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Original: ENGLISH

UNITED NATIONS ECONOMIC AND SOCIAL COUNCIL

ECONOMIC COMMISSION FOR AFRICA

RAILWAYS IN AFRICA STATESTICAL SURVEY

TABLE OF CONTENTS

		Paragraphs	Page
I.	INTRODUCTION	1-31	1 - 5
II.	SUMMARY OF STATISTICAL DATA ABOUT RAILWAY UNDERTAKINGS OPERATING IN AFRICA	3264	5 - 14
III;	SUMMARY OF PROJECTS AND TECHNICAL ASSISTANCE TO AFRICAN RAILWAYS	65-73	14 - 23
IV.	UNION OF AFRICAN RAILWAYS	74-83	23 🛖 24

AFPENDICES:

A: Tanzam Railway Project

B: Summary of Technical Assistance rendered to African Railways by the Crown Agents during the last five years

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RAILWAYS IN AFRICA - STATISTICAL SURVEY

I. Introduction

1. Economic development needs a sound well-functioning combined transport system as a basis. This means the most economic combination of the existing modes of transport as roads, railways, inland water ways, coastal shipping and air transport, which is able to meet sufficiently, and efficiently the increasing demand on transport capacity.

2. In Africa the railway played and still plays a dominant role in African transport, although its specific tasks in the transport sector have changed and although, the improvement of the infrastructure is associated mainly with the construction of new roads, to onsure the completion of a comprehensive road petwork.

3. The map on page 2 gives a general view of African Railways, the existing lines, lines under construction and projected links. Historically, most of these railways had been constructed in the years around the turn of the century and in a few cases during the twenties, and all of them were at that time the only mode of land transport possible. At first they served a strategic purpose, to penetrate inland, and later they were used to convey the produce of the country (cocca, sisal, tea, coffee etc. and minerals) to a specific seaport. As a result from this colonial period most of the young African Nations have to overcome the inherited monostructures of their economies, which hinder the economic development of their countries, as well as the lack of comprehensive land transport networks. The industrialization required to change the economic structure of the country and intra-African Trade as well depend entirely on an improved transport infrastructure.

4. The example of Kenya demonstrates very clearly the importance of the railway as a part of the combined transport system for the development of industries. Only along the railway lines, which guaranteed the proper transport facilities, the growth of small and large scale industries took place. Although, the railway had been constructed to serve quite different purposes, it now forms the most favourable basis for the use of industries.

5. How far the lack of transport facilities together with other unfavourable conditions may influence economic development can be seen from the example of the least developed among the developing countries on the African continent.

6. According to a recent United Nations statistics sixteen African countries belong to a group of twenty-five countries in the world, which are believed to be the least developed among the developing countries, based on their per capita gross domestic product per year.

7. The nine countries out of these sixteen, shown in map page 2, have a per capita gross domestic product per year of some US\$90 or even less. Seven of them do not have an access to the sea, they are the so-called land-locked countries, and five of them have no railway.

8. Amongst other factors, the isolation of the land-locked countries from the world market owing to their remoteness from the sea as well as a deficient infrastructure are the two main reasons for their limited economic growth.

9. Bearing this in mind it is now understandable why in Africa railways are being extended and new lines are under construction, whilst in Europe railway lines are being closed and commissions are dealing with further closures.

10. First of all, the construction of new railway lines in Africa has proved to be right for providing access to mining areas, three have been constructed during the last decade, Miferma in Mauritania, Bong Mining Co. and Liberia Mining Company in Liberia; and two more are projected, the Owendo-Belinga railway in Gabon and the Scrulo-Selebi Pikwe branch in Botswana. But besides this type of railway: the extension of the Cameroon railway from Belabo to Ngaoundere, now under construction, is one of the great railway projects being realized at present in Africa. The greatest railway construction project of all is the new Tanzam Railway from Kapiri M'Poshi - Zambia to Dar es Salaam -Tanzania, about 1,857 km long which is expected to be completed latest in 1975 (see appendix A).

11. Considering the technical advantages of the railroad in carrying bulky goods over long distances, the importance of the railways for the economic development of land-locked countries is very obvious, because the whole volume of exports and imports has to run through the neighbouring country to or from the seaport.

12. According to the Statistical and Economic Information Bulletin for Africa (page 45) it is expected that the transport volume of C.F. du Sénégal of 1973 will be about 400 million ton-kilometres of which 130 million ton kilometres or nearly one third of the whole volume of traffic is expected to be destined for or to originate from Mali. This underlines the great importance of C.F. du Sénégal for the economy of Mali, a land-locked country.

13. The map on page 2 also shows projected lines, mainly linking existing networks. Most of them for the time being have gone no further than the drawing-board stage, although for instance the rail link from Douala to Chad has been already under serious discussion for more than 17 years, even a study called the "Avant-project du Chemin de fer Douala-Tchad" was carried out in 1960/61.

14. The construction of these new projected lines should not be seen exclusively from the point of view of cost-benefit analysis in its pure economic sense, but as well from the point of view of a regional transport policy in connexion with a comprehensive plan for economic development.

15. First, the existence of any traffic system, regardless of the quality of the system, gives the developing or underdeveloped areas a real chance for economic development. The possibility of such economic development taking place and the extent to which it takes place depend on other factors, to name only a few, the social infrastructure of the area, the possibilities of production which exist or are coming into existence, and the forming of preferences.



Nations, Dans certains cad, les frontières indiquées sur la présence carte ne iont pas définitivement fixées, Le fait qu'elles sont indiquées ne signifie pas que l'Organisation des Nations Unies les reconsuit ou les approuve officiellement.

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16. But these criteria signify also that any investment made in the transport sector for increasing its quality does not guarantee by itself a subsequent economic development, if all the other relevant forces are not brought to bear at the same time.

17. Transport policy should be such that each traffic investment aims at the optimal improvement of the traffic system in regard to its three most important functions for the whole economy:

- (a) Opening up of an area;
- (b) Integration into the existing economy;
- (c) Originating further economic development.

The function of opening up an area is the simplest, and it is not necessary to go into further details. But to obtain optimal results in integrating the newly opened-up area into the economy by investments in transport systems is much more difficult and very detailed and comprehensive studies have to be worked cut before taking decisions on the planned investments. The integration function of the traffic system is to be understood as the ability of this traffic system to provide for the optimum integration of the economy of the opened-up area into the economy of the total area concerned. The most critical aspect of planning any traffic system is that of making accurate forecasts as to the economic development that is likely to be generated, because of the complexity of this process (see paragraphs 14 and 15).

18. To highlight the emphasis put on the improvement and development of the communication system by various African countries table 1 below shows some figures for planned investments in certain development plans in these countries.

Country Period	% of economic sector	Total ex- penses <u>a</u> /	Roads & vehicles	%	Rail- ways	%
Algeria 1970 - 1973 Ethiopia 1968 - 1973 Kenya 1970 - 1974 Nigeria 1970/71-1973/74 Senegal 1969/70-1972/73 Sudan 1970/71-1974/7 Tanzania 1969/70-1973/74 Togo 1972-1975	7.8 30.1 34.0 4 27.7 3 15.7 5 14.8 4 .26.3 46.1	441.0 179.6 270.2 798.0 82.9 85.1 217.0 ^C / 93.5	72.9 106.0 120.5 262.6 48.2 $20.0^{b}/$ $106.0^{c}/$ 34.5	16.5 59.0 44.5 32.9 58.1 23.5 49.0 37.0	60.4 6.4 59.6 61.0 13.9 40.2 60.0 ^e / 7.6	13.7 3.3 21.9 7.6 16.8 47.2 27.7 8.1

Table 1: Public expenses for improvement and development of infrastructure (in million US\$)

a/ Including: Roads and vehicles, railways, ports and waterways, airports,

b/ Estimated.

c/ Estimates based on total East African Community expenditures plus local costs of Tanzam Railway.

19. The rate of expenditure on roads and vehicles varies from 16.5 per cent of total expenses for infrastructure in Algeria to 59.0 per cent in Ethiopia, whereas the corresponding figures for railways are 3.3 per cent of the total expenses in Ethiopia and 47.2 per cent in the Sudan.

20. The percentage of the infrastructure expenses of the total investment planned to be spent in the Economic Sector shows, throughout the various countries, nearly the same picture as the distribution of the infrastructure expenses over the various modes of transport. The figure ranges from 7.8 per cent in Algeria to 46.1 per cent in Togo.

21. Speaking in very general terms, this distribution of public expenses on the improvement of infrastructure as indicated above may demonstrate that rail and road networks in Algeria are well developed in comparison with Togo, so that Algeria has no necessity to invest as much as Togo is required to do in improving its surface transport facilities. In fact it is correct that rail and road transport in Algeria is generally in a very satisfactory condition, whereas Togo has to develop its road network and to improve the railway.

22. Sudan is spending the highest percentage of total expenditure on the development of infrastructure to improve its railway system, while Ethiopia is placing emphasis almost exclusively on the extension and improvement of her road network. The present situation of the transport structure in the two countries justifies these decisions. In the Sudan the railway has been and still is the backbone of the whole transport system, and the economy of the country depends nearly entirely upon the capacity and efficiency of the railway, because of the great lack of all kinds of roads.

23. Any restriction or interruption of operation on railway lines because of accidents or damage resulting from the heavy seasonal rainfalls, will cause serious harm to the economy. Therefore, first of all the greatest possible effort has to be made to ensure the smooth functioning of the railway to avoid adverse effects on the economy.

