SOME OBSERVATIONS ON RAIL AND ROAD TRANSPORT IN COMMONWEALTH TROPICAL AFRICA

by

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ABSTRACT

The railways of tropical Africa have undergone drastic changes in the past two decades. On the one hand, some major extensions and improvements have been made, of which the most significant is TAZARA, linking Zambia with Dar es Salaam. On the other hand, the near monopoly position has been shattered by the development of road transport, which has deflected substantial traffic that would otherwise have gone by rail, particularly high-value commodities. At the same time with emphasis on road building, the rail systems, except in Central Africa, have been neglected to varying degrees by governments, with a resulting inability even to carry all the traffic that is available, and there has been considerable deterioration in performance. Finally in some areas, political changes have either reduced traffic or resulted in major realignments of traffic patterns. A major consequence has been loss of profits and growing deficits.

Despite the overall deterioration, however, the railroads in most tropical African countries continue to play a significant role in the transport picture and it is generally agreed that rail costs are lower than road transport costs where volume of traffic is substantial. The volume on the major routes is sufficiently great so that the lines are almost certainly economically justifiable, but some of the branch lines are questionable.

In Central Africa, although the systems have been seriously affected by political events, much greater stress has been placed on the role of the railways than in either East or West Commonwealth Africa. There is also some evidence of a shift in government policy in other areas toward renewed emphasis on rail transport. All of the governments face a basic dilemma, however: if rail costs are to be kept low, volume must be maintained - yet for some traffic road transport offers real advantages. Earlier attempts to protect the railroads by drastic road transport licensing rules have largely been abandoned. A distinction must be made between the traffic for which road transport offers such great advantages that it is uneconomic to keep it on rail, and the substantial amount which can move by either mode with only marginal advantages or disadvantages. It is difficult for the more free-enterprise-oriented economies to control the mode of transportation used; countries such as Tanzania and Zambia are in a much better position to ensure the allocation of traffic along optimal lines.

SOME OBSERVATIONS ON RAIL AND ROAD TRANSPORT IN COMMONWEALTH TROPICAL AFRICA

The railway systems of tropical Africa were products initially of the colonial period, with minor exceptions, being inaugurated around the turn of the century and progressing slowly, primarily built inward from the ports, without connections to adjacent countries. They were built partly for non-economic reasons, partly to facilitate export of minerals and agricultural products.[1] They were built cheaply, with light rails - some no more than 35 pound - and universally with a gauge less than the 4 feet 8½ inches standard of western Europe and North America. Primarily they are either metre or the 1.067 metre gauge that began in the Cape Colony in South Africa. Inadequate as the rail lines were - they never constituted a 'system' except in the southern third of the continent - they were playing a significant role in the economies of the countries at the time of independence. Road systems, while greater in mileage at independence, were largely unsurfaced and unsuitable for heavy traffic.

The purpose of this paper is to survey the development of the lines, with primary emphasis on post-independence policies, to consider the relationships between rail and road transport and economic viability of the rail lines, and to review the studies of the effects of the railways upon economic development.[2]

Emphasis is placed upon the Commonwealth countries of East and Central Africa and the neighbouring areas, with brief reference to Commonwealth West Africa. No claim is advanced that the paper reflects original research; it is based upon existing published material, some not widely known, and interviews in the respective countries in the early months of 1976.

EAST AFRICAN RAILWAYS

In the late 1960s, the East African Railways (E.A.R.) was the model railroad of tropical Africa and the developing world, with 3,300 miles of line, most of it in first-class condition, modern equipment, plans for complete dieselisation, and a heavy volume of traffic relative to most African lines.

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1. The first railway in tropical Africa was built in 1885 between Dakar and St. Louis in Senegal.

2. A summary of regional studies of transportation in tropical Africa prior to 1968 is provided in African Development Bank, 1968.

A decade later, E.A.R., as an entity, had disintegrated; the railroad is essentially operated in three portions and is in the process of becoming virtually three separate roads. It has lost substantial traffic and is desperately short of equipment to handle the traffic it has retained. But it still remains an important artery of commerce in East Africa and there are hopes for major improvements in the constituent parts.

The Origins

E.A.R. was developed from three separate and originally disconnected systems.[3] The major route, the Uganda Railway, was built by the British, in part for political reasons, from the port of Mombasa, beginning in 1896, to link Uganda with the outside world. Track reached the site of Nairobi in 1899; Kisumu, the lake port, with connecting steamer service to Uganda, in 1902; and directly to Kampala in 1931. Major extensions were completed to Kasese, in the west of Uganda, in 1956, and to Pakwach, on the Nile in Northern Uganda, in 1964. The main line, Mombasa to Kampala, is 844 miles in length; the total from Mombasa to Kasese, 1052.

The second element was the Tanganyika Railway, started by the Germans westward from Dar es Salaam in 1905; it reached Morogoro in 1907, Tabora in 1912, Kigoma in 1914 to play a role in World War I, and from Tabora to Mwanza in 1928. This is known as the Tanganyika (now Tanzania) Central line. The third element, the first to be started, was built west from the port of Tanga in 1896 but did not reach Moshi until 1911 and Arusha in 1929. This line was connected to the Mombasa-Nairobi main line in 1916, and the Tanzania Central line in 1960.

The lines were merged in 1945 to become the East African Railways, an element of the East African Common Services Organisation, later the East African Community, and thus jointly owned by the governments of Kenya, Uganda and Tanzania. The administrative headquarters, main repair shops, and training school were located in Nairobi.

Traffic

The total freight traffic increased steadily up to a high in the year of 1970, as shown in Table 1. Passenger traffic rose through 1973 and then dropped slightly.

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3. Hill, 1949 and 1957, provides a detailed history of the lines; a semi-popular but excellent volume, relating the railroad to overall development, is that by Miller, 1971.

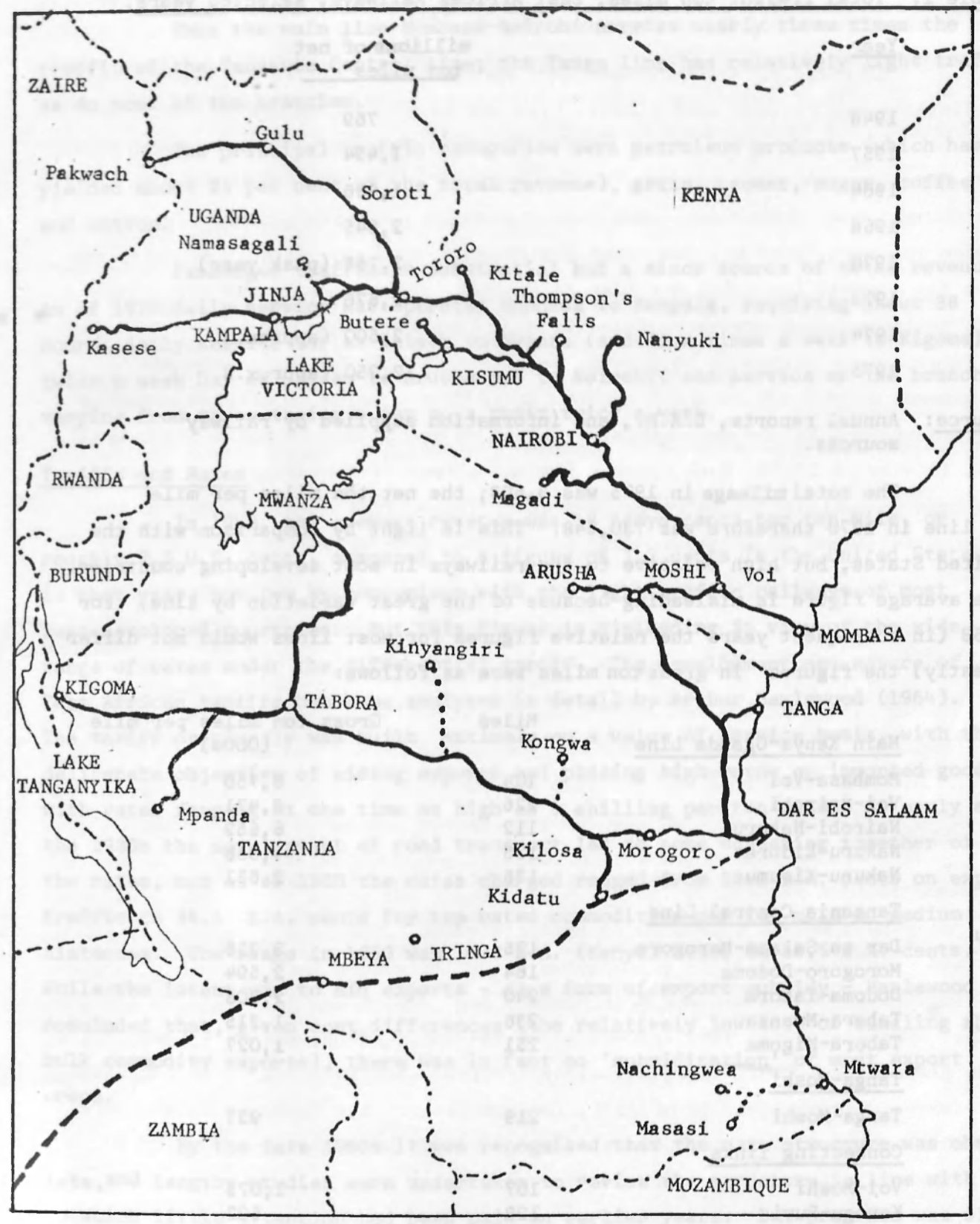

Figure 1.

Railways in East Africa.

Table 1. Total freight ton miles, East African Railways, selected years.

Year	millions of net ton miles
1948	769
1957	1,454
1964	1,986
1968	2,545
1970	2,768 (peak year)
1973	2,676
1974	2,500 (approx.)
1975	2,250 (approx.)

Source: Annual reports, E.A.R., and information supplied by railway sources.

The total mileage in 1975 was 3,663; the net ton miles per mile of line in 1970 therefore was 730,548. This is light by comparison with the United States, but high relative to the railways in most developing countries. The average figure is misleading because of the great variation by line. For 1968 (in subsequent years the relative figures for most lines would not differ greatly) the figures in gross ton miles were as follows:

	Miles	Gross ton miles per mile (000s)
Main Kenya-Uganda Line		
Mombasa-Voi	104	8,750
Voi-Nairobi	226	8,471
Nairobi-Nakuru	112	6,652
Nakuru-Eldoret	125	4,358
Nakuru-Kisumu	136	2,631
Tanzania Central Line		
Dar es Salaam-Morogoro	126	3,216
Morogoro-Dodoma	164	2,594
Dodoma-Tabora	240	2,308
Tabora-Mwanza	236	1,215
Tabora-Kigoma	251	1,027
Tanga-Moshi		
Tanga-Moshi	218	937
Connecting links		
Voi-Moshi	107	1,075
Karogu-Ruvi	129	502
Selected branches		
Nanyuki	100	1,222
Kasese	208	410
Pakwach	313	240
Mpanda	207	123

Source: Annual reports, E.A.R.

Thus the main line Mombasa-Nairobi carries nearly three times the traffic of the Tanzania Central line; the Tanga line has relatively light traffic, as do most of the branches.

The principal traffic categories were petroleum products (which have yielded about 25 per cent of the total revenue), grain, cement, sugar, coffee and cotton.

Passenger traffic is substantial but a minor source of total revenue. As of 1973 daily service was operated Mombasa to Kampala, requiring about 38 hours; daily service Dar es Salaam to Mwanza (and four times a week to Kigoma), twice a week Dar es Salaam to Arusha and to Nairobi; and service on the branches varying from three trains a day to a train twice a week.

Tariffs and Rates

In 1969, the average revenue was 18 Kenya cents per ton mile, or roughly 2.5 U.S. cents, compared to a figure of 1.3 cents in the United States in that year, but low by comparison with the light traffic railways of most less developed countries. But this figure is misleading in view of the wide range of rates under the differential tariff. The development and nature of East African tariffs has been analysed in detail by Arthur Hazlewood (1964). The tariff originally was built entirely on a value of service basis, with the deliberate objective of aiding exports and placing high rates on imported goods, with rates ranging at one time as high as a shilling per ton mile. As early as the 1930s the development of road transport led to some squeezing together of the rates, but as of 1960 the rates charged ranged from 13.2 E.A. cents on export traffic to 36.5 E.A. cents for top rated commodities per ton mile on medium distances. The range in 1969 was 10.9 E.A. (Kenya) cents to 38.5 E.A. cents.[4] While the intent was to aid exports - as a form of export subsidy - Hazlewood concluded that, given cost differences (the relatively low cost of handling the bulk commodity exports), there was in fact no 'subsidisation' of most export crops.

By the late 1960s it was recognised that the rate structure was obsolete, and lengthy studies were undertaken to revise the structure in line with costs, to which little attention had been paid in earlier years. But progress was slow; the governments, particularly that of Tanzania, wanted retention of low rates on fertiliser, maize and livestock, and Tanzania was unwilling to approve changes until it received concessions on greater regionalisation of the system. One consequence of the delay was that rates were virtually frozen from 1969 to 1974

4. The monetary units of the three countries, which are kept at par, are the successors to the East African currency unit.

despite sharp increases in costs, particularly of fuel.

