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INDUSTRIALIZATION, ECONOMIC COOPERATION AND TRANSPORT
HYPOTHESIS OF WORK IN THE REGION OF THE GREAT AFRICAN LAKES

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The Geneva Conference on Trade and Development, in analysing the imbalance of world trade between developed countries and proletarian nations, concluded that the permanent trend is for such imbalance to increase. ^{1/}

On the one hand, the developing countries, whose exports consist mainly of raw materials, find that the value of these products is steadily decreasing because of competition between themselves, and also because of technical progress, which has ushered in synthetic products which can replace natural raw materials at a lower price.

On the other hand, manufactured products coming from the industrialized countries and needed for the equipment of the developing countries, show a tendency to increase, because of pressure on the part of the trade unions for higher rates of pay. This is reflected in prices, and cannot always be offset by increased productivity.

Consequently, under the influence of these two series of factors, there is a steady deterioration in the terms of trade, to the detriment of the developing countries which have to provide more and more raw materials in order to obtain less and less equipment and manufactured products.

^{1/} The permanent nature of this trend is not universally acknowledged and some are of the opinion that it cannot be seriously maintained

The following remedies have been suggested :

- on a short-term basis, to palliate the deficit in foreign accounts by trying to stabilize the prices of raw materials (stabilization fund, quotas, etc..) and to reduce the deficit due to invisible causes (maritime freight, insurance, redemption of loans, etc...)
- on a long-term basis, to seek a new international division of work which would enable the developing countries themselves to produce at least some proportion of the industrial products needed for their development ; by industrializing themselves

Moreover, such industrialization is not intended solely to economize foreign exchange. It constitutes a means of development in itself, by expanding the monetary sector of the economy, establishing a prime sector with various repercussions which could facilitate an economic take-off, and creating great additional value through the multiplying effect of distribution of wages, etc..

These various effects of industrialization have been studied and evaluated in the case of an industrialization project in Cameroun^{1/} which provides for the establishment of ten small and medium industries : two cement-works, one timber-peeling yard, one spinning-weaving centre, one blanket factory, one flour-mill, one biscuit factory, one plastic-goods factory, one match factory and one meat-packing plant.

The effects of such industrialization on the home produce of Cameroun are shown in the following table :

	US\$
- Total investment in the ten factories	14,000
- Annual turnover for the ten factories	8,928
<u>Total added value</u>	
- Added value for factories	4,152
- Backward and forward linkage effects	224
- Multiplying effect	5,660
Total increase in home product	10,036

^{1/} Document S.E.D.E.S. 1960 : Industrial Development in Cameroun

The effects of such industrialization on the trade balance of Cameroon are estimated in the following table :

	US\$	
<u>Imports</u>		
Imports suppressed by industrialization	7,360	
New imports required	- 2,500	
Positive balance : reduced imports	4,860	4,860
<u>Exports</u>		
Possible new exports	1,080	
Former exports suppressed	- 400	
Positive balance : increased exports	680	680
<u>Direct effects on trade balance of operation of factories : improvement</u>		5,540

The above figures should be considered as approximate and applying to a specific case. They cannot therefore be generalized, but tend to prove that industrialization provides a powerful stimulus for the growth of the home product. They explain the determination of the developing countries to industrialize, and the efforts they are making for that purpose. In practice, unfortunately, industrialization limits are quickly reached at the national level.

In an interview published by the weekly paper "Jeune Afrique"^{1/} a specialist on the subject, Mr. George Woods, President of the International Bank for Reconstruction and Development, pointed out the limitations of this method

Question

"One of the ambitions of the developing countries is to set up national industries. Yet it seems that industrial efforts will not be enough unless agriculture is given priority ?

^{1/} Jeune Afrique : N° : 257 of 28.11.1965, p. 24 et seq.

Answer

That is true. More than two-thirds of the population in the under-developed countries are engaged in agriculture. I believe it is not realistic to think that the aim of industrialization is to manufacture and export products towards the industrialized countries; which are much more competitive. The main objective is to satisfy the requirements of the population. As long as the people engaged in agriculture have not achieved a decent living standard and sufficient purchasing power to buy ordinary consumer goods, there can be no market for industrial products. The leaders of the young nations are increasingly aware of this problem, whereas a few years ago they were convinced that industrialization was a miracle solution. Today, they readily give priority to agriculture".

This stresses the importance of the concept of trade, which is easy to explain. The new African products will have to take the place of former imports, and must therefore be able to compete with them as regards quality and price. Technical progress, however, calls for a system of production which is increasingly capitalistic : - production units are getting bigger and bigger, there is more and more automation, and the total investment per unit is constantly increasing. In determining prime costs, financial commitments and structural costs are beginning to out-weigh operational expenses. The law of increasing returns is gaining ground steadily, and the volume of production corresponding to the economic optimum is becoming more and more considerable ^{1/}.

In this respect undertakings in the industrialized world exporting to the developing countries are in an extremely good de facto position. Backed by an extensive national or community-protected market, they operate in the neighbourhood of optimum production

^{1/} This does not mean the disappearance of small and medium industries, for which the interstitial market is still considerable. Vide HERBERT GROSS : "Petites entreprises et grand marché", Les Editions d'Organisation (Paris) and "Econ-Verlag" SARL (Dusseldorf)

This enables them to reach the minimum mean production cost per unit in relation to the local price of production factors. Exports, always uncertain, generally account for a small fraction of production which is not indispensable for the balance of these undertakings. According to document E/CN.14/INR/87 (page 28 of French text), world output of steel in 1963 came to 386 million tons, and of that amount only 41 million tons were placed on the international market, including 11 million tons inside the European Economic Community.

The 30 million tons sold on the open international markets thus accounted for only 7.77% of production. In the fight to win over the African markets these advantages are, however, partly offset by distance. Maritime transport between Europe and Africa costs between 10 and 25 US dollars per ton, which constitutes a natural protection for African firms selling on their own national market.

Another factor is that of prices CIF African port because supply is infinitely elastic in relation to the small quantities of goods imported.

In studying the prospects of African enterprise today, we soon realise that it is impossible to lay down any general rule concerning the relative position of production operations in Africa as compared with the confirmed position in any of the industrialized countries. This depends greatly on local conditions and on the products themselves. Certain factors may favour Africa, like the lower cost of some raw materials (crude petroleum and natural gas in the Sahara; high-density iron-ore in Gabon, Mauritania and Liberia; bauxite in Guinea, fatty substances; fibres, textiles, etc...), considerable reserves of hydro-electric power, taxation which is usually lower than in Europe, lower wages than those obtaining in industrialized countries (apart from productivity), etc.. As against this, there are other factors pulling in the opposite direction. A higher total investment when equipment must be imported; provision for increased maintenance services; construction of housing

for local and expatriate personnel; sometimes provision of water electricity, air-conditioning etc.. Running expenses are likewise increased when it is necessary to employ better-paid expatriate personnel, or when extra spare parts must be provided in the absence of an industrial environment, or when the source of supply is far distant, etc..

In any case, such African production does exist and is subject to the law of increasing returns, which explains the limits of industrialization on the national scale. On the one hand (see Annex 1 - fig. 4), a fixed CIF price for imported products, together with an infinitely elastic supply and, on the other hand, a production cost ex African factory based on the volume of production, and therefore on the accessible market. Several situations may then arise, as follows :

1. The national market is weak (50,000 tons) at the current rate of US\$ 50 per ton. For this volume of production, the African product would cost US\$ 160 per ton, and there is no hope of seeing the industry in question take root without resorting to unorthodox methods like subsidies for equipment and balance. Customs protection seems likewise impossible; it would have to be as high as US\$ 110 per ton, and at that rate would considerably reduce consumption through price-elasticity for the consumer, thus increasing the cost of production still further. To establish such an undertaking would run counter to the aim pursued.
2. At the rate of US\$ 50 per ton, the national market is 225,000 tons. For this volume of production, African manufacture is possible at the rate of US\$ 60 per ton, that is to say 20% more than the imported product. Customs production can then be given (because it is moderate) to help the undertaking to get started. After a few years, the normal increase in consumption through development will enable it to operate alone and unprotected. Short-term implantation is possible.

There are many examples of such cases. Two cement-works are planned in Cameroon (see Annex I-fig.1). In South Cameroon, the market came to around 65,000 tons in 1960 at the price of US\$ 24.6 per ton ex Customs at Douala, and consumption estimated for 1965 amounted to 90,000 tons. Production figures for the undertaking showed an ex facto cost of approximately US\$ 22 per ton for a production of 65,000 tons, and US\$ 19 per ton for a production of 90,000 tons. Cameroonian production could therefore compete with imports, and the factories were recommended. The position was different in North Cameroon. In view of the high cost of road transport between Douala, Yaoundé and Garoua (1260 km. at US\$ 0.04 per t. km., i.e., US\$ 50 per ton for transport), the district was supplied from Benoué via Nigeria, and the cement delivered at Garoua at the price of US\$ 64 per ton. Notwithstanding the weakness of the North Cameroon market (8,000 tons approximately), a small cement-works became economically feasible, especially if it could supply part of the Chad (10,000 tons). A cement-works with a capacity of from 20,000 to 30,000 tons was proposed. This latter example shows how all other things being equal, the distance of the port of entry from the market to be supplied (North Cameroon) can favour industrialization, by adding the cost of road transport to that of the imported product.

According to preliminary studies in connection with industrialization in East Africa, the consumption of wire rods in Madagascar will reach 14,000 tons by 1980. The rods are delivered CIF East African ports at an approximate cost of US\$ 135 per ton, and production estimates (excluding raw materials) show that the cost of manufacture would be far in excess of US\$ 100 per ton for that amount (see Annex I fig.2), whereas at optimum production it would be less than US\$ 20 per ton. Manufacture on a national scale therefore seems to be ruled out so far as The Big Island is concerned.

Smallness of the national market is therefore an absolute impediment to industrialization with the exception of the usual cement-works, breweries etc.. This is due to two factors:

a) Insufficient income ^{1/}, which means that the people cannot afford to buy manufactured products. No immediate action can be taken without pre-supposing that the development problem has been solved. The only way to increase income is therefore through agricultural priority. With the help of time, the natural increase in the population and the growth of income, the national market will expand and it will be possible to reconsider the problem. Meanwhile, studies can help to determine which industries may become feasible in the fairly near future.

b) Too few consumers. India with 397,500,000 inhabitants and a gross national product amounting to US\$ 69 per capita, can have several siderurgical undertakings to feed the national market, whereas the Ivory Coast, with 3,200,000 inhabitants and a gross national product amounting US\$ 186 per capita, would not be able to do so, even if it had all the necessary natural resources.^{2/} This lack of consumers may, however, be remedied if it is possible to conquer outside markets.

So far as the size of national markets is concerned, Africa is, on the whole, the worst-off continent. Not only is the standard of living low, as in all the developing countries, but the population is small and scattered throughout many States as follows :

3 States	have more than	20 million inhabitants
5 "	" between 10 and 20	" "

^{1/} See studies on the relationship between per capita income and average consumption of steel, cement etc...

^{2/} Source : Planification en Afrique - Vol. IV, p. 83 issued by the French Ministry of Cooperation.

5	States or territories	have between 5 and	10 million inhabitants
5	"	"	"
7	"	"	"
6	"	"	"
4	"	"	"
14	"	less than	"

It seems rather unpromising to look for outlets for manufactured products in the developed countries. Their industries are in fact highly competitive and, in this case, maritime transport would work against the interests of the African products. As exports are always uncertain, the African national markets would remain too restricted to support an essentially exporting industry, unless by agreement with the big industrial groups which control in general all the trade channels for distributing products. lastly, there is little probability that the developed countries would readily open up their markets to products manufactured in the developing countries.

