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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

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APPRAISAL OF THE DEVELOPMENT PROGRAM

OF THE

SUDAN RAILWAYS

SUDAN

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Department of Technical Operations

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Table of Contents

	<u>Page</u>
Summary and Conclusions	i - ii
<u>I. INTRODUCTION</u>	1
<u>II. SUDAN RAILWAYS</u>	
A. Ownership	1
B. Organization and Management	1
C. Personnel and Labor	2
D. Property	4
E. Area Served	5
F. Railway System	6
G. River Services	8
H. Port Sudan	8
I. Traffic	9
J. Operating Efficiency	11
K. Finance and Earnings	12
L. Tariffs	14
<u>III. THE DEVELOPMENT PROGRAM</u>	
A. The 1958-60 Program	15
B. Physical Program	16
C. Cost Estimates	17
D. Traffic Outlook	17
E. The Economic Need for the Program	19
F. Procurement and Construction	19
G. Future Financing	20
<u>IV. COMPETITIVE TRANSPORT</u>	22
<u>V. RECOMMENDATIONS</u>	22

(continued overleaf)

Table of Contents (continued).

Table	:	1. Staff Employed, June 30, 1957
		2. Motive Power Ownership
		3. Freight Car Ownership
		4. Passenger Car Ownership
		5. River Services Floating Equipment
		6. Provisional Balance Sheet as at February 28, 1958
		7. Pro Forma Balances, 1958-64
		8. Statement Showing Investment (Gross and Net) in Fixed Assets, as of June 30, 1957 and return thereon for the Fiscal Year 1956/1957, by Classes of Operations and on the Aggregate
		9. Schedules of Initial 6- and 4-Year Development Programs
		10. The Proposed 2-Year Development Program
		11. Traffic: Recent Figures and Estimates to 1961
		12. Details of Proposed Purchases of Freight Cars, Passenger Coaches and Other Plant
		13. Statement of Actual and Estimated Net Income 1956/57 to 1963/64
		14. Sources of Contribution to Capital Expenditures and Amortization of Debt During the Construction Period 1956/1964
		15. Statement and Estimate of Cash Flow
Annex I	:	Procurement and Construction
Appendix I:		Estimated Supply of Agricultural Commodities to the Proposed Railway Extensions
II:		Map

APPRAISAL OF THE DEVELOPMENT PROGRAM  
OF THE  
SUDAN RAILWAYS

SUMMARY AND CONCLUSIONS

i. The Sudan Government asked the Bank to help finance the development program of the Sudan Railways. As originally submitted this was a four-year program, approved by the Government. Agreement however was reached between the Bank mission which visited the Sudan on the one hand, and the Government and the Railways on the other, that - i) the Bank would now consider only the first two years, 1958/59 - 1959/60; and ii) consideration of further financing for a longer term program should await the preparation of reliable studies on future traffic prospects.

ii. This report covers the appraisal of the two-year program, 1958/59-1959/60, estimated to cost ES 17.6 million, including ES 13.6 million (US\$ 39.0 million) in foreign exchange. The Government has asked for a loan to meet the foreign exchange cost.

iii. The Sudan Railways are state-owned. They operate the railway system, Nile river steamers, the port at Port Sudan, hotels and other minor services. The Railways are a government department, responsible to the Minister of Communications. Their finances are separate from those of the Government but, as is usual for a government department, the Railways' operating and capital budgets require parliamentary approval. The Government has provided the Railways' capital and continues to make funds available for investment in addition to the large amounts the Railways provide from their own resources.

iv. The Railways' administration is substantially independent and it is the Government's policy to make the Sudan Railways an autonomous corporation at some time in the future.

v. Management is good and the organization is sound. The departure in recent years of a large number of foreign-officer personnel, as a result of generous retirement terms, has tended to reduce efficiency somewhat. The Railways are trying to recruit trained staff abroad, particularly civil engineers and traffic men, and have sound training programs for the Sudanese who are good material for officers and other grades. Labor relations are good.

vi. The railway system comprises 4,275 track kms of 3'6" gauge line. Steamer services operate on three separate sections of the Nile, giving year-round sailings on 2,400 kms and additional routes on a seasonal basis. Port Sudan, with its modern facilities, is almost the only gateway for the Sudan to world markets; well over a million tons of exports and imports pass through each year. All of the Sudan Railways' properties, equipment, permanent way and buildings are well maintained but require renewal, expansion and modernization to meet the demands for increased capacity, and for greater operating efficiency and economy.

vii. The Sudan Railways' operations have always been profitable. Operating ratios and the rate of return on the capital investment are very good. While the present project is being held to two years pending the development of more reliable traffic forecasts, there is no reason to believe that over the long-term the Railways' profitability will be materially affected. The Railways' estimates for the future indicate that high earnings will continue and that substantially the same rate of return on investment will be earned in spite of the large sums being devoted to capital expenditure.

viii. The Railways' traffic has developed steadily over the past thirty years at a rate averaging 4.5% per year, and it can be expected to continue increasing with the growth of the economy. The Sudan Railways will engage an expert in traffic research and development for a period of at least two years. He will assist the Railways, 1) to establish a permanent Traffic Research Section and 2) to make traffic studies of the Railways' system, in order to provide a sound economic basis for the Railways' capital expenditure programs after 1960.

ix. The 1958/59 - 1959/60 program provides for renewals and modernization, an increase of capacity, and extension of the railway system. The main elements for the railways are the purchase of diesel locomotives and rolling stock, track relaying with heavier rail and the construction of new lines: the Western extension to Nyala and the Southern extension to Wau. The Western extension is about 60% complete and the start of the Southern is scheduled for 1959. The program includes construction of two new quays at Port Sudan which will increase capacity and improve ships' time in port and cargo handling. For the river services the main aim is modernization of equipment. Goods and services purchased abroad will be subject to international competitive bidding.

x. The various services of the Sudan Railways are now, and must continue to be for some considerable time, the principal means of transport in the country. It is therefore sound policy to concentrate transport investment on the development of the Railways.

xi. The cost of the two-year program is estimated at ES 17.6 million. Assuming a Bank loan for the foreign cost of ES 13.6 million (US\$ 39.0 million), the Railways will have to find ES 4.0 million for the local currency costs, which they can obtain from their own resources.

xii. This program is suitable as the basis for a Bank loan to the Sudan Government of about US\$ 39 million equivalent, with a term of 20 years including a four-year grace period.

## I. INTRODUCTION

1. The Sudanese Government has requested the Bank to assist in financing the next two years of the development program of the Sudan Railways. The program is largely for motive power and rolling stock, relaying of existing lines with heavier rail, and constructing new lines. The cost of equipment purchases and construction work in the two-year program July 1, 1958 - June 30, 1960 is estimated at IS 17.6 million of which the foreign exchange amounts to IS 13.6 million. The Government wishes to borrow IS 13.6 million - US\$ 39.05 million equivalent.

2. This report is based on the appraisal made by the technical mission which visited the Sudan during March and April 1958 to study the Railways and their program of development and on information supplied by the Sudan delegation which visited the Bank in June/July 1958.

## II. SUDAN RAILWAYS

### A. Ownership

3. The Sudan Railways are state-owned and include the railway system, steamer services on the River Nile, the port facilities at Port Sudan on the Red Sea, some hotels and other minor facilities.

4. Operated as an entity responsible for all these services, the Sudan Railways are under the direction of the Minister of Communications. The Railways have their own accounting and a separate budget which is presented to Parliament ahead of the government budget but, as a government department, they have no independent borrowing powers. All tariffs are subject to approval by the Sudan Government.

5. The Government intends to make the Sudan Railways fully autonomous and discussions between government and management are underway for this purpose. However, as the Railways already have a large degree of autonomy, the Bank feels that the establishment of an independent corporation is a matter with which the Bank need not now concern itself.

### B. Organization and Management

6. The Head Offices are at the Railways' principal junction, Atbara, 313 kms from the seat of government at Khartoum.

7. Management and operations are directed by a general manager who is appointed by and is responsible to the Minister of Communications.

8. Under the general manager and his deputy are nine chiefs of departments: the chief traffic manager, chief engineer (civil), chief mechanical engineer, chief accountant, stores controller, chief establishment officer,

port manager, river engineer, and hotels controller. The usual subdivisions exist in each department.

9. The traffic districts' headquarters are at Port Sudan, Gebeit, Atbara (rail), Kosti (two offices, one for river and the other for rail), Khartoum, Wad Medani and Kassala. The chief engineer's districts are at Atbara, Gebeit, Kassala, Khartoum and Kosti. The locomotive-running districts are at Atbara, Khartoum and Kassala.

10. Port Sudan is under the direction of a port manager. Under him a dock superintendent is responsible for shore operations and a harbor master for marine operations. Traffic in and out by rail is controlled by the Railways' traffic manager. Maintenance and construction of civil engineering works are the responsibility of the Railways' chief engineer.

11. The river services are managed in the same way as those of the railways, coming under the same department heads and falling within the same operational districts.

12. The Railways' organization has worked well for many years and continues to do so. There are no lines of dual responsibility, and the channels of direction downward and reporting upward are limited to the essential three steps: general manager, department chiefs, district heads, and staff. There appears to be no need for any changes in organization.

### C. Personnel and Labor

13. The staff consists of "officials" and "unclassified personnel". The officials are subdivided into administrative and professional grades, and sub-professional and clerical grades. At the beginning of the last financial year, July 1, 1957, there were 1,949 officials and 24,294 unclassified personnel in service, a total of 26,243 employees (see Table 1). The officials serve at the head and district offices. Of the unclassified personnel 17,177 work on the railway system; 3,036 on the river services; 2,122 at Port Sudan, 890 in hotels and catering, 785 in the police, 284 in other services. The number of employees in relation to the size of operations is good.

14. The staff is now almost all Sudanese. The substantial number of foreign officials in service until a few years ago showed a sudden decline on the eve of the country's independence in 1956 because of the generous retirement conditions offered and not of any desire by the government to accelerate the separation of foreigners. In fact the Sudan Railways regret the speed at which retirements took place and are endeavoring to attract foreign engineers and other trained personnel. The following summary shows the trend of replacements in the officials grade since 1951:

<u>End of Year</u>	<u>Administrative and Professional</u>		<u>Subprofessional and Clerical</u>	
	<u>Sudanese</u>	<u>Foreign</u>	<u>Sudanese</u>	<u>Foreign</u>
1951	15	82	1,135	123
1954	34	68	1,437	88
1955	66	64	1,425	60
1956	102	20	1,505	8
1957	258	22	1,660	9

15. Labor relations have been reasonably good during the past few years and there have been no work stoppages in the last 18 months. There is one union, the Sudan Railways' Workers Union. Negotiating machinery calls for meetings at various levels, such as departmental head with departmental staff committees, and at the top, between the General Manager and the Union's Central Executive Committee.

16. The very rapid transition to Sudanese management and operation has left its mark on operational efficiency. The engineering departments generally and the traffic department in particular suffer from a shortage of competent officers in the leading ranks. Other departments are affected in smaller degree by too sudden promotion to higher posts. An effect of the transition has been the decline in coordination between departments. The Railways' services show deterioration when compared with the past, in punctuality of trains, engine failures, wagon turnaround and other ways.

17. These deficiencies are recognized and it is expected that higher standards of efficiency will be achieved as a result of 1) more initiative and decision taking by officers, all of whom now show energy and competence in performing routine duties, 2) recruitment of competent engineers from abroad, and 3) extensive training programs (see below).