24. After reaching the stage at which the perfect operation of the railway, and adequate and efficient service to meet the demand on transport can be guaranteed, it is advisable to strengthen all efforts in constructing roads in order to provide a more flexible system and to eliminate the existing bottleneck resulting from inadequate transport capacity.

25. In contrast to the situation in the Sudan the present surface transport structure in Ethiopia consists of a road network except for two single railway lines connecting Addis Ababa with the port of Djibouti, and Asmara with the port of Massawa. The enforced development of a comprehensive road network in this country is probably the best means of achieving the objectives of rapid economic progress throughout the country.

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26. The financial support given by World Bank during the period 1967-1971 to various African Railways to improve their service is shown in table 2.

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27. The future role of the African railways in an African transport system should be determined by taking into consideration the technical advantages of this mode of land transport, first of all to convey bulky goods over long distances. Bearing this in mind, all the proposals of forming a comprehensive railway network south of the Sahara, with the construction of links between the already existing networks (see map page 2) are not the utopian desires of engineers, but reflect sound considerations on how to meet, most economically; the traffic demands in the future.

28. To build up such a rail network is not a question of a few years, and for the time being there is no necessity to rush things which require a long time to reach maturity, but if the opportunity to undertake the preparatory work for the later completion of the great task is missed, then the difficulties could accumulate and become insuperable.

29. To highlight only one of the numerous difficulties, which have to be overcome before achieving the lofty aim, attention should be drawn to the very different technical structures of the railway systems to be linked, and the great problems involved therein.

30. Considering the fast progress of the worldwide utilization of transport upits, like containers, to facilitate world trade, this modern kind of transportation, in particular, requires a modernized, widespread railway network to convey goods most economically over the extreme long distances on the African continent.

31. The great effort undertaken in the past and continuing at present days by the African Governments and railways concerned in improving, modernizing, and extending their operations are demonstrating that both politicians and railway managements, are fully aware of the future role to be played by the railway in a transport system.

II. Summary of statistical data about railway undertakings overating in Africa

32. In the following summary of data upon African Railways an attempt was made to undertake as comprehensive as possible a survey on all data of importance, in order to get an instructive view about the present situation of African Railways.

31. Table I shows a summary of the relevant statistical data of the 49 railway undertakings operating in Africa at present. divided into subregions. The Sierra Laone Railway is already considered closed, although it is still under operation, but is supposed to be phased out at the latest during 1973.

34. The total route length under operation at present is 77.099 km and the total track length is 100.729 km. These two figures show that almost all the lines in Africa are only single track lines with a few exceptions, which are concentrated on the outskirts of big cities which serve as traffic junction points, such as Tunis, Casablanca, Rabat, Cairo, Capetown, Durban or Johannesburg, as well as on heavily frequented routes such as the electrified section from Lubumbashi to Tenke (1.8 million tons per year) of the KDL,1/ and the section from Lubumbashi to Teberra of the SNCFA2/ which carry heavy phosphate traffic.

/ KDL = Chemin de fer Kinshasa-Dilolo-Lubumbashi / SNCFA = Société Nationale de Chemin de fer Algériens

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a/ Estimate.

E/CN.14 Page 6

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35. Comparing some data of African railways with those of Europe as shown in table 3 the route length of total Africa is 33.8 per cent or one third of the European network. African railways carry 12.8 per cent of the total freight volume in tons carried by European railways. The traffic density in Africa on railways in ton/kilometres per kilometre route length during one year is 74 per cent of that of Europe, whereas, the specific traffic volume in tons per kilometre route length and year is only 36 per cent. The number of passengers darried per year by the railways in Africa amounts to 11.6 per cent of the number carried by European railways, including suburban traffic.

36. Out of a total of 77.099 km route length in Africa there are only 6.537 km or almost 9 per cent electrified. Electrification is limited to sections with the greatest traffic density and urban areas with essential suburban traffic (see also paragraph 34). The 6.537 km electrified route covers five railways or about 10 per cent out of the 49 railways of Africa, three of them (Egypt Railway, SNCF Algériens, ONCF in Maroc) in the North African subregion account for 16 per cent of the total electrified route length, in the Central African subregion, KDL accounts for 10 per cent and South African Railways for 74 per cent of the total electrified route length (see table 2). The percentage of electrified routes of the European state-owned railways, excluding Ireland, United Kingdom and the USSR is so far 25.4 per cent respectively 59,264 km of a total route length of 234,124 km (see table 3).

37. To meet the annual operating expenses of a railway under African conditions it was found that the volume of traffic should be a minimum of 250,000 ton-km/km line and year.1/ Considering this figure there are 10 railways or 20.4 per cent of all African Railways which are far below that limit and 2 railways which almost achieve it. In other words, 12 railways out of 49 or 24.5 per cent of the African Railways operate under unfavourable conditions.

18. Table 4 shows the financial situation of 15 African Railways for which these data had been available, expressed as an operating ratio which is calculated by the formula:

Operating ratio = $\frac{\text{Expenses}}{\text{Revenues}}$.100%;

The expenses include the respective amount provided for renewals. According to the definition an operating ratio below 100 per cent means a profitable, operation of the railway, whereas an operating ratio higher than 100 per cent signifies a deficit which at least makes the railway unable to reserve the proper amount for the necessary provisions for renewals.

39. The greatest portion of the expenditures for renewals is spent on the sector of rolling stock for the modernization of wagons and carriages as well as locomotives. The modernization of motive power in particular requires high investments.

/ UNECA Department of Economic and Social Affairs ST/ECA/127, page 27.

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Table 3. Data of Europe an Railways

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2/ FT - Freight Train 2/ V - Vooden Sleeper 3 - Staal Blaeper C - Gonorate Sleeper (prestresed)

