753	324	596	1,544	1,840	4,140	11,544	6,988	13,230	33,555	7,530	15,487	43,067	7,300	13,213	37,544						
%	19,0	20,0	21,0	9,2	13,0	18,0	11,7	13,0	16,0	8,0	11,0	15,0	14,6	15,0	16,0	15,4	15,0	17,0	9,9	10,0	12,0						
72 ELECTRICAL MACHINES, APPARATUS MACHINES ET APPAREILS ELECTRIQUES	395	679	1,576	3,164	5,208	10,812	156	257	541	920	1,505	3,078	3,193	5,821	13,841	2,551	5,033	13,173	4,255	7,664	18,146						
%	4,8	4,8	4,8	5,6	5,6	5,6	5,6	5,6	5,6	4,0	4,0	4,0	6,6	6,6	6,6	5,2	5,2	5,2	5,8	5,8	5,8						
73 TRANSPORT EQUIPMENT MATERIEL DE TRANSPORT	2,446	4,132	9,195	6,223	9,671	19,307	500	798	1,583	4,140	6,774	13,853	6,110	10,937	25,166	10,060	19,649	50,666	13,610	24,048	54,752						
%	29,8	29,2	28,0	10,7	10,4	10,0	18,1	17,4	16,4	18,0	18,0	18,0	12,7	12,4	12,0	23,5	20,3	20,0	18,4	18,2	17,5						
TOTAL SEC TOTAL DE LA CONSOMMATION DE PRODUITS DES INDUST. MECANIQUES ET ELECTRIQUES	8,247	14,152	32,841	56,643	92,995	193,071	2,771	4,983	9,653	23,000	37,636	76,959	48,029	88,200	209,718	48,971	96,792	253,332	73,816	132,132	312,860						
POPULATION	721	765	890	3,319	3,765	4,630	308	370	490	3,309	3,880	5,030	2,507	3,000	3,660	1,022	1,110	1,240	3,662	4,235	5,385						
RATES OF GROWTH : GDP/CAP T TAUX D'ACCROISSEMENT : PIB/HABITANT	-	4,7	-	-	3,5	-	-	3,1	-	-	3,0	-	-	4,5	-	-	5,8	-	-	4,2	-						
(COMP. & P.A.) POURCENTAGE COMP. PAR AN : PIB/HABITANT	-	7,2	-	-	5,4	-	-	4,8	-	-	4,6	-	-	6,9	-	-	8,9	-	-	6,5	-						
GDP/CAP PIB/HABITANT	157	241	382	195		337	71		110	70		112	79		162	218		585	216		455						
US \$ \$ EN																											
KG KG	11,4	18,5	36,9	17,1	24,7	41,7	9,0	12,4	19,7	7,0	9,7	15,3	18,4	29,4	57,3	48,0	87,2	204,3	20,2	31,2	58,1						
CONS. PROD. MEC. & ELEC./HABITANT EN KG																											

	GHANA Ghana			TOGO Togo			DAHOMEY Dahomey			NIGERIA Nigeria			NIGER Niger			UPPER VOLTA Haute Volta			MALI Mali		SUBREGION Sous-Region			
	1970	1980	(1963)	1970	1980	(1963)	1970	1980	(1963)	1970	1980	(1963)	1970	1980	(1963)	1970	1980	(1963)	1970	1980	(1963)	1970	1980	(1963)
(1963)	1970	1980	(1963)	1970	1980	(1963)	1970	1980	(1963)	1970	1980	(1963)	1970	1980	(1963)	1970	1980	(1963)	1970	1980	(1963)	1970	1980	(1963)
22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	
104.020	157.915	291.120	5.870	9.495	19.197	7.683	10.811	18.841	228.600	361.463	697.151	2.449	4.024	8.572	4.369	8.742	23.710	6.760	10.626	22.101	475.550	759.775	1.506.672	
53.1	51.0	48.0	47.7	47.0	45.0	58.3	54.0	48.0	54.1	51.0	47.0	37.6	37.0	36.0	43.2	43.0	42.0	52.3	50.0	43.0	50.8	48.2	44.5	
5.000	7.741	18.195	100	202	853	100	200	785	9,000	17,719	44,499	65	163	486	83	203	1,129	67	213	921	19,499	37,016	97,143	
2.5	2.5	3.0	0.8	1.0	2.0	0.7	1.0	2.0	2.1	2.5	3.0	1.0	1.5	2.0	0.8	1.0	2.0	0.6	1.0	2.0	2.1	2.3	2.9	
25.000	40.253	78.845	1.698	2.828	5.972	2.053	3.203	6.673	66,700	113,400	237,328	1.610	2.664	5.834	2.065	4.092	10,726	2.040	3.188	6,906	153,252	265,017	580,049	
12.8	13.0	13.0	13.8	14.0	14.0	15.6	16.0	17.0	15.8	16.0	16.0	24.7	24.5	24.0	20.4	20.0	19.0	15.8	15.0	15.0	16.4	16.8	17.1	
27.470	47.994	109.170	1.687	3.030	6.826	778	1.802	5.103	39,400	85,050	237,328	524	1,088	2,917	747	1,824	6,774	1,170	2,762	6,446	102,531	205,135	543,468	
14.0	15.5	18.0	13.7	15.0	16.0	5.9	9.0	13.0	9.3	12.0	16.0	8.0	10.0	12.0	7.4	9.0	12.0	9.0	13.0	14.0	11.0	13.0	16.0	
13.535	21.675	42.455	626	1,010	2,133	491	801	1,570	16,940	28,350	59,332	521	870	1,945	732	1,418	3,952	836	1,275	2,763	48,315	81,566	175,326	
6.9	7.0	7.0	5.1	5.0	5.0	3.7	4.0	4.0	4.0	4.0	4.0	8.0	8.0	8.0	7.2	7.0	7.0	6.5	6.0	5.0	5.2	5.2	5.2	
20.800	34.060	66.715	2,330	3,637	7,679	2,080	3,203	6,281	62,100	102,768	207,662	1,343	2,066	4,376	2,122	4,052	10,161	2,041	3,188	6,906	135,905	228,984	484,302	
10.7	11.0	11.0	18.9	18.0	18.0	15.8	16.0	16.0	14.7	14.5	14.0	20.7	19.0	18.0	21.0	20.0	18.0	15.8	15.0	15.0	14.5	14.5	14.3	
195.825	309.638	606.500	12,311	20,202	42.660	13,185	20,020	39,253	422,740	708,750	1483,300	6,512	10,875	24,310	10,118	20,261	56,452	12,914	21,252	46,043	935,052	1,577,493	3,386,960	
7.341	8.752	12.130	1,560	1,820	2,370	2,270	2,600	3,355	54,590	67,500	91,000	3,085	3,625	4,675	4,574	5,195	6,415	4,374	5,060	6,485	92,652	111,900	147,755	
-	2.5	-	-	3.3	-	-	2.8	-	-	2.9	-	-	3.6	-	-	-	5.5	-	-	3.5	-	3.1	-	
-	3.8	-	-	5.1	-	-	4.3	-	-	4.5	-	82	5.5	-	-	-	8.5	-	-	5.4	-	4.8	-	
200	-	287	85	-	140	69	-	103	71	110	110	152	45	152	45	45	103	70	-	101	-	-	-	
26.7	34.5	50.0	7.9	11.1	18.0	5.8	7.7	11.7	7.7	10.5	16.3	2.1	3.0	5.2	2.2	3.9	8.8	2.9	4.2	7.1	10.1	13.9	22.1	