18. In addition to the steps already being taken by the Railways, the Traffic Department should be strengthened by the employment for two to three years of a traffic research expert. The Mission so suggested and the General Manager was in full agreement (see paragraph 86).

### Training

19. The recruitment and training of Sudanese staff is well-planned. Recruitment is made from Khartoum University colleges, secondary and elementary schools and the ordinary labor market. The Railways have their own schools, elementary and technical, which take pupils from adolescence upward.

20. University graduates are sent to the United Kingdom for further education and training. Civil engineers go to a consulting engineers' office where they spend one year in design and drawing offices and one year on construction works. Mechanical engineers go to British railway workshops and running sheds and to industrial firms. Traffic and accountant trainees go for one to three years to British railway services. Most of these return from their training with an additional degree obtained from an engineering institution or a school of economics.

## D. Property

### Railway System

21. Construction of the railways was started in 1875 at Wadi Halfa and their early history is closely related to military campaigns. From 1904 expansion of the railways was for development and trade.

22. The railway system consists of a network of lines, 3,797 kms long, of 3'6" gauge track, almost entirely in the northern half of the country. The system reaches the Red Sea at Port Sudan and the Egyptian Nile at Wadi Halfa. A map of the railway system is attached as Appendix II.

23. The principal rail artery is the Port Sudan-Atbara-Khartoum line of 787 kms. Wadi Halfa in the North is connected with this line at Atbara, 611 kms away. A branch of the Wadi Halfa-Atbara line reaches Karima on the Nile. In central Sudan, the system reaches El Obeid, 689 kms from Khartoum. From Rahad, on the line to El Obeid, a newly constructed line runs west to Babanusa, some 350 kms away. A supplementary route from Port Sudan leaves the main line at Haiya Junction passes via Kassala and Gedaref to rejoin the main line at Sennar Junction, a distance of 795 kms. Three extensions are now under construction or projected: the Western to Nyala, the Southern to Wau and the Managil extension from Khartoum to Fakhakhir.

### River Services

24. The steamer services are operated on three separate sections of the Nile (see map Appendix II). The first is the Northern Reach between Wadi Halfa and Shellal, some 338 kms, mostly in Egyptian territory. The second is the Dongola Reach, between Karima and Dongola 287 kms, entirely in the Sudan. The third section is the Southern Reach extending southward from Khartoum along the White Nile and some of its tributaries.

25. The first and second sections are operated in all seasons. Year-round service is also provided on the Southern Reach from Khartoum to Malakal 820 kms, and Malakal to Juba 935 kms. To Wau and Gambela, respectively west and east of Malakal, services are seasonal.

### Port Sudan

26. Located on the Red Sea, one of the busiest waterways in the world, Port Sudan is the principal route for Sudan's foreign trade. Virtually all goods to and from world markets move by this port. In each year since 1951 imports and exports together exceeded one million tons and about 1,000 ships now call each year.

27. Port Sudan has the only modern port in the country capable of berthing ocean vessels. The original construction of the port was completed in 1908 and with subsequent development, it now provides a well protected basin with excellent anchorage and berthing facilities for about nine ships.

Little dredging of the harbor is necessary and vessels drawing up to 33 feet of water can be berthed at all times.

### Hotels, Catering

28. Sudan Railways own and operate four hotels, at Khartoum, Port Sudan, Wadi Halfa, and Juba, and two resthouses at Atbara and Kosti. They also operate a buffet in the Parliament buildings at Khartoum, the airport buffets at Khartoum, Wadi Halfa and Juba, and other resthouses. Combined with the usual hotel operations are refreshment services on trains and steamers. The hotels and resthouses are virtually the only establishments of their kind in the Sudan.

### E. Area Served

29. Most of the Sudan, a million square miles in area, is desert, semi-arid land, and savannah, suitable at best for grazing. There is insufficient rainfall for agriculture in most parts of the country. In the North only a few scattered areas are forest or suitable for tree crops. In the south there is ample rainfall and most of the land is either forests or swamps. Some unworked minerals such as iron ore, manganese, and copper occur over a wide area, but it is uncertain to what extent they may be commercially exploitable.

30. There is intensive cultivation of long-staple cotton, oilseeds, food grains, and other cash crops in densely settled narrow strips along the branches and tributaries of the Nile, in the Gezira region between the White and Blue Nile, and in flush-irrigation deltas such as the Gash, all based on seasonal flooding and man-made irrigation works. Production from the irrigation areas is supplemented by food grains, short-staple cotton, gum arabic, oilseeds, cattle, hides and skins, etc. from rainfall areas far inland.

31. The Sudan Railways with the interlinked river services are essentially a system for connecting the areas which produce the export crops with (a) Port Sudan on the Red Sea, the country's outlet to overseas markets; (b) Wadi Halfa on the Nile, the country's river port for trade with Egypt; and (c) other Sudan areas which produce surpluses of grains, oilseeds, vegetables, dates, etc. for the home market.

32. All but a few of the productive regions are traversed by or within easy reach of the rail network. The most important regions beyond it will be reached in the next few years by the Western extension now being built, the Southern extension shortly to be started, and the Managil extension, the construction of which will start in 1960/61 (see Appendix I and map).

- (a) The Western extension to Nyala will greatly shorten the present hauls over long feeder roads to rainfall savannah districts which produce gum arabic, groundnuts, sesame seed, and tobacco as well as livestock.

- (b) The Southern extension to Wau will connect the main line system with a woodland-grassland area having a good potential for millet, oilseeds, rice timber, and tropical produce.
- (c) The "Managil" line to Fakhakhir will traverse newly irrigated areas, extending the Gezira zone westward, which are well suited to produce long-staple and mid-dling cotton for export, together with grain, vegetables and fruit for the home market.

33. Because the railway system reaches the productive areas while other means of transport are lacking, practically all of the Sudan's exports are carried by the Railways to Port Sudan (approximately 90% of the total) and Wadi Halfa (about 10%). The major item is cotton from the Gezira, from the Gash Delta, from pump irrigation areas around Sennar, and from rainfall districts in the Nuba Mountains. Other important items are gum arabic from Kordofan province; millet, maize, groundnuts, and sesame from the Blue Nile, Kassala, and Kordofan province; and livestock from the West and South.

34. In all, the Railways carry somewhat more than 600,000 tons of export goods in a normal crop year. This movement is balanced by the return transport of somewhat less than 600,000 tons of import freight, this being mainly petroleum products, building materials, machinery and vehicles, textiles for towns en route and some food such as sugar, coffee, and tea.

35. The Railways also carry the entire internal food supply, other than strictly local produce, of most of the Sudan towns. This traffic now totals about 200,000 tons a year brought to market over distances ranging up to 1,000 kms. The main items are livestock, millet, dates, groundnuts, vegetables and pulses. There is also an internal movement of 300,000 tons annually of goods other than foodstuffs.

36. The Railways are the only practical means of long-haul travel for the bulk of the Sudan's ten million people. Due to seasonal needs of agricultural labor, the long distances between productive districts and the country's location on the main pilgrim route across Africa, the passenger load is heavy, amounting to about 3,300,000 persons a year, or 870 persons annually per route-km.

## F. Railway System

### Civil Works

37. The railway network consists of 3,797 route kms of 3' 6" gauge single line, which with loops and sidings makes a total of 4,275 track kms. Main lines are laid with 75 lb rails, secondary and branch lines with 50 lb rails. The future standard permanent way will consist of 75 lb rails on creosoted hardwood ties with bearing plates and elastic rail spike fastenings.

38. Throughout the network the subsoil consists of sand of excellent quality serving as ballast which is resilient and easy to maintain. Stone

ballast is used only in certain short sections where it serves as side support and not as bearing ballast.

39. The maximum gradient is 1 in 100 and the minimum curvature is 1,000 ft. radius. The running qualities and maintenance of the permanent way are good.

40. Bridges and culverts are all of substantial construction and well maintained, as in general are all buildings, offices, stations, sheds, workshops and residences.

41. The communication system consists of telephone circuits of simple and conventional design and is maintained by the Government PTT Department, the cost being charged to the Railways.

#### Motive Power

42. The present locomotive stock includes 156 main-line steam engines of eight different classes, approximately half of which entered service after the last war (see Table 2). These are all oil burning except for 15 built in 1904 and 1907, which are scheduled to be scrapped immediately. There are 37 steam shunting engines of four classes acquired between 1923 and 1952, and 7 diesel engines acquired between 1935 and 1952. All locomotives are maintained in reasonably good condition. Future requirements will be met by the purchase of diesel locomotives.

#### Rolling Stock

43. The total number of freight cars is 3,065 revenue-earning vehicles with an aggregate tonnage capacity of 78,662, and 475 service vehicles (see Table 3). The revenue-earning cars are all on bogies except for about 160 two-axle cars, and are well maintained.

44. The four classes of passenger cars, sleeping and refreshment cars are all on bogies and have vestibule gangways (see Table 4). The total stock is 237 cars with seating capacity of 13,014. The stock is well maintained.

#### Workshops

45. Locomotive, freight and passenger car shops are concentrated at Atbara and are well equipped for all heavy and light repairs. Machine tools are in adequate numbers and of modern design. Heavy locomotive repairs require an average of about 35 days, freight car repairs 6 days, and passenger cars 24 days. These are satisfactory output figures and the work is of high quality. The workshops are equipped for passenger car building, but no locomotives or freight cars are built in the shops. A small assembly plant for freight cars is operated at Port Sudan.

### G. River Services

46. The steamer service employs 54 push-tow units, 8 self-propelled barges, 185 barges, 4 motor-driven ferries and 149 service craft. A detailed classification of the types of craft in service on June 30, 1957 is given in Table 5.

47. The relative importance of the three river sections from an operational point of view is indicated by the following distribution of floating equipment.

	<u>Northern Reach</u>	<u>Dongola Reach</u>	<u>Southern Reach</u>	<u>Total</u>
Push-tow units	9	9	36	54
Self-propelled barges	-	-	8	8
Barges	24	25	136	185
Motor driven ferries	-	-	4	4
Service craft	18	14	117	149
Totals	<u>51</u>	<u>48</u>	<u>301</u>	<u>400</u>

48. The majority of the floating craft is old, but is in a satisfactory condition of repair. The push-tow units are being dieselized.

49. The main dockyard situated at Khartoum North provides maintenance and repairs for all floating equipment on the Southern Reach. It is capable of building new craft. The yard is well laid-out, well equipped and well managed and employs about 1,100 workers. Smaller dockyards exist at Wadi Halfa and at Karima for maintenance on the two smaller upper reaches. The principal railway transshipment point is at Kosti on the Southern Reach and quays are also operated at Wadi Halfa and Karima.

### H. Port Sudan

50. There is a total of over 5,000 feet of berthing space capable of accommodating nine or ten ships, totalling about 70,000 tons. On the north side of the harbor there is a main quay of 2,400 feet with additional berths of 1,400 feet alongside pontoons, all for general cargo. On the south side 1,700 feet of quay is available for bulk cargo handling. The pontoons are to be replaced by a permanent two-berth quay. A small dockyard and adequate fire services are located in the port.

51. The north side berths have transit sheds and adjacent privately-owned storage sheds; the remainder have facilities for handling coal, oil, cement clinker, salt, and other bulk commodities, and there is ample open storage. Access to the port area by road and rail is adequate.