	TABLE I	. Soonom	io and a	tatistic	oal data	of Afric	ben Rail.		net ut to t	,														
	Gauge	Route	Track	5	8 A 11 0 10 00	e and Xe	ailcur.	2 7	iseedg.	freight bere	Passenger o	arried	Freis	11 OLTI	ded.	S]}●	2	Rails	51+	e juze	Load .	Braking System	& 5	upling
RAILMAYS IN AFRICA	ATGU	Longth	Length	Electr.	. D1+=.	Stees I	Anile, 1	total 🖓			num ber/year	aver. journ.	ton/year	AVOJ. VO	n hume in hu√year	54 PT	Ē	veight	ty p	epacing centres	ł.	17	type .	height bore r
	F	5	Ĩ	H.	Ят	Жr	ж. т	Жr	Ηr		thousands	ģ	thousands	5	∎illion	F	hour	Ę.		t	ton			E
EAST APRICAN SUB - REGION									. '			÷												
25. CF France - Mthiopien	1 00	781	842	•	35	ľ	ų	36	62	720	395,6	202	447,3	543	243,0	8 К	35	30/20	6	625/800	13,0	¥sa	Ŀ	810
26. North, Ethiop, Railw, 3.C.	950	306	355	ī	89	17	œ	5	19	306	215,0	ž	109,0	132	14,4	77	••	28/25	¢4	692/819	12,5	Hand brak -	50 + 31 1	6 3
27. Mast African Bailw. Corp.	1 000	5 939	7 031	ı	122	333	,	ŝ	696	18 625	4 617,0	19	5 884,0	103	4 150,0	32 24	72	47/22	64	700	21,0	41 7	- MOA	584
28. HICP Malgaoha	1 000	88.4	1 026	1	Z.		21	51	93	841	2 365,2	Ħ	831,1	331	275,6	8 23	8	30/25	8, 4	668/800	14,0	Yao	Villieon	150
29. Maleri Railways Ltd.	1 067	X	595	,	26	Ś	N	3	24	666	739.7	74	1 069,3	- 	194,0	16 1 8	26	40/ 20	8,¥	788	16,5	Tao	E	864
30. Beasiland Railways (M) 💅	1 067	220	233	e e e e e e e e e e e e e e e e e e e	rated by	- 27 8	• Nogan	bique	•	690	,	•	3 317,6 ¹⁵	200 ⁺	663,5	- 24	21	ţ	=	762	20,0	5	217	8 5
31. Zambian Bailwaya	1 067	1 099	1 609	,	5	8	18	149	8	1 500	1 320,0	161	7 410,0	804	5 985,0	48 24	88	44,6/39,7	7 W, S	668/170	16,5		E	6695
Búbtotal	•	9 736	11 685	ì	263.	45	52	780	- 144	23 548	9 652,5		19 068,3	604	11 525,5								•	•. •
CHATRAL AFRICAT SUB - REGION				·																				
32: BCF du Cameroun	1 000	619	949	ŀ.	2	J	7	8	Ха	958	1 879,2	118	1 071,0	263	303,0	ج 2	8	36/20 ,	ु अ 0	571/668	13,0-	¥ao	Willison	850
33. CF Congo - Ogéan	1 067	515	540	1	56	•	5	104	58	1 165	1 220,5	114	3-612,0	333	1 202,0	60 37	8	36/80	to	571	16,0	¥*o	Willison	870
34. CF de Com.Min.de l'Ogooné(M) 1 067	285	311	÷	18	•	9	71	I	268		ŀ	1 511,6	485	731,0	- 23	55	8	œ	970	16,0	¥40	Villigon	870
35. OF Kinshata-Dilolo-Lubambaa	11 1 067 J	2 612 679 1	8 3 061 858	2	78	8	·· •	219	188	3 976	2 636,0	225	5 499,0	384	2 112,2	22 22	52	62/04	3,0	668/170	15(20)	Tao		, SBC
36. OCF des Grande Laos	1 067	960 125	1 058	13	2 21	i 22		ā &	8 2	8; 5	472.1 7	 	2 192,0 1 418,3	73 1 2	884,0 177,3	× ،	88	29/24		668/170	15,0 12,5	₩mo + 411	, AB	• 80
37. OBATRA du Zaire	1 067	\$	673	i	: 8	i i	•	66	- \$6	2 940	. 1 371,0	• 3	1 310,0	3.8	504 , 4	יא איי	58	40/33 18	60 63	571/668 715	8,0	- 780	88 + 54 ₩	312 312
35. CF Vicinaux du Zaire	8	839 9	87 1	1	5	33	J	1	19	350	93,	207	304,5	235	71,6		с	33/10	6	668	8,0	¥.o	80 + J	500
Subtotal		6 720	7 860	. 51	323	155	64	593	453	10 597	7 672.0	5	17 038,8	352	5 994,5			÷						
OTHER AFRICA	1 067	3 093	3 791		•	223	1	211	186	6 986	4 746,0	52	14 408,0	170	2 450,Đ	8 *	8	45/30	-	668	18,0	T.	E	895
	• • •	ġ į			:	:	•	24	5	995	225,	1 162	1 512,5	Š	386,0	ដ ភូ.	о 73	37/20	#,8	685/770	13,5	Tao	111	-895
40. Trang-Zambesia Emilw. 4 Harb	1 067	21 23		- · = '	324	2 4 2 1	1/2 804	6 6 50	4 399	144 091	29 217,	~	114 773,2	618	70 900,0	2	- 5	48/30	C,W,8	810/915		- Tuo -	Ali	885 5
	610	# 802 706	■ 9 696 872	7 1	•	\$	•	69	.	1 895	(463 691, 7	6)∎uburb. ?	→	7	?	7		7	7	~	(01Ct)	- Nac	E	3 <u>5</u>
42. South African Iron & Steel	1 067	• • 11	# 482		07 <u>/21</u> 6		.: •	8	1	980	ı	,	6 594,0	N	13,2	•	5	40/40	8,W	613	30,0	Ē		5
43. Ehodesis Bailways 11	1 067	3 23 9	, 4 578	ı	73	244	•	317	652	13 116	2 813,	9 -1	11 686,D	539	6 290,0	ຄ	8	45/30	3,0,1	,685/767	17,0	A17 + Tax		- 695
44. Union Lime Company	1 067	6	<u>16</u>	ı	2	۰.	۰	N	1	7	ı	ı	7	: 7	2	۲ ۲	••	3	3		-1	, are i	E	
45. Caminho de Ferro Benguela	1 067	1 348	1 662	I	•	106	•	112	¥	1 656	1 214.	5 96	2 061,0	920	1 900,0	ີ ພ	2 70	40/30	5	638	15,0	146	E	9
46. Caminho de Ferro de Amboim	600	123	126	1	7	N	u.	ĩ	758	368 5	34,	ين د-	8,2	72	9,0			71/02	-	8		d Yao	UN#211#+1	
47. Caminho de Ferro de Luenda	1 D67	8. ⁵	278 528	ī	6	3	. 6	с. С	. y	623	568,	7 81	16,0	250	4,0	je U	0 5	65/15	64		13.5	1 140	E	3
48. Cam, de Perro de Rogemedes	1 067 600	756 124	945 149	1	10	23	ŀ	33	25	313	272,	1 134	6 302,5	524	3 310,0	8	5	51/06	ļ	CL1 /629	1311		ł,	uşu V
49. Co.Sepanola de Minaw del Ai	1 000	28	¥	7	~	~3	>	7	7	ŗ	- +3	~1	Ŷ	*	~	2 7		••	?	7)	-1	-3	-7	••
(#) Subtotal	-	31 785	44 647	1 12	D 552	3 135	2 826	7 633	6 249	170 427	(502 984,	2) <u>14</u>	157 361,4	542	85 253,8									
GRARD TOTAL	•	71 099	100 729	1 26	7 2 899	4 254	3 705	12 125	12 428	271 837	208 172, (799 841,	5,15/	286 204,3	446	128 129,6									
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	9 / <u>61</u>	1 \$ 02 72	ight Vol	1	Iren Or	•		12/ Be	ttery - I	ooceo ti⊽e	•			ات او ب	ng Sutpulot	bur ban	Traffic	of South	i African	Railways an	d Reppt	ian Railwi	4	

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 \overline{TABLE} I Booncaric and statistical data of A^{*} rican Railvays

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0	lauge F	Dute 1	Tack	los	motives	and Re	tloars	ā	T Stens	wight P	авердег аетгі	t.ed	Preight	oarried		Speed	Bat	4	Sleepsra	Arle load	- Brakin System	2 Cou	pling tem	
RAILWAYS IN AFRICA	I dth I	ang th I	ength E	leotr. I	31ea.	tenn Ra	llo. ta	tal.	5	E L	unber/year an jou	ii	on/year ave	r. volum i. ton-i	a in ev E/year Pr	orace a	H H	<u>ն</u> հե էչյ	vertre	29 #	ty p	4 type 5	height above r	-
	1	đ,	<u>,5</u>		μ	ji Li	-	Ŀ	# M	<u>Er</u>	ងៃលានឧដជន	5	bousands ks	111	ton	od / ed	37 21	•	8	ton			8	
NORTH APRICAN SUB - ANDION																						, ,	010	
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2. Egyptian Railways	1 435	4 510	6 677	•	565	,	473 1	950	820	80 394	88 367,0	61 19	1 600,0 24	~	96 0,666	5 5	₹. 8	42 4 , 3,	8		+ 11 P		-	
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5. GF Mediteranné eu Miger	1.435	273	8		5	~		₽	~	۴	2	•	**		٠. ۴	•			F -1		.	.	•	
6. Suita Bailtava	1 067	4 157	5 447	,	162	121	¢,	5 96	650	6 446	3 417,2	302	3 075,4 B	88	658,0 5	8 8 9	\$ 8	, SS	17	16,	та	17	6 88	
7. 2007 Tunisions	98	8	568		55 -			ŝ	181 -	5 372	14 694,4 _	я.	1 098,2 1	. 1	323,0 6	- 	ō. ≵.	а́, Л ОС	- - -	129 129	00 1	4 + + 2 2 2	040 211	
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de de deres		16 334	23 747	96	1 294	161	658 2	602	3 471	51 492	118 250,7 (246 027,7) J	5	t5 536,6 2	49 13	338,8									
NEST AFRICAL SUB - REGION																	:						Ş	
9. OCDE Chem. de fer et Transp.	8	579	635	ı	5	,	2	ŧ	6	ž	11 044,2	8	204.0	5	76.5 5	3	ନ ଛ	5	\$ 6	2			8	
10. Ghana Railwaya & Porte Auth.	1 067	946	1 289	ı	78	118	ı	196	269	3 235	7 233,2	56	1 699,1 1	8	305,2	9 8	6/64 40		. 13	9 [12	ەر يە		876	
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11.5 Cia. miniaro du Comakry (M)	1 435	Ξ	2	ı	2	,	,	N	ı	12	ı	•	•	-	••	* *	-	۲	~		¢.	~	*	
id. BCP Abidian - Miser	8	1 314	1 410	•	Ŧ	,	22	66	63	557	1 147,2	102	452,9 5	÷ •Ç	249+0	2 2	* 25	(()	8 590/	150 13	5	. Willion	ççt v	
15. Lanco (1)	1 435	267	8	,	6		•	ŝ	ı,	562	ı	÷,	11 500,0 2	67	110,0	1 1	× R	5.5	۲ 24	ጽ •	د ا	Ĩ	876	
16. Bone Mining Contant (M)	1 435	22	8	,	4		•	40	,	ž	۱	,	9 Too,0	72	100,0	•	3	0*0	۴ و)		1. 1.	- Bohaltu	1 060	
17. Extional Iron Ore Company (M)	1 067	84	ŝ	ı	8 0	ı	,	80	ı	271	•	ī	3 000,0	đ	252,0		~	5.0	8	8	1 1 1	4	876	
18. In bards Eining Commany (E)	1 067	\$	\$	ı	₽	,		\$	ı	160	•	1	3 000,0	5	204,0	1 1	÷	5,0	3	8 	N . 01	3	876	
19. BOP du Mali	8	645	108	ı	23	1	ę	32	3	239	624,3	126	291.5	191	106,8	46 24	× •	8	8 (CO)	140 111 111	₽ ~(0		. 129	
20. Briese (B)	1 435	%	81	,	8	•	,	8	ı	656	ı	ı	9 000'00 6	8	650,0	• •	22	2	8	2	1	- 1111	ы 870	
21. Missrian Bailware Corporation	1 067	3 523	4 813	•	\$	240		87	546	666 9	8 370,0	13	2 481,0 1	80	2 575,0	32 19	3	a _ 0č/a	/069 #*	760 16	*	Ë,	864	
22. CT du Ministral	00	1 032	1 186	,	8	ı	2	62	96	1 051	0'505 5	8	1 781,0	189	1.766	60 45	8	e/20 8	/569 2"	129			155	
21. Sterre Leone Developm. 00. 6/	1 067	8	. 6		5		•	12	ı	956	,	ı	4 000,0	\$	320,05	1 1	6 -1	*	2		2 b 1	3	876	
24. GF du 7960	8	442	495	ı	F	ı	5	27	63	387	1 467,9	5	7 . 68	122	10,9	45 45	<u>ę</u>	02/50	8 755/ 8	110 IS	••5	- Millin o	on 450/500	
Bubtotal		10 524	12 790	ı	147	358	105	910	111 4	15 773	33 504.5	ı	47 199,2	662	0'111 0									

