12672

Distr. LIMITED

TRANSCOM/516
Octobre 1991

ENGLISH
Original: FRENCH

ECONOMIC COMMISSION FOR AFRICA

REPORT TO THE UNION OF AFRICAN RAILWAYS ON THE PREPARATION OF PROGRAMMES FOR PROCURING AND MODERNIZING ROLLING STOCK IN AFRICA (PE. 3.2.(ii)

Table of contents

I. INTRODUCTION

1. As part of the programme for developing the management and maintenance of railways, the Economic Commission for Africa was entrusted with specific tasks which include those of the Transport, Communications and Tourism Division whose activities cover on all transport modes with a view to the attainment of the goal of physically integrated the African continent, thus contributing to the development and promotion of inter-African Trade.

2. As pointed out by various decision-makers at various summits of Heads of State and Government, transport is the backbone of the economic and social development of all countries. Considering the particular case of Africa whose transport facilities are far from meeting the material needs for securing and promoting its economic development on the basis of its transport infrastructure, this assertion is all the factual as the only existing railways and rail transport facilities in the continent are mostly access tracks constructed early in the century with light characteristics and which do not meet the current operating requirements.

II. AIM OF THE STUDY

3. Given the day-to-day realities of operational difficulties, it has become indispensable to find the necessary ways and means of rehabilitating, modernizing, indeed reconstructing rail transport infrastructure and equipment. To this end, scheduled

programmes will be established, taking into account all the dimensions of and constraints to the development of the sector.

4. Similarly, the management and development of the rolling stock and everything that needs to undergo profound changes for the purpose of technological advancement should be improved.

5. In order to attain these objectives and make rail transport competitive, it has been programmed, among other activities for the rail transport subsector, to draw up programmes for modernizing and procuring rolling stock for railway executives and administration in Africa.

6. The execution of these programmes will make it possible to revitalize the activities of railways which have a major role to play in the economic development of Africa, particularly in long-distance mass transportation.

III. REVIEW OF THE CURRENT SITUATION

7. Railways which have contributed positively to the development of the economically more advanced countries has, in spite of its advantage, been experiencing serious operational and management difficulties for some years now owing to stiff competition from the other transport modes. To enable it to play its rightful role, it is necessary to modernize the rolling stock and equipment which have become old and obsolete. This will help to improve the performance and efficiency of the railway sector

as well as stimulate its development, taking into account its complementarity with the other transport modes. In most African railways, the poor state and low availability of rolling stock reduces the capacity of transport facilities, thus often leading to poor quality of service. Since this situation does not encourage the users of railway services, the consequence is traffic light, low productivity and insufficient income.

8. Given such a continuous deterioration of infrastructure and resources, urgent actions must be taken since a considerable number of the rolling stock of railway networks were constructed in the 1920s. These equipment modernization and replacement programmes carried out by some networks have enable them to face up to their transport needs, but many other railway Administrations have not been able to undertake the same actions for lack of financial and foreign exchange resources.

9. These difficulties are further compounded by the low speed and axle load of trains due mainly to the state of the tracks which, although constructed early in the century, have not been improved technologically. It should be recalled that the African Railway System is irregular and heterogenous. The configuration of the lines lack complementarity, which is a serious handicap to rational operation and to the implementation of a community policy based on the pooling of the existing capacities of equipment as well as on the operations of inter-connected tracks.

10. African Railways have, since independence, experienced many difficulties the major of which is caused by the lack of an appropriate transport policy.

11. The route has developed not as a complement to the railway, but rather as a stiff competitor against its development. The fares of the railways have been such that they operate in deficit and this has not allowed for equipment replacement and continuous maintenance. Twenty to thirty years after independence, some African countries have found themselves in a fait accompli in which equipment have seriously deteriorated, whereas the countries lack the resources for financing the huge equipment replacement and rehabilitation required.

12. Given these facts, a politico-economic support to a transport plan that will lead to the execution of a project for the inter-connection of African railway networks should be sought. A regional transport plan may end up at the subregional level.

13. It is necessary to note at this stage of the analysis that several initiatives have been taken in the various subregions of the continent by Heads of State and Government. The case of the Economic Community of West African States (ECOWAS) clearly illustrates this as the initiative taken in that Community through a decision by the Heads of State and Government has marked time since 13 years after it had been taken, and the plan to inter-connect the Community's Railways has not been

perceptively achieved. This plan which, nevertheless, should imply a strict coordination of transport modes in order to avoid wastage and duplications in a sector whose capital costs are very high would make it possible to minimize the overall cost of transport for the subregion. This step is applicable to the whole continent as it embodies the major factors for subregional economic integration. Therefore, the major response to the main problem of financial profitability of the infrastructure projects should be that the regional infrastructure should be completed so that acceptable costs can be arrived at for the subregions, whatever the financial profitability of project, at this time that Africa is undergoing development. The continent's integration should remain the prime objective on which all efforts, be they internal or external from the development partners, should converge. In this context, the inter-connections are a prerequisite for the self-reliant development of Africa whose economic and social development has to date remained based on North-South trade.

IV. METHODOLOGY

14. The methodology used in conducting the study is as follows:

(a) Study on data available to ECA on Africa Railways;

(b) Mission to three railway networks: "Tanzania Railways Corporation, Botswana Railways and Kenya Railways" in order to discuss with executives of railway administrations the management

and operational problems of railways and to collect the necessary data for drafting the present report which is a follow-up to the PE32(ii) Element - aim of the 1990-1991 biennial work programme of ECA.

V. THE EXPERIENCES OF THE COUNTRIES VISITED AND THOSE NOT VISITED IN CONNECTION WITH THE REPAIR AND MAINTENANCE OF ROLLING STOCK AS WELL AS FOR THE PREPARATION OF PROGRAMMES FOR PROCURING AND MODERNIZING ROLLING STOCK

Review of the composition of the rolling stock and methods used

15. On the basis of the visit to railway workshops and installations, the exchange of views with the authorities of railway Administrations of the countries visited namely, Tanzania, Botswana and Kenya and the study of the available data on the member countries that were not visited, it was possible to make the following observations.

16. Most of the railway networks had operational difficulties characterized mainly by low availability of rolling stock owing to old age and poor maintenance of the fleet.

17. The maintenance programmes did not often correspond with forecasts due to the non-availability of spare parts at the time repairs were necessary. From discussions held with production executives, it was seen that a considerable number of passenger

wagons and coaches were constructed very long ago and that their rehabilitation required heavy work.

18. The inadequacy observed and pointed out served as a framework for searching for ways and means of preparing programmes for modernizing and renewing the rolling stock.

19. The new conditions for managing and operating African Railways requires the authorities of the railway networks to pay greater attention to the definition and careful execution of a suitable programme for the maintenance, renewal and modernization of the components of the network, including the rolling stock. To this end, it is necessary to examine the current situation in all the railway networks, after which a detailed analysis of the various components of the rolling stock should be made. Such analysis should led to the preparation of programmes for modernizing and procuring the necessary rolling stock for a proper operation of railway networks. Once the programmes have been established, it will be necessary to efficiently mobilize the required financial resources, especially foreign exchange, by sensitizing all the financial partners involved, particularly the foreign ones.