52. Floating craft include 6 tugs, 25 barges, two diesel ferries, a dredger, a fire float, 14 launches and various smaller craft.

53. There are fifteen 5-ton and one 15-ton quay cranes, which are insufficient for cargo handling; new units are on order. One 10-ton and one 15-ton floating crane pontoons are used for special lifts. All equipment is well maintained.

I. Traffic

54. About 75-80% of the Railways' revenue comes from rail transport and another 15-20% from the operation of Port Sudan and a river fleet, both of which largely feed the rail service. The hotels and other non-transport services provide less than 5%.

- fS million -

<u>Operating Revenue</u>	<u>1956/57</u>	<u>1957/58</u> (Estimated)
Railways	8.5	8.6
Port Sudan	1.1	1.7
River Fleet	0.7	0.8
Non-transport	0.5	0.5
Total	<u>10.8</u>	<u>11.6</u>

55. The rail operation is primarily the carriage of goods and livestock. About three-fourths of the receipts come from freight traffic and only one-fourth from passengers, baggage, parcels and mail.

- fS million -

<u>Railway Receipts</u>	<u>1956/57</u>	<u>1957/58</u> (Estimated)
Goods and livestock	6.9	7.0
Passengers	1.3	1.3
Baggage, parcels and mail	0.3	0.3
Total	<u>8.5</u>	<u>8.6</u>

56. Most of the work at Port Sudan is cargo handling and storage, although some pilgrim and tourist traffic also moves through the port. The river fleet carries sizable loads of passenger traffic, ordinary freight, and livestock.

57. The rail services now move about 1.7 million tons of goods annually, for hauls averaging about 500 miles, about 500,000 head of livestock, and about 3.3 million passengers. Exports, imports, and domestic goods each contribute roughly equal amounts to the revenue freight tonnage as shown below:

<u>Freight, other than livestock</u>	<u>1955/56</u>	<u>1956/57</u>
Exports tons	627,813	611,322
Imports "	511,479	593,067
Domestic Trade "	487,464	511,582
Total Gen.Mdse	<u>1,659,756</u>	<u>1,721,971</u>
<u>Livestock</u> - head	427,040	545,030

58. Some of the main items carried are export cotton, gum arabic and sesame, imported petroleum, sugar and textiles, and home-grown grain and oilseeds mainly for the home market. The composition of the freight load, including railway service goods, has not changed materially in the past five years despite a 35% increase in total tonnage:

	<u>1951/52</u> (000 tons)	<u>1956/57</u> (000 tons)
Cotton and cottonseed	271	341
Gum arabic	38	49
Dura (millet)	143	145
Groundnuts	15	87
Sugar	77	112
Dukhn (grain food)	3	11
Sesame	13	44
Textiles	10	21
Oils (fuel and lubricating)	117	193
All other revenue freight	<u>579</u>	<u>719</u>
Total revenue earning	1,266	1,722
Railway service goods	<u>154</u>	<u>195</u>
Total traffic	1,420	1,917

59. Port Sudan handles about 1.4 million tons of cargo a year i.e., about 800,000 tons of imports, largely petroleum products, building materials, textiles, and equipment, plus about 600,000 tons of export goods, largely cotton, gum arabic, grains, oilseeds, hides and skins. Some 25% of the import volume is retained in the Port Sudan area for local use, while the remaining 75% is transferred to the Railways for haulage inland and for its own use. The export movement through the Port is about nine-tenths of the Sudan's total exports; most of the remainder moves by the Railways to Wadi Halfa on the Nile and thence by barge to Egypt.

60. The river services now carry about 200,000 passengers a year, about 110,000 tons of freight, and about 45,000 head of livestock. Much of the same classes of commodities are carried by the barges as by the rail services but in different proportions; half the movement, in fact, comes from or is transferred to the railway system. The predominant movement is toward Khartoum and Wadi Halfa.

	<u>1955/56</u> (000)	<u>1956/57</u>
Passengers	179.6	199.3
Luggage (tons)	2.5	2.6
Parcels (tons)	1.7	1.6
Goods (tons)	114.5	109.1
Livestock (head)	31.9	44.7

61. Traffic on the railway system has been increasing steadily from the start of the operation to date. The network is now moving, measured in ton-kms, about three times as much freight as before the war. From 1950 to date, freight and passenger traffic have doubled. Their rapid and unbroken growth is summarily as follows:

<u>Year</u>	<u>System Route Kms.</u>	<u>Revenue Ton - Kms. (000,000)</u>	<u>Number of Passengers (000)</u>
1927		410	
1930		507	
1950	3,247	833	1,431
1951/52	3,247	1,054	2,163
1952/53	3,313	1,173	2,312
1953/54	3,441	1,302	2,392
1954/55	3,442	1,132	2,594
1955/56	3,602	1,397	2,723
1956/57	3,797	1,514	3,324

62. The movement of cargo through Port Sudan has been growing at rates comparable with those of railway traffic. Both imports and exports in 1956/57 were almost twice the volume of 1950:

<u>Year</u>	<u>Imports</u>	(000 tons)	<u>Exports</u>
1950	476		334
1951/52	732		411
1952/53	672		398
1953/54	714		528
1954/55	678		408
1955/56	790		539
1956/57	839		579

63. The growth of the Railways' traffic mainly reflects two inter-related forces over the past 30 years. New productive areas have been opened and are continuing to be opened in the Sudan because of irrigation schemes in the river-basins and agricultural settlement of the rain-lands. At the same time, the rail network with its interlinked river services has been growing by the addition of main and branch lines which serve the developed areas more efficiently and promote the development of new areas. Considering the productive potential of the Sudan, its energetic execution of development projects, and the planned modernization and expansion of the Railway services, there is good reason to expect that traffic growth will continue.

#### J. Operating Efficiency

64. Throughout the history of the Sudan Railways, its management has given particular attention to efficiency and economic handling of traffic.

As a result, the rail services in particular show good productivity which has been maintained and improved over the years. In terms of balance of loaded to empty haulage, vehicle use, density of traffic and other significant measures, the Railways are an efficient operation, although the size and load of freight trains have declined slightly in the recent past.

	<u>1938</u>	<u>1953/54</u>	<u>1954/55</u>	<u>1955/56</u>	<u>1956/57</u>
Freight car per freight train					
Loaded	n.a.	n.a.	20.8	19.0	19.6
Empty	n.a.	n.a.	6.0	6.6	6.2
Productive freight car km					
Loaded (000,000)	44	81	78	90	92
Empty (000,000)	15	23	24	32	30
Load factor, % loaded of total	74	78	77	73	75
Car kms per car per day	n.a.	n.a.	76	85	89
Net ton kms per car per day	n.a.	n.a.	1,141	1,298	1,350
Net train load in tons	n.a.	n.a.	311	288	298
Gross train load in tons	n.a.	n.a.	772	727	730
Number of passengers per vehicle per year	6,751	11,725	12,120	12,054	14,658

65. Port Sudan is also a well-equipped, well-managed operation. Except in times of crisis, such as the Korean and Suez Canal incidents, there is little congestion or delay. The average rate of discharge, about 10 tons per gang-hour for general cargo and 15 tons for bulk goods, is good.

66. The river services have been operating with obsolete equipment and therefore have not functioned with full efficiency in recent years. This will be improved, however, by the present program for dieselizing the fleet. Methods of operation are modern push-towing with a passenger barge on each side and up to five cargo barges forward.

67. There is every reason to believe, from the continued and improving efficiency of their services as a whole, that the Railways will make good use of the equipment and materials which might be financed by a Bank loan.

#### K. Finances and Earnings

##### Finances

68. The financial position as of February 28, 1958 is shown in the provisional balance sheet submitted by the Railways (see Table 6). A summary of the position based on the balance sheet is given below:

As of February 28, 1958  
(IS 000)

<u>Assets</u>		<u>Liabilities</u>	
Current Assets	7,979	Provident Fund	829
Current Liabilities	<u>1,783</u>	Loan - Gedaref Rly and Development Co.	359
Net Working Capital	6,196		
Depreciable Plant & Equipment	13,813	<u>Equity</u>	
Depreciation Reserve	<u>4,649</u>	Capital Provided by Sudan Government	20,526
Net Depreciable Plant and Equipment	9,164	Provision for En- hanced Cost of Re- placement of Assets	2,031
Land, building, Per- manent Way, etc.	<u>16,833</u>	Earnings Appropriated for Capital Purposes	4,495
Net Fixed Assets	<u>25,997</u>	Capital Reserve	<u>5,637</u>
Work in Progress	<u>1,684</u>	Total Equity	<u>32,689</u>
Total Net Assets	33,877	Total Liabilities	<u>33,877</u>

69. The Railways capitalization is sound; there is virtually no funded debt; and the current position is satisfactory.

70. Current assets of IS 8.0 million are 4.4 times current liabilities of IS 1.8 million. Excluding from current assets stores and materials amounting to IS 3.8 million, the ratio is 2.3 to 1.

71. Over 95% of the capital structure consists of equity. The only funded debt is IS 359,000, in respect of the Gedaref Railway and Development Co., which is the balance of IS 1.5 million used by the Railways about 30 years ago to build and equip 135 miles of line between Gedaref and Kassala; it will be fully amortized in 1962. This compares with net fixed assets of IS 26 million (see Table 7).

72. The Sudan Government has provided money for capital expenditures required in excess of the Railways' own resources. Such capital expenditures must be approved by the Ministerial Development Committee, the Council of Ministers and Parliament. These Government funds are permanent investments and are therefore here treated as equity capital, which bears interest at 4% per annum. The Railways' earnings prior to 1951/52 were contributed to the Government's general revenues but since that date earnings have been retained and a fixed rate of interest paid to the Government on its investment.

73. The Railways are not required to pay direct taxes to the Government but are subject to local property taxes which are of minor financial significance.

Earnings

74. The Railways have consistently operated at a profit after allowance for depreciation for equipment. Permanent way, following a general practice, and other structures are not depreciated in the accounts but are charged to operating expenses on the basis of original cost in the accounting period in which they are retired.

75. Since 1946, net operating revenues have been particularly good as indicated below:

Year	(ES 000,000)			%
	Operating Revenues	Operating Expenses	Net Operating Revenues	
1946	4.0	3.0	1.0	75.3
1950	5.7	4.5	1.2	79.3
1952/53	9.1	7.1	2.0	77.5
1955/56	10.5	7.4	3.1	70.4
1956/57	10.9	8.1	2.8	74.7

76. The return on net book value of fixed assets has also been good. During the last five years 1952/53 to 1956/57 inclusive, the rate of return has ranged from a low of 8.7% in 1954/55 to a high of 13.8% in 1952/53; and for the last fiscal year 1956/57, it was 10.5%. A statement for the period follows:

	<u>1952/53</u>	<u>1953/54</u>	<u>1954/55</u>	<u>1955/56</u>	<u>1956/57</u>
	%	%	%	%	%
Operation:					
Railways	16.7	14.5	10.9	15.1	11.7
River Services	*	*	*	*	*
Port Sudan	41.9	22.3	23.4	22.9	19.1
Hotels, etc.	*	*	*	2.4	6.9
All Operations	13.8	11.7	8.7	12.8	10.5

\* Net deficit.

77. A more complete statement of the rates of return on net book value of fixed assets by the principal classes of operations for the year 1956/57 is given in Table 8.