Only one solution still remains : the African countries must cooperate, must cooperate economically. That is the solution chosen by the Heads of State in 1963 and recommended by the Geneva Conference on Trade and Development. It has now become the declared policy of the Economic Commission for Africa. ^{1/}

Economic cooperation raises many problems concerning policy alignment, standard regulations, etc...^{2/} Only one aspect is envisaged here : to enable African industries to take root by extending the market through a regrouping of countries, and to enable an industry located in one State to compete on an equal footing with imported products in another State.

^{1/} Resolution E/CN.14/RES/149 (VII) -Nairobi 22 Feb. 1965

^{2/} See Memorandum on the three conditions governing economic integration (connectivity, compatibility, convergence) by R. Erbes (Economic Review June 1965) and Memorandum on the integration of economic spaces, by J.R. Boudeville (Cahiers de l'ISEA, September 1964)

Even from this restricted aspect, economic cooperation gives rise to some thorny problems by shifting the difficulties from the technical and economic fields to the political field. It will in fact be necessary to determine the following :

1. The framework for cooperation, that is to say the States wishing to join together ;
2. The distribution of industries; an essentially political problem.

The framework for integration could be a first source of conflict, because the localization of raw materials, the geographical position of each State, the distribution of consumers, the structure of the transport system, may lead to suggestions for certain regroupings which are not in line with political affinities. From the economic standpoint, the predetermined administrative framework for the ECA sub-regions is not perhaps the best choice. In practice, and for operational requirements, it is often divided up (Committee for the Industrialization of the Maghreb, Committee for Lake Chad, Committee for the Control of the Waters of Lake Tanganyika, etc..) The possibility of economic cooperation and industrialization would then be the result of conflicting economic exigencies and political constraints. The Savannah is the place to shoot buffalo, not the forest.

Once the framework for cooperation has been chosen, the choice of industries will depend on the factors of available production and the size of the market to be supplied. The distribution of these industries between the States constituting the Community can be determined only by the States themselves. For many industries, indeed, there will be several economically possible sites, and each State will naturally try to reap the greatest benefit from this distribution. Such difficulties can be settled only by negotiations.

The pursuit of economic cooperation presupposes a certain view of Africa's future. At the dawn of its independence, Africa is deeply stamped by a century of so-called "colonial pact" policy. That policy, closely linking the metropolitan country and the Colony, led to transport systems running inland from the coast, in which large sums were invested. The African economy, therefore, is often dominated by the transport system, which forces a State to trade with the outside rather than with its neighbours.

The will to economic cooperation is a complete reversal of the former trend. It would be astonishing if the instrument installed for the "Colonial pact" policy were suitable for a policy of cooperation. To envisage such cooperation within the framework of the present transport system would be to try to use an instrument which is not at all adapted to the purpose in view. Anyone will tell you not to hunt buffalo in the forest with a fishing-rod or a butterfly net, but to go after him in the savannah with a good gun.

The shortcomings of the present transport system are particularly striking in the region of the Great Lakes.

BREAK DOWN OF THE AFRICAN MARKET THROUGH LINES OF PENETRATION IN THE REGION OF THE GREAT LAKES

In contending with imports, African products will above all encounter competition in the trade distribution centres. Trade in imported manufactured products is organized at different levels : importers, wholesalers and retailers. Importers and wholesalers are found at the ports and at the main towns in the interior, where they have their stores from which they distribute imported manufactured products and assemble goods for export. It is therefore access to these trade centres - which are usually administrative centres, too - which should be made easier for African products, to enable them to compete with imports.

As regards the operation of economic cooperation, the lines constituting the African transport system may be divided into three categories : (See Annex IV - Chart 1) :

- Lines of penetration
- Axes of integration
- Supply network

Lines of penetration and axes of integration

The lines of penetration are those traditionally followed by imports and exports. They link the big ports and inland towns, and usually handle much traffic. They consist almost exclusively of railways and navigable waterways, along which the trade centres are naturally located.

The axes of integration consist of the lines followed, or to be followed, by African products traded between the African countries in the event of economic cooperation. Since the trade centres of each country are located on the lines of penetration, the axes of integration link, or should link, the lines of penetration of the various countries. At present, these axes of integration are very diverse : sometimes they are railways or navigable waterways, but more often they are roads in fair or mediocre condition - and even such roads do not always exist.

The supply network includes all the secondary roads which supply the interior from the lines of penetration and the trade centres. Imported goods are distributed through this network, and goods for export conveyed to the exporters' shops. It consists almost entirely of roads and tracks. It is extremely important for national development. From the point of view of economic cooperation and the struggle between African products and imported products, it is of secondary interest, as African products and imported products have to use it from the trading centres on the same footing, and costs are equally affected in both cases. As the supply network does not involve any disparity between African goods and imports, it will not be considered further.

The distinction between these various categories is not absolute, especially in the case of surrounded countries. For instance, in Uganda, Zambia, Rhodesia, Upper Volta and Mali, the railways linking these countries with the ports not only serve as lines of penetration for overseas imports and exports, but are also axes of integration for trade with the coastal country. Lake Tanganyika is a line of penetration for Burundi and an axis of integration between Zambia, Congo Leopoldville, Tanzania and Burundi.

Failing any adequate axis of integration (Kenya - Ethiopia) products for trade must take the lines of penetration of both countries which involves trans-shipment to a maritime line and the drawbacks of two changes, plus those of handling, special maritime backing, etc... Maritime transport also has the drawback of directly exposing the African product Muttalis Mutandi to competition with the imported product.

Lines of penetration in the region of the Great Lakes

The lines of penetration are evident, and their effect may be imagined, on studying the tremendous African region extending from the Sudan to Rhodesia and largely centred on the Great Lakes. There are six of these lines, and almost all imports into the region are carried by one or other of them.

1. The Sudanese line : See Annex II - Chart 2

The Sudanese railways extend their network very deeply inland from Port Sudan, and complete their service by water transport along the Nile which is run by the same company at identical rates. All the main towns of the country are supplied by this system, which goes as far South as Juba, 2,600 km from Port Sudan .

2. The Kenya-Uganda line : See Annex I - Chart 3

East African Railways and Harbours (E.R.A. & H.) run their main line from the port of Mombasa (PK 0) to Tororo (PK 1089), where it divides in two : one branch goes north, and now ends at Pakwach (PK 1589) on the Nile, pending its extension to Okollo and Arua (PK 1729) as soon as the Nile bridge has been completed. From Tororo (PK 1089) the southern branch goes to Kampala (PK 1326) and Kasese (PK 1661) on the Congo Leopoldville border. There are several minor branches of this main line, two of them going to Lake Victoria at Kisumu and Port Bell.

3. The Tanzanian line : See Annex II - Chart 4

This railway, also run by the E.A.R. & H., begins at Dar-es-Salaam (PK 0) and goes via Ruvu (PK 79), Kilosa (PK 289) Dodoma (PK 464), Tabora (PK 850), Kaliua (PK 972), to its terminus at Kigoma (PK 1260) on the shore of Lake Tanganyika. To the north, a branch line from Tabora goes to Mwanza (PK 1230) on Lake Victoria, while another runs south from Kilosa towards Zambia : it now reaches Kidatu (PK 398) and will eventually go to Makumbako (PK 804) and Mbeya (PK 1004), to link up with the Zambian railways at Kapiri-Mposhi (PK 2090). The opening of a branch line from Makumbako to Ilela (PK 1166), on the borders of Lake Nyassa, is under consideration.

From the port of Tanga (PK 0), another railway line leads to Mnyusi (PK 67), Korogwe (PK 82), Kahe (PK 328), Moshi (PK 249) and Arusha (PK 436).

4. The Trans-Mozambique lines : See Annex II - Chart 5 & 8

From the port of Peira, the railway goes to Dondo, Salisbury, Lochimvar and Somabula (PK 935). At Dondo, a line branches off towards Malawi via Blantyre and Chipoka (PK 793)

on lake Nyassa, and ends at Salima (PK 819). From Lochimvar (PK 610) another branch goes to Sinoia (PK 742), 374 km distant from Lusaka by road, and ends at Zawi (PK 776).

From Lourenço-Marques (PK 0) a direct line goes to Somabula (PK 924) and continues via Bulawayo (PK 1074) Livingstone (PK 1559), Kafue (PK 1977), Lusaka (PK 2026), Kapiri-Roshi (PK 2213), Ndola (PK 2347), - centre of the Copper Belt - joining the Congo-Leopoldville railway network at Sakanika (PK 2363). From Bulawayo, a branch line goes towards South Africa across Bechuanaland, thus giving access to the ports of Durban, Port Elisabeth and Capetown.

Two projects now in abeyance may alter the economy of transport in this region :

- Transport along the Zambezi, already studied by the Portuguese authorities. According to certain sources of information, the river could be made navigable to the sea in the neighbourhood of the Kariba Dam by means of sluices and locks at Cahora-Bassa and the Lupata Gorges.
- Construction of a link-line between Sinoia and Kafue (approximately 380 km) which would shorten the distance from Beira to Lusaka by approximately 850 km, reducing it from 2,026 to about 1,176 km.

The main project in Zambia is the railway link with Tanzania, between Kapiri-Roshi and Kidatu (1,692 km approx.), for bringing out copper and developing Northern Zambia and Southern Tanzania. Ndola, centre of the Copper Belt, is situated as follows in relation to various possible ports of exit :

Via Lobito	2,378 km of railway		
" Beira	2,347	"	at present
" Beira	1,500	"	approx., if Sinoia-Kafue line is built

Via Dar-es-Salaam	2,224 km of railway	with the projected new line
" Matadi	2,215	plus 800 km of navigable waterway

II 5. Trans-Angola line : See Annex II - Charts 6 and 7

From the port of Lobito (PK 0) the Benguela railway goes through Nova Lisboa (PK 426) and crosses the Congo-Leopoldville border at Dilolo (PK 1350). It then traverses Kilwezi (PK 1775) and links up with the Congolese system at Tenke (PK 1870). This line gives access to Ndola in Zambia etc..., or north to Kamina (PK 2233), Kabalo (PK 2680) and Albertville (PK 2953) on the shore of Lake Tanganyika, all by rail.

6. The Congolese system : See Annex II - Charts 6 and 7

The Congolese system comprises first of all a common trunk line, which is the railway from Matadi (PK 0) to Leopoldville (PK 366), run by OTRACO. It then divides into three branches as follows :

(a-) To the East navigation on the Congo gives access to Stanleyville (PK 2120) where the river ceases to be navigable because of the rapids. This reach is duplicated by a railway line from Stanleyville to Ponthierville (PK 2245), where navigation is resumed on the Lualaba as far as Kindu (PK 2555). From there onwards, the Congolese railway network gives access to Kabalo (PK 2996) and Albertville (PK 3269) on Lake Tanganyika. From Kabalo, a link-line connects with the rest of the Congolese railway at Kamina.

(b-) To the North-East, navigation up-river on the Congo as far as Bumba (PK 1723) and then the Itimbiri, leads to Aketi, head of the line for the Congo district railways (VICICONGO). An extension of the

latter as far as Bumba (185 km) is under consideration because of the difficulties involved in navigating the Itimbiri. From Aketi (PK 1908), this line gives access to Lienart (PK 2166), Paulis (PK 2466) and Mungbere (PK 2591). An extension of the VICICONGO railway to Kilo et Moto was contemplated in the past.

- (c-) To the South-East, the Congo, and later the Kasai are navigable up to Port-Francqui (PK 1166), where the railway line starts out for Luluabourg (PK 1588), Kamina (PK 2144), Tenke (PK 2507), Jadotville (PK 2612), Elisabethville (PK 2744) and Zambia at Sakania (PK 2144). The Kamina-Kabalo link-line (447 km) joins up with the Eastern line at Kabalo (PK 2591) and the latter continues on to Albertville (PK 2864).

All these lines of penetration converge in the region of the Great Lakes, which is densely populated, highly mineralized, very fertile, and has vast reserves of hydraulic power. A straight line drawn on the map from Juba to Albertville will show how, bearing in mind the VICICONGO extension project from Mungbere to Kilo, the six great lines of penetration come within 50 km of the perpendicular.