A. Tanzania and the Tanzania Railways Corporation

20. The exchange of views with the railway authorities in Dar-es-Salaam on the problems of rail transport operations, particularly on modernization and procurement of rolling stock

made it possible to explore all the areas of activities of the railways, namely, maintenance, repair and procurement of rolling stock. From the discussions, it was noted that:

(a) Actions, including negotiations with funding agencies, were under way to conclude certain programmes for rehabilitating, modernizing and procuring rolling stock in order to meet operational requirements;

21. In fact, most of the rolling stock is obsolete. For example:

(a) Certain categories of this equipment have been selected for replacement under rehabilitation programmes;

(b) The smallness of working space, due to insufficiency of places to set up workshops which could no longer extend their space, makes it difficult for certain works to be executed;

(c) The obsoleteness of a considerable number rolling stock and workshop equipment reduces the quality of production.

22. The Tanzanian Railways which operates approximately 1,860 km of major tracks with an axle load of 20 tons has its headquarters in Dar-es-Salaam. It forms part of a large geographical whole involving Uganda and Kenya whose rail tracks were constructed with a metric gauge of 1,000 metres. This gauge common to these three neighbouring countries enables the Tanzania

Railways Corporation to maintain and repair some of the rolling stock of Ugandan railways since both networks are inter-connected.

1. Composition of the rolling stock

(a) Commodity equipment

23. In 1991, the stock of coaches comprised 2,534 coaches, excluding two coaches to be reconstructed. This fleet will, after the network forecast, be 2,459 coaches in 1992, 2,372 in 1993 and 2,184 units in 1995. The number of wagons will be brought down to 7 per cent of wagons equipped with rail chairs and 93 per cent equipped with.

24. The total number of coaches including obsolete ones of all types is 3,257, broken down as follows:

(a) Covered wagons: 1,918;

(b) Refrigerating wagons: 5;

(c) Cattle wagons: 109;

(d) Flat high sided wagons: 510

(e) Flat low sided wagons: 510

(f) Tank wagons: 252;

(b) The passenger vehicle fleet

25. The passenger stock is made up of 133 coaches, broken down as follows:

(a) All-class passenger coaches: 101;

(b) Buffets-restaurant cars: 10;

(c) Braking equipment cars: 14;

(d) Service coaches: 8.

(c) Availability of rolling stock

26. The following coaches are available:

(a) 83 per cent of covered coaches;

(b) 72 per cent of high sided open wagons;

(c) 80 per cent of tank wagons;

(d) 70 per cent of other coaches.

According to the Network's projections, 92 per cent of this

equipment will be available in 1995, a rate that reflects an improvement in performance.

Rehabilitation programme

27. A rehabilitation has been executed by the Network. From 1988 to 1,990 the number of coaches rehabilitated with the assistance of the Danish International Agency was 800. Under the programme, 1,000 coaches were rehabilitated.

Modernization programme

28. With regard to modernization, studies are under way with the assistance of the Foreign Studies Office. The programme also includes equipment in the depots and repair workshops.

(d) Procurement programme

The procurement programme is as follows:

For Wagons

29. It is broken down as follows:

(a) 50 coaches procured in 1990;

(b) 105 container carrying trailers are currently being acquired;

(c) Also to be delivered in late 1991 are 45 tank wagons, 40 giant tanks and 20 container carrying trailers. The various wagons above have been ordered through external financing.

For first and second class passenger coaches

30. It is planned to acquire 20 first class and 7 second class coaches.

31. It should be noted that for the maintenance and repair of the trailer stock, such as wagons and coaches, the Tanzania Railways has one central workshop in Dar-es-Salaam and ten maintenance depots on line.

(e) The tractive stock

32. The tractive stock is made up of line locomotives and manoeuvre locomotives.

The stock of line locomotives is described in the table below:

Type	Serie	Number	Availability	Year of going into operation
Hydraulic (Germany)	64	21	12	1978/79
Electric diesel (India)	73	15	5	1977/78
Electric diesel (Great Britain)	72	2	0	1972
Electric diesel (Great Britain)	87	7	7	1967
Electric diesel (Canada)	88	35	of 27 which 20 15	 1972 1980

(f) Programme for rehabilitating locomotives

33. The rehabilitation concerns the following series:

(a) Series 87: Number 6. Period of delivery 1989/1990;

(b) Series 73: Number 10. Period of delivery: 2 will be delivered in 1992;

(c) Series 88: Number 7. Two had already been delivered in 1991.

(g) Procurement programme

34. It is planned to have the following delivered in 1992:

(a) Four hydraulic locomotives, Series 64 with 760 HP;

(b) Nine electric diesel locomotives, Series 89 with 200 HP;

The above 13 locomotives are of German make (Henschel)

35. It should be noted that the Tanzanian network has a central workshop at Morogoro for maintaining and repairing locomotives as well as two maintenance depots at Tabora and Moshi.

(B) Botswana (Botswana railways)

36. Botswana Railways is a new railway network which started operating in 1987 it has a metric track of 1.067 m and carries an axle load of 18.5 tons. It is 650km long. It comprises an international line coming from South Africa and joining Bulawayo in Zimbabwe while linking the capital, Gaborone. The line is in good state for most of network.

37. The concern of Botswana Railways is mostly to procure new stock and repair and maintenance workshop equipment. Unlike the other networks constructed early in the century, which need to be modernized in order to meet operational requirements, Botswana Railways has modern installations and an almost new stock of vehicles. The passenger traffic which is handled by only 25 passenger coaches borrowed from the South African Railways will be strengthened by acquiring 41 coaches to replace those hired during the second half of 1991.

38. According to forecasts, the network's traffic will increase from 2,273,000 tons in 1991 to 3,813,000 tons in the year 2000. It will mainly involve transit traffic. Since the entire planning is based on this projection, the programmes for rehabilitating, modernizing and procuring rolling stock and workshop equipment are planned in such a way that their execution can be completed in 1993, through the active participation of the government of Botswana which is providing its own funds. Only a part of the financing will come from external sources.

(a) Composition of the rolling stock

39. The rolling stock comprises 1,101 wagons of all types, 41 passengers coaches and 41 locomotives.

Trailor stock (wagons and coaches)

40. Wagons: The stock of wagons comprises the following:

1,045 Commercial Wagons broken down as follows:

Type	Number	Year of construction
High sided wagons DORBYL	47	1978
High sided wagons ZECO	160	1988
High sided open goods wagons CNMC	101	1991
Open goods wagons ZECO	340	1988/89
Covered wagons ZECO	90	1988/89
Tank wagons ZECO	80	1988/89
Open hopper wagons CNMC	24	1991
Covered hopper wagons CNMC	159	1991
Other ex NRZ NRZ = National Railways of Zimbabwe	134	1949/1943

Service wagons (a mixture of all types)

41. These wagons are 56 in number and were constructed in 1976, 1986 and 1989.

Passenger coaches (all series):41 in number

42. This stock is made up of the following:

(i)	First class coaches	4;
(ii)	Economy class coaches	21;
(iii)	Sleeping cars/couchettes	6
(iv)	Buffet-restaurant cars	5
(v)	Generator vans	5

43. It should be noted that the rolling stock of Botswana Railways were constructed in accordance with the norms of the Standardization Commission of the Southern African group of countries.