ANNEX III

DEMAND PROJECTION OF ENGINEERING GOODS IN 1980

PROJECTION DE LA DEMANDE DE PRODUITS DES INDUSTRIES MECANQUES ET ELECTRIQUES EN 1980

	HAUT-VOLTA HAUTE-VOLTA	SENEGAL SENEGAL	GAMBIA GAMBIE	GUINEA GUINEE	SIERRA LEONE SIERRA LEONE	LIBERIA LIBERIA	IVORY COAST COTE D'IVOIRE	GHANA GHANA	TOGO TOGO	DROMET DROMET										
	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
67 IRON AND STEEL FER ET ACIER	10,181	1,720	92,674	16,000	4,151	710	34,632	5,900	88,082	15,800	70,933	12,000	125,147	21,500	291,120	50,000	19,197	3,300	18,841	3,200
68 NON FERROUS METALS METAUX NON FERREUX	394	230	2,703	1,720	96	60	1,539	980	3,033	3,200	15,200	9,800	5,319	3,400	18,195	11,600	853	550	785	500
69 MANUFACTURES OF METALS ARTICLES MANUFACTURES EN METAL	4,398	2,575	32,822	19,280	1,738	1,020	12,313	6,820	44,041	23,980	60,293	34,200	71,960	41,400	78,845	47,600	5,972	3,560	6,673	3,750
691 Finished structural parts and structures Eléments de construction finis et constructions	2,463	1,300	7,723	4,000	434	250	4,771	2,500	16,777	8,700	24,066	13,000	23,465	12,200	26,080	13,500	640	350	1,138	600
692 Metal containers for storage and transport Réceptacles métalliques pour le stockage & transport	328	150	3,475	1,600	50	30	1,000	450	2,097	980	3,040	1,400	9,386	4,400	3,638	1,700	640	300	589	280
693 Wire products and fencing grills Câbles en file et leurs produits et grillages	493	250	2,703	1,400	232	120	924	500	3,565	1,800	6,080	3,000	4,067	2,000	1,213	800	299	150	432	220
694 Nails, screws, nuts, bolts, rivets, Clous, boulons, écrous, rondelles, rivets, vis	591	190	2,703	870	280	90	1,539	500	4,404	1,400	7,853	2,600	7,882	2,600	5,459	1,800	1,152	380	1,021	350
695 Tools for use in hand or machines Outils à main et outils pour machines	158	260	965	1,250	70	90	385	500	2,097	2,600	3,293	4,200	3,734	4,900	4,246	5,500	512	650	275	350
696 Outlets Coutellerie	33	80	579	1,400	48	110	154	360	420	1,000	295	600	940	2,200	1,213	2,800	43	100	117	270
697 Household equipment of base metals Articles de ménage et d'équipement, en métaux communs	98	45	7,916	3,700	483	230	2,309	1,100	12,154	5,600	7,853	3,400	13,140	6,100	20,014	9,200	1,194	550	2,002	920
698 Manufactures of metal (locksmiths' wares) Articles manufacturés en métal (art. de serrurerie)	394	300	6,758	5,000	131	100	1,231	900	2,517	1,900	7,853	6,000	9,386	7,000	16,982	12,500	1,492	1,100	1,099	750
71 MACHINERY OTHER THAN ELECTRICAL MACHINES, A L'EXCEPTION DES MACHINES ELECT.	6,897	11,750	34,753	57,700	1,544	3,074	11,544	19,790	33,555	62,810	43,087	70,550	37,544	65,400	109,170	193,100	6,826	12,270	5,103	9,030
711 Power generating machines Machines génératrices	493	1,200	3,851	6,500	145	350	1,077	2,400	10,486	24,000	3,293	8,000	4,693	11,000	9,704	23,000	640	1,500	510	1,200
712 Agricultural machines and imp. Machines et appareils agricoles	591	150	5,020	6,500	241	320	3,001	4,000	1,886	2,500	13,933	18,000	7,195	9,500	15,162	20,000	853	1,200	1,099	1,500
714 Office machines Machines de bureau	33	180	386	2,100	19	100	154	850	210	1,200	253	1,400	313	1,600	1,213	6,500	85	470	78	450
715 Metalworking machinery Machines pour le travail des métaux	328	560	1,931	3,300	19	300	154	260	210	360	1,015	1,700	626	1,100	1,213	2,100	85	150	78	130
717 Textile and leather machines Mach. pour ind. textile et prépar. et travail des cuirs et peaux	33	60	1,351	2,300	19	34	385	680	420	750	293	450	1,251	2,200	4,852	8,500	85	150	196	

V = Value in US \$ 1,000.-
Valeur en milliers de dollars des Etats-Unis.

NIGERIA NIGERIA		NIGER NIGER		UPPER VOLTA HAUTE VOLTA		MALI MALI		SURINAM SOU-SURINAM		SHARE OF TOTAL INLAND (IN QUANTITY) IN % POURCENTAGE DE LA DEMANDE TOTALE (VOLUME)														
Q	T	Q	T	Q	T	Q	T	Q	T	NIGER NIGER	UPPER VOLTA HAUTE VOLTA	MALI MALI	BARBET BARBET	GUINEA GUINEA	NIGERIA NIGERIA	Togo Togo	GAMBIA GAMBIA	MAURITANIA MAURITANIA	SENEGAL SENEGAL	SIERRA LEONE	IVORY COAST COTE D'IVOIRE	GHANA GHANA	LIBERIA LIBERIA	SURINAM SOU-SURINAM
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
697,151	120,000	8,752	1,500	23,710	4,100	22,101	3,800	1,506,672	258,930	36,0	42,0	48,0	48,0	45,0	47,0	45,0	43,0	31,0	48,0	42,0	40,0	48,0	28,0	44,5
44,499	28,500	486	310	1,189	720	921	590	97,143	62,180	2,0	2,0	2,0	2,0	2,0	3,0	2,0	1,0	1,2	1,4	2,4	1,7	3,0	6,0	2,9
237,388	135,500	5,034	3,270	10,726	6,500	6,906	4,140	580,049	333,515	24,0	19,0	15,0	17,0	16,0	16,0	14,0	18,0	14,0	17,0	21,0	23,0	13,0	28,8	17,1
47,466	25,000	1,094	540	1,976	1,000	1,151	600	159,244	83,540	4,5	3,5	2,5	2,9	6,2	3,2	1,5	4,5	7,5	4,0	8,0	7,5	4,3	9,5	4,7
20,766	9,500	1,702	780	1,016	470	645	300	48,382	22,330	7,0	1,8	1,4	1,5	1,3	1,4	1,5	0,6	1,0	1,8	1,0	3,0	0,6	1,2	1,4
25,216	13,000	486	250	1,298	600	368	200	47,376	24,090	2,0	2,3	0,8	1,1	1,2	1,7	0,7	2,4	1,5	1,4	1,7	1,3	0,2	2,4	1,4
23,733	7,500	292	90	1,016	380	737	240	58,602	16,910	1,2	1,8	1,6	2,6	2,0	1,6	2,7	2,9	1,8	1,4	2,1	2,5	0,9	3,1	1,7
7,416	9,500	170	230	1,016	1,400	552	720	24,949	32,160	0,7	1,8	1,2	0,7	0,5	0,5	1,2	0,7	0,6	0,5	1,0	1,2	0,7	1,3	0,7
4,450	10,000	73	180	114	260	92	230	8,531	19,590	0,3	0,2	0,2	0,3	0,2	0,3	0,7	0,5	0,1	0,3	0,2	0,3	0,2	0,1	0,3
69,725	32,000	972	450	2,540	1,190	2,210	1,000	142,610	65,445	4,0	4,5	4,8	5,1	3,0	4,7	2,8	5,0	0,3	4,1	5,8	4,2	3,3	3,1	4,2
38,566	29,000	1,045	750	1,750	1,300	1,151	850	90,355	97,450	4,3	3,1	2,5	2,8	1,6	2,6	3,5	1,4	1,2	3,5	1,2	3,0	2,8	3,1	2,7
237,388	409,000	2,917	5,100	6,774	11,510	6,446	11,040	543,468	942,224	12,0	12,0	14,0	13,0	15,0	16,0	16,0	16,0	21,0	18,0	16,0	12,0	18,0	17,0	16,0
22,249	55,000	340	800	976	1,600	552	1,300	58,720	137,850	1,4	1,2	1,2	1,3	1,4	1,5	1,5	1,5	1,5	2,0	5,0	1,5	1,6	1,3	1,7
57,849	75,000	608	800	1,411	1,500	1,750	2,300	110,600	144,270	2,5	2,5	3,8	2,8	3,9	3,9	2,0	2,5	1,8	2,6	0,9	2,3	2,5	5,5	3,3
2,987	16,000	24	130	56	310	92	500	5,883	31,790	0,1	0,1	0,2	0,2	0,2	0,2	0,2	0,2	0,1	0,2	0,1	0,1	0,2	0,1	0,1
5,933	10,000	29	50																					