Ultimately, basic changes were agreed upon. First, the taper for distance was revised drastically. The Hazlewood studies showed that the taper was not nearly steep enough initially (with the short distance rates too low), but continued much too far, on the basis of costs (1964, chapter 7). Thus the rates on short hauls were raised sharply. Secondly, the differential between the high rates and low rates was reduced, with the attempt to raise the rates for commodities which had been below cost and to reduce the top rated goods to lessen road transport competition. Finally, lower rates were provided for large volume shipments to provide incentive to ship in larger amounts. The general effect was to shift substantially from a value of service oriented tariff structure to one more closely related to costs, and to raise the overall level in view of higher fuel costs. The net effect of the change was to cause some loss in traffic but to raise revenues. There still remains considerable differential among commodities, some based upon value of service.

After deficits in early years of the constituent parts, East African Railways earned a profit continuously up until 1967, when small deficits began to occur.[5] But basically the system was much more successful financially than that of many developed, as well as lesser developed, countries. But it was generally believed that profits from the heavily used Mombasa-Nairobi-Kampala line subsidised the lighter traffic on the Tanzania Central and Tanga lines.

Rail Operations

The system was operating as of 1960 with a wide variety of steam locomotives, from ones dating back to the German days in Tanganyika to a group of Beyer-Garretts, built by Manchester in England in the mid-1950s, among the most powerful steam locomotives in the world, used on the high traffic lines.[6]

Some diesels were introduced in the early 1950s, and in the early 1960s plans were made for complete dieselisation.[7] But this was never completed, for reasons noted below. As of 1976, for example, on the Tanzania lines there were 50 line and 16 switching diesels, and 98 steam locomotives, of which 50

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5. In 1970, for example, K sh. 36 million; or abour 4.3 million U.S. dollars.

6. The Beyer-Garrett is essentially two locomotives in one, designed to distribute the weight of the engine on the light-rail lines of the developing countries.

7. As of 1957, there were 129 Beyer-Garretts, 22 standard steam locomotives, 56 tank locomotives (used for switching) and 46 diesels. (Day 1964, p. 39)

were Beyer-Garretts. Some of the others were as much as 60 years old. As the steam locomotives become older, repair costs increase, and the advantages of dieselisation are being lost. East Africa has no coal; if it did, and the steam locomotives were coal burning, there would be some incidental benefit in retaining them. There are still, of course, plans to dieselise in both countries; Kenya plans complete dieselisation by 1980-81.

Passenger equipment is relatively modern on the Nairobi line, but in Tanzania most of the coaches date back to the mid 1920s.

The mainline Mombasa-Kampala track remains in good condition, the other Kenya lines in satisfactory condition but many needing heavier rail. The main Tanzania lines are in fair condition, but the Central line was built cheaply, and the management believes that complete rebuilding is essential. Some of the branch lines in Uganda are reported to be virtually inoperable.

The gauge is one metre, and thus differs from the track in all of Southern and Central Africa, which is 1.067 metres. The problem will be discussed below.

The Deterioration[8]

In the late 1960s a major development plan for the railway was prepared, involving change in the tariff structure, new equipment and other features. But this was not to be implemented except for the tariff changes noted; the system began to deteriorate in 1973 and the process culminated in 1975 in the breaking up of the system into two and to some extent three parts. The source of the difficulty was political, not to any extent economic or technical. Relations among the three member states of the East African Community became increasingly strained. Under military dictatorship Uganda became increasingly disorganised economically for essentially political reasons, beginning with the expulsion of the Asians, and increasingly hostile to Kenya, culminating in claims to a portion of Kenyan territory early in 1976. At times Kenyan railroad employees were reportedly mistreated in Uganda; Kenya at times stopped rail (and road) service to Uganda; and, after Uganda had built up large debts, restricted exports to Uganda The issues became very complicated, in part a result of Uganda's volatile behaviour. But one net effect was a decline in both import and export rail traffic to Uganda and passenger travel.

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8. A detailed description of the disintegration of the East African Community is provided in Hazlewood, 1975.

The difficulties between Kenya and Tanzania were caused less by personalities than by differences in political-economic philosophy and the long standing belief that Kenya benefited at Tanzania's expense as a result of the common market. Socialist Tanzania became more and more unhappy with essentially free-enterprise Kenya and more and more determined to make its economy self-sufficient. There was now a belief in Tanzania that the Tanzania lines were subsidising the main Nairobi line, partly because Kenya was favouring road transport.

There were several consequences of these political differences (which affected other issues as well and culminated in 1977 in the liquidation of East African Airways).

1. The countries could not agree on the provision of funds to E.A.R. for major capital improvements, and foreign lenders were inclined to provide funds to the individual countries rather than the Community.

2. Tanzania and Uganda failed to remit to headquarters in Nairobi funds collected from shippers in their countries. Partly this reflected the desperate foreign exchange positions in which both countries found themselves.

3. Tanzania began to divert the Moshi-Arusha traffic to Tanga and Dar es Salaam rather than to Mombasa, the more logical outlet and the dominant one even as late as 1970 for this area.

4. Following Tanzania's action in barring Kenya road transporters from hauling goods from Mombasa to Zambia (by setting uneconomically low weight limits), and in the belief that Tanzania was not returning freight cars, in 1975 Kenya cut the Voi-Moshi line at the border by removing two sections of rail, and the rail connection between the two parts of the system ended.

5. Disputes among the three countries resulted in the ending of all shipping service on Lake Victoria, thus bringing to an end the operation of the two car ferries and rail service to Musoma, which has rail lines for loading cars to go on the ships, but no overland rail connections.

Thus by 1975 management control over the system came to an end. The Tanzania portion operated on its own, managed by regional personnel in Dar es Salaam, but cut off from the training school and the main repair shops. The portion is doing the best that it can in its own shops in Morogoro (steam) and Dar es Salaam (diesel). The main line is managed from the old headquarters in Nairobi, but the control over the Uganda portion is tenuous at best. There are other problems as well. There is a serious shortage of motive power and cars, the major elements of the system. The steam locomotives are becoming increasingly obsolete; the sight of a great Beyer-Garrett taking the Moshi passenger train out of the old Dar es Salaam station in March of 1976 was impressive - but not a mark of efficiency. However, several have been completely rebuilt. There is

a serious lack of parts, aggravated in Tanzania by the acute shortage of foreign exchange, which makes it difficult for the railway to acquire needed items. Failure to modernise as planned, acute shortages, and obsolete equipment constitute an increasingly serious problem. Morale of employees declined sharply as the system disintegrated. The decline should not be exaggerated; the trains do run, and substantial volumes of freight and passengers are carried. But the deterioration is serious.

The system has suffered as well from increased road transport competition. Partly, as noted, this has resulted from inadequate capacity of the railroad, deterioration in service, and the value-of-service tariff. Road transport could easily take the high-rate merchandise traffic even though its costs were higher than overall rail costs. Kenya and Tanzania, and particularly the latter, had followed, in colonial and early post-colonial periods, a very strict road transport licensing policy to protect rail traffic. But a few years after independence this policy was abandoned. Kenya encouraged African entrepreneurship in the road transport field, stressed the building of trunk roads competitive with the railroad lines, and let weight limits go unenforced. The result was a shift of much of the high-rate traffic, including petroleum, from rail to road. Tanzania, with its stress on co-operatives, encouraged co-operative trucking ventures. Uganda had never employed restrictive licensing of road transport. Furthermore, in both Kenya and Tanzania, the road licensing control was tending to break down with the development of more and more private carrier operations, with goods often handled illegally for other firms on the back haul.

As noted, these shifts should not be exaggerated. A 1976 estimate of the Tanzania government is that 42 per cent of all traffic moved by rail, 54 per cent by road and 3 per cent by water, although much of the country was not served by the railway. The volume of traffic on the Kenya line remains heavy, but now is substantially less than in 1970.

The Immediate Solutions

With the collapse of E.A.R. as an operating entity, the railroads have essentially, in fact, become direct agencies of the three governments, though little is known of what has actually happened in Uganda. Both Kenya and Tanzania have provided funds to cover operating deficits and limited funds for improvements. (Tanzania provided shs. 37 million in 1976.) This trend will undoubtedly continue. A World Bank sponsored study by a Canadian firm, completed in 1976, concluded that regionalisation of the system was essential, given political realities. Separation into three elements does not necessarily mean great loss in operating efficiency, especially if co-operation is resummed among them, and

the separation offers one great advantage. In the past, while roads and road transport were regarded as a national activity, E.A.R. was not, to the inevitable neglect by each government of rail transport and overstress on road transport. With both rail and road now instruments of the national governments, it should be much easier to attain an appropriate balance.

Separation, of course, will not solve the problem of loss of traffic arising out of political difficulties - the ending of the ship service on Lake Victoria and the Tanzania-Kenya service, the collapse of the Uganda economy. It is unlikely that the Moshi traffic will ever flow through Mombasa again to any extent. But some intercountry traffic may be restored in time if the three countries again begin to co-operate.

The Growth of Road Transport

Road transport in East Africa began at an early date, certainly by the 1930s, but it developed slowly, partly because of very inadequate roads, partly because of general shortage of capital, partly because of a highly restrictive road licensing policy in Kenya and Tanganyika.[9] The relatively long distances likewise deterred growth. Only in Uganda, with its early development of good roads, no restrictive licensing and relatively short hauls, did road transport develop to any extent prior to independence (Hawkins, 1962). Since the early 1960s, there has been a very rapid increase in road transport throughout East Africa, both in non-rail areas and in competition with the railroad, particularly in Kenya on the important Mombasa-Nairobi segment. General economic development, rapid construction of trunk roads, to which Kenya gave particular attention until 1975 (surfacing of the Nairobi-Mombasa road was completed in 1968), ending of the restrictive road licensing policy, failure to enforce weight limits in Kenya, deliberate governmental encouragement of co-operatives in Tanzania and of African entrepreneurship in Kenya, lack of adequate rail capacity and deteriorating rail service: all these contributed to the rapid growth of road transport.

The structure of the road transport industry differs among the countries. The dominant firm in Kenya is KENATCO, owned by the government of Kenya, but with much of its hauling done by independent private contractors. There are a number of independent firms. In Tanzania there have been several attempts to develop co-operative trucking enterprises, and considerable trucking is carried on by the various co-operatives and parastatals. There are some private firms, but many of these, it is reported, have been squeezed out in recent years by rising costs and fixed rates. Uganda has had much more of a private enterprise regime in trucking.

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9. The volume by Hofmeier (1973) stresses road transport in Tanzania.

There has been little rail-road coordination. East African Railways developed an extensive road transport network (freight and bus) only in the Southern Highlands of Tanzania, particularly in the Mbeya-Iringa area not reached by a rail line, but there has been no piggy-back development (ed. note: the transport of loaded truck trailers by rail) and little use of containers. It is argued that given the availability of cheap labour, there is little gain in containerisation; in addition, there is a serious directional unbalance of traffic. But the trend to containerisation in ocean freight is strong, and there is obvious potential gain for the railway from increased container use.

The road transport sector was the setting for one of the most bitter disputes in the East African Community. In 1974, because of the congestion in the harbour in Dar es Salaam, Kenya and Zambia arranged for road transport of substantial Zambia traffic from Mombasa. In 1975 Tanzania brought this traffic to a halt by limiting road transport vehicles to 19.4 tons, without a trailer, making the traffic uneconomic. There were several motives. The announced reason, which was probably at least a partial one, was the damage being done by these trucks to the Tanzania roads. But a more significant one was the desire by Tanzania to ensure that the traffic to Zambia passed through Dar es Salaam or Tanga. In addition, there was a good bit of criticism of Kenya capitalism; while KENATCO had the contract, much of the trucking was done by private firms as subcontractors. One consequence was Kenya's action in severing the rail link west of Voi.

Relative Rail and Truck Costs

Good general data on relative costs of rail and road transport are difficult to obtain. The most exhaustive study was that undertaken by the Economist Intelligence Unit for the East African Community under World Bank sponsorship in 1969. The basic rail cost figure is well know - in the early 1970s about 20 Kenya cents per ton mile. Revenues are as low as 11 cents on median hauls and 8 cents on long ones. This suggests that the direct costs are at least this low, under the assumption (not necessarily correct) that the railway has not set rates below out-of-pocket cost. An estimate by Hazlewood for road transport in Kenya was 40 Kenya cents per ton mile (1964, p. 66); O'Connor estimates for Uganda 50 Uganda cents if there is traffic only one way, 30 cents if there is traffic both ways (1965, p. 128). Some estimates, however, indicated costs for road transport as low as 8 cents - a figure not generally believed to be accurate. While these figures are somewhat obsolete in an absolute sense, the relationships between road and rail have probably not changed much.

Other studies suggest similar figures. East African Railways road services in Tanzania charge from 30 to 35 Tanzanian cents a ton mile for larger

shipments. Costs of moving rice from Mbeya to Dar es Salaam were shown by Hofmeier to be 25 cents a ton mile (1973, pp. 193, 196), of shipments from Dar to Arusha, 28 cents, whereas rail charges were as low as 7.6 cents on long haul bulk movements. Other figures for Tanzania show road costs as low as 15 cents per ton mile with a full load in both directions, 28 cents with an empty return.