In addition to the great lines of penetration, there are others, which for the moment, are only of national or lesser importance.

7. Ethiopian lines : See Annex II, Charts 9

These include :

- The Franco-Ethiopian Railway : Djibouti (PK 0), Nazareth (PK 679), and Addis Ababa (PK 782), with an extension project towards Sidamo .

Province : Nazareth - Dilla (PK 1010).

- The railway from Massawa (PK 0), to Asmara (PK 1117), the terminus at Agordat (PK 306) being approximately 150 kilometres from Tessenei, on the Sudan railway line.
- The road from Assab to Addis-Ababa (861 km).

Axes of integration in the region of the Great Lakes

The position here is much more complicated than in the case of the lines of penetration. A distinction will be drawn between railways, navigable waterways and roads.

1. Railways :

- a) The interconnected railway system of Angola, Congo-Leopoldville, Zambia, Rhodesia, Mozambique, Malawi, Swaziland, Bechuanaland, South Africa and South-West Africa provides, in theory, for railway traffic in this zone, but often involves lengthy deviations. Between Lusaka and Salisbury, for instance, a good two-lane asphalt road covers the 491 km separating the two cities, whereas the journey by rail is about three times as long involving a detour via Livingstone and Bulawayo, a distance of 1,435 km.

Similarly, between Salisbury and Blantyre, the partly improved road via tete covers 619 kilometres, whereas by rail the detour via Dondo means a total distance of 1,101 km. or approximately twice as long .

From Lusaka to Blantyre the road covers 1,110 Km. whether via Fort James and Lilongwe or via Salisbury while the rail journey covers 2,536 km. more than twice the distance.

The link-line between Kafue and Sinoia would reduce the distance by rail from Lusaka to Salisbury from the present figure of 1,435 km. approximately 570 km.

b-) The Kenya-Uganda and Tanzania lines of penetration are interconnected by 602 km. of link-line between Voi, Kahe, Korogwe, Mugusi and Ruvu and completed by two branch lines : Mugusi - Tanga and Kase-Moshi-Arusha. All are run by the E.A.R. & H. Through the railway system which is common to Uganda, Kenya and Tanzania, Nairobi is 1,045 km. from dar-es-Salaam and 795 km. from Kampala. When the projected link-line between Moshi and Kalamkwani (192 km.) is built, the distance from Nairobi to dar-es-Salaam will be shortened by 194 km. reducing it to 851 km.

c-) The construction of the Dar-es-Salaam - Kapiri - Mposhi interconnection will enable railway traffic and trade between the two interconnected system mentioned in (b) above. The distances from Kampala to the main centres will then be as follows :

Kampala	PK 0	
Nairobi	PK 795	
Ruvu	PK 1567,	with the Kalamkwani-Moshi link-line
Kilosa	PK 1777,	if not, add 194 kilometres
Kidatu	PK 1886	"
Mukumbako	PK 2292	"
Mbeya	PK 2492	"
Kapiri-Mposhi	PK 2578	"
Lusaka	PK 3765	"
Salisbury	PK 4,335,	with the Sinoia-kafue link-line.

- d) In Ethiopia a team of experts^{1/} recommended, inter alia, an Assab/Addis Ababa railway, to be prolonged to Gambeila and the Sudan, together with secondary lines from Addis Ababa serving the rich provinces of Wollega, Illubabor and Kefa, that is to say, the southwest region of Ethiopia.

2) Navigable waterways

a) The Lower Nile

Until recent years the Nile was navigable and exploited from Wadi-Halfa, terminus of the Sudan railways on the border of the United Arab Republic, as far as Shelal, 340 km. distant, near Aswan.

The building of the Aswan Dam and the formation of the artificial lake, spreading over 500 km., will alter the former conditions of navigation, both up-river, and down-river through flow-control.^{2/}

There appears to be no provision for a sluice or lock to enable ships to pass from the upper to the lower reaches. But Aswan is to have a port served by the Egyptian railways.

When this work is finished and the railway and port installations at Wadi-Halfa are once more in place, the Aswan artificial lake will permit transit of goods between the Egyptian and Sudanese railways.

b) The Nile, the Sobat and the Baro

There is seasonal navigation now between Malakal in the Sudan and Gambeila in Ethiopia, first going up the Nile for 23 km., then along the Sobat for 348 km., and finally along the Baro for 201 km. Gambeila

^{1/} See the Ethiopian Herald, Vol. VI, No. 184, of 5 August 1965

^{2/} See A. Lederer: "Le Bassin Hydrographique du Nil et son équipement fluvial" in the "Bulletin des Séances de l'Académie Royale des Sciences d'Outre-Mer de Belgique", VII - 1961, 4, pages 648 et seq.

is thus 572 km. distant from Malakal. Traffic fell from 2000 tons in 1958 to 900 tons in 1961 and 157 tons in 1963 (including 141 tons of coffee).

c) The Nile and Lake Albert

Because of the rapids, the Nile is not navigable between Juba and Nimule. But after Nimule the Nile and Lake Albert form 400 km. of waterway serving the the ports of Kassenyi, Butiaba, Mahagi, Pakwach, Camp-Rhino and Nimule, located in three countries: Uganda, Sudan and Congo-Leopoldville. The E.A.R. & H. exploited this reach until 1964, but have stopped since the improvement of overland transport in that area, and also because of difficulties due to irregularities of depth. Only one local traffic still continues, and it does not seem that this sector can be of much interest for large-scale international transport.

d) Lake Victoria

Covering an area of 67,000 km², Lake Victoria is common to Uganda, Kenya and Tanzania and is the head of important navigation exploited by the E.A.R. & H. Traffic is in the vicinity of 200,000 to 300,000 tons per annum between the six main ports, as indicated in the following table :

	Kisumu	Port-Bell	Bukakata	Bukoba	Mwanza	Musoma
<u>Kisumu</u> ^{1/} (Kenya)	-	278	333	360	367	233
<u>Port-Bell</u> (Uganda)	-	-	103	256	383	256
<u>Bukakata</u> (Uganda)	-	-	-	137	283	253
<u>Bukoba</u> (Tanzania)	-	-	-	-	180	227
<u>Mwanza</u> (Tanzania)	-	-	-	-	-	198
<u>Musoma</u> (Tanzania)	-	-	-	-	-	-

^{1/} Underlined ports are served by the E.A.R. & H. Railway network.

e) Lake Tanganyika

Lake Tanganyika is more than 700 Km. in length, and borders on four nations: Zambia, Tanzania, Burundi and Congo-Leopoldville. It can therefore form an excellent axis of integration from north to south. Two of its ports, Albertville and Kigoma, are served by the railway.

Up to the present, it has been mainly used as a line of penetration by Tanzania, Congo-Leopoldville and Burundi. Until 1964, the CFL (lake railway) company was the only one linking the northern part with the ports of Kigoma. Rumonge, Baraka, Bujumbura, Kalundu and Kabimba, the respective distances in Km. being indicated in the following table :

	Albert- ville	Kalimba	Kigoma	Rumonge	Baraka	Bujumbura	Kalun- du
Albert- ville ^{1/} (Congo-Leo)	-	57	135	258	309	345	345
Kabimba (Congo-Leo)	-	-	84	207	258	294	294
Kigoma (Tanzania)	-	-	-	123	174	210	210
Rumonge (Burundi)	-	-	-	-	51	87	87
Baraka (Congo-Leo)	-	-	-	-	-	102	102
Bujumbura (Burundi)	-	-	-	-	-	-	24
Kalundu (Congo-Leo)	-	-	-	-	-	-	-

In 1958, 220,000 tons were handled at Albertville and also 220,000 at Bujumbura. In the same year, traffic

^{1/} Underlined ports are served by railway.

on the Congo-Leopoldville line from Rwanda and Burundi via Tanzania amounted to 89,000 tons, all of which therefore passed through Kigoma.

The southwest shore of the Lake is likewise exploited by the CFL company from Albertville (PK 0) to Katakwi (PK 10), Tembwe (PK 70), Moba-Badouinville (PK 135), Zongwe (PK 190) and Lunangwa (PK 320).

On the southwest shore the E.A.R. & H. ensure transport between Kigoma and Mpulungu (480 km.), serving en route Lagossa, Kibweza, Karema, Kirando, Kipili, Wapembe, Kala and Kassanga. Total traffic is around 12,000 tons per annum.

f) Lake Nyassa

About 480 km. in length, Lake Nyassa is bordered by Malawi, Tanzania and Mozambique. Two railways now reach its shores at Chipoka in Malawi and Metangula in Mozambique. In Tanzania, a branch line from Makumbako to Ilela is under consideration. At the moment, there is but little traffic on the Malawi shore, between the ports of Monkey Bay, Chipoka, Kota Kota, Nkata Bay, Deep Bay, Kambwe, Itungi and Mbanba Bay. In view of its great length, it could be used for long-distance international transport.

g) The small lakes

The other international lakes - Lake Edward (Uganda to Congo-Leopoldville) Lake Kivu (Rwanda to Congo-Leopoldville) and lake Moero (Zambia to Congo-Leopoldville) are used for navigation of local interest, but are apparently too small to incorporate in an international transport system. Lake Rudolph (Ethiopia - Sudan - Kenya), does not seem to be used at all.

h) The Zambezi

At present the Zambezi is not suitable for navigation, except up-river from Livingstone and down-river from

Marromeu. The Portuguese plan to work on the river at Cahora-Bassa and in the Lupata Gorges might in the future make it a waterway for trade between Rhodesia and Zambia, on the one hand, and Mozambique and perhaps Malawi on the other.

i) The Congo and the Ubangi

The Congolese system also serves as a line of penetration for Congo-Brazzaville and the Central African Republic. The railway from Pointe Noire to Brazzaville (510 km.), beyond the Congo, and then to Ubangi gives access as far as Banqui in all seasons. Seasonal navigation exists up-river as far as Ouango. On the right bank of the Congo the Sangha, one of its tributaries, gives access to Salo in the Central African Republic and Port Soufflay (by means of a minor confluent, the N'Goko) as far as the Cameroon and Congo-Brazzaville border. This network also serves as an axis of integration between the Central African Republic, Congo-Brazzaville and Congo-Leopoldville.

3) Roads

Apart from air travel, the road network is the sole means of transport between the various countries. It consists roughly of the following :

a) One feed road Matadi-Beira (4640 km.)

With a length of 4,640 Km., asphalted from Matadi to Kengo (650 Km.) and from Kolwezi to Beira (1,900 km.), this road goes to Louluabourg, Kamina, Elizabethville, Lusaka and Salisbury.

b) Five north-south roads

These five roads, fed by the above, consist of the following:

- The Great north-south axis: 4,840 km.

Starting from Asmara (PK 0), this road goes via Addis-Ababa (PK 1066), Nairobi (PK 2549) and Dodoma

(PK 3256), to Tunduma (PK 4023), and rejoins the feed-road at Kapiri-Mposhi (PK 4840). Approximately 700 km. are asphalted, but between Ethiopia and Kenya the road is just a track, accessible only to four-wheel-drive vehicles.

- The Lakes axis: 2,540 km.

From Juba (PK 0), this road goes to Kampala (PK 671) Uvumza (PK 1534), and Abercorn (PK 2162) and rejoins the Great North-South Axis at Mpika (PK 2546).

- The East-Congolese axis: 2,820 km.

From Juba (PK 0), this road runs west of the Lakes to Bunia (PK 657), Goma (PK 1230), Bukavu (PK 1438), and Albertville (PK 1944), to rejoin the feed-road at Elizabethville (PK 2823).

- The Central Congolese axis: 2,800 km.

From Bangassou (PK 0), it goes via Stanleyville (PK 725), Kindu (PK 1327), and Kamina (PK 2363), and ends at Guba (PK 2797), on the feeder, near Jadotville.

- The Malawi axis: 1,980 km.