L. Tariffs

78. The General Manager of the Railways is empowered to prescribe rates and charges of services rendered to the public, subject to agreement by the Ministers of Communications and of Finance, and the approval of Parliament.

79. A consolidated tariff sets forth the conditions and rates for carriage by rail and river services. In addition, the Railways may provide transport services under special contracts, and a substantial volume of freight, especially cotton and petroleum, is carried at agreed rates.

80. The average revenue per ton-km of freight is about 5 millimes which corresponds to about 2.3 U.S. cents per ton-mile. This is reasonable and compares favorably with charges in most other undeveloped countries. Passenger charges are also reasonable and the average revenue per passenger-mile is about 1.1 U.S. cents.

81. Freight rates have been stable over the last 5 - 6 years. Parliament has recently approved upward adjustment of certain low freight rates, which in the aggregate would increase railway and steamer operating revenues by 6 to 7 percent. The increased rates became effective on July 1, 1958.

### III. THE DEVELOPMENT PROGRAM

#### A. The 1958/60 Program

82. For some years, the Sudan Railways have been engaged in a continuous program of modernizing and extending their rail, port, and river facilities. It includes the acquisition of new motive power and rolling stock to replace obsolete equipment and provide for traffic growth; the replacing of lighter by heavier rail to increase line capacity and thus relieve congestion; the construction of new lines into productive areas beyond the easy reach of the present network; the installation of additional berthing facilities at Port Sudan; the acquisition of new barges and dieselization of the river fleet.

83. Early this year, the Railways prepared a tentative six-year program for 1958/1964 estimated to cost about fS 35.5 million including fS 27.0 million in foreign exchange. This was later reduced (see Table 9) to a four-year program, starting 1958, which calls for the expenditure of fS 30.3 million including fS 23.2 million for imported equipment, materials, and services. The four-year program was approved by the Government and was the one submitted to the Mission as the basis for a possible Bank loan. (The development program in the report "The Economy of the Sudan" and its annex, prepared by the Bank economic mission in February 1958, was subsequently revised and is not comparable in cost, composition and duration, to the program now discussed).

84. In the course of examining the program, there was found to be a deficiency of reliable data on future traffic development and the resulting needs of motive power, rolling stock, and other equipment. After examination and discussions, the Mission and the Government tentatively agreed that the Bank would now consider only the capital requirement for the two years from July 1, 1958 to June 30, 1960. The equipment and works in question can be readily justified by immediate needs.

85. The Government has agreed that detailed studies of future traffic growth will be undertaken, concurrently with execution of the loan project, in order to prepare a reliable basis for Railway development plans after 1960. To this end, the Railways will appoint a traffic research expert and establish a traffic research section. The government's agricultural and other services will cooperate with the Railways in assessing the development potentialities of the extension areas.

86. There is no doubt that the Railways' traffic will continue to grow and, as stated before, that the two-year program is required and justified.

#### B. Physical Program

87. The Railways plan to buy 15 main-line diesel locomotives of 1,800 - 2,000 h.p. in the next two years, and to convert several coal-burning shunters to oil-burners. Of these 15 locomotives, 10 will replace some 20 steam engines due for scrapping, and five are additions to capacity.

88. Some 1,477 freight cars will be bought, 268 as replacement and 1,209 as additions which will increase the capacity of the existing fleet by about 40% (see Table 12).

89. Of 101 coaches to be purchased, 40 are service vehicles and 61 are passenger cars, mostly third class, which will be additions to the present fleet of 237 units (see Table 12). All cars will be built in the Railways' own shops and the foreign exchange is required only to pay for import of under-carriages and other components.

90. Relaying of the 800 km Kassala-Gedaref line, which is being done with 75-lb rail, has been in progress for about five years; about half the length remains to be relaid. The planned expenditure is almost entirely on new rail and accessories to complete the work. The old 50-lb rail will be used for the Western and Southern extensions.

91. The Western extension to Nyala, about 340 kms, has been constructed about two-thirds of the way. All materials still required are on site and completion is expected in 1959.

92. Materials for the Southern extension to Wau, about 450 kms, are now arriving in the area, and construction for a third of this distance is expected to be completed by 1960. Foreign exchange requirements, mainly for bridges, structure and plant, will be negligible for the next two years.

93. The program for Port Sudan is mainly the building of two cargo berths together with dredging. Construction has recently been started by foreign contractors, and is expected to be completed in about 2 1/2 years.

94. Improvements of the river fleet are principally the purchase of cargo and passenger barges, conversion of old craft from steam to diesel, and completing the assembly of new diesels at Khartoum Dockyard. The foreign exchange cost represents imports of barges, engines and materials.

95. Also included are a variety of items for railway facilities, such as repair-shop equipment, station loops, marshalling-yard materials, signalling equipment, of which a list is given in Table 12.

C. Cost Estimates

96. The 1958/60 program calls for an expenditure of IS 17.6 million, of which IS 13.6 million would be foreign exchange costs. About 40% of the planned expenditure is for renewals, and about 60% for additions and betterments. The cost of the equipment and works is given below:

	Total cost <u>(million IS)</u>	Of which foreign exchange costs <u>(million IS)</u>
15 Diesel Locomotives	1.5	1.5
1,477 Freight Cars	)	
101 Passenger Cars		
Relaying Kassala - Gedaref line	4.7	4.5
Western Extension to Myala	4.6	4.5
Southern Extension to Wau	1.5	
Port Sudan: Construction of two berths	0.9	.1
River fleet improvements	1.1	.9
Other railways' plant	0.3	.2
	<u>3.0</u>	<u>1.9</u>
	<u>17.6</u>	<u>13.6</u>

97. Over 90%, or IS 16.2 million of the cost of the two-year program is for railway plant and equipment, of which IS 13.8 million is for diesel-locomotives, freight cars, rail repair shop equipment etc., for the existing lines, and only IS 2.4 million is for the construction of new lines. The remainder of about 10%, IS 1.4 million, is for Port Sudan and the river fleet.

98. Of the total cost, IS 15.6 million is needed to pay for complete units of plant and equipment to be acquired in the next two years, and for track relaying and new line construction scheduled to be completed by mid-1960 or earlier. Only IS 2.0 million is to be used for works of which the construction will go beyond mid-1960; they are the new berths at Port Sudan and the extension to Wau. (See Table 10)

99. The cost estimates made by the Railways reflect the prices in existing contracts and orders and the unit costs of comparable work and equipment in the recent past. Firm bids have already been accepted and orders placed for items constituting 45% of the planned expenditures. The estimated costs of the remaining goods to be purchased appear to be realistic.

D. Traffic Outlook

100. No adequate studies have yet been made of the development potentialities of the areas served by the existing system or of those which will be opened by the new lines. The growth of production and trade in particular regions as forecast by local authorities, producers and Railways' staff varies over an extremely wide range.

101. Caution should be used in forecasting traffic growth. The need of a conservative approach is confirmed by the short but intensive studies of individual regions which were carried out by the Mission's agricultural expert. All that can be done in the circumstances is to project past traffic trends for the existing lines and to make rough estimates of potential traffic for the new lines.

102. The volume of railway freight has been increasing steadily over the years partly because the network was being extended by additional main and branch lines, and partly because the productive resources of the Sudan were being continuously developed. Revenue freight volume increased 65% from 1930 to 1950, and has increased another 80% from the latter year to 1956/57, as follows:

<u>Year</u>	<u>Million ton-km</u>
1930	507
1950	833
1951/52	1,054
1956/57	1,514

103. The goods traffic of the present service area should continue to grow. There is a steady inflow of population to the towns which calls for the haulage of additional food and supplies. Agricultural productivity is being increased all the time by new methods and additional irrigation. The Sudan has widely distributed markets for cotton, its main export, and world demand for this commodity should expand at least as much as world population.

104. On the basis of the information available, the Mission believes that freight traffic may increase from 1.6 billion ton-kms in 1957/58 to 2.2 billion ton-kms in 1960/61 (see Table 11). This allows for normal growth on existing lines and traffic induced by the new lines. According to estimates made by the Mission's agricultural expert (see Appendix I), the new lines could eventually add 400,000 tons a year of additional production to the present annual load of 1.7 million tons. The annual figures shown in Table 11 are of course subject to fluctuation according to conditions affecting trade year by year. This year, for example, the freight traffic will diminish somewhat due to bad crops caused by weather and temporary import restrictions caused by lack of foreign exchange. But the general trend shown for the entire period appears to be reasonable.

105. Railway passenger traffic, cargo movements through Port Sudan, and the volume of river transport should also grow gradually. No definite forecasts are practicable but tentative projections can be made on assumptions analogous to those for railway freight (see Table 11).

#### E. The Economic Need for the Program

106. Apart from some line construction to new areas, the program meets immediate needs only. The Railways' main needs at present are new motive power and rolling stock to replace obsolete units; additional equipment, particularly freight cars, to avert shortages of capacity during the peak season and to absorb traffic growth; relaying the Kassala-Gedaref line with heavier rail in order to relieve seasonal congestion on the main-line to Port Sudan; modern river craft and increased dieselization in the interest of efficiency; and additional berths to improve cargo handling at Port Sudan.

107. The diesel locomotives are the first step to complete dieselization of the present engine fleet. Immediately, they will relieve seasonal shortages of motive power. The freight cars are justified by renewal needs, the outlook for traffic growth, and present car shortages during the peak months when traffic is double or more the volume of the slack period. Serious losses thereby result throughout the service area; last year, a substantial part of the cotton crop could not be moved to port in time, and was severely damaged by rain; a cement factory at Atbara often has to operate at half capacity for long periods; and imports through Port Sudan are subject to delays which force merchants to carry excessive stock in their inland warehouses. The passenger coaches are needed because rail transport is the only means of long-haul travel in the Sudan, trains are overcrowded, and freight cars sometimes have to be used for the traffic.

108. Once the entire length of the Kassala-Gedaref line is relaid, it will be possible to use the line for heavy trains to and from Port Sudan. This will relieve sections of the Khartoum-Atbara main-line which become heavily congested during the harvest months and will provide a shorter connection between the port and the southern and western region without traversing the Khartoum area.

109. The Western extension to Nyala and the Southern extension to Wau will help to develop regions with a large productive potential (see Appendix I). Each region should be originating about 100,000 tons of railway freight annually ten years after the new line is opened - largely groundnuts, sesame, tobacco, coffee, and gum arabic from the Nyala region; millet, groundnuts, cotton, palm oil, rice and lumber from the Wau region; and livestock from both. Furthermore the costs of building the extensions are exceptionally low due to topography, soil, the availability of local ballast, and use of second-hand rails taken up from the Kassala-Gedaref line.

110. Improvement of the river fleet should help to reduce operating costs to a level permitting profitable operations. The new berths at Port Sudan will eliminate present impractical and costly operations, during peak-load traffic, at two pontoon mooring facilities installed during the last war.

#### F. Procurement and Construction

111. International competitive bidding is being used and all contracts for equipment and major civil works have been or will be placed on the basis

of tenders invited from firms in Europe, the U.S.A., the Far East and possibly Australia. In many cases contracts have already been placed, or tenders received, and it is expected that the contemplated construction schedules will be met (see Annex I).

G. Future Financing

112. The proposed Bank loan is to meet the foreign exchange costs of the first two years of a much longer development program. In order to evaluate the adequacy of future earnings and finances, the Railways have furnished a financial forecast through 1963/64 (see Table 13).