4 Including Suburban Traffic of Egrptian Eatleave * Estimated Air - Continuous Air Pressure States
 Yao - Continuous Vacuum Eraics
 UTC - Standard Coupling ULC
 Als - Standard Couplings of Assoo. of Assrican Railroads
 Als - McK Coupler
 Als - Scoupler
 Schatu - Scharfenberg Coupler
 Sc + B - Sress and Side-Buffers

Souroes : Amnuel Raports of Railenye Jane's World Railwuye 1972 / 1973

Sterra Leone Railways is excluded because of being passed out 1/ 7 = Data not available 8/ (M) - Mining Bailway

Bubtotal

PT - Passenger Train
 PT - Praight Train
 Y = Vooden Steeper
 S - Steil Steeper
 C - Concrete Steeper
 C - Concrete Steeper

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	4	tion Relly	und Eerpt	. Railways	African	of South	1110	oan Tri	Suburt	Including Including	ĘĘ			•	ooomo ti ve	itary - 1	2 Ber	let.		2	in Iron	Yolu.	might	61 ¥ or 1	10	
	a.	Eștinațe	•			ut in Bo	L.	Houte	635 H	Including	Ę	-		2 Train Sets	letor Coast n Traffic	luding j Suburb		l :		μ	nai de Te	/ 1 00	i Bailway Ing Bailw	Svatilan Svatilan	٤	
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ayo		¥80	13,1	625/715	3, I	30/15	5	ĸ	8	3 310	524	6 302,5	1 12	272,1	3:3	25	33	'	23	6	•	3.		150	1 067 600	48. Can, de Ferro de Mogamedes
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о 1 8 ас	MUIITER	¥ac	16,0	571	50	36/80	8	37	8	1 202,	333	3,612,0	114	1 220,5	1 - 1 65	×.	04	5			2	5		515	1 067	33. GF Congo - Ogéan
850	W1111er	¥80	13,0-	571/668	3,0	36/20	8	Я.	8	303,	263	1 071,0	.118	1 879,2	958	¥	8	7	•	Ĩ.	ý	5	و	839	1 000	32. BCF du Caseroun
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						. •			Ū.	11 525,	8	19 068,3		9 652,5	23 548	1 144	8	ŭ -	5	छ •	28	8.	т,	9 730	•	Subtotal
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Table 4: Operating Table. Reve	enues	100	= PT0110				
	1966	1967	1968	1969	1970	19	
CF du Togo*	137.8	139.8	108.8	97.5	109.1	132	8
CF Franco-Eth.	72.6	85.7	85.8	87.6	80.8	80	,6ª
CF Kinshasa-Kilolo-Lubumbashi	-	98.2	96.9	95.8	96.1	96.	7
East African Railways Corp.	·	87.0	88 . 0	87.0	90+0	-	1
Egyptian Railways	61.3 ^{b/}	74•7	85.5	96.3	 .	-	1
Ghana Railways	82.64 ⁰ /	110,99 <u>d</u> /	132.43 ^d /			/ <u> </u>	1
Malawi Railways	¹		~	82.9	95.0	93	0
Nigerian Railways Corp.	133.0	106.4	107.2	106.9 ^{≞/}			
OCIN - Abidjan - Niger		99.0	116,0	99.0	98.0	-	<u> </u>
ONCF du Maroc	99.98	99.96	98.56	98.43	97.04	97	80
RCF du Cameroun	- · · ·	-		106.7	101.2	105	9 [±] ,
SN(FA Algeriens	109.0	103.0	91,0	85.0	81.0	92	0
South African Railways	88.7	87.6	84.0	89.5	89.5	95	3
Sucan* Railways	82.4	90.1	94.6	97•2	85.6	88	4
Swaziland Railways	89•5	91.0	100.5	94.5	91.0	88	6

<u>Table 4</u>: Operating ratio: $\frac{\text{Expenses}}{\text{Revenues}}$.100 = 100 = Deficit 100 = Prorit

Sources: Annual Reports and Jane's World Railways 1972/73

* Excluding provisions for renewals.

- <u>a/ 1965/66-1970/71.</u>
- <u>b</u>/ 1965.
- <u>o/</u> 1965.
- <u>a</u>/ 1966/67-1967/68.
- <u>e/</u> 1966/67- 1969/70.
- <u>f</u>/ 1969/70-1971/72.

1701.14/1HANS/103 Page 10

40. Besides electric traction the most economic mode of traction is dieseltraction, therefore the trend of all railways is dieselization, whereas steam traction is being phased out more and more by substituting steam locomotives, which are put cut of service by diesel locomotives.

41. Up to now 26 or 53 per cent of the African railways are already completely dieselized and for the remaining 23 railways the programme of dieselization has priority. Graph 1 demonstrates the progress in dieselization made by 5 selected African railways.

42. Malawi Railways changed the mode of traction in between two years from 49 per cent of diesel traction in 1967 to 98 per cent diesel traction in 1969 or to an almost complete dieselization. Chemin de fer Kinshasa-Kilolo-Lubumbashi (KDL) started diesel traction in 1969 with 4.6 per cent of total operating performance and reached, only two years later in 1971, a percentage of 28 per cent diesel traction. At the same time the share of steam traction on the total operating performance performance decreased from 51.2 per cent in 1969 to 23.0 per cent in 1971.

43. Graph 2 shows the development of the number of locomotives including locomotives for shunting during the period 1967 to 1971 for total Africa, and separately for Other Africa. The total number of locomotives has almost remained at the same level with a small increase of 2.6 per cent only, whereas the total oberating performance in ton-kilometres has increased significantly by 26.5 per cent in these five years. Such considerable progress has been made possible only through the essential improvement of the efficiency of operation.

44. It is also shown that the total number of steam locomotives has decreased by 19.3 per cent, whereas the number of diesel locomotives has increased by 50 per cent making the great improvement in operation possible.

45. Graph 3 shows the increase of operating performance in ton-kilometres, together with the development of the number of locomotives for the railways of Developing Africa during the period 1967-1971. It is very remarkable that even though the total sum of locomotives has remained unchanged, the operating performance in ton-kilometre per year increased by 57.5 per cent. The percentage of steam locomotives in the total number of locomotives fell during this time from 54.5 per cent in 1967 to 31.0 per cent in 1972, whereas that of diesel locomotives increased from 42.9 per cent in 1967 to 64.8 per cent in 1971. These figures make the economic success of dieselization very clear, since the efficiency of operation has increased significantly although the total number of locomotives has remained at the same level.

46. It can also be seen in table 1 that the railways of Developing Africa South of the Sahara permit only a low average speed of about 40 kilometres per hour for passenger trains, and of about 30 km/h for freight trains. In comparison with the average speed of European trains the African average is about 20 per cent lower. A higher average speed for passenger trains would make it possible to utilize the coach stock more economically through the improved turn round of carriages, whereas for wagons, the effect of increasing the average speed would not be as big as the effect in respect of passenger cars,





Graph

Development of number of locomotives from 1967 to 1971



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because only a smaller portion, about 30 to 40 per cent of the total turn round time of wagons is covered by pure running time. The bigger portion of the total turn round time of wagons includes time for loading and unloading, shunting, and making the wagons available to the client, and all these time factors cannot be influenced by increasing the average speed of freight trains. The relation is even worse in Europe where the running time is only one-fifth of the total turn round time of wagons, because much time is lost in marshalling yards in reforming the trains.

47. The admissible axle load of African railways south of the Sahara varies from 12.5 tons to a maximum of 18.0 tons, except in the case of the recently constructed private mining railways which permit 20 ton axle loads, and is considerably lower than the standard in Europe which is between 38 and 22 tons.

48. Both factors, low average speed and low admissible axle load have an adverse effect on the operational capacity for the respective routes, and must be improved if the growing demand for transport capacity is to be met in the short time available. The improvements necessary to increase transport capacity on the lines have to be undertaken, first of all in the infrastructure and alignment, and most of the African Railways are intensifying their efforts to improve their operation efficiency, both in respect of permanent ways and rolling stock.

49. Table II contains a summary of important traffic data of African railways extracted from table I and broken down over five subregions according to respective ECA documents with the exception that Sudan is included in the East African subregion. From the point of view of railway matters the Sudan Railways are much closer related to the East African subregion than to the North African subregion and are therefore put in the East African subregion for the purposes of this report, and are added to the railways south of the Sahara as well.

50. The distribution of the number of railway undertakings with their respective route length into subregions quite clearly shows the different character of the railways in the various subregions. In the North African subregion there is 16 per cent of all railway undertakings with 18 per cent of total Africa route length, and in the East African subregion 16 per cent of the railways with 19 per cent of the route length whereas double the number of railway undertakings; that is to say 30 per cent, are in the West African subregion but with only 13 per cent of total route length, which highlights the character of mainly single penetration lines in West Africa instead of networks as in East Africa.

51. Twenty-two per cent of ll railway undertakings in Africa are entirely mining railways, 10 of them are owned by private companies and 8 or more than two thirds are located in the West African subregion. The Swaziland Railway is classed as a mining railway as well because it conveys only freight, no passengers, and 81 per cent of its total freight volume consists of iron ore. 52. The mining railways are of considerable importance among the African railways and 6 of the 10 private undertakings were constructed during the last decade. They are now conveying about 16 per cent of the total transport volume of Africa but account for only 2.5 per cent of total route length, O_a9 per cent of total motive power and 12 per cent of the freight cars.