From Mpulungu (PK 0), this road intersects the Great North-South Axis at Tunduma (PK 236), serves Fort Hill (PK 329), Lilongwe (PK 396), Blantyre (PK 1395) and Tête (PK 1581), and ends at Salisbury (PK 1975).

- Lake Tanganyika variant: 900 km.

An alternative lake axis route from Kampala (PK 0) goes to Rwanda and Burundi via Kigali (PK 584), and Bujumbura (PK 880) to its terminus at Kalundu (PK 903).

c) Transversal roads

There are excellent roads to duplicate the lines of penetration, but here we are concerned only with those giving access from one country to another. They are mainly as follows:

- Bangui/Bangassou/Bambouti/Juba: 2,073 km.

- Stanleyville/Paulis/Juba : 1,186 km.

- Stanleyville/Bunia/Pakwach/Gulu : 1,074 Km.
- Stanleyville/Bukavu/Gitega~~x~~: 1,104 Km.
- Stanleyville/Goma/Kampala : 1,444 km.
- Stanleyville/Kasese/Fort Portal/Kampala : 1,236 km.
- Stanleyville/Kasese/Mbarara/Kampala : 1,220 km.
- Lusaka/Fort Jameson/Lilongwe : 752 km.

On the whole, these roads, which permit or permitted trade between the various countries in the region of the Great Lakes, are mediocre, and the charges are, in practice, very high as compared with those obtaining on the lines of penetration.

Road expenses and charges

The road transport sector has certain rather characteristic features.

The cost of fully-loaded operation (supply per km. per ton) varies according to the features of the itinerary (width, length, layout, road level, type of surface and density of traffic), the type of vehicle used (petrol or diesel engine, lorries, semi-trailers, 5-, 10- or 25- ton lorries and trailers), the competency of personnel employed and the levels of wages and prices. Once these factors are determined, costs are in proportion to the volume of transport : to transport 5, 25 or 100 times the quantity requires 5, 25 or 100 times more vehicles. The advantages of a big undertaking (discount from suppliers, repair shops, etc...) are offset by an increase in general expenses (bureau cratization) and the initiative of small carriers. The road transport sector is therefore a highly competitive one, run for profit, with big and small undertakings existing side by side.

On these technical factors of expenditure will be grafted trade factors which will determine very variable prices , degree of competition, coefficient of loading, probability of return

freight, delays at either end, distance carried, long-term contract security, etc. As the road carrier can do little about the technical factors, he will try to use trade the factors to best advantage by choosing the most favourable itineraries: lengthy journeys carrying a full load in both directions without delay at either end. Road and regulations permitting, the ideal thing is transport between a big town and the port serving it: Port Sudan-Khartoum; Assab-Addis Ababa, Mombasa-Nairobi, Pointe Noire-Brazzaville, Douala-Yaoundé, etc. It will then be the natural policy of the road carriers joined together in a pressure group and backed by powerful private interests, to try wrest from the public authorities the means of competing with the railways along the lines of penetration (improving the roads running parallel to the railway, relaxing the regulations, etc).

Several studies have been undertaken concerning the cost of supply per ton and per kilometre. They all tend to prove that in average trade conditions the price per ton per kilometre can rarely be less 4 U.S. cents, sometimes 3 U.S. cents, with a transport organization (opération Hirondelle in Niger-Dahomey), but never below 2 U.S. cents - big carriers, fully-laden - except as compensation between different types of merchandise (Addis Ababa/Assab). In point of fact, high competition and ignorance of the rules of accountancy and of estimating prime costs leads some carriers to offer below-cost prices regardless of amortizement, provision for major repairs, insurances, etc., which explains some of the prices quoted today.

In Senegal, (CINAM study, June 1961) prices varied from 11.9 U.S. cents/t.Km. on the Tambacounda/Kegougou to 1.80 U.S. cents/t. Km. on the Dakar/Kolack road, a good asphalt road on which competition is very high.

In Nigeria (Transportation: A Guide to Current Costs in Nigeria - June 1964), prices were from 7 U.S. cents/t Km. to 2.8 U.S. cents/t.Km. - a rate regarded as exceptional, possible only in the case of long-term contracts with return freight.

Tariffs on the E.A.R. & H. road services in Tanzania (1960) vary from 3.4 to 6.4 cents/t.Km; according to the type of goods carried.

In Uganda (Study of the Bihanga-Biti Railway Extension), the rate for road transport between Kampala and Biti (330 Km.) is 5.6 U.S. cents/t.km. It is estimated, however, that if the branch line is built this figure may be reduced by about one-third, which would bring it to 3.7 U.S. cents/t.Km.

Again in Uganda, B.K. Hawkins^{1/} mentions the case of a call for offers to carry goods in bulk daily over 50 Km., fully loaded, without return freight, on a stabilized dirt road. Twenty-eight offers were received, as follows:

<u>Number of offers</u>	<u>Rate in U.S. cents/t. Km.</u>
2	3.4 - 4.2
8	4.3 - 5.1
10	5.2 - 5.9
4	6.0 - 6.8
2	6.9 - 7.6
1	7.7 - 8.5
1	over 8.5

Tariffs on the "Central African Road, Ltd" between Nairobi and some towns in Zambia and Rhodesia vary according to the type of goods (from 3 to 5.6 U.S. cents/t.Km.) and according to the weight carried (less than one ton, from one to five tons and over five tons).

The Rhodesian Railways use a scale of charges for their road services varying from 5.32 to 12.57 U.S. cents/t.Km., according to the type of goods. These rates also vary slightly according to distance (up to 320 Km.):

^{1/}E.K. Hawkins : Road and Road Transport in an Under-developed Country. A Case Study of Uganda (p.97).

In 1959, the tariffs in force on the road junction from Bujumbura to Astrida and Kigali (Burundi and Rwanda) were as follows:

- Bujumbura/Astrida	166 km.	14 US. \$ per ton, or 8.4 US. cents/t.km.	
- Bujumbura/Kigali	299 km.	22 " " 7.3 " "	
- Astrida/Bujumbura	166 km.	11 " " 6.6 " "	
- Kigali/Bujumbura	299 km.	17 " " 5.7 " "	

The lowest rates in Africa, on a permanent basis, are probably those obtaining in Ethiopia on the road axis Addis Ababa to Assab (861 km). This road, connecting a big city in the interior with one of the ports that serve it, is used by lorries with trailers (25-ton load) plying fully loaded in both directions without any considerable delay at either end. The tariffs are fixed by the government according to the type of goods carried and the direction taken, within the following limits:

(In U.S. cents/t. Km.)

<u>Addis Ababa/Assab</u>	<u>Assab/Addis Ababa</u>
Hides and skins 2.09	Cars, Pick-up vans 4.65
Coffee 1.74	Beverages, tyres..... 3.02
Cereals, oil-cake.. 1.16	Nails, steel, pipes.... 2.09
	Salt 1.86

Again in Ethiopia, a call for offers in June 1965 for fully-loaded (10-ton) transport both ways on a two-lane asphalt road from Nazareth to Awassa gave the following results:

(In U.S. cents/t.Km)

Journey	Offer No.1	Offer No.2	Offer No.3
Nazareth/Awassa = 234 km.	2,39	2,22	5,62
Modjo/Awassa = 205 km.	2,44	2,15	5,60
Awassa/Nazareth = 234 km.	1,97	2,39	5,62
Awassa/Modjo = 205 km.	1,95	2,34	5,60

In Ethiopia, once more, a call was made for offers to carry 30,000 tons of cement over 25 Km. without return freight at the rate of 2,500 tons a month (unloading only at carrier's expense), with the following results:

- Offer No.1	.....	0,66	US.\$/t	or 2.64	US cents/t.km.
- "	2	.....	0,78	"	3,12
- "	3	.....	1,00	"	4,00
- "	4	.....	1,28	"	5,12
- "	5	.....	1,50	"	6,00
- "	6	.....	1,65	"	6,52
- "	7	.....	1,94	"	7,76
- "	8	.....	2,00	"	8,00

In the Sudan, the through-booking arrangements between the Sudanese and East African railways for carrying goods by road between Juba and Nimule (197 km)., specify a rate of 45 Sudanese millimes per 10 kg., or 4.5 Sudanese pounds, or US.\$ 12.91 per ton. This corresponds to a mean rate of 3.5 U.S. cents/t.km.

Costs and tariffs by waterway

Few studies are available concerning the cost of river or lake transport in Africa.^{1/} Many factors intervene, as follows:

Width of navigable channel and minimum bend radius dictate the size of the convoy: adaptation of the convoy pushed (rigid) to the bends, and facilities for passing and over-taking. Big convoys pushed along the Congo can measure up to 240 m. whereas nothing over 110 m. can negotiate the narrow bends of the Itimbiri.

^{1/} See : A. Dederer, Communications à l'Académie Royale des Sciences d'Outre Mer de Belgique, Bulletin des Séances, VII, 1961, 4 :
Transport sur la Nil en aval d'Aswan : VIII, 1962, 6 : Transport
de bois sur le Congo.

The capacity of the means of transport employed is limited by considerations of depth. V-barges of 1,200 tons (76 m. X 11.50 m.) on the Congo with a 2m. draught ; X-barges of 50 tons (24 m. X 3.50 m.) on the Itimbiri with a draught of 0.90 m. (57-ton capacity if built of light alloy).

Permanency of depth throughout the year is a condition for making best use of equipment,. The capacity of V-barges on the Congo is reduced in the following conditions according to how low they lie in the water :

Depth in water	Capacity	% of maximum
1.80 m	1,444 tons	--
1.70 m	1,005 "	88
1.50 m	805 "	70
1.20 m	570 "	50
1.00 m	414 "	36

"Lack of depth causes increased resistance to the forward movement, and therefore requires greater effort on the part of the tug. This often entails division of the convey.

"It limits the power of the tug-boats, because of a draught of 1.50 instead of 1.20 m were available for k-type tugs, for instance propellers of 1.80 m in diameter could be adapted and made to absorb a power of 625 HP. instead of 330 HP at 330 revolutions a minute. With an additional 30 cm. of draught, the power of a tug-boat of this type could therefore be almost doubled ^{1/}"

Navigation by night is possible through light-buoying, enabling better use of equipment. In studying navigation on the Nile, a duration of 4,000 hours of navigation per annum is estimated without the use of night-buoys, as compared with 6,000 hours per annum with night-buoying and two crews.

The inadequate size of locks involves a division of convoys, and consequently a loss of time. (The usable measurements of the locks at Nag Hammadi, Assiout and Esna are 70 x 15 m. The five locks following the old Aswan Dam measure 80 m x 9.50 . Modernization of the locks would mean that shipping could go through quicker. At present, the hand-manipulated locks at Esna, Assiout and Nag Hammadi require about an hour for each operation.

River works may also constitute an impediment to navigation. The width between the buttresses of the Nag Hammadi bridge is only 16 m., which is not enough to accommodate convoys 15 m. wide.

The technique used also has a great bearing on the cost- the type of propulsion and method of tugging. The method of propelling two or more barges at a time is giving way to that of pushing and of using integrated tow-boats which reduce the resistance to forward movement and can be operated with fewer hands.

For instance, the following figures were drawn up by A. Lederer for transporting timber along the Congo between Dongo and Leopoldville (1,050 km.), with a convoy of four 500-ton barges (2,000 tons) and one 500 HP pusher-night navigation - four days down-river and six days up - seven days loading and five unloading - duration of route, 22 days. Value of tug 240,000 US dollars, in use 240 days per annum. Value of one barge, 60,000 US dollars, in use 300 days per annum.