113. The Railways' projection, which appears to be reasonable, assumes traffic growth due to increased agricultural activity and the opening of new areas. Some loss of traffic however may occur this year due to a poor cotton crop and attendant foreign exchange problems and import restrictions. These factors will be offset by transportation of available tonnage not now transported because of equipment shortages; the upward adjustment of particular freight rates expected to amount to IS 670,000 in 1958/59; and operating efficiency better than assumed in the Railways' projections, due to new equipment and construction.

114. The Railways' forecast indicate that (1) earnings will remain good, whether measured by operating ratios or returns on net fixed assets; (2) the liquidity will remain good for capital and other expenditures; (3) the debt service coverage assuming for purpose of calculation, a Bank loan at 6% for 20 years, will be met by adequate margins.

115. The net operating revenues should develop as follows:

Year	IS 000			Operating Ratios %
	Operating Revenues	Operating Expenses	Net Operating Revenues	
1957/58	11,568	8,833	2,735	76.4
1958/59	12,745	9,238	3,507	72.5 (a)
1959/60	15,019	10,300	4,719	68.6
1960/61	16,233	11,300	4,933	69.6
1961/62	17,062	12,000	5,062	70.3
1963/64	18,417	13,000	5,417	70.0

(a) Reflects rate increase.

116. The good rate of return now about 10.5% should not diminish materially despite the heavy capital investment which will take place in the next few years.

Year	Net Income Before Fixed Charges (₹ 000)	Net Plant and Equipment (₹ 000)	Rate of Return %
1956/57	2,747	26,247	10.5
1957/58	3,000	32,643	9.2
1958/59	3,779	37,468	10.1
1959/60	4,991	47,040	10.6
1960/61	5,205	54,428	9.6
1961/62	5,340	58,171	9.2
1963/64	5,707	61,492	9.3

117. The Railways' capital needs for the two-year program are ₹ 17.6 million. Of this amount ₹ 2.2 million was expended during the last few months of 1957/58, and it is planned to expend the remainder ₹ 15.4 million in 1958/59 - 1959/60, as shown in Table 14. In these same two years, as indicated in the table, the Railways will require ₹ 158,000 for amortization of debt.

118. Funds that would be available in this period include ₹ 1.2 million from depreciation; ₹ 5.6 million from net income, after interest and other minor charges; and ₹ 13.6 million (including ₹ 2.2 million for earlier expenditures, as mentioned above) from the proposed Bank loan.

119. In these two years there would be a temporary accumulation of liquid funds totalling about ₹ 5 million (including some carry over from the preceding period). The Government has agreed that these funds shall be available to the Railways for working capital and capital expenditure after June 30, 1960. In 1960/61 the amount of liquid funds would be reduced by almost ₹ 4 million as a result of the very high level of capital expenditures planned (₹ 8.1 million) for that year. The cash flow position is given in Table 15.

120. The times-interest-earned ratio would remain favorable and debt coverage would continue to be satisfactory, during the next six-year period, as the following indicates:

Period (1)	Net Income (Before Fixed Char- ges) (2) (₹ 000)	Interest Charges		Net Income (Before Fixed Charges) Plus Depreciation (5) (₹ 000)	Debt Interest & Amortization	
		Amount (3)	Ratio to Col.3) (4)		Amount (6)	Ratio to Col.6) (7)
1956/57	2,747	769	3.6	3,145	1,008	3.1
1957/58	3,000	830	3.6	3,430	904	3.8
1958/59	3,779	1,139	3.3	4,279	1,216	3.5
1959/60	4,991	1,524	3.3	5,641	1,605	3.5
1960/61	5,205	1,665	3.1	6,005	1,750	3.4
1961/62	5,340	1,661	3.2	6,215	1,704	3.6
1963/64	5,707	1,613	3.5	6,672	2,220	3.0

121. Pro forma balance sheets as of June 30 are set forth in Table 7; they indicate a satisfactory financial position for at least six years.

#### IV. COMPETITIVE TRANSPORT

122. Practically all the non-local traffic in the Sudan is carried by the Railways, and present and potential competition from other forms of transport is negligible.

123. Throughout most areas, the road system consists of mere tracks through the desert which are reestablished in a primitive way after each rainy season. Except in some southern areas not now served by the Railways, all-weather roads exist only over short and scattered stretches in the provinces and in the immediate vicinity of large towns. The few trucks available are generally poorly maintained, and heavy overloading is common since enforcement and control of a rudimentary traffic legislation is only carried out in municipal areas. Charges for truck transport are excessively high as a rule.

124. At present there are no engineers, transport administrators or legislators of experience, and a road plan could only be devised and carried out gradually and slowly. A primary requirement would be the provision of an adequate system of feeder roads to the Railways. Considering the volumes of freight and passengers and the distances involved, there is no doubt that the Railways are the backbone of the transport system and that the Sudan must concentrate its transport investment for some time on the development of the Sudan Railways.

#### V. RECOMMENDATIONS

125. The Railways' program for the two years 1958/59 - 1959/60 is sound. The timing of development for later years should be determined from reliable estimates of traffic prospects, and to assure that proper estimates are obtained the Railways will engage a traffic expert for two years, who will help to establish a traffic Research Section, and the Government will make the necessary agricultural and other economic studies.

126. Arrangements are being made to assure that liquid funds generated by the Sudan Railways up to June 30, 1960, will be available to the Railways for working capital and future investment.

127. The two-year program is suitable for a Bank loan of £S 13.6 million equivalent. The Government would be the borrower.

128. An appropriate term considering the nature of the equipment to be purchased would be 20 years. In view of probable investments after 1960, a four-year grace period, within the 20 years, would be suitable.

Table 1Sudan RailwaysStaff Employed, June 30, 1957

<u>Department</u>	<u>Officers</u>	<u>Unclassified</u>	<u>Total</u>
Headquarters	61	52	113
Mechanical	263	5,402	5,665
Engineering	217	8,293	8,510
Traffic	625	3,945	4,570
Port	168	1,265	1,433
Steamers	123	3,002	3,125
Stores	170	551	721
Hotels and Catering	45	890	935
Police	11	785	796
Accounts	<u>266</u>	<u>109</u>	<u>375</u>
Total	1,949	24,294	26,243

Table 2

Sudan Railways

Motive Power Ownership

June 30, 1957

<u>Class</u>	<u>Numbers</u>	<u>Tractive Effort</u>	<u>Years Built</u>
<u>Main Line Steam</u>			
<u>% Engines</u>			
69 Class	5	17,493	1904
86 Class	10	18,310	1907
150 Class	9	33,737	1920/1929
180 Class	10	25,992	1923
200 Class	10	29,148	1925/1929
220 Class	51	22,032	1927/1947
310 Class	19	25,922	1952
500 Class	<u>42</u>	35,940	1955/1956
Total	156		
<u>Steam Shunting</u>			
<u>Engines</u>			
7 Class	12	15,184	1927/1942
21 Class	6	19,946	1923 & 1929
31 Class	4	25,585	1931
40 Class	<u>15</u>	15,184	1951/1952
Total	37		
<u>Diesel Shunting</u>			
<u>Engines</u>			
401 Class	2	800 h.p.	1935/1936
403 Class	<u>5</u>	800 h.p.	1952
Total	7		
Total All Motive Power	<u>200</u>		

Table 3

Sudan Railways  
Freight Car Ownership  
June 30, 1957

<u>Class</u>	<u>Numbers</u>	<u>Load Tons</u>	<u>Years Built</u>
<u>Revenue Cars</u>			
Open	671	18,468	1908/1946
Covered	1,634	45,431	1900/1955
Cattle	195	4,702	1939/1954
Flat	99	2,305	1904/1955
Tank (fuel oil)	209	4,279	1901/1956
Tank (refined oil)	98	1,962	1930/1956
Brake and Boiler Wagons	91	495	1921/1956
Stone cars	<u>68</u>	<u>1,020</u>	1921/1931
Total	3,065	78,662	
<u>Non-Revenue Cars</u>			
Service Vehicles	278		1901/1956
Water Tank	<u>197</u>		1904/1956
Total	475		
Total	<u><u>3,540</u></u>		

Table 4Sudan RailwaysPassenger Car OwnershipJune 30, 1957

<u>Class</u>	<u>Numbers</u>	<u>Seat or Berth</u>	<u>Years Built</u>
Sleeping Cars	17	184	1911 - 1956
First Class	14	432	1924 - 1955
Second Class	26	1,372	1924 - 1952
Third Class	33	1,972	1936 - 1948
Fourth Class	122	8,266	1901 - 1956
Composite 1st and 2nd. Class	12	442	1901 - 1935
Composite 1st, 2nd, 3rd. Class	<u>2</u>	<u>82</u>	1936 - 1937
Total Passenger Carriages	226	12,750	
Dining Cars	2	96	1931 - 1932
Buffet Cars	7	168	1929 - 1957
Kitchen Cars	<u>2</u>	<u>-</u>	1931 - 1932
	11	264	
Composite Brake, Post & Baggage, Hospital, Service etc.	<u>160</u>		1901 - 1957
Total	<u><u>397</u></u>		

Sudan RailwaysRiver Services Floating EquipmentJune 30, 1957

	<u>Number</u>
<u>1. Push-Tow Units</u>	
Sternwheelers, steam passenger accommodations	16
Sternwheelers, motor, passenger accommodations	6
Sternwheelers, motor, no passenger accommodations	9
Sternwheelers, steam, no passenger accommodations	2
Sternwheelers, twin screw motor v. stern	3
Tugs, steam	3
Tugs, motor	10
Tugs, diesel	<u>1</u>
Total towing units	54
<u>2. Self-Propelled Barges</u>	
Oil tanker, diesel	1
Coal carrier, diesel	1
Cargo carrier, diesel	<u>6</u>
Total self-propelled barges	8
<u>3. Barges</u>	
First-class passengers	7
Mixed classes, passengers	10
Second-class passengers	8
Third-class passengers	20
Third-class passengers and cargo, including cattle	19
Cargo only	<u>121</u>
	185
<u>4. Motor-driven Ferries</u>	
	4
<u>5. Service Craft</u>	
Launches, gasoline	1
Launches, diesel	12
Boats, gigs and dinghies	98
Dredges	2
Floating docks	3
Pontoons (station, dockyard, landing, crane, etc.)	30
Punts	2
Pontoon pumping unit	<u>1</u>
	149
Total	<u>400</u>

Sudan Railways

Provisional Balance Sheet as at February 28, 1958

Assets	<u>ES</u>	<u>ES</u>	Liabilities	<u>ES</u>	<u>ES</u>
<u>CURRENT ASSETS:</u>			<u>CURRENT LIABILITIES:</u>		
Cash at bank, in hand & transit	2,966,131		Creditors and Accrued charges	881,443	
Debtors	1,217,153		Sudan Govt. Current Acct.	<u>901,179</u>	1,782,622
Stores and Materials	<u>3,295,572</u>	7,978,856	<u>PROVIDENT FUND ACCOUNT</u>		829,366
<u>FIXED ASSETS</u>			<u>PROVISIONS:</u>		
Rolling stock, vehicles floating craft & Plant & equipment at cost (Depreciation of these assets based on actual cost of the assets in use is provided as a revenue charge)	13,812,797		Provision for enhanced cost of replacement of assets		2,030,553
<u>LESS</u>			<u>LOANS</u>		
Accumulated depreciation	<u>4,648,913</u>		Gedaref Rly. & Development Ltd.		359,456
	9,163,884		<u>CAPITAL &amp; CAPITAL RESERVE:</u>		
Land, buildings, permanent way, quays and other works at cost of original assets (Renewals of these assets are dealt with as revenue charges)	<u>16,833,417</u>	25,997,301	Capital provided by Sudan Government	26,450,000	
<u>ADD</u>			Advance for Managil Extension	76,000	
Works in progress (1/7/57 to 28/2/58)		<u>1,684,167</u>	Net Revenue Surplus appropriated for capital purposes	4,495,398	
		35,660,324	Capital Reserve	<u>5,636,929</u>	<u>30,658,327</u>
					35,660,324