53. They have the strongest foothold in the Vest African subregion where 85 per cent of the total freight volume in tons of the region is carried by mining railways, which represent 50 per cent of the railways in the subregion but account for only 12 per cent of route length, 9 per cent of motive power and 15 per cent of freight cars. The West African mining railways are conveying 91 per cent of the total freight volume of all mining railways in Africa. In contrast to West Africa mineral products do not play such a dominant role in the East African subregion, except in Swaziland and Zambia.

54. Bearing these facts in mind it can be stated that the volume of freight traffic in West Africa except for the exclusive transport of minerals (85 per cent) is rather small and this is even more so if we consider that of the remaining 15 per cent of transport volume still some proportion consists of mineral traffic. Although the West African subregion has the greatest population density relatively, 30 per cent of the population on 20 per cent of the area of the continent, the railways have the lowest transport volume, the mining railways excluded,

55. The traffic volume of freight carried by the African railways during the years 1964 and 1971 is shown in Graph 4. The three subregions: West, East and Central Africa have substantially increased the traffic volume carried by railways, whereas in North Africa it increased only by about 14 per cent. This small increase is basically caused by the less of transport of crude petroleum, which is now transported in pipelines. The most considerable increase in traffic volume has been negistered in West Africa, as a result of the two new mining railways, constructed during these years in Liberia (Bong Mining Co. and Lamco). The total traffic volume for Africa has risen by 30 per cent from 1964 to 1971, whereas that of developing Africa even more than doubled, although the railway traffic volume in North Africa had increased very little.

56 and Considering only West, East and Cen ral Africa the rise of railway freight traffic is even more impressive, increasing from 10,805,000,000 t-km in 1964 to 34,294,000,000 t-km in 1971 or more than triple the original figure, underlining the important role of railways, which are still the dominant factor on the transport sector in Africa for the economic development of the continent.

57. Of all the subregions East Africa has the largest average haul per each ton of goods carried 641 km, whereas the shortest one of 204 km is registered in the North African subregion. The Nigemian Railways Corp. has, with 1,020 km, the longest average haul of all African railways. The all-Africa average is 446 km, which is double the average heulage per freight ton carried on European railways - 223 kml/, but less than that of North America and the USSF.

1/ Excluding Bulgaria, Ireland, United Kingdom and USSR, see table 3.

Bconomic and statistical data of African railways comprised into subregious TABLE II

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Subject	NORTH AFRI	CAN SUBREG. 1/	WEST AFRICA	UN SUBRECT	EAST AFRICAD	I SUBREG.	CENTRAL APRI	CAN SUBR.	OTHER APRICA	TOTAL AFRIC.	4
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Number of railway undertakings 2/	P.N	8 16 -	16	34 -	7	14	-	14 -	11 22 -	49 100	1
Mining Railways	THE REAL	1 1	8	50 73		14	۲	14 9	1 9 9	11 22 10	8
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Electrified Route Length	5	54 8 16	1		ı		679	10 5	4 804 ⁴⁴ 15 74	6 537 9 10	8
Route Length of Mining Railways	5		1 379	12 71,5	75027	1,5 12	285	4 15	28 0,9 1,5	1 912 2,5 10	
Motive Power Units 6/	Nr 1 9	11 16	910	1	1 078	6	593	цЛ	7 633 63	12 125 100	
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Electric Locomotives	Nr	96 5 8			1		51	4 6	1120 15 88	1 267 10 10	8
Total Locomotives	Nr 1 2	62 67 15	805	88 9,5	1 017	94 12	529	89 6,5	4 807 63 57	8 420 74 10	, 8
Diesel Locs of Mining Railways	Nr I	ı	94	191/84	operated by A	logambique	1.61	و 16	not available	112 47/10	3
Passenger Cars	Nr 2 6	21 22	111	6	1 794	15	453	4	6 249 50	12 428 100	
Freight Cars	Nr 45 C	46 16	15 773	9	29 994	=	10 597	4	170 427 63	271 837 100	ŀ
Freight Cars of Mining Railwaya	Nr -		2 384	15 71	069	2 21	268	2 , 5 8	not available	3 342 12 10	8
Passengers carried per year	Nr 114 833	00 ¹ /55 00) ² /55	33 504 500	16	13 069 700	vo	7 672 600	-++	39 092 40010/ 19 (463 891 800)1/	208 172 700 <u>12</u> /100 (799 841 500) <u>13</u> /100	
Freight carried par year t	ton 42 461 2	00 15	47.199 200	16	22 143 70C	89	17 038 800	6	157 361 400 55	286 204 300 100	·
Freight carried per year ,000 ton-	-jens 8 680 8	00, 7	14 117 000,	E	14 183 500,	=	5 994 500,	ŝ	85 253 800, 66	128 129 600, 100	
Average Haulage per ton	B	04	563		641		352		542	446	
Freight carried by Mining Railways t	ton		40 200 000	85 at	2 691 361	12	1 399 900	۔ دی	not available	44 291 261 16 10	8
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Average Haulage per ton			260	~	220	t	265	•	not available	258	3
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Атев	cm ² 57520	00 19	6 063 000	20	8 198 000	27	5 417 000	18	4 791 000 16	30 221 000 100	
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6/ Including Railcars (see TABLE I) I/ Percentage of Diesel - Locomotives 2/ Suburban Traffic of Egyptian Railways

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8/ Without Suburban Traffic of Egyptian Railways

TABLE III Gauge widths of African Railways comprised into subregions

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58. The distribution of railway gauge widths in Africa is compiled in table III on the same subregional basis as in table II, with the Sudan included in the East African subregion. The dominant gauge width in Africa is 1,067 mm which is used on 60.8 per cent of the total route length in Africa. Considering the subregions, the 1,067 mm gauge is even more important because it is used on 75 per cent of the total route length south of the Sahara, including Sudan Railways and excluding Madagascar. Therefore, the 1,067 mm gauge has been declared the African standard gauge and this recommendation should be observed for every new railway to be constructed, as well as for extensions of existing lines of other gauges, which should be constructed so as to facilitate future conversion to 1,067 mm, in order to establish a standardized superstructure for Africa, as is being done by the East African Railways Corporation.

59. The figures at table III show that in North Africa as well as in Central and South Africa, railway networks have been formed undoubtedly because of the prevailing gauges of 1,435 mm in North Africa (75 per cent of route length) and 1,067 mm in Central and South Africa (72 per cent of route length in Central Africa and 97 per cent in Scuth Africa) whose networks are already connected. On the other hand, in West Africa the two gauges of 1,067 mm and 1,000 mm have an almost equal share of route length whereas the 9 per cent of route length in 1,435 mm gauge used by four mining railways is without any importance due to standardization. Of the 16 railway undertakings in West Africa which operate independently of each other, (except CF du Sénégal and CF du Mali, which are one line in reality), five have the African standard gauge of 1,067 mm on 46 per cent of total route length and seven railways had been constructed using the 1,000 mm gauge on 45 per cent of total route length. The only network which was formed in the West African subregion is that of the Nigerian Railway Corporation consisting of 3,523 km of lines which cover the Nigerian territory well (see also map between pages 2 and 3).

60. The East African subregion takes a special place amongst the subregions with respect to railway systems because it has three separate big railway networks covering almost the whole region. The southern part of the East African subregion with the railways of Malawi, Swaziland and Zambia is physically integrated in the very large South African interconnected railway network which also includes Zaire and Angola having been constructed using the 1,067 mm gauge, while the Sudan Railways in the North of the subregion can by itself be recognized as a big network in the same African standard gauge, and at last remains, in the middle between these two networks, the second greatest railway network after that of the South African Railways in Africa operated by one undertaking, that of the East African Railway Corporation with the 1,000 mm gaugd. Apart from these dominant railway networks there are two more railways with 1,000 mm gauge, namely the Franco-Ethiopian Railway and the Railway of Madagascar, while the second separate Ethiopian Railway has a gauge of 950 mm (see also map ubetween pages 2 and 3).

61. Table III shows furthermore that of the nine different gauges existing among African railways, only three are of major importance that of 1,067 mm representing 60.8 per cent of the total route length in Africa; that of 1,000 mm with 20.4 per cent, and that of 1,435 mm which accounts for 13.8 per cent of the

total route length of 77,099 km in Africa. The remaining six gauges (1,055 mm, 950 mm, 750 mm, 615 mm, 610 mm and 600 mm) which together account for merely 5 per cent of total route length play an absolutely insignificant role in Africa, and they have to be kept out of any consideration in regard to future standardization.

62. With respect to standardization of permanent way and the forming of an interconnected Pan-African railway network south of the Sahara in the future. it is of great interest to know that 23 railways out of 41 south of the Sahara, including that of the Sudan but excluding that or Madagascar, already have the African standard gauge of 1,067 mm. Taking into account that 6 mining railways with different gauges can be excluded from further consideration, merely 12 railways have gauges which differ from the standard gauge. Nine of them have a 1,000 mm gauge, six in West Africa, two in East Africa and one in Central Africa and the remaining three, one with 900 mm gauge and two with 600 mm gauge should also be overlooked because of their insignificance in regard to future standardization. Considering, furthermore, that the 23 railways with the African standard gauge account for 75 per cent of the total route length on the continent south of the Sahara and that half of the remaining 20 per cent of the route length with 1,000 mm gauge is operated by the East African Railway Corporation, the standardization planned appears more realistic, all the more since the superstructure of East African Railways is especially well adapted to conversion to the 1,067 mm gauge and the ongoing construction of the Tanzam Railway which would link the EAR to the South African network seems to offer the best opportunity to encourage EAR to consider gauge conversion seriously.