(b) Procurement and replacement programmes

44. The new 174 km line which has been in hand since 1989 and whose construction would last two years was planned to be commissioned in June 1991. Except for this line, the replacement programmes planned were to cover only 40 km to 50 km of line per annum. These actions for the rail lines are combined with the rolling stock modernization and procurement programmes. The same applies to the programmes for expanding and equipping maintenance and repair shops. Under the procurement programmes, 570 wagons were acquired in 1989 through external funding, and 284 wagons

ordered from China would be delivered in or before late 1991. The "General Electric" locomotives are currently being delivered. All the following stock planned under the procurement programmes drawn up in 1990 will be delivered in 1993 at the latest. The same applies to the installations whose construction facilitates railway operation in order to allow for a better handling and flow of traffic.

(C) Kenya (Kenya Railways)

45. Kenya Railways, 2,650 km long, is interconnected with the networks of Uganda and Tanzania. It has vast workshops for rolling stock repair as well as maintenance facilities in various major centres in Kenya. Except for some obsolete equipment, the Kenyan network is well equipped to carry out all works required to facilitate railway operation. Efforts should, therefore, be made to operationalize certain production lines of the workshops by procuring new equipment now lacking owing to technological changes in the design and execution of certain works. Also, some buildings of the maintenance centres in Nairobi need far-reaching rehabilitation in order to make them meet the requirements for modern maintenance installations, thereby increasing productivity.

46. Kenya Railways is known for its increasing passenger traffic. It is one of the very few railway networks with heavy passenger traffic. The action plans aim at the execution of modernization projects for both fixed installations and rolling

stock. The major problem facing Kenya Railways is that of lack of spare parts for scheduled overhauls and routine maintenance of machines.

(a) Rolling stock

(1) Locomotives

47. The total stock of locomotives is 218 units broken down in the table below:

Type of Transmission	Serie	Number	Year of construction
Coco Electric diesel GE USA	94	10	1987
Co Co Electric diesel GE USA	93	26	1978
Coco Electric diesel MLW Industry	92	15	1971
Coco Electric diesel English Electric	87	9 14 45	1960 1964 1967/68
Bo Bo Electric diesel GEC-Traction	72	5	1972
Bo Bo Electric diesel English-Electric	71	10	1965
Bo Bo Hydraulic Thyssen-Henschel	62	56	1977
D. Hydraulic HUNSLET AND BRE-NETRO	47	35	1967
D. Hydraulic ANDREW-BARCLAY	46	22	1967
C. Hydraulic ANDREW-BARCLAY	35	5	1972
C. Mechanical	32	6	1950 (Awaiting scrapping)

Programme for modernizing and procuring tractive stock

48. According to forecasts for the period 1991-1996, the rehabilitation modernization and procurement requirements are as follows:

(a) Line locomotives

49. Rehabilitation programmes are planned for the oldest series of locomotives. It will also be necessary to address the requirements of railway operations up to 1995, by replacing a number of locomotives through the procurement of 20 new locomotives. From 1996/1997, it will be indeed necessary to procure eight more locomotives.

(b) Shunting locomotives

50. Among these, 22 locomotives of the 46 series and 5 of the 35 series will soon be reaching the threshold of their economic life span. A performance evaluation will make it possible either to opt for rehabilitation or for the purchase of new shunting locomotives in the future.

2. Trailer stock

(a) Wagons

51. The goods transport rolling stock comprises 6,516 wagons as of 13 May 1991. 1,351 wagons of this stock were acquired during the period 1979-1982. The average age of the rest of the stock is 40 years. The entire stock comprises the following:

Types of wagons	Number
Covered wagons	3,209
Tank wagons	658
Refrigerator wagons	55
Cattle wagons	269
High sided wagons	611
Low sided wagons	1,071
Special wagons	344
Other service and utility wagons	349

(b) Passenger coaches

52. The passenger stock is made up of 440 coaches, 126 of which were acquired during 1979-1985. Sixty-three of the 105 old coaches of the passenger stock will be rehabilitated to meet customer requirements.

The composition of the passenger stock is as follows:

Types of coaches	Number
Passenger coaches	241
Buffet-restaurant coaches	23
Inspection coaches	92
Brake and service vans	188

(3) Rehabilitation and procurement programmes

53. The following is the requirement for wagons during the period 1991-1995. The rehabilitation programme mainly concerns 460 wagons of all types stopped for various damages while 462 wagons will need to be acquired in order to meet traffic demands. To this end and for the purpose of achieving economies of scale, provisions should be made for joint stock order and spare parts supply.

54. For passenger traffic during the period 1991-1995, it is planned to procure 10 first class coaches, 10 second class coaches and 43 third class coaches.

55. These acquisitions will enable Kenya Railways to increase its freight transport from 4,117,000 tons in 1991 to 5,042,000 tons in 1995 and its passenger traffic from 3,530,000 to 4,414,000 passengers during the same period, with its stock availability increasing from 59 per cent to 63 per cent for locomotives and 80 per cent to 90 per cent for wagons.

56. The expected improvements should be enhanced through follow-up measures comprising, inter alia, the necessary workshop equipment modernization measures required to improve the productivity of the maintenance and repair shops. Various studies are under way in various departments of Kenya Railways aimed at achieving the set objectives.

(D) Cameroon

57. Cameroon's railway network which covers 1,115 km of track is one of the very few railway networks that has, since independence, undertaken considerable work to realign its tracks, extend its lines and modernize its maintenance equipment. The details of this network's rolling stock are given below:

(a) Tractive stock

58. The number of locomotives as of 1990 was 67. This stock which comprised 91 locomotives as of 30 June 1989 was reduced to 67 units following the scrapping of 13 locomotives and 11 light rail motor tractors which had become obsolete.

Trailer stock

59. The trailer stock which comprised 2,303 units in 1988 was reduced to 2,157 vehicles following the scrapping and acquisition operations in which 160 wagons were scrapped while 12 tank wagons, two service wagons and two bar-restaurant cars were acquired. The passenger stock comprises 106 coaches, 27 of which were put into service in 1987. The wagon stock was strengthened between 1980 and 1982 by putting 493 wagons into operation.

(c) Rolling stock modernization and procurement programme

60. Within the framework of actions to be taken by officials of the Cameroon Railways, it is planned to carry out a rehabilitation programme for the general overhaul of 17 Bombadier CC 2200 locomotives. This programme will cover a period of three years, with assistance from donors.

61. In the same way, a four-year programme to convert the braking system of the rolling stock began in 1987 and is continuing. It should also be noted that 27 out of the stock of 67 locomotives, 886 out of 1,385 old wagons and 45 coaches have already been converted with external financial assistance. Similar efforts are being made in other areas of the industry in order to modernize the network and ensure that the rolling stock is adequate to the level of traffic.