Table 7

Sudan RailwaysPro Forma Balances, 1958-64  
(ES 000,000)

	<u>As of Feb. 28,</u> <u>1958</u>	<u>As of June 30</u>		
		<u>1960</u>	<u>1962</u>	<u>1964</u>
<u>ASSETS</u>				
Current Assets	8.0	9.4	6.2	8.8
Current Liabilities	1.8	0.8	1.6	0.8
Net Working Capital	6.2	8.6	4.6	8.0
Depreciable Plant & Equipment	13.8	22.4	26.7	28.7
Less Depreciation Reserve	4.6	5.3	6.0	7.2
Net Depreciable Plant & Equipment	9.2	17.1	20.7	21.5
Non-depreciated Land, Buildings, Permanent Way	16.8	29.9	37.5	40.0
Net Plant and Equipment	26.0	47.0	58.2	61.5
Works in Progress	1.7	-	-	-
Total Net Assets	<u>33.9</u>	<u>55.6</u>	<u>62.8</u>	<u>69.5</u>
<u>LIABILITIES</u>				
Provident Fund	0.8	1.0	1.1	1.2
Debt - Gedaref Railway and Development Company Loan	0.4	0.1		
IBRD Loan	-	13.6	13.6	12.4
Total Debt	0.4	13.7	13.6	12.4
Equity	<u>32.7</u>	<u>40.9</u>	<u>48.1</u>	<u>55.9</u>
Total Liabilities	<u>33.9</u>	<u>55.6</u>	<u>62.8</u>	<u>69.5</u>
Ratio of Debt to Equity	1/99	25/75	22/78	18/82
Ratio of Debt to Total Net Assets	1/99	20/80	18/82	15/85
Rate of Return on Net Plant and Equipment (%)	10.5*	10.6	9.2	9.3

\* For 1956/57 fiscal year.

Sudan Railways

Statement Showing Investment (Gross and Net) in Fixed Assets, as of June 30, 1957  
and Return thereon for the Fiscal Year 1956-1957, by Classes of Operations and on  
the Aggregate

<u>Operations</u> (a)	<u>Gross Book Value of Depreciable Assets</u> (b)	<u>Less Depreciation Reserve</u> (c)	<u>Net Value of Depreciable Assets</u> (d)	<u>Non-Depreciable Assets</u> (e)	<u>Gross Book Value of Fixed Assets</u> (f) (b ÷ e)	<u>Net Book Value of Fixed Assets</u> (g) (d ÷ e)	<u>Net (1) Income</u> (h)	<u>Rate of Return</u> (i) (h ÷ g)
Railways	8,746,183	2,874,357	5,871,826	14,296,930	23,043,113	20,168,756	2,366,428	11.7
River Services	3,810,418	1,122,077	2,688,341	378,298	4,188,716	3,066,639	149,769 <sup>(2)</sup>	-
Port Sudan	1,105,853	316,629	789,224	1,859,222	2,965,075	2,648,446	504,818	19.1
Hotels and other services	<u>150,343</u>	<u>86,388</u>	<u>63,955</u>	<u>298,967</u>	<u>449,310</u>	<u>362,922</u>	<u>25,087</u>	6.9
<b>Total Operations</b>	<u>13,812,797</u>	<u>4,399,451</u>	<u>9,413,346</u>	<u>16,833,417</u>	<u>30,646,214</u>	<u>26,246,763</u>	<u>2,746,564</u>	10.5

(1) Total Net Income before Fixed Charges.

(2) Red figure or net deficit.

Sudan Railways

Schedules of Initial 6- and 4-Year Development Programs

(E.S. 000)

6-year program, 1958-64:

	<u>Local Currency</u>			<u>Foreign Currency</u>			<u>Total Expenditures</u>		
	<u>Replace- ments</u>	<u>Expan- sion</u>	<u>Total</u>	<u>Replace- ments</u>	<u>Expan- sion</u>	<u>Total</u>	<u>Replace- ments</u>	<u>Expan- sion</u>	<u>Total</u>
1. 23 main-line, 4 shunting diesel engines and 3 rail cars	-	-	-	1,311	1,480	2,791	1,311	1,480	2,791
2. Freight cars and passenger cars	183	355	538	2,386	6,545	8,931	2,569	6,900	9,469
3. Rail for conversion to 75-lb. track on Kassala-Gedaref line	155	-	155	4,478	-	4,478	4,633	-	4,633
4. New line construction:									
Managil extension	-	180	180	-	1,776	1,776	-	1,956	1,956
Western extension	-	1,514	1,514	-	-	-	-	1,514	1,514
Southern extension	-	3,200	3,200	-	2,852	2,852	-	6,052	6,052
5. Construction of two berths in Port Sudan	-	420	420	340	1,877	2,217	340	2,297	2,637
6. Modernization and additions to River Fleet	209	1	210	468	44	512	677	45	722
7. Other new plant and buildings	238	2,082	2,320	2,105	1,302	3,407	2,343	3,384	5,727
Total	<u>785</u>	<u>7,752</u>	<u>8,537</u>	<u>11,088</u>	<u>15,876</u>	<u>26,964</u>	<u>11,873</u>	<u>23,628</u>	<u>35,501</u>

4-year program, 1958-62:

1. 23 main-line, 4 shunting diesel engines and 3 rail cars	-	-	-	1,311	1,480	2,791	1,311	1,480	2,791
2. Freight cars and passenger cars	114	271	385	1,590	5,382	6,972	1,704	5,653	7,357
3. Rail for conversion to 75-lb. track on Kassala-Gedaref line	155	-	155	4,478	-	4,478	4,633	-	4,633
4. New line construction:									
Managil extension	-	180	180	-	1,776	1,776	-	1,956	1,956
Western extension	-	1,514	1,514	-	-	-	-	1,514	1,514
Southern extension	-	2,400	2,400	-	1,576	1,576	-	3,976	3,976
5. Construction of two berths in Port Sudan	-	420	420	170	1,877	2,047	170	2,297	2,467
6. Modernization and additions to River Fleet	141	1	142	314	44	358	455	45	500
7. Other new plant and buildings	210	1,696	1,906	1,944	1,230	3,174	2,154	2,926	5,080
Total	<u>620</u>	<u>6,482</u>	<u>7,102</u>	<u>9,807</u>	<u>13,365</u>	<u>23,172</u>	<u>10,427</u>	<u>19,847</u>	<u>30,274</u>

Sudan Railways

The Proposed 2-Year Development Program

(£.S. 000)

	<u>Local Currency</u>			<u>Foreign Currency</u>			<u>Total Expenditures</u>		
	<u>Replace- ments</u>	<u>Expan- sion</u>	<u>Total</u>	<u>Replace- ments</u>	<u>Expan- sion</u>	<u>Total</u>	<u>Replace- ments</u>	<u>Expan- sion</u>	<u>Total</u>
1. 15 main-line diesel locomotives	-	-	-	1,011	500	1,511	1,011	500	1,511
2. 1,477 freight cars and 101 coaches	36	182	218	832	3,696	4,528	868	3,878	4,746
3. Rail for conversion to 75-lb. track on Kassala-Gedaref line	155	-	155	4,478	-	4,478	4,633	-	4,633
4. New line construction:									
Western extension	-	1,514	1,514	-	-	-	-	1,514	1,514
Southern extension	-	800	800	-	100	100	-	900	900
5. Construction of two berths in Port Sudan	-	160	160	-	938	938	-	1,098	1,098
6. Modernization and additions to River Fleet	74	-	74	156	-	156	230	-	230
7. Other new Plant	<u>2</u>	<u>1,093</u>	<u>1,095</u>	<u>98</u>	<u>1,765</u>	<u>1,863</u>	<u>100</u>	<u>2,858</u>	<u>2,958</u>
Total	267	3,749	4,016	6,575	6,999	13,574	6,842	10,748	17,590

Table 11

Sudan RailwaysTraffic: Recent Figures and Estimates to 1961Railway Freight

(millions of revenue ton-kilometers)

<u>Year</u>	<u>Existing Lines</u>	<u>Western Extension</u>	<u>Southern Extension</u>	<u>Managil Extension</u>	<u>Total</u>
1951/52	1,054				1,054
1952/53	1,173				1,173
1953/54	1,302				1,302
1954/55	1,132				1,132
1955/56	1,330	67			1,397
1956/57	1,362	152			1,514
1957/58	1,400	221			1,621
1958/59	1,550	302			1,852
1959/60	1,680	302	44		2,026
1960/61	1,700	312	88	110	2,210

Railway Passenger

(millions of revenue passenger-kilometers)

1955/56	n.a.	22			n.a.
1956/57	472	48			520
1957/58	487	70			557
1958/59	502	95			597
1959/60	517	98	22		637
1960/61	532	101	44	23.2	700

Port Sudan

	<u>Imports</u> (tons 000)	<u>General Cargo Exports</u> (tons 000)	<u>Total</u> (tons 000)	<u>Livestock Exports</u> (head 000)
1951/52	732	411	1,143	7
1952/53	672	398	1,070	49
1953/54	714	528	1,242	73
1954/55	678	408	1,086	83
1955/56	790	539	1,329	119
1956/57	839	579	1,418	209
1957/58	1,094	624	1,718	200
1958/59	851	734	1,585	200
1959/60	1,286	878	2,164	200
1960/61	1,362	1,068	2,430	200

River Services

	<u>Freight</u>		<u>Passenger</u>	
	Tons 000	Ton-kms 000,000	Journeys 000	Pass.Kms 000,000
1956/57	109	86.0	199	18
1957/58	110	86.7	218	20
1958/59	111	87.4	239	22
1959/60	112	88.2	262	23
1960/61	113	88.9	288	26

Table 12

Sudan RailwaysDetails of Proposed Purchases of Freight Cars,  
Passenger Coaches and Other Plant.Freight Cars:

<u>Type of Cars</u>	<u>Replacements</u>	<u>Additions</u>	<u>Total</u>
Covered	90	1,060	1,150
Open	125	-	125
Flat	23	-	23
Tank	13	119	132
Livestock	3	-	3
Brake Vans	-	12	12
Service	1	18	19
Miscellaneous	<u>13</u>	<u>-</u>	<u>13</u>
Totals	268	1,209	1,477

Passenger Coaches:

<u>Type of Coaches</u>	<u>Replacements</u>	<u>Additions</u>	<u>Total</u>
Sleeping	1	-	1
Dining	1	-	1
First Class	2	4	6
Second Class	1	1	2
Third Class	-	23	23
Fourth Class	3	24	27
Saloons	1	-	1
Service	4	23	27
Comb. brake, mail, baggage	3	4	7
Other	<u>2</u>	<u>4</u>	<u>6</u>
Totals	<u>18</u>	<u>83</u>	<u>101</u>