BASIC INFORMATION REGARDING MINIMUM ECONOMIC SIZES OF EUROPEAN PLANTS FOR VARIOUS BRANCHES OF INDUSTRY
INVESTMENT NEEDS, LABOUR FORCES, FLOOR AREA AND ENERGY CONSUMPTIONDONNÉES DE BASE SUR LES DIMENSIONS MINIMALES DE RENTABILITÉ DES USINES EUROPÉENNES DANS DIVERSES BRANCHES DE L'INDUSTRIE,
SUR LES INVESTISSEMENTS NÉCESSAIRES, LA MAIN D'ŒUVRE, LA SURFACE AU SOL ET LA CONSOMMATION D'ÉNERGIE

Product group Groupe de produits	Minimum Economic capacity Capacité minimale de rentabilité	Maximum weight of piece to be lifted Poids maximum des pièces à charger	Investment Investissement	Working hours Heures de travail	Output per annum Production par an	Total floor area per work- man Superficie totale par ouvrier	Production workers as percentage of total Ouvriers à la production pourcentage du total	Energy consumption per unit of production Energie consommée par unité de production
	1,000 t.p.a. milliers tonnes par an	kg	US\$/ton \$/tonne	% %	hrs/ton h/tonne	% %	tons per workman tonnes par ouvrier	kWh/ton kWh/tonne
	1	2	3	4	5	6	7	8
Cast iron pipes and fittings Tuyaux et accessoires de tuyauterie en fonte	4-9	500	90	38	40	70	47	1,8
Heavy structures Constructions lourdes	5-10	40,000	120	60	45	40	42	1,2
Light structures Constructions légères	5-10	10,000	70	50	35	40	40	3,6
Fuel and gas tanks Foudres pour combustibles et gaz	5-10	10,000	60	45	34	45	55	2,3
Metal containers Récipients métalliques	2-5	3,000	120	50	32	45	40	2,5
Boilers, pressure vessels, etc. Chaudières, récipients à pression, etc.	10-20	25,000	120	45	44	48	43	1,8
Metal hand tools and implements Outils et instruments métalliques à main	1-1,5	30	150	28	220	80	8,5	0,95
Ironmongery Articles de ferronnerie	1-2	18	115	30	130	80	14,5	1,6
Sanitary and plumbing fittings Appareils sanitaires et appareillage de plomberie	6-8	300	40	36	30	65	62	4,2
Internal combustion engines Moteurs à combustion interne	6-10	150	140	40	110	63	17	1,0
Agricultural machinery for preparing & cultivating the soil Mach. agricoles pour préparation et culture du sol	16-20	-	45	44	23	65	82	3,0
Agricultural machinery for harvesting, threshing, sorting Mach. agricoles pour la moisson, le battage et le triage	4-6	-	42	47	57	72	33	2,2
Machine tools for working metal Machines-outils pour le travail des métaux	0,7-1	210	290	33	188	90	10	0,8
Gas operating, welding and cutting appliances Machines et appareils à gaz pour le soudage et découpage	1,6-1,5	1,000	140	27	87	70	22	2,0
Pumps and centrifuges Pompes et centrifuges	2-3	2,000	180	31	150	56	13	1,0
Earth moving machinery Machines pour travaux de terrassement	2-3	7,500	110	46	80	51	32	1,0
Conveying machinery (light) Transporteurs et appareils similaires (légers)	4-6	500	58	35	47	60	40	2,2
Mining machinery Machines utilisées pour l'industrie de la mine	2-4	3,000	150	37	130	70	15	0,7
Woodworking machinery Machines pour le travail du bois	6-10	1,000	250	31	235	58	7,5	0,5
Sewing, household machinery Machines à coudre, machines à usage domestique	9-10	50	120	30	190	75	10	1,5
Refrigerating equipment Machines et appareils frigorifiques	20-25	110	80	45	95	52	20	1,7
Food preparation machinery Machines pour l'industrie alimentaire	3-5	1,500	160	39	135	52	14	0,7
Stone and glass machinery Machines pour le travail de la pierre et du verre	25-30	10,000	270	39	34	60	56	1,7
Machinery for plastics Machines pour le travail des matières plastiques	1-2	8,000	200	36	150	55	12	1,0
Robasting, annealing and drying furnaces Fours à réchauffer, à recuire et à sécher	3-5	7,000	85	36	90	51	21	2,0
Ball, roller and needle roller bearings Roulements de tous genres (à billes, à aiguilles)	0,2-0,3	-	410	29	3,500	80	0,5	0,05
Brick & ceramic working machinery Machines pour le travail de la brique et l'céramique	6-10	1,500	90	32	75	60	26	1,7
Ballances	20-25	175	80	40	110	53	70	1,3
Valves (industrial) Vannes à usage industriel	4-6	800	100	31	63	85	30	1,6
Motors, 0,1 to 10 kw Moteurs, 0,1 à 10 kW	1,5-2	80	230	31	370	55	5	1,0
Rotating machinery Machines rotatives	3-5	1,420	120	30	87	56	22	2,0
Switchgear & transformers Commutateurs et transformateurs	0,2-0,5	600	265	45	185	54	5	0,5
Industrial furnaces, electrical Fours électriques industriels	4-5	7,000	60	52	82	35	25	2,0
Apparatus for measuring Appareils électriques de mesure	0,7-0,9	50	240	42	700	56	2,7	0,5
Insulated cables Câbles isolés	20-25	-	90	26	22	90	87	1,7
Domestic refrigerators Réfrigérateurs à usage domestique	20-25	110	80	45	95	52	20	1,7
Domestic washing machines Machines à laver à usage domestique	20-25	100	80	45	90	50	20	1,6
Electro-mechanical domestic appliances Appareils électro-mécaniques à usage domestique	1,5-2	50	100	30	115	55	16	2,0
Railway and tram cars, whether mechanically propelled or not Voitures pour trains ferrés et tramways, mues ou non d'appareils moteurs	20-25	10,000	100	39	60	45	32	2,0

2/ Basis of size is competition in the international markets.
La dimension est calculée en fonction de la concurrence sur les marchés internationaux.

3/ Unit is 1,000 pieces.
L'unité est de 1.000 pièces.