E. Zambia

(a) Zambia Railways

62. The Zambia Railways network was established in 1905 when the country was still called Northern Rhodesia. After independence, the Zambian network was extended and lines established in three regions:

- The 164-km-long Livingstone - Mulabesi line was put into service in 1973;

- In 1976, the Tanzanian - Zambia Railways (TAZARA) reached Kapiri M'Poshi to the north of Kabwe.

63. To date, the Zambian network manages 1,266 km of railway line of which 850 km are main lines equipped with centralized traffic control.

The Zambian network is linked with those of Zimbabwe, Zaire and Angola by the Benguela railway.

Composition of the rolling stock

64. The motive-power stock is made up of 67 machines, the most recent of which were put into service in 1980.

65. Passenger traffic is carried by six rail cars and 88 passenger coaches.

66. Freight transport is provided by 5385 wagon units (1986 figures).

(b) The Tanzania - Zambia Railway (TAZARA)

67. The 1,860-km-long railway which links Tanzania to Zambia has an axle load of 20 tonnes and a metric gauge of 1.067 metres.

Rolling stock

68. The stock consists of 80 line locomotives and 15 light rail motor tractors (1988 figures).

The trailer stock is made up as follows: 98 passenger coaches and 1,820 wagons of all types including those privately owned.

F. Djibouti - Ethiopia Railway

69. This railway network has two lines. The northern one with a narrow gauge of 0.95 metres and a 35 per cent gradient, was built between 1887 and 1927. It is 306 km long and links Massawa to Agordate in Eritrea. Traffic on this line has been suspended because of guerilla activity.

70. The Addis Ababa - Djibouti line is 781 km long of which 681 km are in Ethiopia. It has a gauge of 1,000 metres, gradients of 30 per cent and curves with 150 metre radius of curvature. Constructed between 1887 and 1917, the line is the umbilical cord between Ethiopia and Djibouti. It is very uneven and has been the subject of several studies aimed at renovating it and realigning the track, which is now very dilapidated. New studies on rehabilitation and modernization are being conducted at present.

(a) The locomotive stock

71. The locomotive stock comprises 36 units, nine of which were received in 1984, including shunting engines and railcars. Out of the 36, only 26 machines are being used to operate the various types of traffic. The lack of spare parts seriously impedes the network's ability to repair its rolling stock. There are too few locomotives to meet the needs of the industry (passenger and freight traffic). The situation in October 1991 was as follows: 12 locomotives out of the total 15 in the line stock. Of these 12, nine are in good working order. Of the light rail motor tractors, two out of four are used for shunting, while passenger traffic is handled by four out of a total of five railcars.

(b) Trailer stock

1. Wagons

72. In 1988, the wagon stock consisted of 720 units, three-quarters of which had been put into service around 1973. This stock was reduced to 598 wagon in January 1990 and 460 in October 1991. Their lamentable state of repair has led to frequent derailments which interrupt rail services. In addition, the safety of rail travel cannot be guaranteed because the driving gear on many wagons has reached the fatigue threshold. It is therefore essential for the Djibouti - Ethiopia network to replace a good number of its wagons. A programme of modernization and procurement should be drawn up to that end.

2. Passenger trailers and coaches

73. The network had 15 electric railcars and 30 passenger coaches available for passenger traffic. Given the steep rise in the number of passengers on this network, which is one of the few railways in Africa whose supply of rolling stock has fallen far short of passenger demand, urgent action should be taken, after a market study, to procure adequate equipment to meet operating needs. This is in order to safeguard the passenger traffic. Such an intervention calls for simultaneous far-reaching changes on the line. In October 1991, the trailer stock for passenger traffic was as follows: 22 railcars, of which 15 were in service and 16 metal
coaches, 14 of which were in good working order.

G. A case study of the eight West African countries which made up the former AOF railway

74. Many studies have been undertaken in these countries on the strengthening and rehabilitation of the railways, and on their rolling stock, signalling and communications equipment.

75. The total length of railway in the area covered by the eight CEAO countries is only 4,500 km, including 725 km built for the mining industry. Sixty per cent of the track for public transport is more than 30 years old and 46 per cent more than 40 years old.

76. The composition of the rolling stock in the countries (Benin, Mali, Senegal, Côte d'Ivoire, Burkina Faso, Mauritania, the Niger and Togo) is as follows:

(a) Rolling stock

1. Line locomotives (1990 figures)

77. The line locomotive stock is made up of 117 units, 60 per cent of which are less than 20 years old and 19 per cent less than five years old. The average availability rate is 68 per cent.

2. Light rail motor tractors

78. There are 72 units of this type of which 4 per cent are less than five years old and 71 per cent less than 20 years old. The average availability rate is 64 per cent.

3. Railcars

79. The railcar stock consists of 32 units, of which 9 per cent were procured under the renewal scheme in Senegal less than five years ago, and 51 per cent are between five and 15 years old, making a total of 60 per cent under 15 years old. The average availability rate is 58 per cent.

4. Passenger trailers

80. The stock consists of 401 trailers, 64 per cent of them under 20 years old. The average availability rate is 51 per cent. Included in these figure is the rolling stock of the Chemin de fer du Togo, 35 per cent of whose stock is between 30 and 40 years old or 82 per cent of the rolling stock (trailers) more than 30 years old.

5. Freight wagons

81. The freight wagons stock comprises 3,564 units with a capacity of 127,204 tons; 33 per cent of the wagons are under 10 years old and 27 per cent between 10 and 20 years old, that is a total of 60 per cent of less than 20 years old. The average availability rate is 72 per cent.

82. Taking all the railway networks together, more than 60 per cent of the rolling stock for freight, both tractive and trailer, is under 20 years old. The average availability rate is noticeably higher for trailer stock than for tractive stock.

(b) Traffic

1. Passenger traffic

83. Passenger traffic fell by 5.7 per cent a year between 1979 and 1989. The average distance travelled for all eight countries

dropped from 198 km in 1979 to 184 km in 1989.

2. Freight traffic

84. For the eight countries, the total traffic amounts to 173 million tonnes or the equivalent of 1,111 million tonne-kilometer over an average travelling distance of 461 km. The relatively high figure for the average distance travelled compared to the length of the networks shows the importance of the international traffic component in the transport of various goods by rail.

(c) Length of the rail networks in the CEAO countries

85. The length of the network in each country is as follows:

Chemin de fer Benin - Niger (OCBN) 579 km
Chemin de fer du Togo (CFT) 500 km
Chemin de fer de la Côte d'Ivoire (SICF) 639 km and
61 km of double track
Chemin de fer du Burkina-Faso (SCFB) 518 km and
105 km under construction
Chemin de fer du Mali (CFM) 640 km
Chemin de fer du Sénégal (SNCFS) 906 km
Chemin de fer de Mauritanie (SNIM) 689 km

86. It is seen that all these rather short railway lines are access routes constructed directly to the coast at the beginning of the century. Their poor state of repair, along with that of

their rolling stock, seriously impair the services they can provide. It is also seen that the composition of their rolling-stock is rather limited with 3,564 wagons for all the eight countries which is much lower than the stock of a single network in other subregions of the continent. This illustrates the low level of development of the railways in this subregion and the lack of the complementarity which would promote a more rational operation. The existing railways should be interconnected to boost railway development in Africa and increase their profitability. Linking up the railways will also ensure a more efficient use of rolling stock over long distances and minimize the breaking of cargo between the ports and the hinterland.