Other Plant (IS 000):

Creosoting Plant	15
Workshop machines	282
Plant and Machinery	287
Dockyard equipment	18
Station loops	460
Signalling	117
Other trackwork	50
Marshalling yard (Khartoum)	232
Sanitation equipment	60
Fire Float	34
Various minor items	<u>308</u>
	<u>1,863</u>

Sudan Railways  
Statement of Actual and Estimated Net Income  
1956/57 to 1963/64  
(£S 000)

	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64
<b>I. Operating Revenue</b>								
<b>A. Railways</b>								
1. Goods and Livestock	6,730	7,072	8,602	10,167	11,150	11,727	12,109	12,551
2. Passenger Traffic	1,280	1,280	1,330	1,420	1,510	1,604	1,709	1,825
3. Baggage, Parcels and Mails	263	270	280	293	306	320	334	346
Total Railway Receipts	8,273	8,622	10,212	11,880	12,966	13,651	14,152	14,722
<b>B. Steamers</b>								
C. Port Sudan	758	818	780	784	789	794	800	805
D. Hotels and Catering	1,085	1,650	1,219	1,819	1,918	2,017	2,116	2,215
E. Other	448	422	473	470	500	535	570	600
	52	56	61	66	60	65	70	75
Total Operating Revenue	10,586	11,568	12,745	15,019	16,233	17,062	17,708	18,417
<b>II. Total Operating Expense (Including Depreciation Expense)</b>								
<b>A. Railways</b>								
B. Steamers	6,129	6,847	7,255	8,317	9,320	10,013	10,504	10,998
C. Port Sudan	928	929	928	926	928	930	931	930
D. Hotels and Catering	609	613	612	613	618	622	629	635
E. Other	386	386	386	387	388	389	390	391
	59	58	57	57	46	46	46	46
Total All Operating Expenses	8,111	8,833	9,238	10,300	11,300	12,000	12,500	13,000
<b>III. Net Operating Revenue</b>								
<b>A. Railways</b>								
B. Steamers	2,144	1,775	2,957	3,563	3,646	3,638	3,648	3,724
C. Port Sudan	170*	111*	148*	142*	139*	136*	131*	125*
D. Hotels and Catering	476	1,037	607	1,206	1,300	1,395	1,487	1,580
E. Other	32	36	87	83	112	146	180	209
	7*	2*	4	9	14	19	24	29
Total Net Operating Revenue	2,475	2,735	3,507	4,719	4,933	5,062	5,208	5,417
<b>IV. Non-Operating Revenue</b>								
<b>A. Railways</b>								
B. Steamers	222	219	225	225	225	230	235	240
C. Port Sudan	21	16	16	16	15	15	15	15
	29	30	31	31	32	33	34	35
Total Non-Operating Revenue	272	265	272	272	272	278	284	290
<b>V. Net Income Before Fixed Charges</b>								
<b>A. Railways</b>								
B. Steamers	2,366	1,994	3,182	3,788	3,871	3,868	3,883	3,964
C. Port Sudan	149*	95*	132*	126*	124*	121*	116*	110*
D. Hotels and Catering	505	1,067	638	1,237	1,332	1,428	1,521	1,615
E. Other	32	36	87	83	112	146	180	209
	7*	2*	4	9	14	19	24	29
Total Net Income before Fixed Charges	2,747	3,000	3,779	4,991	5,205	5,340	5,492	5,707

\*Indicates red figure.

SUDAN RAILWAYS  
Sources of Contribution to Capital Expenditures and Amortization of Debt  
During the Construction Period 1956-1964  
(£ S 000)

	<u>1956/57</u>	<u>1957/58</u>	<u>1958/59</u> #	<u>1959/60</u>	<u>1960/61</u>	<u>1961/62</u>	<u>1962/63</u>	<u>1963/64</u>	<u>Totals</u>	<u>%</u>
Capital Expenditures	2,415	7,054	7,583	7,771	8,059	4,625	3,339	1,888	42,734	
Amortization	<u>239</u>	<u>3,464</u>	<u>77</u>	<u>81</u>	<u>85</u>	<u>43</u>	<u>572</u>	<u>607</u>	<u>5,168</u>	
Total	2,654	10,518	7,660	7,852	8,144	4,668	3,911	2,495	47,902	
Sources of Funds:										
Depreciation	398	430	500	650	800	875	925	965	5,543	11.6
Net Income*	2,477	1,641	2,140	3,457	3,515	3,699	3,814	4,064	24,807	51.8
Cash Surplus-Years										
Operations	(1,221)	4,208	(2,467)	(2,342)	3,829	94	(828)	(2,534)	(1,261)	(2.6)
Borrowings	-	-	7,487	6,087	-	-	-	-	13,574	28.3
Advances-Sudan Govern- ment	1,000	1,500	-	-	-	-	-	-	2,500	5.2
Government Current Acct.	<u>-</u>	<u>2,739</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>2,739</u>	<u>5.7</u>
Total	2,654	10,518	7,660	7,852	8,144	4,668	3,911	2,495	47,902	100.0

# Excludes £S 2.2 million of the two-year program cost actually paid for in last months of 1957/58.

\* Represents net income after interest and other minor charges.

() Represents red figure or additions to cash surplus.

The Sudan Railways  
Statement and Estimate of Cash Flow  
(Sudanese Pounds in Thousands)

	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1956/64
<b>I. Cash Required:</b>									
<b>A. For Interest:</b>									
1. Gedaref Railway & Development Co. Loan	19	18	17	13	9	5	-	-	81
2. Sudan Govt. Capital Advances	750	812	840	840	840	840	840	840	6,602
3. IBRD Loan	-	-	282	671	816	816	808	773	4,166
<b>Total Interest</b>	<u>769</u>	<u>830</u>	<u>1,139</u>	<u>1,524</u>	<u>1,665</u>	<u>1,661</u>	<u>1,648</u>	<u>1,613</u>	<u>10,849</u>
<b>B. For Principal Payments:</b>									
1. Egyptian Government Debt	125	3,390							3,515
2. Gedaref Railway & Development Co. Loan	114	74	77	81	85	43	-	-	474
3. IBRD Loan	-	-	-	-	-	-	572	607	1,172
<b>Total Principal Payments</b>	<u>239</u>	<u>3,464</u>	<u>77</u>	<u>81</u>	<u>85</u>	<u>43</u>	<u>572</u>	<u>607</u>	<u>5,168</u>
<b>C. For Capital Expenditures:</b>									
1. Replacement of Assets	786	2,471	2,847	3,791	2,133	902	810	636	14,376
2. Additions to Assets (excluding extensions)	1,045	2,500	3,508	2,794	3,070	1,547	853	852	16,169
3. Managil Extension	-	696			1,956				2,652
4. Western Extension	584	1,387	1,228	286					3,485
5. Southern Extension	-	-	-	900	900	2,176	1,676	400	6,052
<b>Total Capital Expenditures</b>	<u>2,415</u>	<u>7,054</u>	<u>7,583</u>	<u>7,771</u>	<u>8,059</u>	<u>4,625</u>	<u>3,339</u>	<u>1,888</u>	<u>42,734</u>
<b>D. For Grants-in-Aid to Local Governments</b>	<u>16</u>	<u>20</u>	<u>20</u>	<u>25</u>	<u>25</u>	<u>30</u>	<u>30</u>	<u>30</u>	<u>196</u>
<b>E. For Working Capital</b>	<u>515*</u>	<u>509</u>	<u>480</u>	<u>- 15*</u>	<u>-</u>	<u>- 50*</u>	<u>-</u>	<u>-</u>	<u>409</u>
<b>Total Cash Required</b>	<u>2,924</u>	<u>11,877</u>	<u>9,299</u>	<u>9,386</u>	<u>9,834</u>	<u>6,309</u>	<u>5,589</u>	<u>4,138</u>	<u>59,356</u>
<b>II. Cash Available:</b>									
<b>A. From Net Income (before fixed charges)</b>	2,747	3,000	3,779	4,991	5,205	5,340	5,492	5,707	36,261
<b>B. From Depreciation</b>	398	430	500	650	800	875	925	965	5,543
<b>C. From Central Govt.: Advances</b>	1,000	1,500	-	-	-	-	-	-	2,500
<b>D. Central Govt: Current Acct.</b>	-	2,739	-	-	-	-	-	-	2,739
<b>E. IBRD Loan</b>	-	-	7,487	6,087	-	-	-	-	13,574
<b>Total Cash Available</b>	<u>4,145</u>	<u>7,669</u>	<u>11,766</u>	<u>11,728</u>	<u>6,005</u>	<u>6,215</u>	<u>6,417</u>	<u>6,672</u>	<u>60,617</u>
<b>III. Cash Surplus from Years' Operation</b>	1,221	4,208*	2,467	2,342	3,829*	94*	828	2,534	1,261
<b>IV. Cash Balance June 30, 1956</b>	3,310								3,310
<b>V. Cash Balance at end of period</b>	4,531	323	2,790	5,132	1,303	1,209	2,037	4,571	4,571

\*Indicates red figures

Sudan Railways

Procurement and Construction

All diesel locomotives and spares will be supplied by overseas builders to agreed designs. Railway staff will receive instruction in operation and maintenance, first at the builder's works and later in Sudan. Routine inspection during the building of these engines will be carried out by the Railways' inspecting engineers.

Most of the rolling stock will be supplied from overseas to existing railway designs and specifications. Freight cars will be assembled at Port Sudan and the passenger car bodies will be built in the Atbara workshop.

The imported track materials for the Kassala-Gedaref re-railing will be inspected during manufacture by the Railways' inspecting engineers. The used materials resulting from this track renewal will be employed on the extensions. All permanent way work will be carried out by railway forces and local contractors; steel bridge spans procured from abroad are already in the country.

The two new cargo berths in Port Sudan are being built by a foreign contractor supervised by the Railways' consulting engineers, a London firm.

Modernization and construction of river craft will be carried out in the Railways' own dockyard with diesel engines and other materials being procured from abroad.

Other plant consisting mostly of special machines and tools will be procured from overseas manufacturers.

Sudan Railways

Estimated supply of agricultural commodities  
to the proposed railway extensions

(This report was written when  
El Obeid was the effective south western  
terminus of the existing line)

A rather detailed description of the general agricultural situation in the Sudan is included in the report on "The Economy of the Sudan" (AS-64) of January 28, 1958, and in Annex B thereof. This appendix will therefore be limited to an analysis of the probable increase in the supply of farm products and farm requisites to railway traffic, which may result from the building of the Western, Southern and Managil extensions.

The Western and Southern extensions will connect with the rest of the system near El Obeid which is the southern terminus of the existing system. Present shipments to the existing railway line from the service areas of these extensions total about 60,000 tons per year and originate mainly in Kordofan province. This appendix contains an estimate of the amount of farm products that might be added to the present quantities about ten years after the extensions have been completed.

The Western extension to Nyala will run through the southern border area of the gum arabic region and just north of the area fit for rainfed farming. It will connect the province of Darfur and eastern Kordofan with the network.

The impact area is classified as "woodland-savannah with low rainfall". The rainfall varies from 400 mm. in El Obeid and El Fashir, to over 600 mm. south of the line.