- Daily cost of pusher :

- Repairs, upkeep, amortisement, interest	120 US \$
- Fuel and lubricants	120 "

- Wages of crew (2 x 7 men)	24.8 US\$
- General expenses (crew)	18.6 US\$

Daily 283.4 US\$

- Daily cost of barges	
- Repairs, upkeep, amortisement, interest	24 US\$
- Cost of transport :	
- Tug for 10 days	2834 US\$
- Four barges for 22 days	2112 US\$

Cost of one trip 4946 US\$

Prime cost per ton (return empty) 2,473 US \$

Prime cost per t. km. 0,236 US cents

The relative value of the incidence of various factors (draught - navigation by night - return cargo - equipment used) on the cost were assessed by A. Lederer in his study of transport on the Nile. He arrived at the following results in which the figures indicate the cost per t. km. on the basis of 100.

	M	P	T	P			
	200HP 470t.	200HP 470t.	400HP 470t.	400HP 470t.	450HP 500t.	800HP 500t.	1,500HP 1,050t.
	+	+	+	+	+	+	+
	1 PB 500t.	1 TB 500t.	2 PB 500t.	2 TB 500t.	4 PB 500t.	4 PB 1,050t.	
Convey load (tons)	470	970	970	1.000	1.000	2.000	4.200
<u>Draught below 1.80 m.</u> <u>without night naviga-</u> <u>tion.</u>							
- without return cargo	116	87	97	81	100	75	69
- with return cargo (50%)	87	62	66	56	69	52	47

(continued....)

	M	P	T	P			
	200HP 470t.	200HP 470t.	400HP 470t.	400HP 470t.	450HP 500t.	800HP 500t.	1500HP 1,050t.
	1 PB	1 TB	2 PB	2 TB	4 PB	4 PB	
	500t.	500t.	500t.	500t.	500t.	1,050t.	
<hr/>							
<u>With night navigation</u>							
- without return cargo	100	74	80	69	84	62	55
- with return cargo (50%)	76	55	59	47	58	43	38
<u>Permanent 1.80^m draught without night navigation</u>							
- without return cargo	92	68	72	64	79	60	55
- with return cargo (50%)	67	49	52	44	55	41	37
<u>With night navigation</u>							
- without return cargo	82	58	62	54	65	49	43
- with return cargo (50%)	60	43	46	37	46	34	29
<hr/>							
M : Motorized (200 or 400 CV)				PB : Pushed barge (500 or 1.050t.)			
P : Pusher (400, 800 or 1500 CV)							
T : Tug (450 CV)				TB : Tugged barge (500 t.)			

These few figures show that the price can be low if a good waterway is available. This is the case with the Congo, the Kasai, the Nile - at least from Khartoum to Malakal - and the Great Lakes. That is why Congo Leopoldville decided to extend the railway from Aketi to Bumba - the distance is shorter of course, but also there are navigational difficulties on the Itimbiri.

Generally speaking, the waterways - both river and lake - are exploited by the same companies as the railways, and at the same rates, as follows :

- The Sudan Railways exploit the navigable reaches of the Nile at the same rates as the railway.
- The E.A.R. & H. exploit Lake Victoria and Lake Tanganyika at the same rates as the railway, allowing for expenses of load transference.
- The Lake Railways (CFL) exploit the Luluaba and Lake Tanganyika at two-thirds of the railway tariff plus transfer expenses and harbour dues (1959)
- The OTRACO exploits the Congo, the Kasai and the Matadi-Leopoldville railway. No data is available concerning the rates charged.
- All the Congo carriers (OTRACO, CFL, BCK and VICICONGO), grouped together in the Congo Carriers Committee (COMITRA), apply a concerted policy with the tariffs, and allow for goods carried on associated networks in applying the provisions concerning lower rates for longer distances.

As the great lines of penetration are managed by a single company or group of companies, the tariff policy is the same as that of the railways.

Railway costs and tariffs

The business of rail transport has a number of special characteristics.

At the economic level, expenditure on construction and financing is high, whereas expenditure on operations is low. Income increases with volume of traffic, and mean expenditure decreases. Therefore the only justification for a railway is that there should be considerable traffic.

Insofar as accounting methods permit of analysis by airing and correctly assessing expenses, the actual costs vary around this mean average in relation to the distance carried (incidence of terminal loads) and volume of load (small quantities, full trucks whole trainloads), all other things being equal.

The concept of public service is usually preponderant in railways which are of general interest. The public authorities require them to carry at certain rates (approved rates) and within certain time-limits. For passenger service, they are likewise required to ensure minimum regular connections. The concept of profit in private enterprise gives place to that of public service. The railway is not required to make a profit, but to cover its expenses by receipts and do its best to help develop the economy.

The public authorities exercise close supervision over the railway and, by way of compensation, allow it certain advantages (power of expropriation and of drawing up regulation) ; they protect it (control of road competition along routes parallel to the railway line) and help it to comply with the required conditions (traffic papers, etc..) . The most remarkable characteristic of the railway, however, is undoubtedly the economic policy it enables the State to follow in connection with the scale of charges thanks to its monopolistic position.

Several factors come into play in fixing the mean cost ; layout and contour of the line, bracing of the track, spacing of railway-stations, degree of modernization (electric, diesel ; welded rails, heavy trains, automatic coupling, etc..); wage-levels, skill, conscience and productivity of personnel ; competency of management; volume, type, structure and balance of traffic; distance of transport, group charges, loan conditions, etc...so that the mean cost depends on local conditions, and it is not possible to transpose from one network to another. Only one factor is common to all ; Cost decreases with the rising volume of traffic.

This is explained, first of all, by the considerable financial expenditure involved. The cost of a railway line varies between US\$ 50,000 per km. (Uganda, Kenya) and US\$ 100,000 per km. (Camercom);

At 7 per cent per annum, this means 3,500 to 7,000 US\$/km. For a traffic of 100,000 tons per annum this expenditure is between 3.5 and 7 US cents t.km. For a traffic of 500,000 tons per annum it falls to between 0.7 and 1.4 US cents t.km. In practice, events (devaluation, payment of loans) have often eliminated them; and in new constructions they are reduced by favourable financial conditions (grants, long-term loans at a low rate of interest).

Structural expenses (upkeep of track, premises and telecommunications, station personnel, etc..) are almost independent of the volume of traffic, at least within certain limits. In the study for the Trans-Cameroon railway, they are assessed at 1,640 US\$/km. For the Bihanga Biti extension in Uganda, they are estimated at 1,480 US km. and on the Moshi-Kiu link-line (Uganda-Tanzania) at 1,400 US km.

Operational costs, on the other hand, are very low, 86 US cents/t.km for the Bihanga-Piti extension; 69 US cents/t. km. for the Kilombero Valley Project; 36 US cents/t.km. offered for the Trans-Cameroon, and 25 US cents/t. km. offered for Moshi-Kiu link-line.

The incidence of this various expenditure on the mean cost t. km. is indicated in US cents in the following table, with figures taken from the Kiu-Moshi link (see graphic representation, Annex II figures 5 and 6).

Volume of traffic in 1,000 t.p.a.	Exp. on Operat- ion (4)	Struc- tural Exp. (3)	(4) + (3) (3)	Rene- wal Annui- ty (2)	(4) + (3) + (2) (2)	Exp. on Finan- ce (1)	(4)+(3) (2)+(1)
100	0,25	1,40	1,65	0,30	1,95	3,15	5,10
200	"	0,70	0,95	0,15	1,10	1,57	2,67
300	"	0,46	0,71	0,10	0,81	1,05	1,86
400	"	0,35	0,60	0,075	0,67	0,78	1,455
500	"	0,28	0,53	0,06	0,59	0,63	1,22
600	"	0,23	0,48	0,05	0,53	0,52	1,05

(continued)

Volume of traffic in 1,000 t.P.a.	Exp. on operat- ion (4)	Struc- tural Exp. (5)	(4) + (3) (3)	Rene- wal Annui- ty (2)	(4) + (3) + (2)	Exp. on Finan- ce (1)	(4)+(3) (2)+(1)
700	0,25	0,20	0,45	0,043	0,49	0,45	0,94
800	"	0,17	0,42	0,037	0,46	0,39	0,85
900	"	0,155	0,405	0,033	0,438	0,35	0,788
1.000	"	0,14	0,39	0,030	0,42	0,315	0,735
1.100	"	0,127	0,377	0,027	0,404	0,286	0,69
1.200	"	0,116	0,366	0,025	0,391	0,262	0,653
1.300	"	0,108	0,358	0,023	0,381	0,242	0,623
1.400	"	0,100	0,35	0,021	0,371	0,225	0,596
1.500	"	0,093	0,343	0,020	0,363	0,210	0,573

In any case, once a given traffic level is reached, the cost of rail transport is lower than that of road transport. This level varies with local conditions and is around 150,000 to 300,000 t. km. per annum.

In the region of the Great Lakes all the railways reach or even greatly exceed this level. In 1962-1963, the average density of traffic on the Sudan Railways was over 500,000 tons. On the E.A.R. & H. it was 525,000 t. km., (including transport in service in 1964). The average traffic on the network in Rhodesia and Zambia, is around 1,600,000 t/km. In the Congo it was about 1,710,000 t. km in 1958 on the Matadi-Leopoldville Railway; 700,000 on the BCK; 143,000 on the CFL, but only 52,000 on the VICICONGO. On the Angola Railway the average density of traffic was 1,050,000 t. km. in 1960. Nearly all the railways thus have low prime costs, which enables them to follow a tariff policy.

For a network, the mean cost varies according to the line in relation to the volume of traffic it carries, since structural expenditure would be distributed on a pro rate basis in proportion to such traffic. Structural expenditure per t. km. is lower on the Mombasa/Nairobi or Port Sudan/Khartoum line, where traffic exceeds 200,000 tons per annum, than on the Kaliua/Mpandú or Babanousa: Wau line, where it has not yet reached 100,000 tons per annum. A single tariff based on distance and regardless of line is thus an initial compensation with a view to the general interest.

Discriminatory rates based on the type of goods carried are a second compensation. To carry a truckload of whisky or of fertilizer costs the railways about the same amount, but the tariffs are very different. The following figures are for 500 km:

	<u>Rhodesia</u>	<u>E.A.R. & H.</u>	<u>Sudan</u>
Whisky	37.0 US\$/ton	16.0 US\$/ton	36.0 US\$/ton
Fertilizer	2.9 "	3.3 "	3.7 "

If the mean cost is 1.5 US cents/t.km. or 7.5 US\$/ per ton for 500 kilometres, carrying one ton of whisky 500 km. in the Sudan gives a profit of 28.5 US, which enables 7.5 tons of fertilizer to be carried 500 km at the reduced rate of 3.7 US\$ per ton.^{1/}

The discrimination of rates and the economic policy thus permitted explain the reserved attitudes towards projects for major routes parallel to the railway: Mombasa/Nairobi, Port Sudan/Khartoum, etc.. On these axes the road carriers would be in a position to charge around 2.5 to 3 US cents/t.km. (long distance, fully loaded in both directions, with large carrier lorries and without any appreciable delay at either end), thus depriving the railway of all the profitable traffic which enables it to practice a transport policy, or else forcing it to lower its tariffs.

^{1/} Note for whisky drinkers. This indirect subsidy in the present instance represents an approximate rate of 6 US cents a bottle, or 0.4 US cents per well-filled glass.

In both cases, this would lead to a decrease in compensation possibilities and therefore to an increase in privileged tariffs (fertilizers, foodstuffs, exports, etc.).

Diminishing rates according to distance is a third form of a compensation in so far as it does not reflect the exact decrease in costs, but rather amplifies it.^{1/} The diminution is very marked as may be seen from the figures for the Rhodesian Railways in category 10, for example (coffee-steel) :

Distance in km.	Tariff in US\$ per ton	Tariff in US cents per ton per km
100	6,17	6,17
500	10,80	2,16
1.000	15,12	1,51
1.500	19,44	1,30
2.000	22,22	1,11
2,500	24,68	0,98

Discrimination according to type of goods carried and diminishing rates according to distance are the rule on the great lines of penetration in the region of the Great Lakes : Sudanese Railways, Rhodesian Railways, E. A.R. & N. (see tariffs graph, Annex II - figures 10, 11, 12, 13, 14, 15, 16, 17, and 18).