ANNEX IV (2)

DATA RELATIVE TO ENGINEERING INDUSTRIES OTHER THAN ELECTROTECHNICAL WITH POSSIBILITIES FOR DEVELOPING COUNTRIES

BASED ON U.S.A. CONDITIONS IN 1959/1960 AND ONE SHIFT OPERATION

STATISTIQUES RELATIVES AUX INDUSTRIES MECANISTIQUES AUTRES QUE LES INDUSTRIES ELECTROTECHNIQUES AVEC POSSIBILITES OFFERTES AUX PAYS EN VOIE DE DEVELOPPEMENT

FONDEES SUR LES CONDITIONS AUX ETATS-UNIS EN 1959/1960 ET SUR LE SYSTEME D'UNE SEULE EQUIPE

Branch industry Branche d'activité	Annual Production Capacité de production annuelle	Capital Requirements (in US\$ '000)					Employment			Fixed invest- ment per empl. Total US\$ '000 US\$ '000 US\$ '000	Annual sales Ventes annuelles US\$ '000 US\$ '000 US\$ '000	Gross annual Profit Bénéfices annuels as % of Total En % de Total	Foreign Currency Devises étrangères			Value added Valeur ajoutée % of gross sales % des ventes par an	Capital output ratio Taux de rendement du capital		
		in US\$ '000					in US\$ '000						in US\$ '000						
		fixed capital Capital fixe	working capital Capital de roulement	total Total	Foreign currency Part de devises étrangères	local currency Part de devises locales	Direct labour Main- d'œuvre directe	Indirect labour Main- d'œuvre indirecte	Total Total				Annual savings par an	Residuals amortissement des amortissements	% of gross sales % des ventes par an				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Metal filling cabinet Casseurs métalliques	8,000 units 2,575,000 lbs 1,168,000 kg.	55	30	85	43	42	11	3	14	3,900	200	149	51	60	66	134	137	68	0,62
Flexible steel conduit Tuyaux en acier flexible	10,500 tonnes	310	72	382	284	98	14	20	34	9,100	697	434	263	69	188	908	530	76	0,72
Galvanized steel pipe Tuyaux en acier galvanisé	11 million feet of tubes 3,352,000 m. de tubes	493	254	747	635	112	22	25	49	10,000	1,900	1,528	372	50	1,226	674	732	39	1,02
Steel mechanical tubes Tubes mécaniques en acier	1,000 twenty foot long. 1,000 tuyaux d'une long. de 6 mètres	248	96	344	273	71	8	4	12	26,700	825	696	169	49	20	496	329	43	0,98
Welded pipes Tuyaux soudés	1,000 twenty foot long. 1,000 tuyaux d'une long. de 6 mètres	168	43	211	98	113	9	3	12	14,000	279	216	63	30	23	116	163	61	1,24
Centrifugal C.I. pipe Tuyaux en fonte centrifugée	320 tonnes	320	159	479	282	197	17	7	24	13,300	1,094	819	275	56	25	594	600	56	0,78
Gray iron jobbing foundry Fonderie de pièces en fonte grise	4 million lbs. 1,800,000 kg.	81	86	167	91	76	26	7	33	2,500	480	390	90	54	19	164	316	67	0,52
Brass foundry Fonderie de laiton	400,000 lbs. 180,000 kg.	32	60	92	50	42	16	6	22	1,500	320	297	63	68	19	145	175	56	0,52
Diecastin, parts and pans Séaux et casseroles	350,000 pièces 350,000 unités	73	45	118	76	42	14	6	20	3,700	250	210	40	34	16	76	174	71	0,66
Farm hand tools Outils agricoles	250,000 tools 250,000 unités	202	67	269	187	82	27	9	36	5,600	411	322	89	33	22	93	318	79	0,83
Hand tools Outils	500,000 hand tools 500,000 unités	108	54	162	89	73	27	5	32	3,400	350	293	97	60	28	80	270	76	0,61
Building hardware Serrurerie de bâtiment	301,750 doz. pièces 301,750 doz. pièces	147	115	262	162	100	33	10	43	3,400	440	380	60	23	14	140	300	68	0,87
Sanitary ware Articles sanitaires	44,250 pièces 44,250 pièces	201	120	321	185	136	46	8	54	3,700	922	722	200	62	22	217	705	45	0,77
Aluminum windows and doors Fenêtres et portes en aluminium	9,000 win. 2,250 doors 9,000 fen. 2,250 portes	22	34	56	18	38	8	3	11	2,000	250	185	65	117	26	119	131	53	0,42
Aluminum cooking utensils Ustensiles de cuisine en aluminium	150,000 pièces 150,000 unités	105	43	148	91	57	22	5	27	3,900	275	209	66	45	24	77	198	74	0,73
Enamelled plates, pots and kettles Assiettes, pots et marmites émaillés	600,000 pièces 600,000 unités	246	103	349	200	149	26	6	32	7,700	678	514	264	76	39	264	414	61	0,84
Automob. & truck leaf springs Bessorts à lames pr. auto & camions	18,000 for auto. 54,000 for tr. (vnm.)	352	164	516	347	169	35	10	45	7,800	1,314	1,019	295	57	23	625	689	51	0,76
Centrifugal pumps & valves Pompes & soupapes centrif.	820 pumps 1.5"-10"; 1,900 1/4"-16" 820 p. 3/8-10cm; 1,900 1/4-38mm.	618	120	738	576	162	33	5	38	16,300	667	510	157	21	24	219	448	70	1,59
Agricultural implements Machines agricoles	1,800 implements 1,800 machines	260	46	306	206	100	31	5	36	7,200	336	288	68	22	20	107	229	72	1,27
Ploughs Charrues	12,500 ploughs 12,500 charrues	92	50	142	66	76	23	6	29	3,200	350	278	72	51	21	83	267	67	0,61
Utility tractors 10 HP Tracteurs à toutes fins de 10 H.P.	10,000 tractors 10,000 tracteurs	234	232	466	238	228	38	8	46	5,100	1,450	1,252	198	42	14	977	473	31	1,05
Conveyors and portable elevators Transporteurs et élévateurs mobiles	4,750 conveyors 4,750 transp.	77	58	135	60	75	14	5	19	4,100	380	300	80	59	21	192	188	51	0,70
Job machine shop Ateliers de construction de machines	US\$190,000 worth EU\$190,000 (valeur)	105	30	135	93	42	12	4	16	6,600	190	152	48	36	25	50	140	67	1,05
Bicycle (assembly) Bicyclettes (montage)	12,000 bicycles 12,000 bicyclet.	40	78	118	77	41	19	4	23	1,700	444	346	98	83	22	253	191	43	0,61

2/ One shift operation except enamelling which is three shifts. Based on the Industry Fact Sheets published by the Department of State, Agency for International Development, U.S.A.
Système à équipe unique, sauf pour l'émaillage qui est à trois équipes. Tableaux fondés sur les Industry Fact Sheets publiés par le Department of State, Agency for International Development, U.S.A.