63. The normal 1,435 mm gauge is exclusively used in North Africa. for only 9 per cent of the route length south of the Sahara uses the 1,435 mm gauge and this is restricted to the four mining railways in the West African subregion.

64. Actually, the distribution of different gauge widths throughout the subregions does not seem to be too unfavourable to the standardization of the superstructure of African railways, if we consider North Africa as a separate independent railway network without links to the railways south of the Sahara. At least for the time being this is not under serious discussion at all.

III. Summary of projects and technical assistance to African railways

65. The following provides a survey of railway projects in Africa both ongoing or under consideration. They are classified according to the organization responsible for implementation or financing. There is also a summary on studies and technical aid for railways in Africa. The most important contribution in this field is that of the international organizations of the United Nations followed by those donor countries which offer bilateral aid and finally by some private organizations e.g. Crown Agents or Sofrerail which are State supported. 66. The aims of projects cover a wide range from the final stage of construction planning as for the Owendo-Belinga railway to construction work on new railways, such as the extension of the Cameroon railway from Balabo to Ngaoundere or the new Tanzam railway from Dar es Salaam to Kapiri M'Poshi. The improvement of structures on existing networks in the Sudan, Zaire, and on that of the East African Railways Corp. is also included among the most important goals. Some of the projects have been underway for some years, others are at the initial stage, but altogether underline the great importance of the railways in the transport system on the African continent.

67. The studies as well as the special railway projects are evidence of the great effort made in Africa to overcome their economic problems by improving transport facilities. Studies cover a wide variety of objectives from highly specialized work such as the exploration of some mineral resources to general studies on the transport situation in larger regions, and from special research ou possible technical solutions to overcome the great obstacles to forming an African railway network to very general comments on technical specifications for all modes of transport.

68. Lists of projects underway or proposed are given in table 5 and table 6. Hesides the construction of the extension of the CF du Cameroun and the new Manzam Railway, there is one more mining railway under construction in Guinea and work on one in Gabon is to be commenced shortly. Total route length will be about 2_r700 km .

69. But, the aim of the majority of all the projects is to modernize the railway systems. First, disselization and the modernizing coaches and wagons is given priority to facilitate the improvement of operations. Besides the purchase of rolling stock great efforts are being made to improve track alignment, track maintenance and to modernize signalling, the basic requirements for efficient and economic operation, and for decreasing wear and tear of rolling stock and thus lower the maintenance costs for rolling stock which in some cases are very high. Not only the decrease of running maintenance costs of rolling stock in an essential sector is achieved by the improvement of the permanent way, but also the lifetime of locomotives, passenger and freight cars will increase substantially.

70. Table 7 shows the percentage of maintenance costs for rolling stock and permanent way out of total operating costs for ten African railways excluding the depreciation allowances. The percentage of expenses for maintenance of both rolling stock and permanent way of the total running costs varies from 22 per cent for Swaziland Railways to 71 per cent for the CF du Togo, demonstrating the importance of reducing this cost factor by the use of improved methods. The percentage of about 20 per cent to 40 per cent of total operating costs for the maintenance of rolling stock and permanent way should be considered a quite acceptable average, but figures like 71 per cent are too high. Comparing the 22 per cent of Swaziland Railways and the 71 per cent of the CF du Togo special attention has to be drawn to the fact that Swaziland Railways has been the CF du Togo has been in operation for three quarters of a century and unfortunately has suffered in recent times from a constant deficit, which naturally

E/CN.14/TRANS/103

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Table 5: List of railway projects in Africa supported and financed by j	nterviatri 91	lel organizatio	N.14/ e 16
NORTH AFFICAN SUBREGION			TRANS
I. <u>Egyptian Railways</u>			5/103
First phase Five-Year Railway Investment Programme rehabilitation and improvement of Railway network. Relaying 300 miles track; purchase of 18 Diesel-locs, 400 freight cars, telecomm, and signal- ling equipment.	I DA	30,0 ^a /	Period 1972 through 1976, ongoing
2. <u>Sudan Railways</u>			
Purchase of railway equipment,	ADB	2,8	Underway
Set up of a quarantine station for livestock exportation,	ADB		
Railway III - expansion of capacity and improvement of operation to meet growing traffic demand.	IDA	25°C	Arpraisal mission scheduled for December 1972
Technical Assistance to Railway	dIND	Ç.	Under consideration
WEST AFRICAN SUBRECION			
3. RCF du Mali			
Railways II - track renewal, improvement and strengthening of bridges, replæement of small number of locs, and about 70 freight cars.	IDA	5°5 ^b /	Appraisal report being prepared
$\underline{a}/$ This amount is in million US\$ and approximate, if not otherwise	i ndi cat ed		
$\underline{b}/$ Total project cost about 7.7 million including 5.5 million fore	ign exchan	• 9 59	
		. ,	

г.ł	<u>able 7</u> (cont'd)			
	<u>RCF</u> du Sénégal			
	Railway II - 175 km track renewal and equipment rehabilitation- total cost 12.3 million	World Bank IDA	6•4	Appraisal report being unensmed
μr,	<u> Tvorv Coast RCF Abidjan-Niger</u> Purchast			1917 11 1911 1911 1911 1911 1911 1911 1
	Transportation survey phase III	ADB UN DP/IBRD	834 CFA 0.9	Completion expect-
, <u>,</u>	Nigeria			ed January 1973
	Rehabilitation of Nigeria's transportation network; purchase of materials and equipment. Transport survey of the Mid-western State.	IBRD	25.0	· 1
۴ ۲۰۰۰	<u>Upper Volta</u>	LBKD	۴.	Not yet commenced
	Technical and economic feasibility study for the section Kaya- Tambao of the proposed 60 mile railway extension from Ouagadougou to Tambao with investigation on possibilities of further extension in Niamey.	dQND	1.6%	Underway
ۍ ۱	Guinea			•
	Eoke-Project; railway construction for bauxite mining 137 km Additional infrastructure work to the above project: heavier rails and lengthening loops-lines.	IBRD (US AID) World Bank	64 • 5 ^{<u>à</u>/ 9 • 0}	Under construction
	$c/$ The railway study is made up of feasibility studies on mineral d $\dot{d}/$ Amount for the whole project.	evelcpment in th	e northeast.	E/CN.14/TY F
		An and a management of the second		ANS/103 age 17

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roe l	e. 1: List of railway projects in Africa supported and financed by :	international or	<u>gani zations</u>	.14, 18
EASI	AFRICAN SUBRECION			/TRAI
•	<u>East African Railways Corporation</u>			∜S/1C
	Railway IV- 1973-1976 next phase of continuing projects for development of railway facilities serving East Africa.	World Bank (IBRD)	to be de- termined	Awaiting submis- sion by Government
				of final programme 1972-1976 for consi- deration by Bank
	Improvement of railway system.	IBRD	42.4	Ongoing
T0.	RNCF Walgache (Malagasy Railways)			
	Railway rehabilitation - part of Five-Year Development Plan 1972-1976, modernizing railway system.	World Bank	0.0	Appraisal mission planned for Jan. 1973
	Restoring rails on a 260 km section of Tenanarive-Tamatave line and purchasing new rolling stock.	TBRD	4°9 Malag.	
11	Zambi an Rai l way	•	Francs	
	Training of railway personnel.	dCIND	ی ا	
CEN	'RAL AFRICAN SUBREGION	•	19. 	·
27	CF Congo-Océ an			•
	Ré-alignment of Holle-Dolisie (110 km) section, feasibility study of improvements to Congo-Océan Railway.	IBRD	45•8	Completed
				•

<u>Xable 5</u> (contd)

Cameroor	the second secon
n.	
H	

Reh. bri(ubilitation of 90 miles trauk; construction of a steel ge, purchase of rolling stock, consulting services.	IBRD	5•2	Expected to be
Čoni froi	itruction of the extension of the Trans-Cameroonian Railway Belabo to Ngaoundéré.	ELB	43.1	under construction
Ind. 1. Gabo	mnification for unforseeable technical difficulties. <u>n</u>	EEC	α 	
Cone anci tote	truction of Owendo-Booue-Railway (38 km) including llary road construction and timber port facilities; l project costs about \$200 million.	ĽDA	To be de- termined	Appraisal report being prepared
Engi stuä	neering of the Owendo-Belinga Railway-tie production Y.	IBRD	, I	Completion expe¢-
Tech	nical assistance to the Office du CF Trans-Gabonais (OCTRA)	World Bank	ł	ed in early 1973 Under considera- tion by Bank
i. Zair	e - ONATRA	,		
Rail rail	way and river transport refabilitation of Kinshasa-Matadi Way and inland waterways and ports.	IDA	To be de- termined	Project identifica- tion mission in
4				field