The net conclusions of these and other studies are that average rail costs are lower than truck costs, but the differences are not tremendous. The great difference is between road transport costs and long distance bulk rail commodity rates, some of which, of course, may be below marginal cost. The very rapid growth in road transport in East Africa therefore cannot be explained in terms of lower rates; the other major factors have been inadequate rail capacity to handle the traffic (this was particularly important in shifting petroleum from rail to road between Mombasa and Nairobi), deteriorating rail service with delivery time of from two to three weeks, the greater flexibility of trucking, the emphasis of the Kenya government upon the need for African entrepreneurship in the road transport industry, and the advantages of private carrier operation to many business firms.

The Kenya line is faced with drastic loss in traffic - as much as 20 per cent - with the completion of the oil pipe line from Mombasa to Nairobi by the end of 1977. Originally all of this traffic moved by rail; in recent years a substantial amount shifted to road, partly because of shortage of rail tank cars, the available supply being reserved for the longer haul to Uganda. The pipe line will bring an end to all rail, as well as truck, movement of petroleum with a cost reduction estimated between 64 and 74 per cent of present rail and road costs. The line will carry initially 1.44 million tons of petroleum a year, ultimately 5.12 million tons. There has been some controversy in Kenya over this project, but the general attitude of the government has been that the pipeline will free rail capacity for other purposes and the cost reduction will more than offset any loss to the railway. But the immediate effect is certain to be adverse to E.A.R.

Some Policy Issues

Some major issues relating to transport remain to be resolved in East Africa, and the future is by no means clear, partly because it depends to such a great extent on political relationships among the three countries.

1. Future rail vs. road relationships. This issue is common to all African countries and will be analysed in the overall summary section. The particular problem of the past in East Africa was that there was no co-ordination of road investment and road hauling control policy, whereas the railroads were

unified. If there are to be three separate railroads in the future, this problem will be avoided, but overall coordination of transport in East Africa will be much more difficult.

2. Possible extension of rail lines. In the last decade, Tanzania has been much more enthusiastic about construction of new rail lines than Kenya (most of the new mileage since 1960, other than the TAZARA, has actually been in Uganda). But currently the one project that is under serious consideration (bids have been requested) is for a line in the Kerio Valley in Kenya, extending from Kampi ya Moto to Tenges (10 miles), Kimwarer and Koloa, a total of 62 miles, designed to serve fluorspar and other mineral deposits. A cut-off from the main Kenya line to the Arusha line to shorten the distance to Nairobi has long been considered but is unlikely to be built, given present conditions. A much more serious project is one from the Moshi line to Musoma on Lake Victoria to enable the traffic from Musoma to move directly by rail through Tanzania and give Uganda a route to the sea independent of Kenya (no great advantage at the moment, since relations between Uganda and Tanzania have been worse than those between Uganda and Kenya).[10]

3. Improvement of the rail lines. While the main Kenya line remains in relatively good physical condition, the branches are in need of heavier rail, and the entire Tanzania Central line requires substantial rebuilding, it is reported by the Tanzanian authorities.

4. The problem of the light traffic branch lines. There are a number of lines with relatively light traffic - under 300,000 net ton miles per mile per year. The Mpanda branch in Tanzania is the worst, with less than 50,000 net ton miles per mile. Built to serve lead mines that have ceased operating, it has been kept in service by direct subsidy of the Tanzania government because of limited road facilities in the area. Both the long Kasese and Pakwach branches in Uganda have traffic under 300,000 net ton miles. Studies elsewhere indicate that such services are particularly likely to be sources of deficits - yet they may be important for regional development purposes.

5. Gauge. As discussed in the following section E.A.R. and TAZARA gauges are different and no interchange of traffic is possible.

The Effects of the Railways upon Economic Development in East Africa

Two studies in the last decade have considered the question of the effects that the building of railway lines have had in East Africa, that by

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10. There has also been discussion of a line to connect Kenya with the Sudan railways.

A.M. O'Connor on Uganda (1965), and of Rolf Hofmeier on Tanzania (1973). The studies suggest that the building of the Kenya-Uganda line from Mombasa to Kisumu (with the steamer connection to Uganda), the Tanga-Moshi and the Tanzania Central lines all significantly aided economic development by allowing the development of export-oriented agriculture and other activities and importation of manufactured goods. In doing so they perpetuated the export-of-materials, import-of-manufactured-goods approach to development, from which a break has been made only in recent years. The whole pattern of economic activity of Tanzania centred around the two rail lines, while the Southern Highlands, with many economic advantages, lagged badly. The Kenya-Uganda railway was almost solely responsible for the existence and dominance of Nairobi.

But there is strong evidence that later rail building has had much less economic effect, even the rail line from Kisumu to Kampala. Economic activity in Uganda never has clustered around the railway as in many other African countries. The Kasese line in Uganda, while allowing the development of copper mining, contributed little to overall economic development of western Uganda, given the availability of road transport. The Mpanda line in Tanzania did little to create activity, and the Manyoni-Kinyangari line built in the 1930s in central Tanzania into the Singidi region had so little effect that it was abandoned in 1947. The extreme case was the line from Mtwara to Nachingwea and Masasi in southern Tanzania. Built as an element in the groundnut scheme, it had so little effect on development that it was abandoned in 1962, eight years after building (four years in the case of Masasi branch), following the end of the scheme. Abandonment may have been premature, but certainly there was no evidence of stimulus to economic activity.

ZAMBIA AND OUTLETS TO THE SEA

The development of few, if any, African countries has been influenced as much by the railroad as Zambia. Virtually all commercial activity has developed in the narrow belt up through the centre of the country known as 'line of rail'. Furthermore, no other country has had its pattern of rail traffic so disrupted in recent years as Zambia, and it has shared with Tanzania the most important rail construction project in the developing world in the last several decades.

Development of Railways to Zambia[11]

Unlike other tropical African railways, the line reaching Zambia was not built directly in from the nearest port, but came north out of southern

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11. A survey of the development of the rail lines to Zambia is provided by Bostock, 1971, pp. 377-96.

Africa. In the early 1890s, the South African railway system reached Mafeking (famous for the great siege in the Boer War), and the Rhodes interests (British South Africa Co.) pushed a line across the deserts of Bechuanaland (now Botswana) to reach Bulawayo in 1897. Already there were European settlers in Southern Rhodesia. The line, later called Rhodesia Railways (R.R.), was designed in part to provide access to the settlers and the farm land, but Rhodes was also lured by the known but as yet undeveloped mineral resources in what are now Zambia and Zaire, and by his dream of a Cape to Cairo railway. The line reached the coal mines of Wankie in 1903, crossed the Zambesi into Northern Rhodesia at one of the few feasible spots just below Victoria Falls in 1903, and reached the lead-zinc mining area of Broken Hill (now Kabwe) in 1906. A siding about half way up through Northern Rhodesia was labeled Lusaka; three decades later (1935) the site was designated to become the capital of the colony. A line also was extended north from Bulawayo to Salisbury (1902), and in 1899 another B.S.A. railroad had reached Salisbury from the port of Beira in Mozambique. In 1909 in an effort to obtain an outlet for the copper mines they were developing in Katanga in the southern Congo, British interests headed by Sir Robert Williams built south from the Congo to join Rhodesia Railways at Broken Hill. This line, as far as the Congo border, was taken overby R.R.in 1928. Rhodesia Railways was an element in the great British South Africa Company complex in central Africa; the company ruled Northern Rhodesia politically as well as economically until 1924, when the area became a crown colony.

Tanganyika Concessions Ltd., the Williams enterprise, also built the Benguela Railway, extending from the port of Lobito in Angola, reaching the Congo border in 1931 and connecting with the Congo lines, thus providing the Katanga mines and those of Zambia with another outlet to the sea. Likewise in 1928, Belgian interests completed a line from the Katanga area to Port Francqui (now Ilebo) on the Kasai River, from which water transport was available. In 1947 Rhodesia Railways was nationalised; under the statutory authority of the countries involved, following the formation of the Federation of Rhodesia and Nyasaland in 1954, the system was transferred to the Federation. The centre of operations and the main shops were in Bulawayo. Another route to the sea from the Bulawayo-Salisbury line to Lourenço Marques in Mozambique - providing a less congested route for Zambia traffic than the Beira line - was completed in 1955.

Thus at the time of Zambian independence in 1964, virtually all Zambian import traffic (including petroleum) and export traffic was handled by

Rhodesia Railways;[12] few countries in the world were so completely dependent on rail transport for their access to the outside world. Most Zambia traffic moved via Beira and Lourenço Marques; there was likewise substantial through rail traffic between Zambia and South Africa, traditionally the supplier of processed foods and many other commodities for the country. There was only a limited amount of road transport, primarily with Rhodesia.[13] Initially after independence Rhodesia Railways was owned and controlled jointly by Zambia and Southern Rhodesia, still a crown colony. The Lobito route via the Benguela handled little Zambia traffic.[14] Zaire copper moved partly via the Benguela, partly via the Port Francqui route, under pressure from the Zaire government. Most of the Benguela's traffic came from within Angola.

Disruption of Traffic Patterns

The twelve-year period from 1965 through 1976, and particularly 1973 to 1976 saw several major disruptions in access routes to the sea and in traffic patterns within the country. These disruptions resulted entirely from political events, which can be noted briefly:

1. In 1965 Rhodesia declared itself independent from Great Britain. U.D.I. - Unilateral Declaration of Independence, as it was called - under a white regime was viewed with great disfavour in Zambia. Zambia forced the dissolution of Rhodesia Railways as a joint venture as of 1 July 1967 and took over operation of the portion north of the Victoria Falls bridge, but retained few of the employees (the great majority were white and most preferred to stay in Rhodesia) and only an inadequate share of rolling stock and engines.[15] For a time all engines had to be sent to Bulawayo for repair, until Zambia completed its own repair shops at Kabwe (formerly Broken Hill). Even the billing was done from Bulawayo for a time. Zambia was committed to use R.R. for all international rail traffic or pay a penalty on any traffic diverted under the terms of the breakup.

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12. Even the headquarters of Zambia Customs and Excise was (and still is) located in Livingstone.

13. The rail distance from Lusaka to Salisbury was almost three times the road distance. A direct rail link, crossing the Zambesi at Chirundu, was long planned.

14. This was a product of agreements between the railways and the copper companies. In 1936 the copper companies agreed to ship entirely via R.R. in exchange for low rates. In 1957 under pressure of the companies, R.R. agreed to let a specified amount of copper move out via Lobito, but then quoted such a low rate on this segment that it also moved via Rhodesia.

15. The first year of Zambia Railways operation was one of chaos, derailments, and an inability to keep coal moving to the mining complex. (Toronto Globe and Mail, 11 October 1968, p. 2)

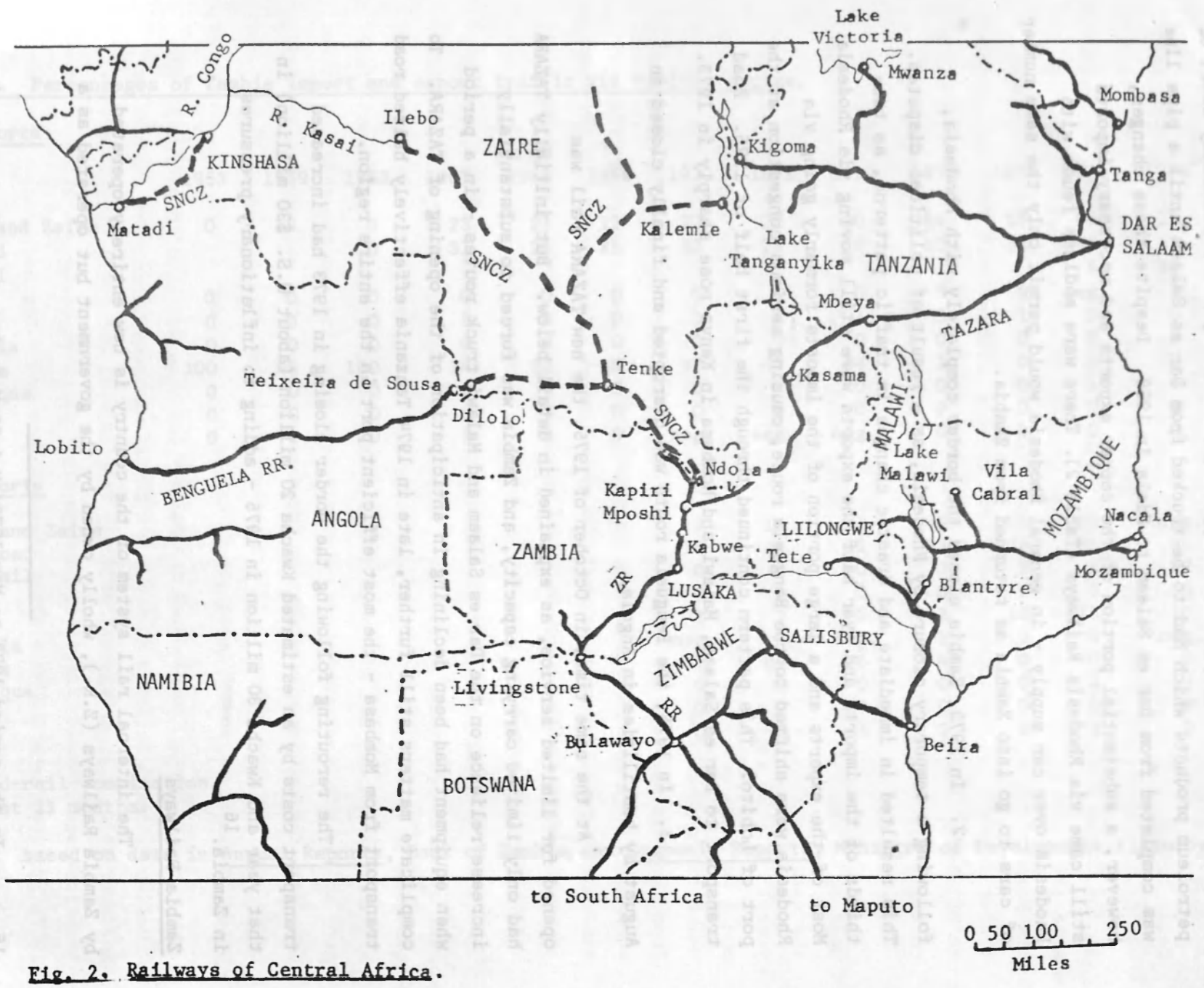

Fig. 2. Railways of Central Africa.