VI. THE BASES FOR PREPARATION OF ROLLER STOCK MODERNIZATION AND PROCUREMENT PROGRAMMES

1. Trailer stock

87. The aim of the present study is to provide the upper echelons of railway administration with well-prepared programmes for the modernization and procurement of rolling stock in Africa. The following points must therefore be taken into consideration in any decision regarding the replacement of trailer stock:

(a) Expected future traffic patterns;

(b) Expected future average freight loads;

(c) The expected annual mileage of a freight train and passenger train;

(d) A replacement programme, based on the age and obsolescence of the stock.

88. In order to deal with these points properly, a preliminary analysis of the railway networks should be undertaken. It must cover existing infrastructure, railway projects and rolling stock. The rolling stock component should address the following parameters:

- The make-up of the freight and passenger rolling stock;
- The state of the wagons and carriages;
- The annual mileage of the stock;
- The annual mileage of a wagon and coach;
- The stoppage rate of wagons and coaches;
- The life expectancy of a wagon and a coach;
- The number and capacity of maintenance and repair facilities;

- The number and capacity of factories manufacturing the existing rolling stock.

89. On the subject of traffic flow, the following areas must be looked at:

1. Traffic development over the past 10 years on existing lines and possible trends on projected lines.

2. Expected traffic development over the next 10 years on existing and projected lines.

90. An analysis of the above points should enable each railway network to determine its real requirements in trailer stock and assess the transport capacity required for current and projected traffic.

91. Within the context of restructuring and redefining the economic role of the railways, almost all the railway administrations now have studies at their disposal which can help with the formulation of various rolling stock modernization and acquisition programmes.

92. It is vital for the interconnected railway networks to consult together to take into account all the common factors and parameters which might benefit programme formulation and implementation in a given subregion; they should also take

advantage of economies of scale in spare parts and materials supply.

A. Trailer stock modernization programme

93. As mentioned in the preceding chapters, this part of the study focuses on equipment (wagons and coaches). Given an economic life expectancy for trailer stock of between 40 and 45 years, there should be a rigorous periodic overhaul if proper service is to be provided. Particular care and attention should be paid to running gear and coupling and brake equipment in order to guarantee operational safety on the railways.

B. Principles for modernizing rolling stock

94. As a general rule, rolling stock is subjected to regular periodic overhaul. It must be decided, according to the age of the wagon or coach, whether the stock should undergo a complete overhaul or be rebuilt. If the network administration opts for modernization of the stock, a programme should be drawn up to cover part or all of it, if the financial resources are available. Comparative studies of the cost of modernization and the cost of procuring new rolling stock will have to be conducted before the decision is taken to modernize. Consideration must also be given to the type of service and the sort of traffic for which the rolling stock will be used. The necessary equipment improvements will be made in accordance with the requirements for

traffic safety, with respect to the running gear, coupling and braking gear, the underframe and the body. Modernization could include reconstruction of the underframe and replacement of running gear, resulting in increased wagon tonnage capacity and greater axle-load capacity.

95. As for the passenger stock, the comfort aspect should be taken into consideration so as to make the modernized stock more attractive to customers.

96. As part of their rolling stock modernization programmes, many networks have undertaken the conversion of braking gear, thus improving the braking system and making it possible to operate heavier trains at higher speeds. Many such studies of this type have been conducted by railway administrations and manufactures of rolling stock. Some railway networks have already made the conversion, changing from vacuum brakes to air brakes.

97. It is generally understood that the speed of a train depends on the power of the engine pulling it, but that is not all; the maximum permitted speed of a train depends, to a large extent, on the type of brakes used or, in other words, the braking distance obtained with the braking system. Here, the capabilities of vacuum brakes are limited. Certain railway networks have decided that unit trains can be fitted with air brakes. To ensure a gradual changeover from one braking system to another, some wagons and coaches will have double braking

controls and vacuum brakes replaced by air brakes on all the trains later on.

98. Studies should be conducted on the development of modernization programmes beforehand. Depending on the studies undertaken by a particular railway network, it should be possible to divide the stock of wagons and coaches into three broad categories as follows:

(a) Wagons and coaches to be overhauled and modernized;

(b) Wagons and coaches to be converted in accordance with the nature of the traffic;

(c) Wagons and coaches to be disposed of and replaced by new acquisitions.

99. Programme implementation should take account of the necessity for economies of scale, as already mentioned above, and for the lowest possible total costs as the financial resources of the railway administrations are very limited. Depending on the amount of investment planned for, the works will be undertaken under state control with funding from the networks themselves or from external financial sources. In the light of the future interconnection of African railway lines, the programme implementation should take account of norms and the efforts being made by the Union of African Railways to

standardise services and promote international rail transport traffic.

100. Exchange of experiences among railway administrations could strengthen the South-South cooperation so eagerly sought by African countries.

101. Similarly, the cost price of imported rolling stock should also be borne in mind. A cost analysis could help the decision-makers to opt for the establishment of community factories at the subregional level, thus improving supplies. The effects induced by such initiatives could lay the basis for beneficial actions in the railway sector and promote the industry for the overall development of the African continent.

2. Motive-power stock

102. The modernization of the motive power stock (locomotives, light rail motor tractors and electric railcars) requires different handling from that of the trailer stock (freight wagons and passenger coaches). This is because of the multiplicity of types and makes and the consequent diversity in spare part suppliers.

Motive-power stock modernization and procurement programmes

103. Some railway networks began these programmes by replacing steam locomotives with diesel electric or mechanical

locomotives and in some subregions (Northern and Southern Africa) by introducing electric locomotives.

104. In Zimbabwe, for example, where the coal mines are still being worked, the national railway network, in contrast to other subregions, has kept its steam locomotives in service and developed a modernization programme. Other parallel programmes have been started to develop diesel-electric and electric locomotives. This peculiar situation observed in this network demonstrates that programme orientations will differ from country to country depending on the specific requirements of an administration as well as its geographic situation and the mineral wealth of the subregion.

105. While steam locomotives have only few components, most of which can be manufactured in the central workshops of the railways, diesel locomotives have up to 10,000 parts, most of which need to be imported. This causes delays and uncertainties in spare parts supply. Thus, one can easily understand the difficulties involved in the modernization of motive-power stock.

106. Over and above the obsolescence of certain locomotive stocks, there is also the lack of the spare parts necessary for the maintenance and repair of tractive equipment. The number of locomotives in the total stock of a given network is irrelevant unless they are in good working order. In most cases, there is such a high rate of immobilization (50 to 70 per cent) that it becomes practically impossible to meet the operating requirements

of the railway. The diversity of makes worsens the situation further since spare parts cannot be found for each of the type, make and class of locomotive. The networks are unable to take the necessary action in the increasingly worsening situation for lack of adequate resources, particularly foreign exchange. Railway managers are becoming powerless in spite of the ad hoc initiatives they often take during desperate situation.