This policy is likewise followed by the Congolese system with an added compensation organized between the various Congolese carriers for inter-regions tariffs : (see transport in the Belgian Congo, 1959, Chapter X, Tariff Policy) based on six principles, as follows ,

1. Expensive products pay for inexpensive products

^{1/} See A. Hazlewood ; Road and Rail in East Africa - Oxford - Basil Blackwell, 1964.

2. No product should pay more than it can afford;
3. No product should normally pay more in internal transport than it would pay in export;
4. Tariffs should correspond to transport allowances;
5. The general tariff should apply equally to all customers;
6. Profits from tariffs as a whole should provide carriers with whatever resources they require.

Lastly, the tariff policy is also used to favour African industrialization and African products: in Nigeria, cement from Nkalagu and Abese; in East Africa, fibro-cement at Tororo, iron and steel from Jinja, etc.

For products regarded as most indispensable for the economy of the country, this policy allows of extremely low tariffs on the lines of penetration - frequently lower than 1 US cent/t.km. over long distances and as little as 0.5 US cents/t.km. for products such as fertilizers, over a distance of some 2,500 km.

On the other hand, tariffs are high (around 6 US cents/t.km.) on the axes of integration, which consist mainly of mediocre roads. Even if the roads are improved, tariffs cannot in practice be lower than 3 US cents/t.km.

This difference in tariffs between lines of penetration and axes of integration involves a real break-down of the African market in favour of imports and to the detriment of the African products. It is an obstacle to economic cooperation, thus paralyzing industrialization.

Dismemberment of the African market - See Annex II, Fig. 7.

This is very evident on all the axes and lines. Take, for instance, the Sudanese line, where it is most striking.

In the case of an imported product listed in Category 14 (cement), for instance, the rate for carriage along the line of penetration from Port Sudan to Juba (2,500 km) is 11.76 US.\$ per ton. From there on, it must be sent by road at 6 US cents/t.km. Over a total distance of 5,000 km., the cost of transport is 41.76 US.\$ per ton, of which 30 US.\$ per ton is in respect of the last 500 km. (graph 1).

At the end of this itinerary (Uganda), if the intention is to make and sell cement in the Sudan, the African product will be heavily penalized. It will have to travel 500 km. by road at 6 US cents/t.km. thus adding 30 US.\$/ton to carrying costs at the very outset. Then it will take the Sudanese line in the opposite direction, paying the same rate as imported cement (graph 2).

The diagram shows that, for the same outlay on transport, the African product travels only 350 km, while the imported product can travel 2,650 km, or almost 8 times the distance. Half-way, the African product is therefore penalized at the rate of 28.32 US.\$ per ton. Although the Cif. cost of the import is the same as the ex-factory price of the African product, the market for the latter is only 350 km. distant.

Assuming now, that an improved transport system and a tariff policy allow of equal transport rates in both directions, then the African product (given equality of Cif and ex-factory prices) could compete with the imported product up to half-way, or 1,500 km. (graph 3). With a Customs protection of 7.28 US.\$ per ton, the African product could be sold at 2,500 km. from the place of manufacture, but with the present system of transport it would need a protection of $28.6 + 7.2$, i.e., 35.8 US.\$ per ton.

A change from the current rates to equal rates in both directions would increase the sales radius from 350 to 1,500 km. For a continent where consumption would be in proportion to the

sales radius (same density of population, same tastes, same income (brackets, etc.)), this would multiply by 18 the size of the market available to African enterprise.

The dismemberment of the market varies with tariffs, and therefore with the category of goods transported (See Annex II, Fig. 8). Categories for which the tariffs are highest are only lightly penalized (1,500 km. sales radius for Category 1), whereas for Category 17 the radius is only 300 km. For Category 10 (steel produced in Uganda), the sales radius would be approximately 500 km.

By reducing the natural sales radius the present system paralyzes industrialization, for some types of industry which cannot exist under the present system would become possible thanks to sizeable economies in a built-up market.

Dismemberment of the market and economies of Scale - Annex II - Fig.9

It is presumed in the diagram that an African product, the productive operation of which is shown in the north-east quadrant, is in competition with an import costing 20 US.\$ per ton Cif. The price of the import (Cif plus transport) is shown in the north-west quadrant, graph III.

For a given localization of African enterprise it is possible to determine consumption in the various trade centres (actual or estimated consumption) and to draw a graph showing the size of the market in relation to the sales radius (south-east quadrant).

These graphs and hypotheses regarding transport tariffs will enable us to determine the feasibility of starting up a new industry, as follows:

- Starting out from D, 2,400 km. distant from the site of the proposed industry, the south-east quadrant gives a bearing on the size of the market: (DFG), i.e., 100,000 tons, which leads to a

price of 54 US.\$ per ton (point L) ex-factory, 2,400 km. distant. An improved transport system would lower the price to 25 US.\$/ton

Repeating this operation for the various sales areas, and joining all points obtained with the present transport system (point L), we come to graph I, showing the price at the market limits with the existing transport system.

Repeating it again for an improved transport system (point K), we have graph II, which gives the market-limit price with the improved transport system.

Assessing consumption, we obtain graphs I' and II' based on the present transport system and the improved transport system.

The relative positions of graphs I, II, I', and II', and graph III indicate the possibilities of industrialization. These relative positions depend on the market, production operations, transport tariffs and the c.i.f. cost of the competing import. Graphs I, II, I' and I' and II', start to decrease with distance from the proposed centre of production (economies of scale are greater than increased carrying costs), down to a minimum, and then rise as optimum production approaches; economies of scale weaken and increases due to transport costs become preponderant.

It is easy to interpret the diagram.

Graph I does not cut across graph III: the industry cannot be started, because in any case the African product is dearer than the imported product. Industrialization cannot be contemplated without the help of strong customs protection.

Graph I' does not cut across graph III either. Even by estimating consumption, it is not possible to forecast the date on which industrialization could be contemplated without recourse to customs protection.

Graph II intersects graph III. If a better transport system were available, the new industry could be considered at once. The African product could naturally compete with the imported product up to approximately 2,200 kilometres. Graph II confirms the possibility of industrialization.

The diagram cannot be applied in cases where several lines of penetration lead to the neighbourhood of a projected centre of production (for instance, Uganda has the Sudanese, Kenya-Uganda, Trans-Angola and Congolese lines), because it presupposes the following conditions:

- 1) that the c.i.f. price of the competing product is identical in all sorts commanding the lines of penetration;
- 2) that the lines of penetration and the axes of integration linking them to the proposed production centre are the same length;
- 3) that the tariffs in force there are the same.

These hypotheses, however, may easily be counteracted by making use of the isoline theory, with global production and transport costs. It is best to retain the previous diagram, the presentation being less intuitive in this case.

The causes of the dismemberment of the African market may then be summed up as follows:

- on the axes of integration, high cost of transport: road transport on mediocre roads;
- on the lines of penetration, low tariffs due to various causes such as:
 - the existence of good navigable waterways;
 - the use of technique: the railway which, through an economic factor of dense traffic, permits low average costs;
 - the application of a tariff policy (discrimination according to type of merchandise - reduction for

distance) which permits a lowering of tariffs for the most useful products.

How can the African market be built up to facilitate economic co-operation? There are many obstacles and vicious circles to be encountered.

BUILDING UP THE AFRICAN MARKET:

ECONOMIC CO-OPERATION:

OBSTACLES

To try to build up the African market, some way must be found to obtain the same tariffs on the axes of integration as on the lines of penetration.

One way would be to increase the tariffs on the lines of penetration to the same level as those obtaining on the axes of integration. From the political and social standpoints, however, **this** is not practicable. It would be curing the disease by killing the patient.

The solution, therefore, would be to reduce tariffs on the axes of integration, so that African products to compete with imported products on an equal footing.

A road solution is apparently not enough. Considerable improvement of the existing roads would mean, at best, an average rate of 3 US cents/t.km., whereas the tariff policy in force on the lines of penetration permits, in some cases, a figure as low as 0.5 US cents/t.km.

A waterway solution seems to be ruled out, because such enormous investments would be required. At the present time, it is not possible to consider seriously making the Nile navigable from Juba to Lake Victoria, or digging canals between the lakes and over the mountains at a cost of hundreds of millions of dollars.

The only workable hypothesis that remains is to inter-connect the various railway networks.^{1/}

^{1/} This hypothesis encounters certain technical difficulties due to the various characteristics of the African networks: gauge of tracks, coupling system, braking system, etc. As the ECA Secretariat has undertaken a study of ways and means of overcoming such difficulties, they will not be considered in the present text.

But this is not a miracle solution. We have seen, indeed, how high structural expenditure prevents the railway from offering low-cost transport unless there is enough traffic. Otherwise, the cost per ton per kilometre would be higher than that of road transport. So this solution is not suitable unless a certain minimum volume of traffic is assured - say, approximately 200,000 to 300,000 tons per annum.

It is perhaps possible to make this condition a little more elastic. An interconnection between networks consists of extensions which are marginal as compared with each individual network. General expenses are not the same as for an independent new line. Furthermore, the same compensation which comes into play between existing lines could also apply to the extension, subject to slight changes in the tariffs as a whole. This possibility should therefore be studied in detail.

In any case, it is not without its limitations, and harks back to the fundamental condition of a traffic minimum. Everyone agrees that transport facilities are the bottleneck for African development. ^{1/}

^{1/} See interview with P. Moussa, former Director for Africa of IBRD, Le Figaro, 19 May 1964.

Question : Which categories of investment are most productive and desirable ?

Answer : Infrastructure, in some cases : roads, railways, ports, canals, dams, power stations - these are the most desirable investments. After her Liberation, it was clear that the first priority in devastated France was to rebuild lines of communication. Similarly, they constitute the most serious bottleneck in Africa, the one which must be got rid of first. French aid has long given very clear priority to infrastructure.

In the case of industry, Africa is facing a serious difficulty because of her extremely restricted national markets. Of 35 independent countries in Africa, only two - Nigeria and Egypt - have more than 20 million inhabitants. Twenty-six of the 35 countries in question have less than 10 million, and 22 of them less than five million. Eight independent African countries have even less than two million inhabitants.

but in point of fact economic justifications are lacking, because of a series of vicious circles, contradiction and constraints.

1. Studies on industrialization and economic co-operation are on a long-term basis. Target-year in the documents submitted to the Lusaka conference was 1975, even 1980. On the other hand, the governments and those in charge of day-to-day administration are faced with short-term problems. Hence, a conflict in which sweet-and-sour words are easily bandied; Utopianism and realism, broad views and down-to-earth considerations.

Non-industrialized and dominated by systems handed down from colonial times, States must first of all export raw materials and import equipment goods. National development plans are based on non-African, foreign, trade. Most of the traffic that can be forecast is concentrated on the lines of penetration, more especially on the sectors nearest to the ports. In making improvements, it is normal to give priority to these sectors - thus strengthening the lines of penetration.

National planners and foreign experts are inevitably drawn towards the same attitude. Nearly all the plans advocate improving the supply network and lines of penetration, and overlook the axes of integration. The reason for this is simple : nowadays traffic is negligible on all these axes, and there is no means of foretelling what it will become in the future. To apply even a 10 per cent trend to traffic in the neighbourhood of 2,000 to 3,000 tons per annum does not lead to proposals for any considerable changes.

The outlook for trade in agricultural products is not very encouraging, because economies are frequently in competition and trade in industrial products is unpredictable, as it depends on an inter-State agreement on economic co-operation and the location of undertakings and markets. In the absence of such agreement, plans to improve the axes of integration have no foundation.

The authorities responsible for national transport systems, faced with the daily difficulties of operating and of achieving financial equilibrium, are not anxious to overload their networks with lines which might create further liabilities through lack of traffic. Multi-lateral and bilateral organizations decline to finance infrastructure which is not justified by traffic, because they are afraid of burdening the budget of the States with maintenance expenses, or of seeing equipment deteriorate through lack of upkeep.