Secondly, the government began to divert a substantial amount of traffic via truck transport to Dar es Salaam, under great difficulties because of the bad condition of the Great North Road, and via the Benguela. After Rhodesia cut off petroleum supplies, the country was drastically short of petroleum products which had to be trucked from Dar es Salaam until a pipe line was completed from Dar es Salaam to Ndola in 1968. Despite these changes, however, a substantial portion of the copper exports and necessary imports still came via Rhodesia Railways (Table 2). There were endless feuds with Rhodesia over car supply - in general Rhodesia would permit only the same number of cars to go into Zambia as returned from Zambia.

2. In 1973, Zambia closed the border completely with Rhodesia, following a temporary closure by Rhodesia, as a result of political disputes. This resulted in immediate and drastic changes in traffic patterns, as two-thirds of the imports and over half the exports were still moving via Rhodesia. Most of the exports and a large portion of the imports formerly going via Rhodesia were shifted to the Benguela route, causing serious congestion at the port of Lobito. This pattern continued through the first half of 1975. Road transport to Dar es Salaam, Malawi and Mombasa in Kenya rose sharply in 1973.

3. In 1975, the Benguela route was disrupted and finally closed in August by hostilities in Angola.

At the same time, in October of 1975, the new TAZARA rail was opened for limited service, as explained in detail below. But initially TAZARA had only limited carrying capacity, and Zambia was forced to substantially increase reliance on the Dar es Salaam and Malawi truck routes - in a period when equipment had been declining in anticipation of the opening of TAZARA. To complicate matters still further, late in 1974 Tanzania effectively halted road transport from Mombasa - the most efficient port in the entire region.

The rerouting following the border closing in 1973 had increased transport costs by an estimated Kwacha 20 million (about U.S. $30 million) in that year and Kwacha 30 million in 1975 - adding to inflationary pressures in Zambia.[16]

Zambia Railways

The internal rail system of the country is now entirely operated by Zambia Railways (Z.R.), wholly owned by the government but operated as a

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16. In the period 1973 to May 1976, K 1.00=U.S. $1.55; after devaluation that month K1.00=U.S. $1.25. For some years prior to 1973, K1.00=U.S. $1.40.

Table 2. Percentages of Zambia import and export traffic via various routes.

1. Exports

	1953	1959	1963	1967	March 1968	1969	1970	1971	1972	1973	1974	1975	1976[b]
Lobito and Zaire	0	15	0	23	21	17	22	22	20	54	55	40	13
Dar-Road			0	31	24	35	30	28	26	35	35	45	38
Dar-Rail												6	38
Kenya	0	0	0	0	0	0	0	0	0	6	9	neg.	1
Malawi	0	0	0	8	8	0	1	1	1	5	1	9	5
Kazungula	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhodesia	100	85	100	34	32	48	47	49	54	1	0	0	0
Mozambique	0	0	0	0	0	0	0	0	0	0	0	1	4
Kigoma	0	0	0	0	5	0	0	0	0	0	0	0	0
Air	0	0	0	5	9	0	neg.	neg.	neg.	0	0	0	0

2. Imports

Lobito and Zaire	7	16	11	49	45	29	neg.
Dar - Road	15	18	19	23	28	35	34
Dar - Rail	0	0	0	0	2[a]	8[a]	42
Kenya	0	0	0	8	9	3	3
Malawi	1	2	3	13	13	15	10
Kazangula	neg.	1	neg.	1	2	5	neg.
Rhodesia	77	64	66	4	0	0	0
Mozambique	0	0	0	0	0	3	7
Kigoma	0	0	0	0	0	0	0
Air	0	0	1	3	3	2	3

a. Road-rail combination.
b. First 11 months.

Source: based on data in Annual Reports, Bank of Zambia, and Economic Reports, Ministry of Development Planning, Zambia.

separate government corporation in the same fashion as Zambia Airways. Its own line is 650 miles in length, and it also operates about 75 miles of the former Zambesi Sawmills Railway as an agent for the government. The main Z.R. line extends in a general north-south direction from the connection on the Victoria Falls bridge with Rhodesia Railways via Lusaka to the Copper Belt, specifically via Ndola and Kitwe and Chililabomwe to Konkola on the Zaire border, with branches in the Copper Belt to Mufilira, to Luanshya and from Ndola to Sakamia to connect with the Zaire lines. There are no other branches except a short one serving the Maamba coal mines. The former Zambezi Sawmills Railway, built to serve the timber industry in the Southern province, extends northwestward from Livingstone to Mulobezi. The line once extended another 50 miles to Kataba for the handling of logs, but this portion is not now operated (though shown on most maps).

Z.R. was built to the 1.067 metre gauge - known as Cape Gauge - used by all main lines from Zambia and Zaire south. Track is in good condition; the sawmills line, which had deteriorated, has been rebuilt in the last two years. Z.R. is entirely dieselised, with 80 diesels; 10 were received in 1975 and 8 more are on order. These are U.S. General Electric built engines, with which the system is well satisfied. A number of the Beyer-Garretts inherited from Rhodesia Railways are still in the yards in Livingstone awaiting ultimate scrapping. A number of new freight cars (wagons) have been acquired, typically with 40-ton capacity, and another 1,000 are on order. Cars are freely interchanged - in normal times - with the Benguela and Zaire, Rhodesian, South African and Mozambique lines.

Gross revenue of the railway in 1975 was Kwacha 27.9 million; in 1976 an estimated Kwacha 35 million. Despite the complete disruption of traffic patterns in recent years (when copper moves out via the Benguela Z.R. receives little revenue, and not much more with TAZARA), the great increase in road transport on the import-export routes, the petroleum pipe line and the shift to petroleum from coal by the mining complex for many purposes, the railway has avoided large deficits (the figure in 1975 was only Kwacha 600,000) and hopes to be covering all costs in the immediate future.

Since independence the railway has been assisted in many ways by Canadian National Railways (C.N.R.). A formal management contract expired in November 1975, with management entirely Zambianised, but C.N.R. still provides technical assistance. Almost the entire staff has been newly recruited since 1967. Headquarters and main shops are in Kabwe.

The traffic patterns, as noted, have shifted dramatically. Prior to 1967 virtually all imports came in via Livingstone and were taken north almost the entire distance of the line to the Copper Belt or over half of the

entire line to Lusaka. This traffic included very heavy volumes of petroleum products coming from Beira, coal from the Wankie mines in Rhodesia, and products from South Africa, including fertiliser, coke, farm and mining equipment, processed foods, etc. The copper and other exports (copper constitutes about 95 per cent of the total) came down the entire distance from the Copper Belt to the Victoria bridge. Currently nothing for Zambia comes in at Victoria Falls, although in the last two years the road has handled substantial transit traffic between Zaire and Rhodesia (copper going out, particularly after the closing of the Benguela, coal and maize coming in). By agreement with Zaire, Zambia handles this traffic, although it will not handle any Zambia traffic from Rhodesia.

The principal Z.R. traffic items in recent years have been copper, hauled the relatively short distance to the Zaire border and now to the junction with TAZARA at Kapiri Mposhi; some lead and zinc from Kabwe to Kapiri; substantial movements of maize, mostly from southern Zambia to the Copper Belt and for export to Zaire and Tanzania; and coal, from the Maamba mines to the Copper Belt. The government has been moving all petroleum products within the country by road, but some of this is likely to be returned to rail. In 1975, 59 per cent of Z.R. traffic was domestic, the rest export traffic.

Traffic volume was 1,323 million ton miles in 1973, 1,105 million in 1974, and about 1,300 million in 1975, or 2.2 million ton miles per mile of line. The revenue is about 2.6 ngwee per ton kilometre, compared to an estimated average of 5 to 6 ngwee for heavy volume trucking. The 2.6 figure is roughly equal to 4.6 U.S. cents per ton mile at current exchange rates. The traffic volume is not as heavy as on the main Mombasa-Nairobi line of E.A.R., nor as the expected volume on TAZARA when it is in full-scale operation; it is somewhat comparable to that of the Tanzania Central line and adequate to allow reasonably low cost.

The tariff is basically a class tariff comparable to that of East African Railways in many respects with 14 classes, classification based on cost, value of service, and essentiality considerations, plus separate rates for tank cars and mineral products (the lowest figures) and special rates on copper. There has been less concern thus far about the loss of high-rate commodities to road transport than in some countries because transport is so completely controlled by the government, given the scarcity of facilities.

For many years, daily passenger service was operated Lusaka to Livingstone, and overnight three times a week Lusaka to the Copper Belt. The initial equipment after independence consisted of ancient wooden open vestibule cars of Rhodesia Railways. These were replaced by diesel motor trains, and in 1975 by new equipment manufactured in Japan. Since that time two trains are operated each day, the relatively fast Kafue and the slower Luangwa. The former

provides three classes, sleeper, standard and economy, the latter standard and economy. In 1976, the sleeper fare Livingstone to Lusaka was Kwacha 16.60, standard Kwacha 8.30, economy Kwacha 5.50. These are roughly fares of 6, 4 and 2 U.S. cents a mile. About 1,200,000 passengers are carried per year.

Internal Road Transport

Road transport in Zambia is dominated by Contract Haulage, formerly Central African Road Services, a parastatal organisation. Contract Haulage maintains a fleet of its own trucks and also contracts with private trucking firms. It also handles the Malawi export-import road service as a part of the Dar es Salaam traffic as a subcontractor. Rates ranged in 1974 from 1.2 to 4.6 ngwee (ed. note: 100 ngwee = 1 Zambian Kwacha) per ton kilometre. Both Contract Haulage and private firms contract with NAMBORD, which controls all farm product marketing, for transport of farm products on a set rate schedule which in 1974 was as follows: fertiliser and maize: ng per t/KM 7.50 up to 80 km, 6.75 for 81 to 160 km and 6.00 over 160 km; cotton: ng per t/m 9. NAMBORD's policy is to use rail wherever feasible, partly because it is cheaper, partly because of general government policy.

In the days before independence, the Federation restricted road competition with the rail system drastically. While present policy is less restrictive, there is no free competition and so much of the total traffic is by or for parastatal organisations that the overall picture differs markedly from that of Kenya.

The Export Routes

The major export routes noted above can be described briefly. Rhodesia Railways to Beira and Lourenço Marques (Maputo). As noted, this route carried virtually all import and export traffic prior to 1967. The line was well built and the equipment modern. The revenues rose steadily up until 1966, but the operating ratio was relatively high, averaging 84 in this period (Prest 1969, p. 95). Rate policies were influenced by the desire to hold the copper traffic from the Benguela, but the usual pattern was to keep copper rates relatively high except for the marginal traffic that could, by agreement, go via the Benguela. This amounted to a form of profits tax on the copper companies benefiting the Federation and reducing the amount that Northern Rhodesia and then Zambia could raise by an income tax on the companies' profits. Particularly high rates were charged at times on Zaire copper, but the Zaire firms could not effectively avoid this because they had to rely on Rhodesia Railway for their coal from Wankie.

After years of profit, except in the 1962-63 period, the loss of traffic and rising costs resulted in small deficits in the early 1970s; in 1974. the first full year after closure of the border, the system incurred a net loss of Kwacha 10 million (about U.S. $15.5 million), and in 1975 Kwacha 21 million(U.S.$31 million). Guerilla warfare has resulted in some damage to the lines.

From a longer range standpoint, African rule of Zimbabwe (Rhodesia) will undoubtedly result in some resumption of traffic from Zambia via Victoria Falls and the Mozambique ports and trade between Zambia and Zimbabwe, although the Salisbury-Lusaka-Copper Belt traffic except in bulk commodities is almost certain to go by road. Opening of the border at Victoria Falls would also result, in all likelihood, in the resumption of rail traffic in fertiliser from South Africa, and in beef and other products from Botswana. But never again is this likely to be a major route for exports and imports for Zambia.

The Benguela Railroad, via Zaire and the port of Lobito. This route involves, in traffic from the Copper Belt, a relatively short haul on Zambia Railways, thence via the Zaire system (S.N.C.Z.) through Lubumbashi to Tenke on the main line to Port Francqui, westward to Dilolo, and thence westward on the Benguela to the port of Lobito. The Benguela has been a subsidiary of Tanganyika Concessions Ltd., a British firm, and unique in its reliance on wood burning steam locomotives. The line was to revert to Portugal in the 1980s; its present status is not clear, but undoubtedly it has been or will be nationalised. This route offers one very significant advantage: since Lobito is on the Atlantic, the total haul is substantially less than via Indian Ocean ports, and substantial time - as much as two weeks - is saved. This is particularly important for imports. But use of the route was long restricted by the agreements between the mining companies and Rhodesia Railways,by Rhodesia Railways' rate policies, by the fact that the port of Lobito was less satisfactory for handling cargo than Beira, by limitations on capacity on outbound traffic because of the handling of large quantities of Angolan manganese and iron ore, and during the period between Zambian and Angolan independence by the reluctance of the Zambian government, for political reasons, to make use of this route.