107. It is therefore important before preparing any modernization or procurement programme, to take a detailed inventory of the locomotive, light motor tractor and railcar stock and carefully assess their condition. The locomotives, light rail motor tractors and railcars should then be classified by age according to type and class. The most dilapidated of them should be taken out of service. It should then be found out whether supplies could be obtained from the equipment manufactures or from new factories substituting for the original makers.

108. After all the investigations, comparative cost studies will make it possible for a decision to be made either for a modernization, conversion programme or a procurement programme. Here, a distinction should be made between line locomotives and shunting locomotives, commonly called light motor tractors and railcars which are used for passenger transport.

109. In a conversion programme, certain line locomotives could be converted or modernized to serve as shunting locomotives. As indicated earlier, that decision depends on the nature of the traffic that will be carried by the rolling stock and the facilities available for maintaining and repairing it during its new economic life cycle, which itself depends on the level of scheduled repair/maintenance in the programme.

110. For certain categories of motive-power stock, rehabilitation programmes could be developed. These should reconsider and redefine the organizational structures of maintenance and repair. Implementation of such programmes require timely investments in order to speed up the rate of work in the workshops and reduce the periods of immobilization of machines. The availability of locomotives for operating commercial services depends, among other things, on immobilization periods in the workshops. These periods are often prolonged for lack of the necessary spare parts at the right time for undertaking the various scheduled activities.

111. The smaller railway networks often resort to this form of rehabilitation which involves reorganization of activities to ensure optimum exploitation of the tractive stock and thus reduce the rates of immobilization to the minimum possible.

112. In the case of light rail motor tractors which are fewer in number (because they are very expensive) account is taken, in addition to the requirements specifically related to locomotives,

of the difficulties in operating passenger rolling stock. Modernization programmes for passenger rolling stock aim at the comfort, safety, speed and regularity of trains.

113. As such, it is important to conduct detailed analysis of the prevailing situation to decide on how best to renovate the motive-power stock and ensure that they last the longest time possible, taking into account the current difficulties.

114. To attain these objectives, it is necessary that suppliers and manufactures guarantee the sources of supply, reckoning on the economic life cycle of railway equipment of between 20 and 25 years. Implementation costs should be fully taken account of in the formulation of the various programmes.

115. In view of these consideration, it should be possible, as already mentioned with regard to the trailer stock, to achieve economies of scale if the necessary measures are taken for concerted action at subregional or regional level by the authorities of railway administrations which have the same types of rolling stock.

VII. SUMMARY AND CONCLUSIONS

116. On the basis of the data contained in the preceding chapters, account should be taken of the following factors in the formulation of rolling stock modernization and procurement programmes:

(a) The current situation of the trailer and tractive stock;

(b) Current and projected traffic;

(c) The capacity of stocks and their adequacy to the traffic;

(d) The status of new projects affecting the traffic.

117. The data analysis should identify the categories of rolling stock to be purchased or modernized in accordance with the age structure. The tables on the trailer stock which figure in the annex illustrate the situation in those countries from where data was collected for this study.

118. It was observed for the countries concerned that the trailer stocks were increasing overall, but that the increase in the stock compared to the increase in the total tonnage capacity of equipment was low. The gains after the modernization and procurement exercise as far as wagons are concerned, will be more in the increase in the tonnage capacity than in the increase in the stock. For the tractive stock, the advantage will be more in improved availability and more reliable services.

119. It is seen that most railway networks in Africa do not undertake systematic renovation of the rolling stock in line with the economic life cycle. It is therefore very common to find passenger wagons and coaches of over 40 years and 30-year old

locomotives which are still being used for passenger and goods transport. As a result of this, railway administrations are able to purchase new equipment or undertake major rehabilitation or modernization programmes only when financial resources are available or when there are funding opportunities.

120. Since most railway networks in Africa do not have a policy of systematic renewal, the modernization or procurement programmes will be a management tool for railway administrative officials, enabling them to plan investments and to spread them over a long period of line, once the main initial efforts have been made to set the clock right after the major work on obsolete rolling stock.

121. A renewal period of 40 years for trailer stock and 20 to 25 years for tractive stock could be established, despite the critical state of railway infrastructure in Africa and the severe climatic conditions which cause rapid depreciation of rolling stock. In conclusion, rolling stock modernization and procurement programmes for Africa, should necessarily take account of the obsolescence of some of the railways and of their hard parts. These deficiencies have adverse effects on the performance of the driving gear of rolling stock and determine to a large extent the economic life cycle of wagons, passenger coaches and tractive equipment.

122. All rolling stock procurement and modernization activities should be accompanied by measures that would reduce

the negative effects of deteriorated railways, which need to be urgently rehabilitated.

123. Also, decision-makers at all levels should be sensitised to this need so as to secure the firm support of government authorities for implementing the various programmes aimed at achieving sound management in the railway industry, which is the backbone of economic development. Rational operation of the railways with modern and reliable rolling stock, running on well-maintained tracks, built to stable and safe specifications will yield positive results that could contribute effectively to the physical integration of Africa and of its development.

Capacity and age structure of the equipment of the Senegalese Railways (SNCS)

Type of vehicle	Number	%	Tonnes	%	Age of wagons					
					40 years	31 to 40	26 to 30	21 to 25	11 to 20	0 to 10
WAGONS OF THE SNCS										
Open goods wagons	17	2	500	2	0	9	0	8	0	0
Special open trucks	157	18	6 421	22	4	36	0	10	0	107
High sided open goods wagons	124	15	4 532	15	0	47	0	6	14	57
Covered wagons	321	38	10 747	36	123	12	0	75	0	111
Bulk covered wagons	204	24	6 774	23	19	49	0	50	48	38
Bulk self-discharging wagons	2	0	60	0	0	2	0	0	0	0
Tank wagons	25	3	796	3	9	6	4	0	6	0
% of the total	850	100%	29 829	100%	155	161	4	149	58	313
TAIBA WAGONS	71%		66%							
Self-discharging wagons	124	96%	5 844	97%	0	0	53	0	53	18
Tank wagons	5	4%	205	3%	0	0	0	0	5	0
% of the total	129	100%	6 049	100%	0	0	53	0	58	18
PECHINEY THIES WAGONS	11%		134							
Tank wagons	3	4	129	5%	0	0	0	3	0	0
Self-discharging wagons	80	96	2 732	95%	42	38	0	0	0	0
% of the total	83	100	2 861	100%	42	38	0	3	0	0
	7%		6%							
CAT WAGONS										
Tank wagons	62		2 809		0	34	0	0	6	12
% of the total	5½		6%							
B.P. WAGONS										
Tank wagons	1		25		1	0	0	0	0	0
% of the total	0		0%							
SOBOA WAGONS										
Refrigerator wagons	1		13		0	1	0	0	0	0
% of the total	0		0%							
SEFICS WAGONS										
Hoppers	27	35	1 215	34	0	0	0	0	0	27
Tank wagons	50	65	2 310	66	0	0	0	0	0	50
% of the total	77	100%	3 525	100	0	0	0	0	0	77
	6%		8%							
TOTAL SENEGAL	1 202		45 111		198	234	57	152	142	420
	100%		100%							