ANNEX IV (3)

DATA RELATIVE TO ELECTROTECHNICAL ENGINEERING INDUSTRIES WITH POSSIBILITIES FOR DEVELOPING COUNTRIES
BASED ON U.S.A. CONDITIONS IN 1959/1960 AND ONE SHIFT OPERATION

STATISTIQUES RELATIVES AUX INDUSTRIES ELECTROTECHNIQUES ET POSSIBILITES OFFERTES AUX PAYS EN VOIE DE DEVELOPPEMENT, SUR LA BASE DES CONDITIONS
PROPREES AUX ETATS-UNIS EN 1959/1960 ET DU SYSTEME A EQUIPE UNIQUE

Branch industry	Annual Production capacity	Capital Requirements (in US\$ '000)										Employment					Gross annual Profit					Foreign Currency					Value added									
		Fixed investment					Working capital					Total					Gross annual sales					As % of:					Annual					Annual				
		Fixed capital	Working capital	Fixed investment	Working capital	Total	Fixed capital	Working capital	Fixed investment	Working capital	Total	Fixed capital	Working capital	Fixed investment	Working capital	Total	Fixed capital	Working capital	Fixed investment	Working capital	Total	Fixed capital	Working capital	Fixed investment	Working capital	Total	Fixed capital	Working capital	Fixed investment	Working capital	Total	Fixed capital	Working capital	Fixed investment	Working capital	Total
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
Copper tubing	1,875 tons	238	312	550	460	90	15	13	28	8,500	2,810	2,000	810	148	29	1,600	1,210	1,230	44	0,45																
Copper wire drawing & insulating	120 tons	67	24	91	67	24	2	3	5	13,300	200	167	33	36	18	115	85	87	44	1,04																
Electroplating	Services worth US \$120,000	47	19	66	23	43	11	3	14	3,400	120	90	30	45	25	11	-	108	90	0,61																
Galvanisation	Services d'une valeur de 120,000 \$EU.																																			
Air conditioning & refrigerators	30,000 air condition, 3,000 refrigerat.	208	132	340	190	150	38	8	46	4,500	900	555	245	72	27	360	540	545	60	0,62																
Electric motors 1/6 to 10 H.P.	3,000 motors	87	60	147	73	74	23	11	34	2,600	410	325	85	58	21	144	266	264	64	0,56																
Electrodes for Neon lights	800,000 electrodes	14	11	25	10	15	3	1	4	3,500	80	54	26	104	35	24	56	57	71	0,44																
Electrodes for lamps in neon	800,000 electrodes																																			
Electric spools basters	25,000 basters	50	20	70	38	32	8	2	10	5,000	135	108	27	39	20	50	85	89	66	0,79																
Radiateurs electriques	25,000 radiateurs																																			
Fans, domestic, 12"electromechanical	10,000 units	41	32	73	26	47	9	4	13	3,200	200	158	42	59	21	75	125	124	62	0,59																
Ventilateurs electr. mech. a usage domest., de 30cm de diametre	10,000 units																																			
Electric bulb assembly plant	11,000,000 units	150	130	280	120	160	33	15	48	3,100	880	640	240	86	26	284	596	550	63	0,51																
Assemblage d'ampoules electriques	11 millions d'unités																																			
Specular reflectors	75,000 units 12" diam.	85	65	150	70	80	16	4	20	4,300	450	335	115	76	26	145	305	310	69	0,48																
Reflecteurs	75,000 u. 30cm de diam.																																			
Radios (assembly)	25,000 units	40	100	140	75	65	31	3	34	1,200	670	570	100	72	15	375	295	260	39	0,54																
Radios (montage)	25,000 unités																																			
Automobile batteries	24,000 units	54	38	92	50	42	10	3	13	4,200	264	222	42	46	16	150	114	109	41	0,84																
Accumulateurs pour automobiles	24,000 unités																																			
Motor starters	4,200 starters	38	33	71	35	36	12	7	19	2,000	210	170	40	56	19	65	145	145	69	0,49																
Demarreurs	4,200 démarreurs																																			

Based on the Industry Fact Sheets published by the Department of State Agency for International Development, U.S.A.
Tableau fondé sur les Industry Fact Sheets publiés par le Department of State Agency for International Development, Etats-Unis

ANNEX V (2)

PROPOSED NEW FACTORIES - PRODUCTION IN METRIC TONS
NOUVELLES ENTREPRISES POUR LA CONSTRUCTION DES USINES - PRODUCTION EN TONNES

STC Description CNI Produits	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
718 Food processing, milling ... Machines pour l'ind. alimentaire, la minoterie... Food washing, washing fruits, cutting ... Machines pour l'ind. alimentaire, lavage des fruits, découpage						5,000										5,000	24,000
719				2,000				4,000								6,000	
722																	
723																	
725																	
729																	
731																	
733																	
TOTAL	13,000	48,520	2,700	16,500	40,620	168,500	51,120	106,320	3,400	5,100	207,520	6,000	7,100	6,000	104,200	786,700	1,097,700

[illegible]

[illegible]

[illegible]

ANNEXE VII (2)

PROPOSED NEW FACTORIES - VALEUR AJOUTEE EN MILLIERS DE DOLLARS DES ETATS-UNIS
NOUVELLES ENTREPRISES DANS LA CREATION DES ENTREPRISES - VALEUR AJOUTEE EN MILLIERS DE DOLLARS DES ETATS-UNIS

SIC DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
716 Food processing, milling ... Machines pour l'ind. alimentaire, la distillerie Food and feeding, milling, cutting ... Ind. alimentaire, ind. alimentaire, lavage des fruits, découpage				1,170		3,500		2,340								3,500
Excavateurs		4,500			4,500			5,400			5,400					19,800
Crushing and sorting machines Machines à concasser et à trier						9,000										9,000
719 Valves, cocks, fittings Soupapes, robinets, accessoires Pumps and centrifuges Pompes et centrifuges Weighing machines Appareils et instruments de pesage	8,720				2,860	5,720	2,860	5,720			2,860					8,120
Winches, hoisting Treillis, appareils de levage						4,250					3,400					12,600
Belt and latch conveyors Transporteurs à courroies et à lattes					1,080		1,080	1,440	300	300	1,440					7,650
722 Electro motor up to 5 kW Moteurs électriques jusqu'à 5 kW Electro motor up to 5-10 kW Moteurs électriques jusqu'à 5-10 kW Electro motor and generator up to 10 kW Moteurs électriques et générateurs au-dessus de 10 kW Transformateurs jusqu'à 5 kVA Transformateurs jusqu'à 5 kVA Regulators transformers up to 25 kVA Transformateurs régulateurs jusqu'à 25 kVA Switchgear up to 3,000 A Commutateurs jusqu'à 3,000 A				1,440				1,440	300	300		300	300			1,500
Switches and electrical accessories Interrupteurs et accessoires électriques						650										2,880
723 Insulated wire and cable Cables et fils électriques isolés	3,040			1,200												2,640
725 Air-conditioners and refrigerators Appareils de climatisation et réfrigérateurs Weighing machines Machines à lever							1,590									900
Electrical mech. domestic appliances Appareils électriques à usage domestique																1,125
729 Electrical accumulators Accumulateurs électriques Torchlight batteries Piles pour lampes de poche Automotive electrical equipment Équipement électrique pour véhicules Railway vehicles Matériel roulant pour chemins de fer Wells and aces feet Puits et aciers feet Boilers Chaudières																2,000
Electrical accumulators Accumulateurs électriques																240
Torchlight batteries Piles pour lampes de poche																5,440
Automotive electrical equipment Équipement électrique pour véhicules																1,650
Railway vehicles Matériel roulant pour chemins de fer																830
Wells and aces feet Puits et aciers feet																1,300
Boilers Chaudières																1,260
733 Boilers Chaudières																1,300
Trailers Remorques																1,640
TOTAL	11,420	32,762	1,140	6,881	22,048	64,798	27,080	65,885	1,716	2,586	114,163	5,292	5,406	5,798	29,820	396,695

ANNEXE VIII (1)