Once Zambia closed the Rhodesia route completely, it was forced as a practical matter to make greater use of the Benguela, in part because Lobito alone could handle some types of heavy cargo. Furthermore, by then Angolan independence was assured. In 1972 this route handled only 14 per cent of Zambia's imports and exports; in 1974, about 50 per cent. In that year, for example, the port handled some 104,000 tons of wheat for Zambia, 51,000 tons of coke, 259,000 tons of general import cargo. But this sudden shifting of traffic onto the Benguela

coincided with substantial unrest in Angola as independence approached, as well as loss of Portuguese technicians, which led to congestion in the port, surcharges by the shipping firms and delays in handling cargo. Then came the final breakdown in late 1975 as military action resulted in severe damage to the line and destruction of two major bridges at Lumeje, west of Luso, and at Luau, close to the Zaire-Angola border. Continued unstable conditions resulted in delays in rebuilding the line and bridges. About 800 Zambia Railway freight cars were stranded in Angola, along with new diesels for the railway and substantial quantities of copper.

Up until recent disorders, the Benguela has been a consistently profitable venture, with an average operating ratio of 60 for 1955-60 (Prest 1969, p. 96) and consistent dividend payments. Partly, of course this was due to the absence of road transport competition; there are no roads of any kind between Zambia and Katanga (now Shaba) and the Atlantic. Secondly, it handles a substantial volume of traffic, although much of it is of low value and earns low rates.

Over time, the Benguela should again become a significant outlet to the sea for Zambia, particularly for import traffic, given the importance of speed. While Zambia is committed in principle to concentrate traffic on the Dar es Salaam route, there is substantial feeling that the country should never allow itself to be dependent solely on one route. Possible completion of an all-Zaire route would hurt the Benguela to some extent, but renewed development in Angola should in time more than offset this.

The capacity of the Benguela was greatly increased by the completion in 1974 of the Cubal variant, 128 kilometres of relocated line beginning about 350 kilometres east of Lobito, built to eliminate severe grades that reduced train speed and length drastically.

The lines in Zaire were built by several private firms, allied with the mining complex in Katanga and to some extent with the Benguela. The most important was B.C.K. (Bas-Congo au Katanga), later K.D.L. (Kinshasa-Dilolo-Lubumbashi), the main route from the Zambia border to Port Francqui (now Ilebo).[17] A second major route extends northeastward from Kamina, on the Ilebo line, to Kindu as part of a rail-water-rail route to Kisangani and the original all-Congo route to the ocean. From Kabalo a branch (built in 1915) extends east-

17. The portions from Lubumbashi to Kamina and the junction at Tenke to Mutshatsha are electrified, the only electifield system in all tropical Africa.

ward to Kalemi (Albertville) on Lake Tanganyika.[18] This system was not connected with B.C.K. between Kabalo and Kamina until 1957. These lines have been nationalised in recent years, consolidated as the Société Nationale de Chemins de Fer Zairois (S.N.C.Z.). The all-Congo route to the sea requires transfer to steamer at Ilebo on the Kasai River, transfer back to rail at Kinshasa and to ocean-going vessels at Matadi, Zaire's only ocean port. There have been extensive discussions about building a connecting link from Kinshasa to Ilebo through difficult terrain. Completion of this link would result in substantial diversion of Zaire traffic from the Benguela, but thus far Zaire has been unable to obtain financing for this project.

Apart from the export traffic to Lobito, there is a considerable volume of traffic between Zambia and Zaire, consisting largely of maize exported to Zaire. Some 41,000 tons were reported in 1975. As of 1977, some Zaire copper traffic is moving to the ocean via Zambia and TAZARA, as noted below. From a longer range standpoint, there is substantial rail traffic potential between the two countries, especially since the road system of Zaire is very limited.

The Kenya Route. The port of Mombasa is one of the most modern in the world and one of the few good natural harbours in all Africa. It has not been congested in recent years, in part because of the diversion of the Arusha-Moshi traffic to Tanzanian ports. In 1973 KENATCO, the Kenya government-owned road transport firm, began hauling copper from Zambia and primarily sulphur and lubricants to Zambia, to the extent to which it was handling about 9 per cent of all Zambia traffic. Much of the hauling was done by private Kenya firms under contract to KENATCO. As noted, in late 1974 Tanzania put an abrupt end to this traffic by setting a 19.4 ton maximum load and banning trailers, thus making road haulage uneconomic.

The Malawi Route. The original rail line to Malawi (then Nyasaland) was built north from Beira via Blantyre to Salima, on Lake Nyasa. In 1970 a line was completed east and west from Nova Freixo on the rail line from the port of Nacala and Mozambique (city) to Vila Cabral in Mozambique east of Lake Nyasa, and to connect with the Malawi line north of Blantyre at Nayuci. The Malawi route with road transport to Salima was used for Zambia traffic to some extent from 1967 on. After the closure of the border with Rhodesia and the serious port congestion at Dar es Salaam, greater use of this route was undertaken, primarily for the handling of fertiliser which comes from South Africa, since Tanzania

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18. This line was operated by the Compagnie de Chemins de Fer du Congo Superior aux Grands Lacs Africains.

will not handle any traffic originating in South Africa. By 1975, 75 per cent of all fertiliser was coming by this route, as well as considerable general cargo and about 10 per cent of the export of copper. Several problems arose very quickly: Malawi Railways' lack of freight cars and congestion in the ports of Nacala and Beira due in part to loss of Portuguese technicians after independence. The hauling to the railhead has been done by Contract Haulers, owned by the Zambia government, but it has been possible to handle only 12.5-ton loads, given the condition of the roads. Extension of Malawi Railways to Lilongwe has shortened the road haul somewhat. There has also been some road hauling from Zambia to Moatize near Tete, the rail head in Mozambique, but the road conditions are particularly unsatisfactory.

From a longer range standpoint, this route, with improved roads and/or a rail connection as noted below, may have some potential, but for the Copper Belt traffic it can scarcely be competitive with TAZARA.[13]

Kazengula Route. With the Rhodesian border closed, Zambia was cut off from direct contact with both Botswana and South Africa except by the Zambezi River crossing at Kazangula. The state of roads in Botswana prevented this route from being a significant avenue of commerce, but it has been used for hauling some mining equipment and supplies from South Africa, which, together with fertiliser, have been the only items Zambia has been purchasing from that country. This traffic in general has moved through Zambia by road to the Copper Belt destinations.

The Lake Tanganyika Routes. A route which traditionally was used for some traffic to Zambia involved rail movement on E.A.R.'s Tanzania Central line to Kigoma, transfer to steamer for the trip down Lake Tanganyika and road transport from Mpulungu at the south end of the lake. In the late 1960s for example, considerable copper moved out this way, and petroleum for northern Zambia came by this route. But it was a slow route at best, requiring twice the time of the road haul to Dar es Salaam and two transfers. Use came to an end when the engines of the 60-year-old E.A.R. steamer, Liemba - the only vessel in the service - gave out in the early 1970s. An alternative route, involving rail movement through Zaire to Kalemie, transfer across the lake and E.A.R. from Kigoma, has not proved viable.

Air Freight. For a time following the initial attempt to restrict traffic via Rhodesia and the petroleum shortage, air transport between the Copper Belt and

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13. Malawi Railways, with relatively short hauls, has not been highly profitable; the operating ratio for 1960-65 averaged 80, with an upward trend. (Prest, 1969, p. 95)

Dar es Salaam was used to haul copper out and supplies in. But this proved to be very costly, and improvements in the Great North Road allowed the cessation of this traffic. Air freight, however, continues to be important for importation of some goods from Europe and Kenya, as well as meat from Botswana. It amounted to only 2.8 per cent of total Zambia imports in 1975 and yet used up 17 per cent of the country's payments for external freight traffic.

The Dar es Salaam Route - Road Transport. At the time of independence in Zambia, the Great North Road to Dar es Salaam was a bare trek through the semi-desert, impossible in bad weather. Following the Unilateral Declaration of Independence in Rhodesia, the government of Zambia began an organised effort to haul copper out and imported goods in over this road. The result was a sharp increase in cost and very substantial damage to imported goods, but a substantial volume of goods flowed both ways. Gradually, with U.S. aid, the road was surfaced and the flow became much more regular, but it never handled more than half of the total traffic. In 1974, 70,000 tons of steel, 40,000 tons of chemicals and fertiliser, 16,300 tons of timber and 145,000 tons of general merchandise were hauled in. In that year there were 11,625 trips out and 12,613 in, or about 30 a day each way. Some 245,000 tons of copper were carried out, as well as 73,000 tons of maize to Tanzania. Zambia-Tanzania Road Services (Z.T.R.S.), owned by the two governments and an Italian firm, had the basic contract and carried about half the traffic in its own trucks, Contract Haulage (C.H.), owned by the government of Zambia, carried a portion and private subcontractors carried the remainder. Z.T.R.S. used trucks in the 25- to 30-ton range, averaging 23.1, Contract Haulage, 21.5 (net cargo). Z.T.R.S. was using 442 trucks; C.H., 105; and the other subcontractors, 419. The vehicles averaged from 1.3 to 1.7 round trips per month. As of 1974, the rate on copper was Kwacha 54 per ton, on general cargo, Kwacha 49. The latter rate was 2.45 ngwee per ton kilometre, the equivalent of about 6.7 cents per U.S. ton-mile at 1975 exchange rates or 5.3 cents at the more realistic 1977 exchange rate. All in all, this was a very impressive performance, particularly considering the fact that it was started from almost nothing and that phasing out, or at least a substantial reduction, was the long-range plan.

TAZARA - The Dar es Salaam Rail Route. The idea of a railroad from the Copper Belt directly to the Indian Ocean had been considered long before Zambian independence. The first serious study was made by a consultant for the British Colonial Office, published in 1952 (United Kingdom, 1952). After independence, studies were made by the World Bank (1964) and the Economic Commission for

Africa, which found such a railroad to be uneconomic.[14] But the government of Zambia was extremely anxious to end reliance on the Rhodesian outlet and Tanzania was highly sympathetic to a rail line across the southern part of the country. The presidents of the two countries agreed on the desirability of the line in 1964. While the World Bank, the United Kingdom and the Soviet Union all rejected requests to assist, a Canadian study (1966) indicated the economic feasibility of the line, even if the other routes could be used. In 1967 Zambia and Tanzania reached an agreement with China to build the line.[15] The original plan to build to a connection to E.A.R. was abandoned because of the gauge difference, and the final plans called for a line all the way to the Dar harbour. Construction began in 1970, the Zambia border was reached in 1973, and a connection with Zambia Railways at Kapiri Mposhi was completed in October of 1975. The railroad is known as TAZARA.[16]

The route passed through Mbeya (but not Iringa, the other major city in southern Tanzania), and Kasama and Mpika in Zambia. The final length was 1,852 kilometres, or 1,158 miles, to the junction; thus the distance to Lusaka is about 1,275 miles. Many observers were skeptical for several years as to whether the line would actually be built, and there were rumours that the U.S. aid for surfacing the Great North Road was designed to head off construction of the railroad.[17]

TAZARA operates with a separate set of docks in the Dar es Salaam harbour used exclusively for Zambia cargo.

Operations began on a limited scale in October of 1975 when a trainload of wheat for NAMBORD reached Kapiri Mposhi as the first cargo. Initially there was only one freight train a day with 30 cars, but operations were gradually stepped up. In December 1975, 20,000 tons of copper were carried,

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14. A Brookings Institution study was also very critical on the grounds of unnecessary duplication. See Haefele and Steinberg, 1965.

15. A good survey of this development is to be found in Hall 1969, Chapter 14, and Yu 1971, pp. 1101-15.

16. For Tanzania Zambia Railway Authority. It is owned jointly by the two governments.

17. Two books have already appeared on TAZARA: Hall and Peyman, 1976 and Bailey, 1976.

and in June 1976, 58,000 tons. By late 1976, the typical copper traffic was 42,000 tons a month. In the first 12 months of operation, 350,000 tons of freight were carried and 293,000 passengers; in the first 11 months of 1976, 610,000 tons. The initial capacity, once full scale operations are under way, will be two million tons in each direction per year - about twice the present needs of Zambia. In recent years slightly under one million tons have moved each way, exclusive of the pipeline traffic, which is almost as great as Zambian surface imports in tonnage. Ultimately, capacity is planned to reach 4.3 million tons each way, and finally 7 million tons. This would require seventeen freight trains a day each way. At present five trains per day are operated each way. The entire emphasis in this early period has been upon outbound movement of copper and inbound movement of bulk shipments, leaving much of the manufactured goods traffic to road transport for the moment. Road transport will eventually be phased down, but some may be retained. Much of the road transport fleet is near the end of its useful life.