Total by type of wagons	174	144	6 921	15	4	45	0	18	0	107
Open goods wagons	124	10	4 532	10	0	47	0	6	14	57
High sided open goods wagons	525	44	17 521	39	142	61	0	125	48	149
Covered wagons	233	19	9 851	22	42	40	53	0	53	45
Bulk self-discharging wagons	146	12	6 274	14	10	40	4	3	27	62
Tank wagons	1	0	13	0	0	1	0	0	0	0
Refrigerator wagons										
TOTAL SENEGAL	1 203	100	45 111	100	198	234	57	152	142	420
					16%	19%	5%	13%	12%	35%

Source: SNCS/TRANSURB-CONSULT-BN

Growth in stock, purchases and scrapping of SNCS stocks
(in number of wagons)

	1979 (1)	1980 (1)	1981	1982	1983 (2)	1984	1985 (3)	1986	1987	1988 (4)	Difference 1979/88
INVENTORY											
Open goods wagons	45	35	45	45	53	68	97	144	174	174	129
High sided open goods wagons	166	124	124	124	125	132	123	123	173	124	-47
Covered wagons	313	254	254	254	232	232	231	231	342	321	8
Covered bulk good wagons	227	210	210	210	125	213	204	204	204	204	-23
Bulk self-discharging wagon	23	20	20	20	70	20	20	20	20	2	-21
Tank wagons	28	22	22	22	18	18	21	21	21	25	-1
Total	802	665	675	675	623	683	696	743	934	850	48
Capacity in tonnes	27 739									29 829	7 590
PURCHASES			(5)			(5)		(5)	(5)		Total for 10 years
Open goods wagons			10		8	15	24	52	30		139
High sided open goods wagons					1	7			50		58
Covered wagons									111		111
Covered bulk wagons						38					38
Bulk self-discharging wagon											0
Tank wagons							3			4	7
Total	0	0	10	0	9	60	27	52	191	4	353
Down grading											Total for 10 years
Open goods wagons		10			0		0			0	10
High sided open goods wagons		47			0		9			49	100
Covered wagons		59			22		1			21	103
Covered buld wagons		17			35		9			0	61
Bulk self-discharging wagon		3			0		0			18	21
Tank wagons		6			4		0			0	10
Total		137			61		19			88	305

1) Source : Plan National de Transport du Senegal; Situation au 30 June 1979.
2) Source : Etude SETEC-D. Consult; Octobre 1985.
3) Source : Etude Banque Mondiale RCFS: 1986.
4) RCFS Inventory on 1/1/89.
5) Estimates based on dates of purchase given in SNCS inventories.

Capacity and age structure of the stocks of the Mali Railways RCFM)

Type of vehilce	Number	%	Tonnes	%	Age of wagons					
					40 years	31 to 40	26 to 30	21 to 25	11 to 20	0 to 20
RCFM WAGONS										
Open goods wagons	94	22	3 645	23	4	0	0	0	30	60
High sided open goods wagons	50	12	1 855	12	0	2	6	0	27	15
Covered wagons	233	56	8 485	54	28	13	0	0	140	52
Tank wagons	41	10	1 799	11	2	2	0	0	1	18
Total RCFM	418	100	15 784		34	17	6	0	216	145
% of the total	95%		94%	100%						
TRANSIMPORT WAGONS										
Tank wagons	10		460		0	0	0	0	10	0
% of the total	2%		3%							
SEPAME WAGONS										
Tank wagons	12		552		0	0	0	0	12	0
% of the total	3%		3%							
TOTAL MALI	440		16 796		34	17	6	0	238	145
	100%									
TOTAL PER TYPE OF WAGON										
	94		3 645		4	0	0	0	30	60
High sided open goods wagons	50	21%	1 855	22%	0	2	6	0	27	15
Covered wagons	233		8 485		28	13	0	0	140	52
Tank wagons	63	11%	2 811	11%	2	2	0	0	41	18
		53%		51%						
		14%		17%						
TOTAL MALI	440		16 796		34	17	6	0	238	145
		100%		100%	8%	4%	1%	0%	54%	33%
Capacity per age group					955	530	180	0	9 222	5 908
					5%	3%	1%	0%	55%	35%

Source: RCFM/TRANSURB - CONSULT-BN

Growth stocks, purchases and scrapping of RCFM stocks
(in number of wagons)

	1982 (1)	1983	1984	1985 (2)	1986	1987	1988 (3)	Difference 1982/1988
Inventory								
Open goods wagons	18	49	49	70	70	94	94	76
High sided open goods wagon	19	35	35	40	40	50	50	31
Covered wagons	141	175	175	196	196	227	227	86
Covered bulk wagon	2	6	6	6	6	6	6	4
Bulk self-discharging wagons								0
Tank wagon	62	63	63	63	63	63	63	1
Total	242	328	328	375	375	440	440	198
Capacity in tonnes	9 465						16 796	7 331
PURCHASES	(5)		(4)	(4)				TOTAL FOR 6 YEARS
Open goods wagons	31		5	16				76
High sided open goods wagons	16		5	9				31
Covered wagons	34		12					86
Covered bulk wagon	4							4
Bulk discharging wagons								0
Tank wagon	1							1
Total	86	0	22	25	65	0	0	198
DOWNGRADING								TOTAL FOR 6 YEARS
Open goods wagons								0
High sided open goods wagons								0
Covered wagons								0
Covered bulk wagons								0
Bulk self-discharging wagons								0
Tank wagon								0
Total	0	0	0	0	0	0	0	0

(1) Source : Etude SETEC-0 Consult. Octobre 1985.
(2) Source : Annuaire statistique RCFM 1985.
(3) RCFM inventory on 1/6/68.
(4) Estimates based on dates of purchase given in RCFM inventories.
(5) Purchases in theay derived from the rations inventories.

Capacity and age structure of the Ivoriano and Burkina Faso stocks in 1988
(Interconnected networks)

Type of vehicle	Number	%	Tonnes	%	Age of wagons					
					>40 years	31 to 40	26 to 30	21 to 25	11 to 20	<11 years
RAN WAGONS										
Covered wagons	736		24 805	50	57	173	86	98	124	198
Flat wagons	233	52	8 279	17	4	22	18	11	27	151
High sided open goods wagons	212		7 120	15	18	4	41	0	149	0
Hoppers	51	16	1 144	2	0	2	0	20	6	0
		15								
		4								
PRIVATE GOODS WAGONS	1 232	87	41 348	84	79	224	145	129	306	349
Tank wagons	187		7 794	16	0	28	21	5	38	95
		134								
	1 419	100	49 142	100	79 6%	252 18%	166 12%	134 9%	344 24%	444 31%
Capacity per age group					1 390 3%	7 628 16%	5 692 12%	4 255 9%	12 007 24%	18 170 37%