So far as transport is concerned, therefore, the economists find it impossible to propose any appreciable change in the present system and to justify it from an economic standpoint.

2. Industrial planners appointed to study industrialization and economic co-operation are obviously hampered by the pre-determined framework of the sub-regions and by the fact that the present system of transport is not adapted to circumstances. The documents of the Lusaka conference are convincing in this respect.

Document E/CN.14/INR/83 (Chemical Industries) deals with the transport system, accepts the existing framework but, reading between the lines, regards it as ill-adapted.

" Document E/CN.14/INR/89 (Electro-technical industries) goes further. Paragraph 99 reads as follows :

"From the market point of view and considering transport difficulties, it would be well to treat the Sub-region in three sections (see map) :

- (i) The North, covering Ethiopia, French Somaliland and Somalia, which have better communications with neighbouring countries to the north than with those to the south.
- (ii) The Centre, comprising Kenya, Uganda, Tanzania, Burundi and Rwanda. These countries have considerable ties with Congo (Leo.) to the west.

- (iii) The South, comprising Malawi, Zambia and Rhodesia. These have ties with Mozambique to the east and Angola to the west.

Malagasy, Mauritius and Reunion could join either the central or the southern sections."

Document E/CN/INR/87 (Metal Products Industries) gives special attention to projects for transport infrastructure (Chap. VII - paras. 36 & 37) which might change the picture (rail communications between Zambia & Tanzania, link-line from Sinoia to Kafue, navigability of the Zambezi). Regarding the projected metal products industry at Tororo, it makes a discreet appeal that the markets of the Upper Congo & Equatorial Sudan be taken into consideration.

Yet none of these planners, taken individually, is able to propose any change in the framework or in the system of present-day transport. The quantities of finished products to be distributed by each country are insufficient to justify any appreciable change. The predetermined framework and the present transport system inevitably tend to mask some of the possibilities, and perhaps lead to an under estimation of the true possibilities.

The result is therefore a vicious circle :

- industrialization is impossible, because the market is not big enough.
- to build up the market by improving the lines of communication is not economically justifiable because, through lack of industrialization, there is no trading to be done.

3. Moreover, improvement the transport system is complicated by conflicts of doctrines between the financial and the economic concepts.^{1/} This is obvious in the case of the railways .

^{1/} See slogans : "The Railway must pay for itself", "The roads bring wealth", "Transport is not an end in itself", etc..

We have seen that the railway costs :

- an initial investment on track and premises, and
- annual operational expenses : running expenses - structural expenses - renewals.

According to the financial concept, the railway regarded as a private enterprise must bear the amortisement of the initial loan. Such expenditure has very marked effect on mean cost. In the case of Annex II, figures 5 and 6, these financial commitments amount to 1.6 US cents km for a traffic of 200,000 tons per annum, whereas the total amount for other commitments is 1.1 cents/t.km. To obtain a mean cost of 1.22 US cents/t.km. the traffic would have to reach 500,000 tons per annum. The financial conditions of the loan are of overriding importance.

According to the economic concept, the initial investment is separated from annual operational expenses. The investment (building of infrastructure) leads to low transport costs : 1.10 US cents/t.km. for a traffic figure of 200,000 tons per annum. This low rate favours economic growth and, therefore, increased national production. The soundness of the operation is then judged by the relationship between the increasing national production and the amount of the investment.^{1/} If the project is not considered economically sound, financial problems are solved by whatever means are available grants, long-term low-interest loans, financing from the State budget with maximum limitation of commitments incurred by the railway.

Two conditions must be fulfilled in applying this concept :

- A traffic minimum to allow a low mean cost. This minimum, however, is lower than in the case of the financial concept because amortisement of the initial loan is excluded.

^{1/} For further details, see Investment theory, actualization, etc....

In the hypotheses considered in Annex II, figures 5 & 6, this minimum is approximately 200,000 tons per annum instead of 500,000 tons per annum, to obtain a mean cost of approximately 1.15 US cents t.km.

- Economic soundness through economic growth made possible by the low mean cost. This growth, by forward and backward linkage effects and through the multiplier, gives added value to the GDP which, in theory, is partly recoverable through fiscal channels and thus facilitates loan repayments.

This economic concept was applied in studying the Trans-Cameroon railway.

4. The economic concept tends to regard industrialization and the building up of the market through improved lines of communication as an indivisible whole composed of factors which justify one another.

The starting point is the present position in which the dismembered market makes it impossible to set up important industries because of the high tariffs charged on the axes of integration.

At the cost of a large investment, a railway interconnection is built between two or more lines of penetration. If there is enough traffic, the low mean cost on this interconnection will help to build up the market.

This low mean cost, by building up the market, will enable African undertakings A, B, and C to be started on a sound financial basis - which heretofore would have been impossible. Forward and backward linkage effects plus wage distribution and their multiplying effects will give added value to the GDP (see example given for Cameroon at the beginning of the present text).

If these undertakings are financially sound, that is to say, if they reward capital outlay by making a profit, no further attention

need be given to such outlay, which lays no burden on the community. Indeed the community profits by the value added to the GDP to compensate for its sacrifice in making the large initial investment.

The conditions must then be confirmed, as follows :

a) The volume of traffic caused by supplying raw materials to factories A,B,C, etc.. and distributing their finished products must reach a certain minimum, to justify a low tariff and enable the effective rebuilding of the market.

b) The added value for these factories must be sufficient to justify the considerable investment on the part of the community.

Some approximate amounts may be estimated on the basis of the figures given at the start for studies on the industrialization of Cameroon, as follows :

- Capital investments for 10 factories	14,000,000 US \$
- Annual turnover	8,900,000 "
- Total increase in domestic product	10,000,000 "

Let us assume that a railway inter-connection for rebuilding the market would cost about 200,000,000 US \$ and involve annual financial commitments of 14,000,000 US \$ (at 7 per cent).

Rebuilding the market would enable the establishment of various industries (steel and metal products, fertilizers, etc..) involving a volume of international transport amounting to 300,000 tons and giving an added total value of 280,000,000 US \$. The 300,000 tons would permit a low mean cost of transport. Moreover, it can be estimated that 5 per cent of the added value (or 14,000,000 US\$) will be recoverable through fiscal channels to amortize the construction of the inter-connection.

It is clear, therefore, that from the economic standpoint industrialization, transport and economic cooperation are inextricably

linked. They are different aspects of one and the same objective, and cannot be solved independently of one another. But these links make it possible to suggest an approach which would tackle each problem in turn, solving them one by one. The great African Lakes region seems appropriate for such procedure.

HYPOTHEIS OF WORK FOR REBUILDING THE AFRICAN MARKET IN THE GREAT LAKES REGION

It has been seen in connection with the lines of penetration that six of them, operating at very low tariffs, arrive close to the perpendicular of a straight line drawn from Juba to Albertville (1,250 km). If it is possible to inter-connect the six lines and to obtain the same tariffs as on one lines of penetration, then the market will be strengthened throughout this and industrialization and economic cooperation will appear in a different light.

The method of work would consist in providing the various industrial experts with a rebuilding hypothesis (politically acceptable to the States) that is to say, an inter-connection with a tariff to be confirmed a posteriors, based on proposals put forward by the experts if the hypothesis is held to be economically justified.

Hypothesis of Layout

The principle is the inter-connection of the lines of penetration. Several layouts may be considered, but the final choice can be determined only by field studies, economic studies, and negotiation between the States. The layout indicated below is merely an example, and distances are approximate (See Annex II, Fig. 19).

Such a layout might comprise :

Juba	- Gulu	Approx.	300 km
Gulu	- Kasambia	"	370 km
Kasambia	- Bugene	"	280 km
Bugene	- Kigali	"	140 km
Kigali	- Bukavu	"	220 km
Bukavu	- Uvira	"	130 km
Uvira	- Bujumbura	"	30 km

Approx. 1,470 km

and the following branch lines :

Mungbere	- Okillo	approx.	380 km
Bukavu	- Kongolo	"	410 km
Bugene	- Bukoba	"	100 km
Bugene	- Kaliua	"	420 km

Approx. 1,310 km

Some sectors like Bugene-Bukoba or Bugene-Kaliua might not perhaps be indispensable. It might be well to link up Kasene and Stanleyville instead of Mungbere and Okollo. All this would be considered in detail in the studies.

The layout comprises some 2,800 km of railway. The existing African network consists of 80,000 km, built over a century at an average rate of 800 km per annum. A 2,800 km inter-connection to be built over half a dozen years to promote economic cooperation does not therefore seem too Utopian.

Approximate costs

Several extensions now planned in East Africa are estimated at about 50,000 US\$ per kilometre. In West Africa, the Trans-Cameroon line will cost roughly 1,000 US\$ per kilometre. As some

sectors of the inter-connection will have to be built in difficult mountainous country, the investment figure may be estimated at from 200,000,000 to 300,000,000 US\$. This sum does not seem excessive when compared with other investments.

Assistance to the developing countries amounts to 8,000,000,000 US\$ per annum. Over a period of 5 years, this work would account for about 0,75 per cent of that amount.

The investment programme in the transport sector of 7 Latin-American countries (Argentina, Columbia, Chile, Bolivia, Peru, Brazil and Venezuela), over an average 7-year period, is in excess of 9,000,000,000 US \$ (see Doc. E/CN.12/703/ Add.2, Transport in Latin America)

The cost of work on the Aswan High Dam with the power-station and the power transport network is in the region of 1,000,000,000 US \$.

The big African dams (Akosombo, Kainji and Kariba) together with the work related thereto each represent investments in excess of 200,000,000 US \$.

The total amount for investments estimates in Doc. E/CN.14/INR/102 for the Industrialization of East Africa (Lusaka Conference) from now until 1975 - 1980 is more than 4,000,000,000 US \$.

The steel and metal products industry planned for Tororo around 1975 for an annual production of 460,000 tons (35,000,000 US \$) represents an investment of 114,000,000 US \$, and would create an added value of 23,000,000 US \$ ^{1/} . (See Doc. E/CN.14/INR/102)

^{1/} The concept of added value in this document apparently does not take account of forward and backward linkage effects or of the multiplier.

THE GREAT LAKES REGION

The Great Lakes Region can be considered merely by taking the Sudan and Congo-Leopoldville into account in studies on East Africa. The present population of the Sudan is around 13,000,000 and that of Congo-Leopoldville is 15,000,000 or 28,000,000 souls in all, representing some 40 per cent of the population of continental East Africa.

Covering about 1,200 km, the proposed inter-connection axis concerns 7 countries (Sudan, Kenya, Uganda, Tanzania, Ruanda, Burundi and Congo-Leopoldville) hence the possibility of creating an international development axis to distribute industries between several nearby countries.

All the extremities of the axis are far from the sea. The cost of over-land transport is therefore a natural protection against competition from imports. The inter-connection, by opening Africa to herself, gives the shut-in countries a chance, as well as the regions which are far from the sea board.

The Great Lakes region appears suitable for industrial activities : important accessible market, dense population and therefore abundant man-power, plentiful natural resources, vast reserves of hydraulic power, etc.

The market could be extended as follows:

- To the north-east Ethiopia, by improving communications with Southern Sudan and Uganda, will naturally be called upon to form part of this market when the Ethiopian railway network is developed. It would then be shorter to send steel from Tororo to Addis Ababa via the interior than along the lines of penetration with maritime transit.
- To the South, the development of navigation on Lake Tanganyika and improved communications between Mpulungu and the rest of Zambia would lead to the inclusion of Zambia in the market.

This leads to the concept of an industrial axis from north to south, in the heart of Africa, centred on the Great Lakes and of interest to at least 9 countries.

Extending the market

A study might be undertaken, for instance, on the limitations of the market for an undertaking located at Tororo (near the Kenya-Uganda border).

On the assumption that the steel and metal products industry at Tororo could sell at Mombasa (1,089 km from Tororo) and at Dar-es-Salaam (at least 1,400 km from Tororo), this would mean that in contending with imported products the steel and metal products industry would have an advantage equivalent to transport over 1,100 km or 1,400 km (either through lower cost or through customs protection).