Currently the line is also handling a substantial amount of Zaire copper traffic because of the problems with the Benguela. It is expected that some Zaire products will continue to move over TAZARA. There is also substantial traffic within Tanzania, particularly to the Mbeya area. On 14 July 1976, the road was turned over by the Chinese contractors to the TAZARA authority, but about 1,000 Chinese will remain to provide instruction, gradually being phased out over the next two years.

While TAZARA connects with Zambia Railways at Kapiri Mposhi and the gauges are the same, immediate free interchange of equipment was impossible. Zambia Railways, like the entire network of rail lines of central and southern Africa, uses vacuum brakes rather than air brakes, whereas TAZARA equipment uses air brakes - as does East African Railways and most other railways in the world. Z.R. converted several of its diesels to air brakes and thus has been able to bring TAZARA trains to the Copper Belt and to Lusaka. But the cars cannot be mixed in trains and substantial traffic has been off loaded on to road transport at Kapiri Mposhi. The intent is ultimately to change entirely to air brake operation - but this requires change by the other countries in southern Africa as well.

TAZARA headquarters are in Dar es Salaam and shops are in Dar es Salaam and Mpika.

Tariff. The preliminary tariff, to be replaced in 1977 by a permanent tariff, was based upon that of Zambia Railways. Goods are grouped into fourteen

classes plus separate mineral and tank car rates. A negotiated rate on copper is not included in the tariff. Sample figures are shown in Table 3.

Table 3. Sample rates for TAZARA.

Rates per 1,000 Kilogrammes (Kwacha)

Dar es Salaam to:	Kapiri Mposhi (1852 KM)	Mbeya (850 KM)
First class	65.40	42.10
Fourteenth class	9.58	4.74
Minerals	8.58	4.25
Tank car	30.06	19.32
Copper	42.04	-

Note: 1 Kwacha= U.S. $1.25 (1977).

The minerals rate is about 8 mills per U.S. ton mile, which is comparable to U.S. rail rates on similar movements. The first class rate is about 7 U.S. cents per ton mile. A tapering rate structure is used, though the degree of taper varies with the classes. The degree of tapering is much less than is typical in the U.S.

Rates are established for carload minimum weights only, plus a separate tariff for parcels. The first class rate is above the Z.T.R.S. (Zambia-Tanzania Road Services) rate, but most of the class rates and the special rates are lower. There are as yet no joint rates with Zambia Railways, although these are expected in time.

Passenger Service and Fares. Passenger service was commenced almost immediately upon the opening of the line. The train left Dar es Salaam at 10.00 in the morning, arriving in Mbeya at 9.05 the next morning, Mpika at 11.00 that night, and Kapiri at 7.00 the next morning - about 40 hours, averaging little better than 20 miles an hour, but with a total of 55 stops. By the end of 1976, two trains were being operated; one makes the trip in 36 hours and one in 42 hours. The third class fare is Kwacha 6.65 , or about U.S. $8.30 for a 1,100 mile trip. The first class fare is Kwacha 28.36, or about U.S. $35.00 - extremely cheap by comparison with air fares, and a much lower basis than Zambia Railways. Passengers must change trains Kapiri; ultimately cars may be run through to Lusaka once the problem with the brakes is solved. Zambia Railways has been reluctant to run the trains through, partly because of shortages of diesels and partly because of questions about crews.

Additional Traffic Potential. In addition to the through traffic destined to and from the Copper Belt and Lusaka, there is other traffic potential. A truck assembly plant is being established at Kasama in northeast Zambia. Considerable agricultural product traffic to and from the northeast province is almost certain to develop. To Zambia Railways, traffic coming from TAZARA bound for southern Zambia and maize traffic coming from the south bound for Tanzania are particularly attractive.

Within Tanzania there are potentials as well. Already the railway has taken over traffic from road transport in the Mbeya area. While some claims about future effects of the railway upon the Kilombero Valley are exaggerated, there is bound to be considerable influence. One of the greatest potentials is provided by the coal and iron deposits in the Njombe district if a branch line were built from Makumbako via Njome to Liganga. The Njombe area is also important agriculturally, particularly in the production of tea. On the other hand, the line may spell the doom of E.A.R.'s Kidatu branch, the previous railhead into the Kilombero Valley.

The possibility of interchange of traffic with East African Railways is restricted by two factors, technical and political. TAZARA uses the 1.067 metre gauge of the southern lines, E.A.R., one metre. It is impossible to lay a third rail, as could be done with the standard and three-foot gauge lines in the United States, as there is insufficient clearance. There has long been discussion of changing E.A.R. to the broader gauge. Currently there is considerable discussion of this question in Dar es Salaam, but none at all in Nairobi, and it is not impossible that the Tanzanian lines might be changed while the Kenya lines are not. The task of changing is not an impossible one although some disruption of service would result. Much E.A.R. equipment acquired in recent years has been so designed that an equipment change can easily be made. The main task is to move one rail out three inches.

The main obstacle to through traffic, however, is political. The greatest potential for trade in the next decade or so is between Kenya and Zambia, in view of Kenya's progress in manufacturing in many fields. Even now, Kenya has to some extent replaced South Africa as the supplier of processed foods, butter, tin cans and other products to the Zambia market. But given the unfriendly relations between Kenya and Tanzania, there is little hope of Tanzania's encouraging rail interchange. From a longer range standpoint, however, there is potential for free movement of commodities among all three countries (and possibly Uganda as well).

Other Potential Rail Lines

Given the emphasis placed on rail transport in Central Africa, there has been substantial discussion of the building of additional lines, although in all likelihood few of these will come to fruition:-

1. A line to connect Lusaka with Malawi Railways at Lilongwe. This would facilitate trade between the two countries and give Zambia another rail outlet to the sea, although not as good an outlet as TAZARA.

2. In conjunction with a line to Malawi or built independently, a line from Lusaka to the railhead of the Mozambique system near Tete, crossing into Mozambique at Feira-Zumbo. This would provide a much more direct outlet to Beira than the route via Rhodesia.

3. The so-called Luso variant, a line extending from the Copper Belt through northwestern Zambia to connect with the Benguela at or near Luso, thus reducing the distance and avoiding the haul via Zaire. This would also facilitate the development of mineral resources in the northwest province of Zambia.

4. As noted above, with an independent Zimbabwe, a direct route from Lusaka to Salisbury, crossing the Zambesi at Chirundu where the highway crosses.

5. As noted, an all-rail outlet to the sea in Zaire.

Conclusion

Zambia now has a good rail route to the coast, with rates less than those which were available for many years (in real terms, the lowest rates ever available). TAZARA is capable of handling all import and export traffic once full operations are underway, although some traffic will likely continue to move by road and other routes once opened will undoubtedly be used to some extent. Since the government of Zambia controls the routing of all freight, it is in a position to determine routes and methods of transport. The volume of traffic on TAZARA will be sufficient, on the basis of studies elsewhere of the relationship of volume of traffic, directionally balanced traffic and cost per ton mile, to be economically viable and also more economical than road transport, although the importance of speed and handling may dictate the routing of some traffic via road.

No studies have been made of the effects of railways upon economic development in Zambia, so far as is known, partly because the results have been so obvious. Without the railway outlet to the sea, the copper complex in Zambia

could not possibly have developed when it did. With high world copper prices, it could operate without railroad access today, given a good road to Dar es Salaam and present road transport operations and costs. But without the railway in the past the development of the industry would have been delayed for several decades at least. The significance of the railway for the economy, however, has extended far beyond the copper industry. Along the 'line of rail', the narrow belt on each side of the railroad, developed commercial agriculture, trade and limited manufacturing, while the rest of the country for the most part remained in subsistence agriculture. The line of rail became the dominant region in the economy of the country, although it had no other particular advantages; it just happened to lie in the path of a rail line from Victoria Falls to the Copper Belt. An estimated 85 per cent of all economic activity in the country is in this narrow belt. Over time this small area may lose ground relatively, but it is likely to dominate the economy for a long time to come.

Supplementary Tables

Table 4 shows the distances to the various ports from Lusaka. The distance from Ndola is about 200 miles less via Lobito, 150 miles less via Dar es Salaam, and 200 miles greater via Beira.

Table 4. Distance to various ports from Lusaka.

	Kilometres	Miles
via Benguela	2,683	1,678
Rhodesia Railway and Beira	2,040	1,275
Malawi and Beira	1,653	1,033
Malawi and Nacala	1,750	1,093
Dar es Salaam Road	2,090	1,306
TAZARA	2,040	1,275
Mombasa	2,350	1,469

Table 5 provides samples of rates on copper for export at various times.

Table 5. Transport rates on copper to ports, selected years (Kwacha).

1957	All three ports	K 29.70
1960	via Rhodesia on portion allowed to go via Benguela	19.00
1962	Rail via Rhodesia	30.67
1965	Rail via Rhodesia	30.67
1967 (Oct.)	Rail via Rhodesia	40.00
1967	Lobito	42.20
1967	Beira via Malawi	54.20
1967	Dar es Salaam Road	43.16
1967	Dar es Salaam, Air	113.00
1968	Road via Dar es Salaam	44.80
1968	Via Lobito	45.81
1968	Via Rhodesia	45.98
1976	Road via Dar es Salaam	54.00
1977	Via TAZARA	42.04

COMMONWEALTH WEST AFRICA - NEGLECT AND DETERIORATION

Of the four Commonwealth West African countries, Gambia has never had a railroad, the Sierre Leone system has now been abandoned, and the Ghanaian and Nigerian systems have, from all indications, declined substantially in importance in their economies - to a much greater extent than in East Africa, and in stark contrast to the picture in Central Africa.

Nigeria

As the largest country in Africa in terms of population, Nigeria has a relatively substantial rail system - a total of 2,178 miles (3,505 kilometres) - but the system's present role in the economy, compared to road transport, is not nearly as great as might be expected.

The system was an outgrowth of two separate lines, one from Lagos and one from Port Harcourt, joining at Kaduna, the British-created capital of the former Northern Region. The line was started north from Lagos in 1896, reached Ibadan in 1901 and the crossing of the Niger at Jebba in 1909, and in 1912 it was connected at Minna to the line from Baro on the Niger and completed to Kano in 1912. The Port Harcourt line was started northward from that city in 1913, reached the coal mines of Enugu in 1916, the Benue River in 1924 and Kaduna in 1926, with a branch to Jos in 1927.[18] Branches were extended to Kauru Namoda from Zaria in 1929, to Nguru from Kano in 1930, and in a major construction project from Jos to Maiduguri in Bornu in 1964. One of the serious deficiencies is the lack of an east-west line - while passenger trains ran through from Lagos to Port Harcourt, for example, on certain days of the week, the time was much greater than on a direct route. The primary traffic item has been ground nuts moving from the north for export; cola nuts, cotton, timber and cattle have been among the other major products moved, plus petroleum products and manufactured goods bound for the north. The system originally used a small number of Beyer-Garretts, but primarily it relied on 2-8-2 steam locomotives, many built in the 1940s and 1950s. In 1955 all motive power was steam (218 line, 55 shunting); by 1974 there were 133 steam and 138 diesel line engines and 43 steam and 39 diesel shunting engines.

While in the early years the system was relatively profitable, the earnings subsequently became somewhat erratic. In the 1955-65 period, the operating ratio ranged from 81 (1955-6) to 113 (1965-66), averaging 96 (Prest 1969, p. 97). The figure was 107 in 1970 and 138 in 1972-73. From 1959 on, a

18. A 2 foot 6 inch gauge line was built from Zaria to Jos in 1914 to serve the tin mines. This was abandoned in 1957, since the Jos area was served more effectively by the main line.

Fig. 3.

Nigerian Railways

loss was incurred after interest but before taxes in every year except 1963-64; the deficit was Naira 6.9 million in 1965-66, Naira 10.3 million in 1969-70 and Naira 23.1 million in 1973-74 (Nigeria, Third National Development Plan, 1975, pp. 214).[19]

As shown in Table 6, the decline in traffic has been substantial; from a peak of around three million tons in the early 1960s, the figure fell by more than half by 1971-72, recovered somewhat following the end of the Biafran war, but was about one third less in 1973-74 than in 1961-62. The declines in tonnage and ton miles have been comparable. Passenger traffic has fallen sharply, from 11.0 million in 1961-62 to 4.7 million in 1973-74, but passenger miles, while falling after 1970, were greater in 1974 than in the early 1960s. The freight traffic in 1973-74 was 439,853 net ton miles per mile, a relatively low figure. The average length of haul is about 600 miles. The freight revenue was about 3 U.S. cents per ton mile in 1972.

Table 6. Net ton miles for Nigerian Railways, 1960-1974.

Year Ended 31 March	Net Ton Miles (thousands)
1960	1,249,840
1961	1,181,101
1962	1,412,165
1963	1,410,950
1964	1,554,793
1965	1,221,025
1966	1,215,058
1967	1,004,000
1968	986,000
1969	1,094,000
1970	950,147
1971	981,793
1972	750,129
1973	844,000
1974	958,000

Source: Nigeria, Annual Abstract of Statistics 1972, Federal Office of Statistics, 1975.