E/CN.14/TRANS/103 Page 19

Tar	is 6: List of railway projects supported by bilateral aid from donc	r countries or	private compa	uni es
NOF	TCH AFRICAN SUBRECTON			
<u></u>	Sudan Railways			
	Modernizing railway operation and signalling; training for railway staff and technical co-operation.	Federal Republic of Germany	55 DM	Underway
MEC	1 AFRICAN SUBRECION			
N	Ghana Railways		L	-
,	Furchase of Diesel locomotives.	U.K.	₽3 . 8	m
	Purchase of railway equipment.	U.K.	54.2	I
ů.	Guinea			
	Construction of the railway from Beké deposits of bauxite to Kamsar Port.	USA	45	
4.	CF du Sénégal			
	Four-Year modernization and replacement programme diesel locs., rail tracters, spare parts, bogies.	France	326.5	1971-1974
5.	CF du Togo			-
	Purchase of rolling stock.	France	150 CFA	
EAS	T AFRICAN SUBRECTON			
9.	East African Railways Furchase of diesel locs.	Canada	C\$14	•
ł	Purchase of diesel locs. and spare parts.	U.K.	昭上1。0	
• /	RNCF Walagache			
••	Modernizing the railway system.	France	116 F. Frai	JCS
:	Connection of track alignment between Ambila and Brickaville.	US AID	1,8	1972/73
a 	Malawi Railways			
15	Purchase of diesel locs., spare parts and special tools; training of railway staff in Canada.	Canada	I	1971/72

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6	Tanzam Railway		
	Construction work and supply cf rolling stock of the total Railway.	China	Abcut Under construction
-7 0	Zambian Railways		
	Purchase of diesel locs.	USA	4•3
C 団 C	WFRAL AFRICAN SUBRECION		
, ,	Cameroon Railways		
	Construction costs of the Trans-Gameroon Railway from Belabo to Ngaoundéré.	FAC	1,655.0 CFA
	-do	US AID	3.324.0 GFA
	10g-	Euronean	
12.	Congo-Océan		
	Equipment for Workshops and extension of the marshalling yard at Pointe Noire.	FAC	220.0 CFA
13.	Gabon	•	
	Railway construction from Owends to Boeué first section from Owendo to Belinga.	Fed. Rep. of Germany	1,900 CFA Not yet commenced
14.	Zaire CF du Grand Lac	Automatica 200	
	Modernization of the railway network including locomotives, coaches and other equipment.	IJĶ	E7.25
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led to a greater reduction in expenditure on maintenance than should have been made. Once maintenance work was reduced after a certain period there were breakdowns and consequently a very high amount had to be spent on maintenance costs to meet the minimum requirements of operational safety.

Øshie 7∙	Percentag	e of expens	es in tota	<u>l operatir</u>	IE COST	S CI HILL	$\frac{Coll_1}{100000000000000000000000000000000000$	<u> <u> </u></u>
100.00	<u>, </u>	- C molling	atock and	nermanent	wav (e	excluding	expenses	for
for ra	<u>unter nce</u>	OI TOITING	BUUUMAIIC	por mentorie	<u>, , , , , , , , , , , , , , , , , , , </u>	•••	۰	

depreciation)

	Expenses fo	r maintenance	·.
Railway	Rolling stock	Permanent way %	Total
Swaziland Railways CF du Togo Chana Railways OCDN - Abidjan-Niger SNCF Algériens RCF du Cameroun Trans-Zambesia Railway Sudan Railways* Nigeria Railway Corporation South African Railways	8 39 47 26 23 46 41 30 16 20	14 32 20 14 22 18 7 21 12 18	22 71 67 40 45 64 49 51 28 38

Including depreciation.

71. Technical assistance to African Railways is given also by governmental and private organizations such as the Crown Agents, Railway Consulting or Sofrerail. Taking the Crown Agents as an example which might stand for all other firms concerned, the services rendered by the Crown Agents to African Railways are spread over every aspect of railway engineering. They cover the preliminary procedures of purchasing railway equipment such as preparing specifications, issuing tenders on a world-wide basis, evaluating tenders received and making recommendations, as well as the highly technical work involved in certain problems in railway engineering such as the building up of wheels by means of welding.

72. To provide a better review of the activities of the crown Agents in respect of their assistance to African Railways, a summary on their services during the last five years is shown in Appendix B. The role of such agencies in the improvement of African Railways can hardly be over estimated, as a view of all the objectives of their work quite clearly demonstrates. Whether a new bridge has to be built or the tariff structure revised, every possible task is included in their programme of activities.

73. Careful study of the voluminous list of projects carried out by the Crown Agents over the last five years will show the great efforts made by African Railways to make substantial improvements in the standard of service. Especially

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the emphasis placed on the improvement of locomotives, diesel-traction and rolling stock in parallel with track improvement, is a very encouraging factor in regard to the future development of railways in Africa considering the demand forecast for transport capacity.

IV. Union of African Railways

74. During the Seminar on Modern Railway Operations and Traction held in 1970 in Berlin at which senior officials of African Railways participated, the idea was born to establish the Union of African Railways to best meet the challenge faced by African Railways to play their part in the economic development of their countries in 2 most modern and most economic way.

75. After two years of preparation the Conference for the Establishment of the Union of African Railways took place in September 1971 in Addis Ababa where the Union established.

76. In June 1973 the First Meeting of the General Assembly of the Union of African Railways was held again in Addis Ababa, and the ways and means of preparing sound proposals for short-term and long-term programmes of work of the Union were decided upon. Consideration was also given to the election of officers and the establishment of the organs of the Union, and basic criteria were fixed for the various posts.

77. According to its Constitution the Union of African Railways was established, because of the desire of the countries in which they operate to corroperate in all fields of transportation especially the administration of railways, and in the interests of African countries. Its aims are to improve the operations of their railways, the communication systems, to reduce the cost of their operations necessary for the speedy and improved transportation of the natural resources, agricultural products and manufactures of the African Region to markets within the region, and to ports in the region for export. It was realized that these aims could best be achieved by corroperation and through the corrordination of their activities through the establishment of an African Railway Union.

73. The objectives of this Union shall be:

(a) to seek the standardization, expansion, cc-ordination and improvement of the railway services of the members of the Union with a view to linking them to each other and to other means of transportation, linking the Africa region to the world; and

(b) to establish and maintain under the terms of the Constitution relationships with other transportation undertakings or associations and interested Governments and institutions for the study of matters of interest to, and the co-ordination and development of the activities of, the members of the Union.

79. It is now up to the members of the newly created Union to ensure that they respect these fundamental principles and give all possible support to their Union to enable the organ of intra-African co-operation to do the great things expected of it.

80. As a first step toward this, a Subregional Group was set up at the First Meeting of the General Assembly of the Union of African Railways to deal with:

1. Determining the criteria for the selection of:

(a) the Secretary-General

b) the departmental directors

(c) the headquarters

2. Remuneration of:

(a) the Secretary-General

(b) the departmental directors

(c) the administrative secretariat and the operational personnel

3. Establishment of a procedure for calculating the contributions of the networks to the Union budget.

4. Determining the Union's Programme of work:

- (a) short-term programme
- (b) long-term programme
- (c) budget of the Union and members' contribution.

81. As a guideline for the most important objectives of the Work Programme of the Union, the following points were agreed upon:

1. Short-term programme:

(a) organization of the secretariat;

(b) organization of information and documentation;

(c) work of the Subregional Group;

(d) holding of the next General Assembly.

2. Long-term programme: In accordance with the objectives set out in the Constitution of the Union, the long term programme is as follows:

(a) ways and means of standardizing the network:

(b) co-ordination and improvement of railway services;

(c) co-ordination of rail transport with other means of transportation;

(d) compatibility (standardization).

82. According to these guidelines the Subregional Group will work out the essential details for the Work Programme of the Union and the proposals for the establishment of the organs of the Union, on which the Second Meeting of the General Assembly of the Union scheduled to be held in April 1974 in Kinshasa is supposed to decide.

83. As far as can be seen now, the Union of African Railways will next year start its very important task to establish continental wide co-operation on railway matters in particular and on transportation problems in general so as to make substantial improvements in the transport infrastructure in Africa.

E/CN.14/TRANS/103 Appendix A

APPENDIX A

Tanzam Railway Project

The new Tanzam Railway 1,857 km long, linking Zambia and the Zambian Copperbelt with the Tanzanian sea port of Dar es Salaam, is so far the greatest running railway project in the World.

Tanzam Railway, although planned first of all to give Zambia a new access route to the sea independent from possible political pressure, could be an example demonstrating the further economic development of an area newly opened up by the construction of transportation facilities. It is expected, that with the Tanzam line as backbone of the transportation the further improvement of the transport infrastructure will make it possible to develop economically the whole region in southern Tanzania and northern Zambia as well, which is for the time being economically not fully utilized, although it is rich of natural resources. These natural resources besides deposits of copper, manganese, iron ore and coal also obtain in using the fertile land for agricultural production and cattle farming. The deposits of copper and manganese are found in the Mkushi area in northern Zambia whereas the large reserves on coal and iron are at Muchuma and Njomb respectively in southern Tanzania.

The exploitation of all these minerals has now become economically feasible through the new railway and will undoubtedly contribute a lot to economic development of the two countries concerned. It is also expected by agricultural experts that the new Tanzam line will give strong impulses for the development of tea cultivation, as well as for the growing of other tropical crops in much of the area traversed by the line and a number of collective projects are already in hand.

The construction work of the new Tanzam Railway started in 1967 with the survey of the designed alignment and it was expected that the line could be completed up to Kasama in Zambia by the end of 1973, with a length of about 1,150 km. To speed up the completion of the whole line it was suggested to start construction work also in Kapiri M'Poshi going eastwards and meeting the line coming from Dar es Salaam. If the construction has started as proposed it should be possible to complete the remaining 710 km of line during 1974 and to come into full operation much earlier than originally scheduled provided that the delivery of locomotives and rolling stock could also be made possible during the year 1974.