PROPOSED NEW FACTORIES - EMPLOYMENT
NOUVELLES ENTREPRISES SONT LA CREATION EST ENVISAGEE - MAIN-D'OEUVRE

SIC	DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
CODE	GROUPES DE PRODUITS																		
691	Heavy machinery Grands équipements	300					650					380				450	1,810	13	6,700
	Light structures Ouvrages légers	120	530	120	380	1,000	1,500	1,000	1,950	150	120	3,000	120	120	120	2,550	12,750	10	4,900
692	Tanks and vats Réservoirs et cuves	140							210			270				300	920	15	6,700
	Boilers and gas cylinders Chaudières et récip. pour gaz						1,280	1,000				680					1,680	12	7,800
693	Drawing works Tréfileries						300					300					1,280	47	9,400
	Wire rope and cables Câbles en fer ou acier																600	33	14,700
	Wire gauze and netting Toiles métalliques & grillages					470											470	17	5,600
694	Wire fencing - Trilles métalliques Grilles, fils, etc.											110				150	260	20	4,900
695	Agricultural hand tools Outils agricoles à main					110	120	180	180			380	90		120	1,800	1,800	27	9,300
	Other hand tools Autres outils					330	450	600	680			1,280	300		380		1,180	8-10	2,700
696	Outfitterie Coutellerie	120			190							900					4,000	3	4,100
697	Shoemakers Serrurerie	530	530			980	530	980	4,650	350	4,950						1,550	3	4,800
	Shoemakers Serrurerie	270				190		150	380			380				230	10,730	6	3,600
	Shoemakers Serrurerie	1,350							1,800			2,250					1,330	7	7,300
698	Locksmiths Artisans de serrurerie	380	200					380	380	200	200	750	200	200	200		5,400	2-3	3,700
	Iron and steel chains Chaînes en fer et en acier		40	40					75	30	15	30					3,050	5	5,000
	Springs Resorts, etc.			15								75					270	13	9,300
	Stoppers, crown corks Bouchons métalliques, bouchons filetés	100										30		15			120	35	20,000
	Pins, needles, etc. Aiguilles, épingles, etc.								45	45		100					335	20	9,000
699	Metal boxes, cases ... Boîtes métal, bidons ...												65	65	65		195	8	13,400
711	Internal comb. engines Moteurs à combustion interne	750				750			750			750				2,100	2,100	7	6,700
	Stems gun, boilers Chaudières agricoles						600										3,000	7	17,400
712	Agricultural tractors Tracteurs agricoles								3,750			6,300					600	17	29,000
	Churns Charnières						150		200			300				380	10,050	4	6,000
	Harvesting, seeding, threshing Mach. agric. pour la récolte, semer, les semences, le battage ...						630					630					1,030	11	5,400
714	Typewriters Machines à écrire												360				1,260	8	8,000
	Calculating machines Machines à calculer																360	3	16,600
	Office duplicating machines Imprimantes																400	2	16,000
715	Drilling machines Perceuses	200											330				350	5	17,300
	Mach. for sheet working Mach. pour la fabrication des tôles																200	8	16,600
	Lathe and shapers Tours et bancs à l'écouler																260	10	17,500
	Grinding machines Rectifieuses		40	40													300	7	16,600
717	Grinding machines Machines à aiguiser	380							380								200	5	8,000
																	760	4	8,000

ANNEX VIII (2)

PROPOSED NEW FACTORIES - EMPLOYMENT
NOUVELLES ENTREPRISES DONC LA CREATION EST ENVISAGEE - MAIN D'OEUVRE

FACTORY USINE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	TOTAL PER EMPL. TOTALS PROJECTIONS PROJECTIONS EMPLOYES	GR. O. PAR EMPL. O. US PROJECTIONS PROJECTIONS (en 2 20)
718						570										570	10	13,600	
Food processing, milling Machines pour l'ind. alimentaire, la minoterie...																			
Food washing, washing fruits, cutting ... Machines pour l'ind. alimentaire, lavage des fruits, épluchage								570								770	8	10,000	
Excavators Excavateurs		430			430			600			600					2,060	10	16,600	
Grubbing and sorting machines Machines à condenser et à trier						1,200										1,200	7	18,600	
719	1,500																		
Trucks, cars, fittings Camions, voitures, accessoires					600														
Pumps and centrifuges Pompes et centrifuges						1,200		1,200			600					1,500	3	7,700	
Welding machines Appareils et instruments de soudage		860														4,200	4	9,300	
Measures, bolting Treillis appareils de levage						1,260										2,160	5	9,400	
720		380			290			380		150		150				1,780	5	8,500	
Ball and lath conveyors Transporteurs à courroies et à lattes																750	2	5,000	
Electro motor up to 5 kW Moteurs électriques jusqu'à 5 kW																1,200	3	6,000	
722																			
Electro motor up to 5-10 kW Moteurs électriques jusqu'à 5-10 kW								600								750	4	8,600	
Electro motor and gen. above 10 kW Moteurs électriques et générateurs au-dessus de 10 kW					260											580	2	3,500	
Transformers up to 5 kVA Transformateurs jusqu'à 5 kVA				260												620	2	3,700	
Regulators transformers up to 25 kVA Transformateurs réguliers jusqu'à 25 kVA						360										1,000	2	4,000	
Switchgear up to 1,000 A, 10 kV Disjoncteurs jusqu'à 1,000 A, 10 kV																1,000	2	4,000	
723	380																		
Switchgear and electrical accessories Interrupteurs et accessoires électriques																110	1	2,700	
725																			
Isolated wire and cable Cables et fils électriques isolés				230				230								840	20	16,600	
Air-conditioners and refrigerators Appareils de climatisation et réfrigérateurs							380									380	4	8,000	
Washing machines Machines à laver								210								210	5	7,400	
Electrical mech. domestic appliances Appareils électriques à usage domestique											380					380	3	7,600	
729																			
Fans Ventilateurs		35		35		35		35	35	35		35	35	35		330	3	7,500	
Electrical space heaters, boilers, stoves Radiateurs pour le chauffage des locaux, chaudières poêles											420					420	5	8,200	
731																			
Accumulators Accumulateurs électriques		110						140			110					170	9	7,000	
733																			
Flashlight batteries Piles pour lampes de poche		200				400		650			650					2,640	6	6,000	
Automotive electrical equipment Equipement électrique pour véhicules																1,000	2	7,000	
731																			
Railway vehicles Matériel roulant pour chemins de fer						750					750					1,500	20	14,000	
Wheels and axles fast. Roues et essieux																380	27	23,000	
733																			
Biocycles Bicyclettes		190		110		190		450	110		1,500		190	110		3,300	3	4,600	
Trailers Remorques		590						590			970		590			3,490	4	3,200	
TOTAL	2,000	8,460	400	2,095	5,392	13,600	8,262	18,607	670	935	32,047	1,310	1,725	1,620	9,470	107,400			