The Third National Development Plan issued in 1975 provides a detailed analysis of the decline in traffic and increasing operating deficits (apart from the effects of the Biafran war). This has been brought about by a decline in agricultural production, particularly for export, which was a major source of traffic; a sharp decline in coal production; and deterioration in rail

19. 1 Naira = U.S. $1.50.

transport services. As stated in the Development Plan:-

> In fact, for the past ten years the volume of traffic moved by rail has been limited by the Railways' capacity to carry it. The Railways have even lost considerable long distance bulk traffic to the roads in spite of the fact that they would carry this for a lower charge and at a lower cost to the country's economy. This situation is largely attributable to the unreliability, slowness and inadequacy of Railway goods transport services.
>
> Several factors have been responsible for this:
>
> 1. Unbalanced traffic, with greater up than down traffic.
> 2. Rapid decline in wagon (freight car) utilisation due to inadequately co-ordinated scheduling of car use.
> 3. A large proportion of time out for repairs for both steam and diesel locomotives. In 1974, availability times were only 17 per cent for steam locomotives and 54 per cent for diesels. In general, usable motive power is entirely inadequate.
> 4. Slow train speeds, due to the excessive curvature and inadequate track maintenance. The maximum speed allowed anywhere on the system is 40 miles per hour, and restrictions as low as 10 miles an hour are common.
> 5. Inadequate communications, due in part to constant thievery of the copper wire of the communications lines.

Road transport has increased substantially at the expense of the railroad, including long distance transport from the north. There has been little restriction on road transport and weight limits have not been enforced. The increased road transport has added seriously to traffic hazards and congestion (the two roads from Ibadan to Lagos are regarded as death traps by many drivers), but the government has pushed its investment in roads and the railway has been relatively neglected.

In the Third Development Plan a major overhaul of the railway system was proposed, involving essentially the construction of a completely new system to standard (4'8.5") gauge, serving the same points as the present system and built parallel to it, to be phased in gradually. The plans call for building about 320 kilometres per year, and thus will not be completed until well into the 1980s. About Naira 885 million was allocated to the rail system for 1975-80 out of a total of Naira 4 billion for transport, and from this Naira 714 million will be allocated to the first stage of the new system. Meanwhile, some basic improvements will be made to the present system and a new rail commuter service in the Lagos area will be established.

The plans are based upon a study by consultants completed in 1973. The government is convinced that, given potential growth in the economy, improved rail service will cost less than primary reliance on road transport. Whether the proposed system will in fact be carried to completion remains to be seen.

Ghana

Ghana Railways has suffered much the same fate as Nigerian Railways. The system is essentially A-shaped, lines extending from the ports of Sekondi-Takoradi and Accra northward and northwestward, respectively, joining at Kumasi. These two lines in turn are linked by an east-west line paralleling the coast, permitting relatively direct service between Accra and Secondi. The western line was started northward from Sekondi in 1898, primarily to facilitate gold mining in the area around Tarkwa, reaching that city in 1901 and Kumasi in 1903, 168 miles from the ocean. In 1909 a line was started north from Accra to Kumasi, but did not reach there until 1923. The total distance Accra—Sekondi was 363 miles. A long branch was built from the Tarkwa area to Kade, completed in 1927, and this was connected to the Accra-Kumasi line in 1956. Like Nigerian Railways, 3 foot 6 inch gauge is used. Dieselisation began in 1954 and has continued slowly.

The main line of the system is the western line, Takoradi to Kumasi, 171 miles, which handles about 90 per cent of all the traffic. The eastern line, from Accra and the port of Tema to Kumasi, is 214 miles in length. The central line, which connects the other two is 120 miles. There are three branches, to Prestea in the west, to Awaso in the northwest, which handles the bauxite traffic, and to Kade in central Ghana. Total length is 592 miles (953 kilometres).

Total traffic in the early 1970s was about 1.7 million tons and 190 million ton miles (1970), but 90 per cent of this is concentrated on the western line, to give this line a reasonably high ton mi/mi figure of about one million. The rest of the system handles only 200,000 tons, with a ton mi/mi figure of 45,000 - low by any standards. Over 90 per cent of the traffic is southbound, and about 90 per cent of the revenue comes from four commodities - cocoa, timber, manganese and bauxite. Most of the imports and manufactured goods traffic is by road. The operating ratio averaged 89 from 1958 to 1964, but was increasing.

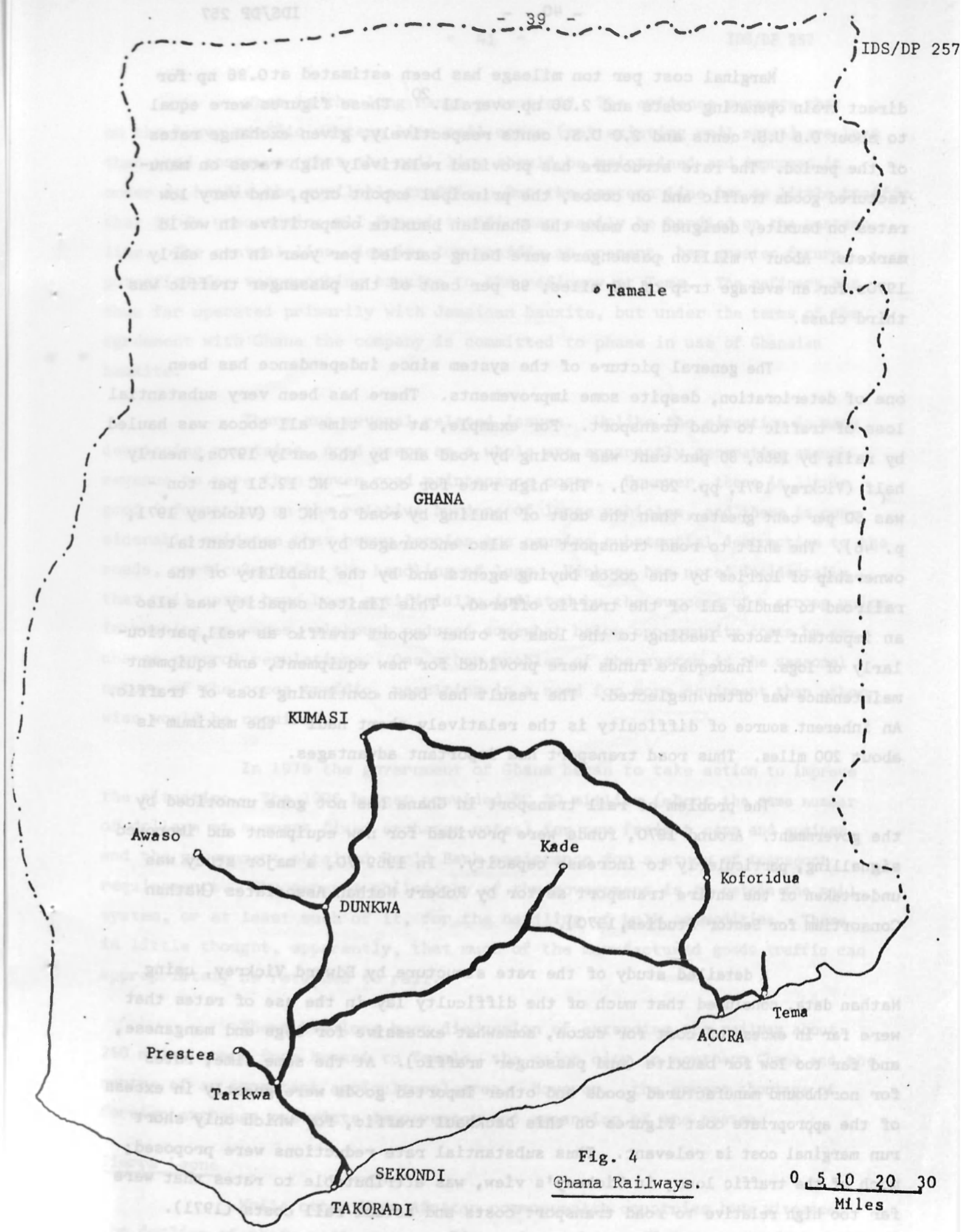

Fig. 4
Ghana Railways.

Marginal cost per ton mileage has been estimated at 0.86 np for direct train operating costs and 2.36 np overall.[20] These figures were equal to about 0.8 U.S. cents and 2.0 U.S. cents respectively, given exchange rates of the period. The rate structure has provided relatively high rates on manufactured goods traffic and on cocoa, the principal export crop, and very low rates on bauxite, designed to make the Ghanaian bauxite competitive in world markets. About 7 million passengers were being carried per year in the early 1970s for an average trip of 40 miles; 98 per cent of the passenger traffic was third class.

The general picture of the system since independence has been one of deterioration, despite some improvements. There has been very substantial loss of traffic to road transport. For example, at one time all cocoa was hauled by rail; by 1966, 30 per cent was moving by road and by the early 1970s, nearly half (Vickrey 1971, pp. 28-46). The high rate for cocoa - NC 12.51 per ton - was 50 per cent greater than the cost of hauling by road of NC 8 (Vickrey 1971, p. 46). The shift to road transport was also encouraged by the substantial ownership of lorries by the cocoa buying agents and by the inability of the railroad to handle all of the traffic offered. This limited capacity was also an important factor leading to the loss of other export traffic as well, particularly of logs. Inadequate funds were provided for new equipment, and equipment maintenance was often neglected. The result has been continuing loss of traffic. An inherent source of difficulty is the relatively short haul - the maximum is about 200 miles. Thus road transport has important advantages.

The problem of rail transport in Ghana has not gone unnoticed by the government. Around 1970, funds were provided for new equipment and improved signalling, particularly to increase capacity. In 1969-70, a major study was undertaken of the entire transport sector by Robert Nathan Associates (Nathan Consortium for Sector Studies, 1970).

A detailed study of the rate structure by Edward Vickrey, using Nathan data, concluded that much of the difficulty lay in the use of rates that were far in excess of cost for cocoa, somewhat excessive for logs and manganese, and far too low for bauxite (and passenger traffic). At the same time, rates for northbound manufactured goods and other imported goods were greatly in excess of the appropriate cost figures on this backhaul traffic, for which only short run marginal cost is relevant. Thus substantial rate reductions were proposed; much of the traffic loss, in Vickrey's view, was attributable to rates that were far too high relative to road transport costs and actual rail costs (1971).

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20. Ed. note: np = new pesewa; 100 np = NC (new cedi); as of September 1973, U.S. $1=NC 1.54.

What is the long range potential? The evidence suggests that on the heavy traffic western line rail costs (not existing rail rates) are less than road costs, so that the rail line should be maintained and improved in order to handle the available traffic. But the eastern line has so little traffic that it is uneconomic; all Kumasi traffic can easily be handled on the western line. The central line, despite low traffic at present, has greater future potential for transporting bauxite to the refinery at Tema. The refinery has thus far operated primarily with Jamaican bauxite, but under the terms of the agreement with Ghana the company is committed to phase in use of Ghanaian bauxite.

There are several related issues. Unlike the situation in many developing countries, road users as a whole are apparently generating enough revenue to more than cover road maintenance costs. However, there is little good information on the relative burdens of large vehicles, and there is considerable evidence that heavy lorries are causing substantial destruction to the roads, particularly in the handling of logs. Vickrey has noted incidentally that rail costs have been artificially inflated by the success of a strong union in pushing up wages, although reduced somewhat below opportunity costs by exchange control regulations. One other problem of the system is the seasonal nature of the cocoa traffic, resulting in a need for more equipment than otherwise would be required.

In 1976 the government of Ghana began to take action to improve the situation. The 1976 budget provided NC 20 million (about the same number of dollars at current fixed exchange rates) for new freight cars and engines, and the government obtained World Bank assistance for a study of transport requirements. The general philosophy of the government is to retain the rail system, or at least much of it, for the handling of bulk commodities. There is little thought, apparently, that much of the manufactured goods traffic can appropriately be returned to rail.

There has long been discussion of extending the railway about 250 miles north from Kumasi to Tamale, the major city in northern Ghana and the centre of an important agricultural area. However, the severe shortage of foreign exchange restricts improvement and expansion of the system.

Sierra Leone

While other West African commonwealth countries have witnessed the decline of their rail systems, Sierra Leone has, under pressure from the World Bank, phased out its 311-mile system altogether.

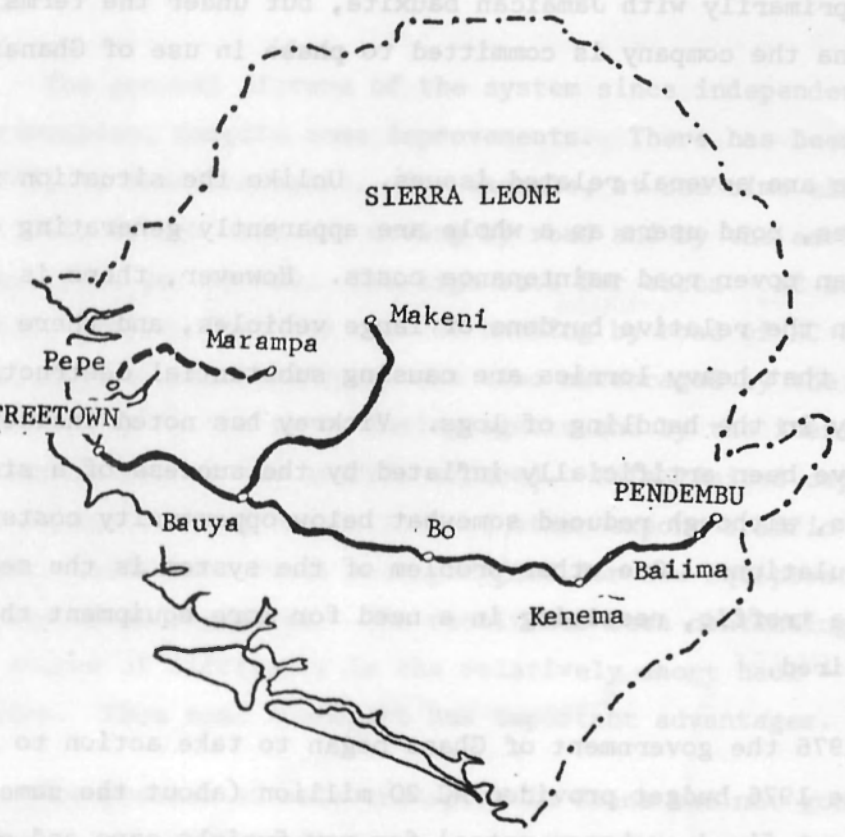

Figure 5. Railways in Sierra Leone.