Tanzam Railway is constructed as single track with sidelines at certain stations according to the demand of transport capacity. The use of the African standard gauge of 1,067 mm (3' 6") has been a wise decision, because of making it possible in the future to link the East African network with the very large network in south and central Africa and taking a great step towards standardization in Africa as well.

The line is designed for a maximum speed of 100 km/hour permitting short turn around times for trains and high average running speed as well. To meet the technical demand of the high maximum speed the track is constructed of 45 kg per metre rails laid on reinforced concrete sleepers on ballast and continuously welded. There will be 19 tunnels with a total length of about 8 km, out of which 13 are on the most mountainous section of the line from Mlimba to Makumbako. The longest tunnel is 817 m long. There are 2,500 bridges and culverts of standard design. E/CN.14/TRANS/103 Appendix A Page 2

To supply the whole railway with most of the materials necessary, a main supply base was set up at Mangula near Kidatu, similar to a large industrial complex served by a branch of East African Railways. The concrete sleeper plant is also located here as workshops producing almost every item which could be possibly required for the new railway. This main supply base can on the other hand also be seen as a great advantage in favour of Tanzanian economy, because many of the required parts for the construction of Tanzam Railway are manufactured for the f_rst time in Tanzania. . or the continuous supply of the whole line with ballast a quarry has been opened near the main depot producing now about 1,200 m³ of crushed stone ballast per day.

Included in the loan, granted by China to Zambia and Tanzania will be the provision of about 100 diesel-hydraulic locomotives of 2,500 h.p. as well as shunting locomotives of 1,000 h.p., some 2,000 covered and uncovered wagons and 100 passenger carriages for final operation on the Tanzam Railway.

In addition to performing its primary task of providing a rail link between Zambia and the sea, the Tanzam Railway has a secondary function in providing " rail-heads" for the onward movement (distribution) of goods by road. This function adds considerably to the combined transport capability of both countries.



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E/CN.14/TRANS/103 Appendix B

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APPENDIX B

SUMMARY OF TECHNICAL ASSISTANCE RENDERED TO AFRICAN RAILWAYS BY THE CROWN AGENTS DURING THE LAST FIVE YEARS

I. <u>Activities</u>

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1. Financial services

Operating of loans, their payments, debits and safeguards required in the purchase of equipment. Short-term financial assistance to principals can be managed. Organization of raising loans in the financial market.

2. Training of roilway staff

Arrangements for training courses for railway personnel utilizing appropriate establishment to give the particular expertise.

Arrangement of courses on the maintenance of motive power, rolling stock and permanent way.

Arrangement of courses on the operation of newly supplied equipment to the railway.

Provision of courses for training in the supply and stores management field.

Assistance in operational and organizational planning and in tariff policies

Studies on Traffic Prospects including preparation and updating of traffic forecasts and estimates.

Examination of administrative organization together with the organization and operation of the Traffic Engineering and Mechanical Engineering Departments and advice on their suitability or otherwise, recommendations for revisions.

Review of existing tariff books and making recommendations as to the rating amendments needed, both passenger and freight, producing the rovenue required to enable the railway to pay its way, also certain other recommendations for changes in pricing policies to produce a more viable undertaking. Examination of various conditions of carriage laid down in the Tariff Book and recommendations for the layout and contents of a new Tariff Book.

Advice on the desirability or need for a telecommunication system wholly owned, maintained and operated by Railway Administration and preparation of a phased telecommunication development plan taking into consideration the organizational changes being planned and the telecommunication requirements of the planned computer system.

Technical assistance in the recruitment of staff.

4. Mechanical Engineering

Assistance and advice in preparing specifications of equipment

E/CN.14/TRANS/103 Appendix B Page 2

to be purchased, issuing tenders on a world-wide basis, evaluating tenders received; supervision of designs; full inspection of the purchased equipment and its shipment.

Investigations on technical problems concerning mechanical engineering as motive power, rolling stock and other equipment.

5. Civil Engineering and Permanent May

Assistance and advice in preparing specifications of all kinds of equipment to be purchased, issuing tenders on a world-wide basis if necessary, evaluating tenders received; supervision of designs; full inspection of the purchased equipment and its shipment.

Technical assistance in the procurement of permanent way materials including flat bottom rails, grooved dock rails for port installations, sleepers, switches and crossings, track fastenings and fittings and accessories of all kinds including the latest automatic maintenance machines.

Preparing of truck layouts over the years, and detailed switch and crossing designs, and special designs for guage convertible rail fastenings.

Technical assistance in the procurement of materials for maintenance and extension of all types of signalling installations and train working apparatus.

Technical assistance in design and construction of bridges, road and footbridges over tracks and combined rail and road traffic bridges; moving bridges for Ferry Terminals.

Design and/or supply of all kinds of buildings as for example Storage Sheds, Customs Sheds, Locomotive Running Sheds, Workshop Buildings, Maintenance and Servicing Buildings, Locomotive Workshops and Erecting Sheds.

Technical assistance in design and construction of Diesel Oil Fueling Installations with associated bulk oil storage tanks, Water Storage Tanks with supporting structures, Water Columns and Hoses, Platform Buildings, Piers and Jetties.

Investigation on bridge strengthening programmes consequent upon the introduction of more powerful locomotives and heavier capacity rolling stock.

II. <u>Special projects</u>

1. <u>Studies and Investigations</u>

East African Railways

A survey of telecommunications for the East African Railways and the East African Harbours Corporation.

Provision of Load Testing Equipment for D.E. Locomotives

Adaptation of Locomotives for hump yard duties

Investigation into provision of special equipment to provide

(i) automatic and (ii) manual slow speed control of Locomotives to suit hump yard duties

Investigation into toilet equipment suitable for installation in Locomotives

Investigation into and report on, proposed conversion to MCB Knuckle Coupler Locomotives, Carriages and Wagons

Wheel Load Characteristics Torsionally Stiff Wagons

Openable Roofs for Highsided Wagons

Wheels for Rolling Stock

Failure of Brake Beams on Gloucester C.S. Bogies

Movement of Bulk Commodities by Rail

Centre Pivot Lubrication

4-wheel Wagon Suspension

Variable Gauge Trains

Track Pollution Problems

Material for Carriage Roof Tanks

Influence of Track Twist and Cant on Carriage and Wagon Design Rationalisation of Choke sizes on Air Brake

Distributors

Auxiliary and Control Reservoir Charging Times on Air Brake Distributors

Interchangeability between Charmilles and Oerlikon Distributors

Nigerian Railways

Structure Cauge Modification

Aluminium Wagons

Tyre Thickeners

Train Lighting Systems and Refrigerators

Failure of Diamond Frame Bogie Bolster Springs

Merits and demerits of Diamond Frame and various types of Cast Steel Bogies

Building up Wheels by means of Welding Driver/Guard Communication E/CN.14/TRANS/103 Appendix B Page 4

Zambian Railways

A study of Traffic Prospects 1969-1974 Report on the Working of the Railway and its Organization

A review of the Tariff Structure

<u>Ghana Railways</u>

Report on Rehabilitation and New Work in signalling and telecommunication equipment

Specification for Coaches

2. <u>Purchasing Locomotives, Rolling Stock</u> and Miscellaneous Equipment

East African Railways

Locomotives:

			wneer	Site
No.	🔓 Class an	d type	arrangement	<u>H.P.</u>
10	71 Class D.E.	Small Main Line	lBo - Bol	1240
22	46 Class D.H.	Shunting	0-8-0	530
8	87 Class D.E.	Main Line	1Co - Col	1840
15	92 Class D.E.	Main Line	10o - Col	2590
20	88 Class D.E.	Main Line	lCo - Col	2050
10	72 Class D.E.	Small Main Line	lBo - Col	1240
15	35 Class D.M.	Shunting	0-6-0	302
10	61 Class D.M.	Shunting Trip	В – В	730

0:1

Rolling Stock:

911 Wagons of 8 different types

5 Stainless Steel Milk Tanks

15 Motor Rail Inspection Cars

6 Inspection Car Trailers

Miscellaneous Equipment

2 Tugs for service at Mombasa and Dar es Salaam

2 Railway Wagon Ferries for service on Lake Victoria

Nigerian Railways

Wheel	Site
arrangement	H.P.
lCo - Col	1500
1Co - Col	1500
• 0-6-0	364
	Wheel arrangement 1Co - Col 1Co - Col • O-6-O

Rolling Stock:

200 Bogies Covered Goods Wagon

120 Under frames and Bogies.

Ghana Railways'

Locomotives

16 D.E. Main Line

Rolling Stock

150 Covered Goods Wagons 700 Bogies.

Malawi Railways

4

D.E. Main Line

<u>Sierra Leone Railways</u>

2 Rail Motor Gang Trolleys

1 Hand Pump Trolley

Swaziland Railways

5 Inspection Cars. 3

Gang Trolleys

Zambian Railways

5 Heavy Duty Gang Trolley Train Sets

8 Inspection Cars.

3. Engineering projects

Nigerian Railways

Single track bridge 3 No. deck spans with single girders 107' 6" long weighing 22 tons each.

East African Railways

Combined Road/Rail Bridge over the River Nile at Pakwash, three spans through types bridge, each span 260' long.

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E/CN+14/TRANS Appendix B

Page 5

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