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
691 Heavy structures Grues ouvrages		900				2,000					1,000				1,400	5,300	1,100	17	6,400	3,000	220
Light structures Ouvrages légers	150	750	150	450	1,500	2,300	1,900	3,000	150	150	4,500	150	150	150	3,000	18,050	5,000	25	24,050	1,400	150
692 Tanks and vats Réservoirs et cuves		270						400			540				540	1,750	600	25	2,350	1,900	134
Boilers and gas cylinders Chaudières à vapeur, pour gaz							3,000				2,100					5,100	1,200	19	6,300	3,000	250
693 Drawing works Tréfileries						10,800										10,800	1,200	10	12,000	8,500	180
Wire rope and cables Câbles en fer ou acier						2,300					2,300					4,600	1,500	25	6,100	7,500	230
Wire gauze and netting Toiles métalliques et grillages					2,800											2,800	300	10	3,100	6,200	350
Wire fencing Treillis métalliques											480					480	300	38	780	4,500	240
694 Screws, bolts, nails Boulons, vis, clous					210	240	390				900	180				18,000	2,500	12	20,500	9,500	340
695 Agricultural hand tools Outils agricoles à main					810	1,080	1,530	1,800			3,150	720				2,550	300	10	2,850	2,200	300
Other hand tools Autres outils à main				960		480	480	1,440			6,000					9,990	1,340	12	11,330	2,500	900
696 Outferry Goutalleries		720														10,080	780	7	10,860	6,700	2,400
697 Bannalene Articles émaillés		3,150		3,150	6,300	3,150	6,300	10,500		2,100	31,500					66,150	5,900	8	72,050	6,200	1,000
Stoves, boilers, cookers ... Foyers, chaudières, fourneaux ...		450			230		230	680			680					2,270	2,000	48	4,270	1,700	230
Gas appliances Appareils au gaz		2,700						3,600			5,400					11,700	2,200	16	13,900	2,800	900
698 Locksmith's wares Articles de serrurerie		750	380				750	750	380	380	1,500	380	380			6,030	3,000	30	9,030	2,000	370
Iron and steel chains Chaînes en fer et en acier		150		150				300		150	300					1,050	300	23	1,350	4,000	300
Springs, etc. Resorts, etc.				180			120	240	120		240		120			960	360	27	1,360	8,000	240
Stoppers, crown corks Bouchons métal., bouchons filetés	450			230			230	230			450					1,590	450	22	2,040	4,500	230
Pins, needles, etc. Aiguilles, épingles, etc.													380			1,140	650	36	1,790	6,000	750
699 Metal boxes, cases ... Boîtes métal., bidons ...																					
700 Internal combustion engines Moteurs à combustion interne	1,880			1,880				1,880			1,880					8,400	800	9	9,200	4,000	500
Steam gear, bellows Chaudières à vapeur						3,000										7,520	10,000	57	17,520	2,500	370
701 Agricultural tractors Tracteurs agricoles								9,000			15,000					3,000	3,000	50	6,000	5,000	300
702 Agricultural ploughs ... Charrues ...								1,400			1,700					24,000	14,000	37	38,000	2,400	600

ANNEX II (2)

PROPOSED NEW FACTORIES - FIXED CAPITAL IN US\$ 1,000

NOUVEAUX ENTREPRISES ENVIRONNEMENTS - PRODUCTION SEULE EN MILLIERS DE DOLLARS DES SECTEURS-UNIS

SYNOPSIS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
DESCRIPTION	MAURITANIA	SENEGAL	GAMBIA	GUINEA	SIERRA LEONE	LIBERIA	IVORY COAST	GHANA	TOGO	DROMEDARY	NIGERIA	NIGER	UPPER VOLTA	MALE	Non located	SUBREGION	Working capital	% of fixed capital	Total capital	fixed capital	fixed capital	
OTCI PROJECTS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
718 Food processing, milling... Mach. pour l'ind. aliment. pour la sembleria... Food processing, washing fruits, cutting . Mach. pour l'ind. aliment. pour le lavage des fruits, pour le découpage.					2,600			1,800								2,600	750	22	3,350	5,100	470	
Renovateurs	2,000				2,000			2,400			2,400						8,800	4,000	47	16,800	4,000	400
Crushing and sorting machines Machines à concasser et à trier					3,600											3,600	4,500	55	8,100	3,000	450	
719 Valves, cocks, fittings Soupapes, robinets, accessoires	4,200															4,200	2,000	32	6,200	2,800	1,000	
Pumps and centrifuges Pompes et centrifuges					1,500			3,000			1,500					10,500	5,000	32	15,500	2,500	750	
Weighing machines Appareils et instruments de pesage	1,800							1,350			1,350					4,500	4,000	47	8,500	2,100	450	
Winches, hoisting Treillis, appareils de levage					3,000						2,400					5,400	3,000	36	8,400	2,500	600	
Belt and lathe conveyors Transporteurs à courroies et à lattes					450			600			600					2,700	2,000	43	4,700	1,650	300	
722 Electric motor up to 5 kW Moteurs électriques jusqu'à 5 kW									110		110					550	400	42	950	7,000	370	
Electric motor up to 5-10 kW Moteurs électriques jusqu'à 5-10 kW	450							450								900	800	47	1,700	7,500	300	
Electric motor & gens, above 10 kW Moteurs élect. & génératrices au-delà de 10 kW											680					680	700	50	1,380	5,600	220	
Transformers up to 5 kVA Transformateurs jusqu'à 5 kVA					110			110								220	300	58	520	4,400	220	
Reg. transf. up to 25 kVA Transformateurs régulés jusqu'à 25 kVA					160											270	400	60	670	4,400	250	
Switches up to 3,000 A Commutateurs jusqu'à 3,000 A					510											510	600	54	1,110	5,100	3,000	
Switches & elect. accessories Interrupteurs & accessoires électr.	60				60			60			60					300	50	14	350	2,700	270	
723 Insulated wire and cable Câbles et fils électriques isolés	2,250				1,350			1,350								4,950	1,500	23	6,450	6,000	370	
725 Air-conditioners and refrigerators Appar. de climatisation et réfrigérateurs																570	400	41	970	1,500	370	
Washing machines Machines à laver								380								380	300	44	680	1,800	370	
Electric mach. domestic appliances Appareils électr. à usage domestique											300					300	400	57	700	1,250	300	
Fans Ventilateurs	30				30			30			30					300	400	57	700	1,250	300	
Electr. space heaters, boilers, stoves Radiateurs en le chauff. des locaux, chaudières, poeles											600					600	400	40	1,000	1,450	300	
729 Electr. accumulators Accumulateurs électriques	480							830			480					490	2,280	400	15	2,680	4,600	920
Torchlight batteries Piles pour lampes de poche	690							2,100			2,100					1,120	8,700	1,500	15	10,200	3,200	550
Automotive electr. equipment Équipement électrique pour véhicules																450	450	70	1,450	4,500	220	
731 Railway vehicles Matériel roulant pour chemins de fer					2,900						2,900					5,800	4,000	41	9,800	3,900	190	
Wheels & axles fact. Roues et essieux					5,300											5,300	1,000	16	6,300	14,000	520	
733 Bicycles Vélos	230				230			590			2,250					4,540	3,000	40	7,540	1,400	450	
Trailers Remorques	1,200				1,800			1,200			2,400					7,800	1,300	14	9,100	2,400	600	
TOTAL	6,600	20,900	770	6,330	19,300	52,170	21,740	50,700	1,020	3,010	101,890	3,450	3,500	3,380	33,550	388,210	118,380					

SUMMARY OF PROPOSED FOR ENGINEERING FACTORIES IN THE WEST AFRICAN SUBREGION IN 1980
TABLEAU RESUME DES PROPOSES DE CONSTRUCTIONS INDUSTRIELLES EN AFRIQUE DE L'OUEST
LA CREATION EST ENVOYEE EN 1980 DANS LA SOUS-REGION DE L'AFRIQUE DE L'OUEST