Construction started from the Freetown area in 1896, reached Bo, the second largest city, in 1903, and pushed rapidly on to Baiima in 1905 and Pendembu in 1908 - 225 miles from Freetown. At the time, this was one of the longest railways in tropical Africa. A branch was completed to Makemi in 1914.

The line was built for reasons of economy with 35 pound rail to a 2 foot 6 inch gauge, miniature by any standards. Much of the line traversed mountainous country, with numerous bridges and grades. A number of Beyer-Garretts were used, the later ones weighing 66 tons. Palm kernels and chrome ore provided most of the traffic. The road was a source of operating losses over most of its history. In the period 1959-1964, for example, the operating ratio averaged 145 - expenses of operation were nearly 50 per cent greater than revenues. Finally, under strong World Bank pressure tied to grants for highway improvement, the government, despite considerable opposition, agreed to phase out the system. This began in 1968, though the main portion from Kenema via Bo to Freetown was retained until late in 1974.

Distinct from this line was a 52-mile line from a point on the river above Freetown to the iron mines at Marampa which was completed in 1933. The closing of the mines in 1976 leaves the future of this line in doubt.

Cameroon and Gabon

While this paper deals primarily with the Commonwealth countries, brief mention will be given to two ex-French areas, Cameroon and Gabon. One of the major railroad projects in Africa in the last decade, second only to TAZARA, was the building of the Transcameroon Railway.[21] Cameroon was a German colony prior to the First World War, and the Germans began to plan construction of rail lines as early as 1902. The first line was built in the north between 1906 and 1911 from a point across the river from Douala to Nkongsamba, about 100 miles. The most important potential route, however, was the central line between Douala, the main port, and Yaoundé, the capital. Construction was started in 1908 on this route, planned ultimately to reach Chad and to cross the continent to link with the Tanganyika lines. The line reached Eseka in 1914, but all construction was stopped by the war. The French began extending the line after the war, but it did not reach Yaoundé until 1927. The French made plans for further expansion, but no development, beyond converting the Mbalmayo

21. This is described in detail in a publication of the Ministry of Transport of Cameroon (1974).

branch from 0.6 metre to 1.0 metre gauge in 1933, was accomplished before the Depression and then the Second World War stopped further work. In 1955 a bridge across the Wouri River was completed to join the northern and central lines. After independence, with financial aid from the United States, the European Economic Community, West Germany and France, the line was started northward from Yaoundé in 1964 and reached Ngaoudere in 1974, an extension of 622 kilometres (390 miles). This is a well built one-metre gauge line; the daily passenger train makes the run in eleven hours - very good for passenger service in Africa, considering the number of stops.

The great problem facing the system, however, is the old Douala-Yaoundé link, over which traffic for the new line must flow. This 308-kilometre segment has 730 curves, many very sharp, and severe grades and numerous bridges. It is an impressive line through very difficult terrain, but it is entirely inadequate to handle the traffic and numerous derailments are occurring. Plans are underway for substantial reconstruction. The present capacity is only about 1.2 million tons a year.

The system as a whole is handling about 1.2 million tons or 325 million ton-kilometres (about 223 million ton-miles) per year, about 305,000 ton-miles per mile. Of the total, the northern line carries only about 150,000 tons. The traffic on the system in 1972-73 was concentrated in a number of categories as shown in Table 7. Thus timber, aluminum products and petroleum provide the bulk of the traffic, followed by manufactured goods and major food items. Road transport competition is not serious on most of the systems.

Table 7. Traffic on the Transcameroon Railway, 1972-73.

Commodity	Tons 000s	Ton-kilometres 000,000s
Timber	282	98
Aluminum ore	128	11
Aluminum ingots and sheets	45	33
Fuel	112	43
Building materials	62	21
Merchandise	97	31
Cocoa	56	17
Bananas	48	5
Coffee	32	6
North Cameroon transit traffic	37	22
Wine and soft drinks	42	7

Source: Cameroon 1975, p. 51.

About two million passengers are carried per year. The system is entirely dieselised, and diesel rail cars are used for passenger service.

The major current project is in Gabon, which adjoins Cameroon on the south. Work was started in 1975, linking the ports of Owendo and Santa Clara via Booué with Franceville, where there are manganese deposits. The line will also be extended to Belinga, where there are iron ore deposits. The line, ultimately 930 kilometres, will cross virtually the entire country. The portion to Franceville is expected to be completed by 1980 and the entire system by 1985.

Major reconstruction of the Congo-Brazzaville line, connecting Brazzaville through mountainous country with the port of Pointe Noire, is being carried out by an Italian firm.

CONCLUSIONS AND POLICY ISSUES

Table 8 summarises the traffic data of all the systems covered in this paper. The costs, converted to cents per ton-mile, should be regarded as only very rough figures because of the artificiality of the rates of exchange in many instances.

Table 8. Summary of traffic and costs of six African rail systems.

Railroad	Mileage	Year	Approximate Net Ton-Miles per Mile of Line 000s	Cost per Net Ton-Mile US cents
East Africa				
entire system	3,663	1975	731	2.5
Nairobi-Mombasa	330		8,500 gross	
Tanzania Central	530[a]		2,700 gross	
Zambia	650	1975	2,190	4.6
TAZARA	1,158	1977	2,000[b]	n.a.[c]
Nigeria	2,178	1974	440	3
Ghana				
entire system	592	1970	170	2
western line	171		1,000	
other lines	421		45	
Cameroon	730	1973	305	

a. Dar es Salaam-Tabora portion.

b. Estimated. Capacity is about twice this great.

c. Likely around 2 cents. Existing road transport Zambia to Dar es Salaam estimated at 5.3 cents.

Conclusions

Out of this brief survey a number of general conclusions can be drawn.

1. The volume of traffic on the main lines - Mombasa-Kampala, Tanzania Central, Zambia, TAZARA, the western line of Ghana Railways and portions of the Nigerian system - is adequate to allow these lines to be run economically. Studies in the United States indicate that many economies are attained at one million net ton-miles per mile (roughly two million gross), and most at two million, even though full economies are not attained until traffic reaches about ten million (twenty million gross) (Harris, 1976).

2. The cost per ton mile would appear to be lower on the main lines than the cost of heavy volume road transport, but road transport services have obtained substantial traffic, partly because of inadequate railway equipment and partly because of the value-of-service rate structures of the railways.

3. A much better picture of relative rail and road costs will be available after a few years of experience with TAZARA, which is replacing heavy volume road transport.

4. There is a substantial mileage, in East Africa and Ghana, of relatively light traffic lines - with traffic under 100,000 net ton-miles per mile. Experience in the United States shows that such lines have substantially higher costs than main lines and that road transport is cheaper in such cases.

5. While all of the systems have survived dramatic readjustments in recent decades, they have all (except Zambia Railways) suffered from general deterioration in the last few years for a number of reasons: governmental emphasis on road development, shortages of equipment due to lack of foreign exchange and governmental neglect, loss of traffic to road transport because of obsolete tariff structures and other reasons and in some instances lack of trained personnel.

6. General attitudes toward the railways differ widely among the countries surveyed, from acute neglect in West Africa to strong emphasis in Zambia. In Central Africa, broadly defined - including Zambia, Zaire, Angola and Mozambique- the railway remains the dominant transport form, in part in some areas because of the lack of inter-city roads.

7. The initial railway tariffs were designed to obtain as much revenue as possible from 'luxury' imports and from exports of primary products, allowing low rates on exports of low-value commodities and imports of items regarded as necessary for development. The structures did not universally favour exports as is commonly argued - witness the high rates on copper from Zambia and on cocoa in Ghana. Of the imports, in some instances particularly heavy rates were placed on petroleum products. One consequence of this value-of-service type of tariff structure was the loss of traffic to road transport as roads were built. Readjustment of the tariffs in light of changing conditions has been slow.

8. Political considerations have played a major role in railway development. As is well known, the political problems of southern Africa resulted in dramatic shifts in traffic patterns; the political difficulties among the three East African countries have seriously injured East African Railways.

9. From the various studies that have been made, it is clear that the early railway lines had a major impact upon economic development and the shaping of modern locational patterns; Nairobi, in some respects the most important city in tropical Africa, owes its existence to the railway. But there is now clear evidence that under present conditions the building of railway lines may have little impact upon development, particularly of agriculture, since road transport is adequate on relatively light traffic lines and rail costs are no lower, and may be even higher, than road transport costs.

10. The importance of petroleum products in total transport is very great. The tonnage of petroleum products imported into Zambia by pipeline is about the same as all surface transport import tonnage. For years East African Railways has received about 25 per cent of its revenue from petroleum traffic; much of this will be lost with the opening of the pipeline.

11. Air transport of freight has proven very costly, and while important in some instances, has not expanded rapidly.

12. Passenger traffic on the railways has changed little in recent years; loss of higher-income and tourist traffic to air and road transport has been offset by increased total passenger travel. Third class service dominates the traffic completely today at fares that are extremely low by comparison with other countries.

Major Policy Issues

The African countries covered in this survey face several policy issues in the transport field.

1. Should new rail lines be built? As suggested above, there are probably relatively few instances in which new lines are warranted. One is to allow development of mineral products providing a substantial volume of traffic. The other is to provide better routes where existing traffic is high - as in the case of TAZARA and the possible connection of Zambia Railways with those of Malawi and Mozambique.

2. Should existing rail lines be preserved? The answer appears to be clearly in the affirmative so far as the main lines are concerned - partly because costs are lower than those of road transport at existing levels and partly because failure to do so would result in such an increased level of road transport that it would precipitate the rapid destruction of the roads. In other words, there is reason to believe that heavy road transport does not pay adequately to cover the damage it does to roads. Taxes on diesel fuel are typically low according to the argument that low rates aid economic development. To build roads to adequate standards to allow heavy volume road transport without prohibitive maintenance costs would add tremendously to government costs in this sector. From all indications, preservation and improvement of the heavy-density rail lines will be much more economical.

Doubts can be raised, however, about some of the longer light-traffic lines, whose high costs per ton-mile raise overall costs and drain the resources of the railway system. But premature abandonment of a line before roads have been developed and before opportunities for economic development have been fully explored may be even more unwise.

A substantial portion of the mileage may be more or less marginal. In comparison of rail and road costs for purposes of determining economic viability of these lines, it is important that true opportunity costs, not simply monetary costs be used. On the one hand, costs for which road transport is responsible but for which it does not pay (additional road costs above those covered by user charges) must be included. Relative drain on foreign exchange at artificially maintained exchange rates should be considered, as well as future relative energy costs, particularly in countries lacking petroleum. The railway is a more efficient user of fuel if traffic is above a relatively low level; if total traffic is no more than a few cars per train, road transport is more efficient.

Another element to consider is the artificial inflation of railway wages in some countries due to strong unions and the previous employment of non-Africans. Road transport, especially with owner-operators, is not subject to this effect. The economic cost of railway labour is not the actual wages paid but the opportunity cost - what these workers could earn in another occupation - and this is often much lower.

3. When railroads are retained, how can an optimal balance between road and rail transport be attained? First, as noted, tariff structures have resulted in uneconomic diversion of traffic from rail to road in many instances; a shift away from value-of-service to cost-related tariffs is obviously required as is recognised in most of the countries.

Secondly, experience in other countries suggests that for a substantial volume of traffic costs of shipping by rail and road, considering not only transport costs but speed, handling and loss and damage elements, are much the same. Should governments seek to ensure that this traffic moves by rail rather than by road by restrictive licensing or other means in order to lower rail costs per ton-mile and avoid deficits? There is obviously some merit in doing so. But the policy is difficult to implement and can easily be overdone, forcing traffic to move by rail when road is far more efficient. In some African countries in which much of the traffic is controlled by marketing boards and parastatal enterprises, it is relatively easy to ensure that this marginal traffic is moved by rail. But in more broadly free enterprise economies, attempts to restrict road transport by licensing are not likely to be successful; the rules are difficult to enforce and firms will develop their own road transport fleets - a practice few countries seek to curtail.

In general the best measures to ensure a reasonably efficient division of traffic appear to be the following:-

a. Revision of tariffs to reflect cost rather than value of service,
b. A policy that all government enterprises use rail rather than road when costs are comparable,
c. Establishment of reasonable weight limits on road transport and enforcement of them,
d. Adequate charges on road transport for road use, and
e. Outright subsidy by government of rail transport in certain instances (for example, to cover the costs of a line retained for regional development purposes or of passenger service if the government seeks to make cheap passenger transport available) rather than requiring the rail systems to cover all costs from revenue.

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