Source: RAM

Growth, purchases and scrapping of stocks of the SICF and SCFB

	1978 (1)	1979	1980	1981 (2)	1982	1983 (3)	1984	1985	1986	1987	1988 (4)	Difference 1978/1988
INVENTORY												
Open goods wagons	107	107	258	258	258	258	258	258	258	258	233	126
High sided open goods wagons	241	241	241	241	241	241	241	241	241	241	212	-29
Covered wagons	701	767	899	895	895	877	827	827	827	827	736	35
Hoppers	51	51	51	51	51	51	51	51	51	51	51	0
Tank wagons	148	148	178	243	243	243	243	243	243	243	187	39
Total	1 248	1 314	1 627	1 688	1 688	1 670	1 620	1 620	1 620	1 620	1 419	171
Capacity in tonnes						60 110					49 142	
PURCHASES		(4)	(4)	(4)								TOTAL FOR 10 YEARS
Open goods wagons			151									151
High sided open goods wagons												0
Covered wagons		66	132									198
Hoppers												0
Tank wagons			30	65								95
Total	0	66	313	65	0	0	0	0	0	0	0	444
DOWN GRADING												TOTAL FOR 10 YEARS
Open goods wagons										25		25
High sided open goods wagons										29		29
Covered wagons				4	68					91		163
Hoppers										0		0
Tank wagons										56		56
Total	0	0	0	4	68	0	0	0	0	201	0	273

(1) Source : LA VIE (DU) RAIL No. 1660 (1979)
(2) Source : RAIL Africain no. 3 (1984)
(3) Source : Etude SCTEC-D Consult; October 1985
(4) Source : RAN inventory on 1/6/68

Capacity and age structure of stock of wagons of Togo Railways (CFT) in 1988

Type of wagons	Number units	%	Tonnes	%	Age of wagons					
					> 40 years	31 to 40	26 to 30	21 to 25	11 to 20	< 11 years
CFT WAGONS										
Open goods wagons	54	70	1 663	18	0	0	0	49	5	0
High sided open goods wagon	53	19	1 260	14	33	0	0	0	20	0
Hoppers	100	37	3 576	39	8	0	0	0	0	92
Tank wagons	25	9	1 776	19	0	0	0	0	0	25
Covered wagons	41	15	1 050	11	0	0	18	0	23	0
Total CFT	273	100	9 275	100	41	0	18	49	48	117
as % of total					15%	0%	7%	18%	18	43
					Average age of CFT stock 21.7 years					
Capacity per age group as percentage of total capacity of CFT					/40	0	360	14/8	14/5	5 222
					8%	0%	4%	16%	16%	56%
OTP WAGONS					0	0	0	72	99	68
Hopper	239		5 975		0%	0%	0%	30%	41%	28%
% of total					Average age of OIP stock 17.5 years					
Capacity per age group as % of capacity of OTP					0	0	0	1 800	2 475	1 700
					0%	0%	0%	30%	41%	28%
TOTAL FOR TOGO	512		15 250		41	0	18	121	147	185
as % of total					8%	0%	4%	24%	29%	36%
					Average age of stock of Togo Railways					

Growth purchases and scrapping of CFT stocks
in number of wagons

	1979	1980	1981	1982	1983 (2)	1984	1985	1986	1987	1988 (3)	Difference 1983/1988
INVENTORY											
Open goods wagons					95	85	75	65	54	54	-41
High sided open goods wagons					68	68	63	58	53	53	-15
Covered wagons					87	17	67	57	41	41	-41
Hoppers					107	102	107	102	100	100	-7
Tank wagons					74	24	24	25	25	25	1
Total	288	392	387	371	371	351	376	302	273	273	-98
PURCHASES	(3)										TOTAL FOR 10 YEARS
Open goods wagons											0
High sided open goods wagons											0
Covered wagons											0
Hoppers	92										92
Tank wagons	12							1			13
Total	104	0	0	0	0	0	0	1	0	0	105
DOWN GRADING											TOTAL FOR 10 YEARS
Open goods wagons						10	10	10	11		41
High sided open goods wagons							5	5	5		15
Covered wagons						10	10	10	11		41
Hoppers									2		7
Tank wagons									0		0
Total	0	0	10	11	0	20	25	25	29	0	99

1) Source : RAIL AFRICAIN no. 3 October 1984
2) Source : Etude SETEC-D.Consult: October 1985
3) CFT inventory on 1/6/88

Capacity and age structure of wagon stocks in June 1988

in number of wagons and in tonnes

Type of wagon	Number		Capacity		Age of wagons					
	Units	%	Tonnes	%	40 years	31 to 40	26 to 30	21 to 25	11 to 20	< 11
STOCK										
Open goods wagons	69	25	2 602	26	2	4	8	20	6	29
High sided open goods wagons	7	6	624	6	0	0	0	8	4	5
Bulk self-discharging wagons	18	7	716	7	0	0	0	0	18	0
Tank wagons	24	9	1 026	10	0	12	0	1	1	10
Covered and groupage wagons	147	53	5 102	51	24	9	0	0	104	10
TOTAL OCBN	715	94	10 070	91	26	25	8	29	133	54
					Average age of OCBN stock: 20.3 years					
SOMACOP STOCK										
Private tank wagons	18	5	936	9	0	0	0	0	0	18
TOTAL BENIN as % of total	293	100	11 006	100	26 9%	25 9%	8 3%	29 10%	133 45%	72 25%
Capacity per age group and as % of total capacity					530 5%	890 8%	284 3%	992 9%	5 064 46%	3 226 29%

Growth, purchases and scrapping of OCBN and private stocks
in number of wagons

	1979	1980	1981	1982	1983	1984 (1)	1985	1986 (2)	1987	1988 (3)	Difference 1984/1988
INVENTORY											
Open goods wagons						77	77	62	69	69	-8
High sided open goods wagons						17	17	17	17	17	0
Covered and groupage wagons						183	183	142	147	147	-36
Buld self-discharging wagons						23	23	18	18	18	-5
Tank wagons						63	63	51	42	42	-21
Total	n.d	n.d	n.d	n.d	n.d	363	363	290	293	293	-70
Capacity in tonnes						13 043				11 006	-2 037
PURCHASES	(3)&(4)	(5)									TOTAL FOR 10 YEARS
Open goods wagons									7		36
High sided open goods wagons	29										5
Covered and groupage wagons	5								5		15
Bulk self-discharging wagons	10										16
Tank wagons	16	23									35
	12										
Total	72	23	0	0	0	0	0	0	12	0	107
DOWN GRADING											TOTAL FOR 5 YEARS
Open goods wagons							15		0		15
High sided open goods wagons							0		0		0
Covered and groupage wagons							41		0		41
Buld self-discharging wagons							5		0		5
Tank wagons							12		9		21
Total	0	0	0	0	0	0	73	0	9	0	82

(1) Source : Etude SETEC-D Consult; October 1985.
(2) Source : Annual statistique des transports 1986 (Ministere de l'équipement et des transports - Benin)
(3) Source : OCBN Inventory on 1/6/88.
(4) Source : Marché no. 9341 (OCBN -REMAFER) pour 5 W. plateformes, 5 W. tombereaux et 10 W. couverts et Marché No. 9129 (OCBN -CADOUX) pour 12 W. citernes.
(5) Source : Marché No. 09 008 80 (OCBN - REMAFER) pour 23 wagons citernes.