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	Unités																	
Population	890	4,530	490	5,030	3,650	1,240	5,395	12,130	2,370	3,355	91,000	4,675	6,415	6,485	147,755	92,652	147,755	
Population	340	1,560	54	562	593	726	2,446	3,487	332	344	10,060	708	662	697	22,531	8,400	22,531	
Population	382	337	110	112	162	585	455	287	140	103	110	152	103	101	153	91	153	
Population	32,847	19,071	9,653	76,939	209,718	253,332	312,868	606,500	42,660	39,253	1,483,300	24,370	56,492	46,043	3,386,960	935,092	3,386,960	
Population	27,005	138,540	8,159	57,530	162,770	216,320	232,500	433,900	38,190	27,030	1,044,000	19,660	44,190	33,950	2,551,144	613,924	2,551,144	
Population	13,000	48,620	2,700	16,900	40,620	168,900	51,120	106,320	3,400	5,100	207,520	6,000	7,100	6,000	104,200	786,700	207,300	994,000
Population	19,720	65,110	2,120	12,830	44,560	131,880	47,920	126,090	3,580	4,350	209,900	10,770	12,050	12,320	50,910	754,110	314,900	1,069,010
Population	11,420	34,782	1,140	6,881	22,048	64,798	27,020	65,825	1,716	2,586	114,163	5,292	5,406	5,798	29,820	395,695	112,700	509,395
Population	2,000	8,467	400	2,095	5,392	13,600	8,282	18,607	670	935	32,847	1,310	1,725	1,680	9,470	107,400	78,200	185,600
Population	3,4	2,1	2,1	1,2	3,7	8,8	1,1	1,9	0,5	0,8	1,1	0,8	0,8	0,8	1,8	1,3	2,3	
Population	0,22	0,18	0,08	0,04	0,15	1,10	0,15	0,15	0,03	0,03	0,04	0,03	0,03	0,03	0,07	0,09	0,13	
Population	39,7	25,2	28,0	21,5	19,5	66,5	16,3	17,5	8,0	13,0	14,0	24,7	12,6	13,0	23,2	22,1	29,3	
Population	73,0	47,0	26,0	22,3	27,4	61,0	20,6	27,8	11,2	16,1	20,1	54,8	27,3	36,3	29,9	51,2	42,4	
Population	9,860	7,690	5,300	6,124	8,264	9,697	5,800	6,776	5,343	4,592	6,390	8,221	6,985	7,605	5,376	7,022	4,000	5,760
Population	5,710	3,872	2,890	3,284	4,089	4,765	3,270	3,538	2,951	2,767	3,476	4,040	3,134	3,579	3,149	3,694	1,000	2,745
Population	9,8	8,6	10,4	11,9	11,1	18,6	9,3	8,6	7,6	8,3	9,5	6,9	6,5	5,6	16,5	7,4	2,6	5,4
Population	36,9	41,7	19,7	15,3	57,3	204,3	98,1	90,0	18,0	11,7	16,3	5,2	8,8	7,1	22,1	10,1	22,1	
Population	6,600	20,900	770	6,330	19,200	52,170	21,740	50,700	1,020	3,010	401,890	3,490	3,500	3,380	33,550	328,210	33,550	
Population	22,565	97,694	5,406	40,788	116,603	167,199	182,402	297,185	22,610	19,527	741,650	15,072	31,613	23,021	1,783,145	440,003	1,783,145	
Population	25,035	120,820	7,389	50,690	144,370	194,520	208,000	392,300	28,340	21,330	895,500	17,850	39,370	29,560	2,200,034	519,353	2,200,034	
Population															580,049			
Population															476,800			
Population															82,0			
Population															543,468			
Population															187,900			
Population															34,5			
Population															175,326			
Population															59,000			
Population															33,7			
Population															484,302			
Population															63,000			
Population															13,0			

3/ 321,632 ton or about 66,5 % in don't by Road Motor Veh.
321,632 tonnes soit environ 66,5 % représentée par les véhicules automobiles routiers.

ANNEX XI

ALTERNATIVE DEMAND PROJECTION

An alternative demand projection may be based on figures relating to the monetary sector only. In this case, it is found by regression analysis that the elasticity of consumption of engineering products per head in relation to GDP per head for the monetary sector only is 1.255. The actual increase in GDP per head in the monetary sector from 1960 to 1980 is estimated to average 2.1 per cent per annum, and therefore, the estimated increase in engineering goods consumption per head will average 2.6 per cent per annum. The average annual increase in the number of persons in the monetary sector is 4.5 per cent so that engineering goods consumption increases by 7.2 per cent per annum, as compared with the figure of 7.6 per cent given in the Paper by a consideration of the economy as a whole.

ANNEX XII

NOTE ON FURTHER INDUSTRIAL POSSIBILITIES

1. Textile Machinery

No projection has been made for the manufacture of textile machinery mainly because the variety of types at present in use precludes manufacture on an economic scale. By 1980, however, the demand for new looms, for example, should be of the order of 3,000 a year and if it were possible for the West African countries to agree to adopt henceforward the same type of loom, the basis of economic manufacture either under licence from or in participation with an established textile machinery manufacturer would exist. Replacement parts for textile machinery are normally required on a large scale but the same condition of some degree of standardization is essential to their economic production. In order, therefore, to establish the textile machinery industry in West Africa, it is necessary for the various Governments to agree that from a certain date, e.g., 1970, only certain types of textile machinery would be installed in new mills and that these types would be those that a textile machinery manufacturer had undertaken to produce in West Africa. The Conference is invited to approve the carrying out of further studies on this subject.

2. Assembly and Manufacture of Machinery

The projections in regard to mechanical and electrical engineering envisage factories beginning on an assembly basis and developing by 1980 into virtually complete manufacturing units. It is not practicable without detailed study and much more information to make recommendations as to the stages by which this should be reached in every case, and it is considered, therefore, preferable to recommend that in regard to each assembly unit to be constructed, Governments should obtain an undertaking that the manufacture of certain agreed components would be undertaken every three years or so with the object of arriving at virtually complete manufacture by 1980. This undertaking should be obtained as part of the general agreement on market outlets, protection and other matters involved in establishing a new works.

3. Construction Machinery

Detailed proposals have not been made on the types of machinery to be manufactured in West Africa to meet the construction requirements of the sub-region. Reference was made in paragraph 46 to excavators and to stone and mineral crushing machinery required for construction and other purposes, and in paragraph 47 to lifting and handling machinery also required in part for construction purposes. In addition, two other types of machinery may be considered, viz., presses for the manufacture of concrete pipes and blocks, and concrete mixers. In regard to presses a calculation based on the demand for concrete products in 1980 and the capacity and life of a typical press suggest that two factories each with a capacity of from 4000 to 5000 tons per annum, and each employing 200 people could be established. Suitable locations would be Nigeria and Liberia. Similar calculations in regard to concrete mixers suggest that two factories each of 1500 tons per annum capacity and employing 150 people should be constructed. Suitable locations would be Ghana and Senegal.

4. Copper Wire

The projection for copper wire manufacture based on a plant in Mauritania envisaged production to the extent of the copper supply likely to be available in that country, viz., 10,000 to 15,000 tons per annum. It is considered that the remaining requirements of West Africa would be best met by similar plants based on other copper producing areas in Africa, e.g. Zambia or Congo.

5. Other Assembly Plants

Because of the great variety of consumer requirements in regard to durable goods such as refrigerators and space heaters, it has been considered that only about 1/3rd of total requirements could be manufactured in the sub-region. Such production would be carried out most economically in a single plant undertaking a process of complete manufacture i.e., including compressors or other mechanisms as well as the cases. As demand increases, however, it would become practicable to establish other units undertaking the manufacture of cases but obtaining the mechanisms from a central source.

6. Iron Foundries

Reference has been made in Para 59 to the need to establish iron foundries to undertake the production of castings not made by the engineering factories themselves and relating therefore to general repair work and castings for building and domestic purposes. The total demand for iron castings of all kinds may be estimated on the basis of information available in developed countries at about 20 per cent of the demand for finished steel or at about 500,000 tons per annum of which about one quarter will be engineering castings and about one-third building and domestic castings (the balance consisting of castings for railways, ingot moulds, for motors and tractors and abrasives and repairs). This figure includes, of course, castings imported directly and indirectly in the form of machines. Because of the high weight of castings in relation to value most foundries making building and domestic goods and including necessarily those engaged on repair work will operate on a national scale. Exceptions will be the spinning of cast iron pressure pipes which unless replaced by P.V.C. and asbestos/cement pipes could be undertaken in one factory for the whole sub-region and the production of small castings in mechanized foundries.