Most of the land consists of dark cracking clay often covered with sand. There are silt deposits along the seasonal rivers, which are cropped intensively.

Most of the inhabitants in the impact area (probably one million people) are of Arab origin. They are frequently cattle-owning nomads, especially north of the proposed line. South of the future railway line are groups of farming Arabs and negroid tribes.

The Jebel Marra area is a mountainous region in W. Darfur, capable of growing a great variety of crops if properly developed.

At present some shifting cultivation of dura is practised north of the line of 600 mm. rain. The main occupations in this area are cattle raising and tapping gum-arabic from acacia trees.

South of the line of 600 mm. rainfall a more permanent system of fallow farming has been established. The main crop is dura, but groundnuts, sesame and, on a small scale, cotton and tobacco are also grown.

It is estimated that there are three million head of cattle in Kordofan and Darfur and a considerable number of sheep.

Forestry is of very little importance.

There are no paved roads in the area and traffic comes nearly to a standstill in the rainy season (July-September). Transportation is very **expensive**; it costs IS12 or more to move a ton of goods from the main markets to El Obeid.

Cattle auctions have been organized in Nyala and two other cities. Nyala is a lively, well-organized commercial center. On a normal day 20 well-loaded trucks move in each direction between Nyala and El Obeid. A quantity of over 30,000 tons of oilseeds is said to be exported per annum from Darfur, and 85,000 head of cattle have been sold in recent years on Darfur auctions.

It is impossible to make firm estimates about the future because of lack of basic information. It is, however, safe to assume that very large areas south of the 600 mm. rainfall line and even north of that line, can be cultivated. There are also large untapped areas of gumtrees in Western Darfur. Establishment of more watering points would increase the usefulness of the cattle-grazing areas. The cultivation of ~~many~~ small crops can be developed along the rivers and in the Marra Mountains.

For the traffic estimate it should be noted that the volume on the line Nyala-present railhead would consist of two categories:

- a) traffic of goods at present moved by trucks and camels to El Obeid;
- b) traffic of goods resulting from the increase in production as a consequence of the improvement in local prices which can be expected after the completion of the railway.

It is estimated that in the tenth year after the completion of the line the following quantities may be offered for transport by rail from Nyala eastward:

1) seeds (like groundnuts, sesame, melonseeds)	60,000 tons
2) small crops (like tobacco, peppers, nuts, coffee, fruits)	7,000 tons
3) gum arabic	15,000 tons
4) cattle	150,000 head
5) sheep	20,000 head

It is not possible to make an estimate of the quantity of farm requisites to be moved into the area, but this quantity would probably be small.

Improvement of the roads from Fasher, the Marra area and Buram to Nyala would facilitate the flow of goods to the railhead greatly.

The Southern extension will give a permanent trade route to the province of Bahr el Ghazal and also to Equatoria province since the towns in this province are connected by all-weather roads to Wau. The line will mainly tap the central part of Bahr el Ghazal, between the Nile marshes in the east and the **infertile tse-tse infested area** in the west.

The northern part of the impact area is acacia-tall grass country. Tree vegetation increases slowly going south, but there are several low treeless flood plains along the rivers. The soils range from heavy clays covered with sand in the north through young clays in flood areas (toich lands) to lateritic red soils with iron ore concretions in the southwest (ironstone area). There are strips of grey sands between the ironstone region and the clay region. Most of the present cultivation is done on these strips.

Rainfall increases from 600 mm. near El Obeid to 1,000 mm. at Wau, and 1,400 mm. in the south. The rainy season lasts from May to September in the north and from April to December in the south.

The population of the impact area, mainly negroes, numbers probably one million people. They practice at present a very primitive type of cropping and cattle breeding and trade facilities are very poor. In fact they are largely living in a non-monetized economy.

The official estimate of crop production in Bahr el Ghazal for 1956/57 is:

Dura ( <del>allot</del> )	105,000 acres,	47,000 tons
Sesame	23,000 acres,	5,000 tons
Groundnuts	34,000 acres,	19,000 tons

In some years, when crops are bad, there is a shortage of dura, the staple food, in Bahr el Ghazal. Cattle raising is in this area mainly done for prestige reasons and not as a commercial enterprise. There are probably 1.5 million head of cattle in the province. They are small, badly-fed animals of little commercial value. The region supports also 1.5 million sheep and goats. There are signs of overgrazing and shortage of fodder.

Agriculture is still of little importance in Equatoria province. It can support its population and produces small quantities of various export crops.

Forestry is of ~~some importance~~ in both provinces. Bahr el Ghazal province produced 135,000 cu.ft. of sawn lumber in 1955/56 and Equatoria even more.

It is at present very difficult and costly to move goods from the area northwards, or from the center of the country into the area. There are no permanent roads between the area and El Obeid and steamer services are unreliable. It costs about **ES 4** to move a ton of freight by truck over 100 miles in the area. There is very little organized trade and commerce and no banking in the area. The area exports at present not more than a few thousand tons.

The physical potentialities for development of agriculture in the area are large. Many thousands of acres of "toich" lands could produce rice, and large quantities of grains, groundnuts, cotton, sisal and sesame could be grown on the higher lands. The ironstone areas could be used for tree crops (mangos, citrus, nuts, lumber). The Equatoria area could probably grow all the coffee, tea, tobacco and sugar that the Sudan now imports.

However several factors make it very difficult to estimate when and at what rate these potentialities will be developed. Some of these factors are:

- a) the small number of inhabitants and their simple, non-commercialized way of life;
- b) lack of commercial and financial facilities;
- c) lack of detailed knowledge of the area and of how to promote economic development in it.

The following estimates are therefore very tentative. They indicate the quantities of farm products that might be available for rail transport in a year, ten years after the completion of the line:

- |                                                                          |             |
|--------------------------------------------------------------------------|-------------|
| 1) dry land crops, such as dura, groundnuts, sesame, cotton, sisal, etc. | 55,000 tons |
| 2) tropical products, such as palm oil, coffee, tea, tobacco, fruits     | 5,000 tons  |
| 3) rice from the "toich" lands                                           | 5,000 tons  |
| 4) cattle                                                                | 25,000 head |
| 5) lumber                                                                | 15,000 tons |

It is at present impossible to estimate the quantity of farm requisites that might have to be moved into the area in the future. Experiments with fertilizers have recently been started, but there are as yet no firm indications of the reactions of the farmers.

A number of measures should be taken to ~~accelerate~~ the development of the region, such as:

- a) development of a marketing organization;
- b) the organization of facilities for land improvement loans;
- c) expansion of the equipment of the sawmills of the forestry service;
- d) improvement of existing roads and the completion of the road Mau-Meshra'er Req.

The Managil extension to Fakhakhir will connect a new irrigable area south of Khartoum with the existing railway system. This area is adjacent to the already irrigated Gezira region. The Sudanese hope to have the full area of 800,000 acres provided with irrigation facilities by 1961. It is expected that 250,000 acres will be used for cotton growing, and 150,000 acres for other crops, like dura, wheat, groundnuts, castorbeans, oilseeds. For reasons of

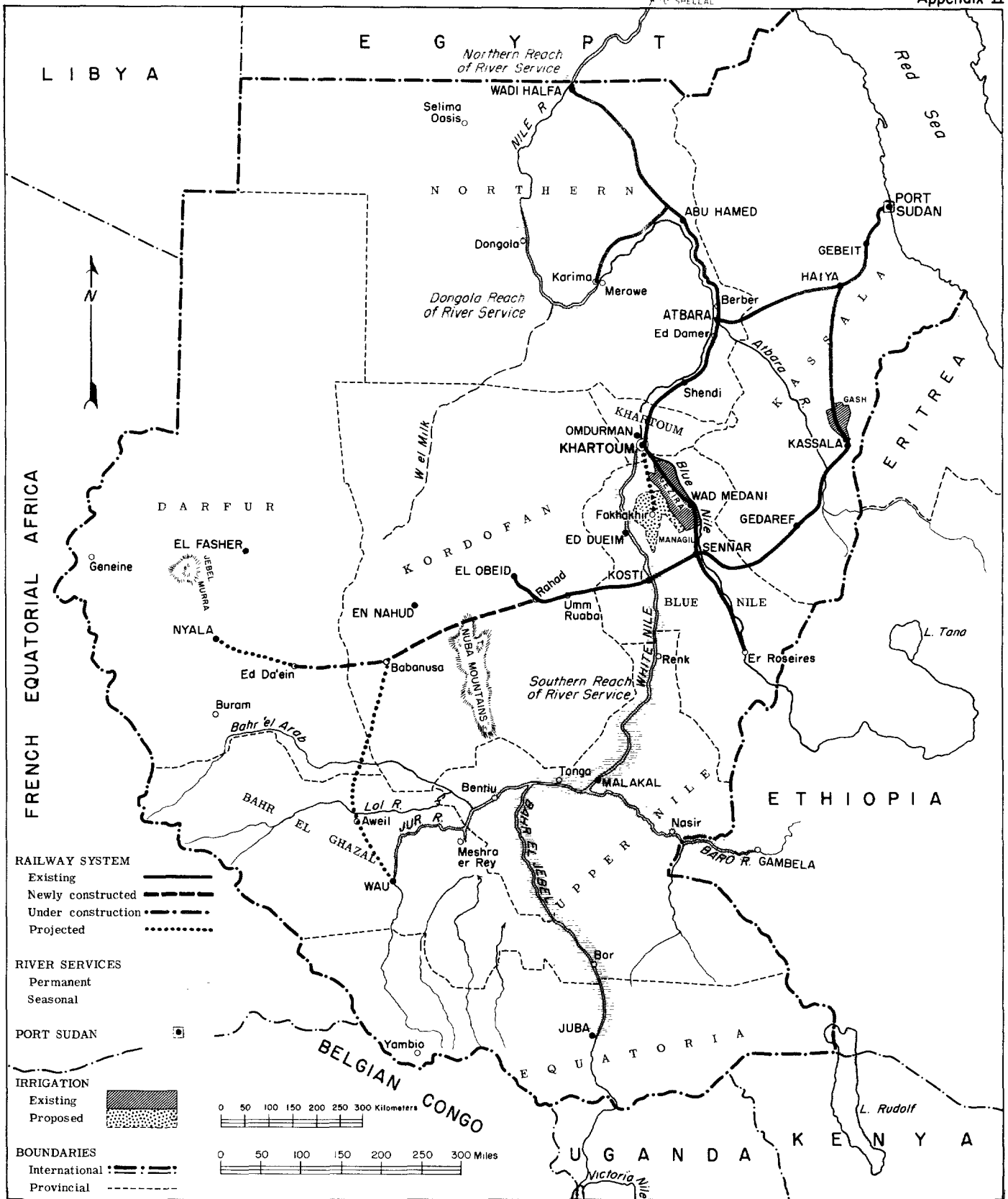
water economy and marketability it is assumed that the cotton grown in the Managil area will be of the American medium-staple type. A further assumption made for the traffic estimates is that 2/3 of the cottonseed produced in Managil will be available for export. On this basis the quantity of farm products offered per annum to the railroad after the completion of the irrigation project might be:

cotton lint	70,000 tons
cottonseed	90,000 tons
other products	<u>40,000 tons</u>
	200,000 tons

The quantity of fertilizers to be used in the Managil area can initially be estimated at 20,000 tons per year.

# SUDAN RAILWAYS

Appendix II



MAY 1958

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