With the interconnection, Tororo would be roughly 670 km from Juba, 1,720 km from Babanoussa (1,780 km distant from Port Sudan) and 2,100 km from Khartoum (800 km distant from Port Sudan). Assuming the ex factory cost of the African product to be the same as the Cif cost of the imported product, an African product manufactured at Tororo could go beyond Babanoussa and be sold as far away as Chad in the Abeché region. With a protection equivalent to 1,400 km, it could compete with the imported product as far as Khartoum, which means that it could capture practically nine tenths of the Sudanese market. To the west, a product manufactured at Tororo could reach Kamina in Katanga at the end of approximately 2,050 km whereas Kamina is 2,140 km distant from Matadi on the Kasai and 2,230 km from Lobito. With a protection equivalent to only 400 or 500 km, the Tororo market would extend to all the east of Congo-Leopoldville : Kivu, Katango, and the eastern Province.

Conversely, a Sudanese undertaking could market its products throughout the whole of Uganda and even further away, and the same would apply to an undertaking located at Stanleyville.

Consequences of extending the market

Studies on the steel and metal products industry at Tororo were based on the following consumption estimates (in thousand of tons).

	Projections (Atkins & Co)			Projections (ECA 1980)			
	Present	1970	1980	Direct consump- tion	Exist- ing facto- ries	Propo- sed fac- tories	Total
Kenya	71	93	165	98	38	160	296
Uganda	26	34	60	53	11	39	103
Tanzania	45	56	100	89	20	194	303
Rwanda- Burundi	1	2	3	1	1	1	3
Total :	143	185	328	241	70	394	705
Ethiopia	29	37	66	39	14	27	80
Somalia	5	6	11	6	2	-	8
Malawi	4	5	8	4	2	1	7
Zambia	54	70	125	100	22	120	242
Rhodesia	168	220	395	200	93	168	461
Madagascar	34	44	79	53	13	22	88
Mauritius	20	26	46	33	7	1	41
Total :	457	593	1,058	676	223	732	1,362

We therefore have a weak hypothesis (328,000 t. in 1980) and a strong hypothesis (705,000 t. in 1980) for Uganda, Kenya, Tanzania, Rwanda and Burundi. The adoption of the latter led to the projection of a steel and metal products industry at Tororo around 1975 with a capacity of approximately 450,000 tons.

The statistics for Congo-Leopoldville steel imports show the following figures (metals and metallurgical articles) :

1953 : 213,000 tons	1957 : 244,000 tons
1954 : 211,000 tons	1958 : 141,000 tons
1955 : ?	1959 : 117,000 tons
1956 : 230,000 tons	

The 1962 statistics for Sudan are as follows :

Cast-iron and iron-alloys	50,000 tons
Plates and sheets	20,000 tons
Strips	3,000 tons
Rails-railway equipment	28,000 tons
Iron and steel wire	1,000 tons
Tubes and pipes	7,000 tons

Total : 109,000 tons

The Congo market shows very considerable variation. Assuming that in normal circumstances it now amounts to 200,000 t/annum and that the Sudan market amounts to 100,000 t/annum, the total for both is 300,000 t/annum, or twice the present market of Kenya, Uganda, Tanzania, Rwanda and Burundi . If only half the Congolese market and three-quarters of the Sudanese market are within range of the Tororo factory, this will mean a further 175,000 t/annum, or more than the present consumption of Kenya, Uganda, Tanzania, Rwanda and Burundi.

In the case of the strong hypothesis, the inter-connection would enable a bigger factory to be built at Tororo, or would enable it to be built sooner. In the case of the weak hypothesis, assuming the same rate of growth of consumption in the Sudan and Congo-Leopoldville as in the other countries, it could at all events be built around the year 1975. The inter-connection would thus

have a traffic of some 100,000 tons per annum northward and slightly more southward; which would be a partial justification.

Another example : the Sudan imported approximately 110,000 tons of sugar in 1962, of which 60,000 tons came from developed countries. Uganda is an exporter of sugar (5,000 tons in 1963) It would perhaps be possible to develop this production in Uganda for sale in the Sudan, which would lead to a not inconsiderable traffic on the inter-connection.

Another example : the soil and climate of East-Africa are apparently unsuitable for growing Hevea. Advance planning in the rubber industry forecasts a consumption of some 15,000 tons per annum around 1975. The soil and climate of Congo-Leopoldville are more suitable. In Kivu, in the Eastern Province, 13,900 hectares were under Hevea cultivation in 1959, and produced 8,500 tons of rubber. Perhaps rubber from Congo-Leopoldville might be used in East Africa ? That would mean traffic on the inter-connection .

These few figures tend to show that re-traffic in the region of from 250,000 to 300,000 tons per annum may be possible in 10 years or so, provided ^{agreement} is reached on economic co-operation, alignment of plans and location of enterprise.

Economic cooperation could then be concentrated on the concept of building-up the market. As regards transport, studies should make a point of systematic research on the possible flux of traffic.

- imports from and exports to the outside world for sectors of the inter-connection to be used as lines of penetration, as in the case of Rwanda.
- development of agricultural activities within the framework of the built-up market, in order to bring possible complementary factors into play.
- research on new industrial activities made possible by the extended built-up market.

This leads to consideration of the practical method of organizing and conducting an overall study of this nature. The organization of the Mekong Committee in South-East Asia might well be a source of inspiration.

The Mekong Committee

The Mekong is a major international river in south-east Asia which is being cooperatively developed by four States : Cambodia, Laos, Thailand, and the Republic of Viet-Nam.

The aim is to develop the hydraulic resources of the ^{Lower} Mekong basin, both on the main river and on its tributaries, for the production of hydro-electric power, and for purposes of irrigation, water-control, drainage, improved navigation; development of the watersheds, water supply, and other related fields, for the benefit of all peoples of the Basin regardless of nationality or politics. Roughly speaking, the work is divided up as follows :

a) Planning; pre-investments including connection of basic data, general development programme for the basin, planning of various improvements on the main river and its tributaries, planning of improved navigational facilities and related projects ;

b) Construction ;

c) Financing ;

d) Management ;

(See 1964 report of the Committee for Co-ordination of Studies on the Lower Mekong Basin : E/CN.11/679)

This project, which covers a very wide field (cartography, hydrology, dam projects, transport studies, pilot farms, mining prospection, studies on the power market, studies on industries, legal , administrative and customs problems, professional training, agricultural planning as a whole, food, etc..) is supervised by a Committee of the four States. The statutes and rules of procedure of the Committee are annexed to the present document.

The Committee appointed an Advisory Board of Experts of world-wide renown. In 1964, there were six of these experts.

The big United Nations family cooperates with the Committee : the secretariat of the Economic Committee for Asia and the Far-East , the Special Fund, the Extended of Technical Assistance Programme, the International Labour Organisation, the Food and Agriculture Organisation, UNESCO, WHO, WMO, IEEA, the world Bank and the World Food Programme.

The following countries likewise assist the Committee : Australia; Canada, United States, India; Japan, New Zealand , Pakistan, and the United-kingdom through the Colombo Plan; Belgium, China, Denmark; Finland, France, Iran, Israel; Italy, Norway, Netherlands; Philippines, Federal Republic of Germany and Sweden.

Three foundations also assisting the Committee are the Asia Foundation, the Ford Foundation and Resources for the Future Inc.

In addition to all these, four private companies have made direct offers of assistance which the Committee has accepted. They are : Gestetner Eastern Ltd., Price Waterhouse Co., Shell Oil Co., and Sycip, Gorres, Velaya and Co.,

Each of the programmes for the development of the Mekong basin (E/CN.11/679 page 120 of French text) operates within the framework of a plan of operation, project agreement, or exchange of letters signed by :

- a representative of cooperation programme and,
- the Committee, a representative of the Committee, or a country which is a member of the Committee, each of these programmes being part and parcel of the Mekong project as a whole. Within the framework of each of

of these programmes, and after drawing up the plan of work, supervision devolves to a large extent upon the country or cooperating body which submitted the programme in question. Each of these countries or cooperating bodies reports to the Committee on progress of work or on problems arising, and from time to time requests assistance and advice from the Committee and its secretariat, but remains largely responsible, together with the counterpart personnel collaborating with it, for achieving the predetermined objectives approved by the Committee.

On 11 January 1965, total amounts paid in or pledged to the Mekong project were as follows :

1) Studies, pre-investments and plans :

- Bilateral contribution from certain states	11,396,000	
US \$		
- United Nations family		
ECAFE	485,000	
TAB	-	
BTAO	363,000	
ILO	12,000	
FAO	134,000	
UNESCO	17,000	
WHO	5,000	
WMP	45,000	
IAEA	55,000	
Special Fund	6,513,000	
Food Programme	126,000	

Total 7,756,000 7,756,000 US \$

- Counterpart from States to committee 77,991,000 US \$

Total : 27,143,000 US \$

2) Investments for construction : 40,623,000 US \$

According to the method followed by the Mekong Committee, the States in question can themselves organize and supervise their assistance. Assistance from the States comes within the general framework, and thus the donors are assured that their contribution forms part of a coordinated whole.

The Great Lakes Region

The following procedure might be used to study the method of building up the market by means of a railway inter-connection in the Great Lakes region, coupled with industrialization and economic cooperation:

- 1) The ECA secretariat might be asked to test the hypothesis roughly, that is to say, to determine if the minimum-traffic condition (200,000 to 300,000 t/annum) is within the realm of possibilities or if it is Utopian.
The secretariat might also be asked to study the various implications and consequences of the project (duration: a few months).
- 2) If the results are favourable, a conference of the States concerned could be convened, and the files submitted to it. In the event of agreement, the Special Fund could be asked to undertake a study for the purpose of:
 - a) providing exact data: brief outline of layout, construction costs, possible tariff, possible trade, etc.
 - b) determining the methods to be used, as studies should be coordinated and would doubtless call for techniques such as operational research, etc.
 - c) defining the later stage of research: duration, cost, nature, etc.
- 3) The States might meet again to make final arrangements for appointing a Committee to supervise operations.

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P.S.: The decision to draw up this report was taken on Friday 17 December 1965. It had to be drafted in great haste, to allow for translation, printing of graphs etc., in time for submission to the Cairo Symposium. The manuscript was finished on 2 January 1966. As it could not be checked in detail or discussed, compared or adjusted, the author apologizes for any obscure points or errors it may contain.

Committee for the co-ordination of studies

on the lower Mekong Basin

Statutes (E/CN.11/475)

Adopted by the Preparatory Committee of the four Governments at its meeting of 17 September 1957, amended on 31 October 1957 at the first session, and approved by the participating governments.

Section I - Establishment of the Committee

The Committee for the co-ordination of studies on the lower Mekong Basin hereinafter called "the Committee" is hereby established by the Governments of Cambodia, Laos, Thailand and the Republic of Viet-Nam (hereinafter called "the participating Governments"), further to the decision taken at its third session by the United Nations Economic Commission for Asia and the Far East (hereinafter called "the Commission"). By this decision, recorded in paragraph 277 of the annual report of the Commission for the period 15 February 1956 to 28 March 1957, the Commission endorsed the wish expressed by the participating Governments that studies devoted by the Secretariat to the development of the lower Mekong basin, that is to say, that portion of the hydrographic basin of the Mekong situated on the territory of the participating Governments, should be carried out in conjunction with the aforesaid Governments. The participating Governments hereby establish a Committee whose terms of reference are set forth in the present Statutes.

Section II - Organization

Article 1:

1. The Committee shall consist of four members.
2. Each of the participating Governments shall appoint one full plenipotentiary member, together with such deputies, experts and advisers it may wish to appoint.

Article 2 :

The Committee shall be presided over by each of its members in succession according to alphabetical order of member countries. Each member shall assume the duties of Chairman for a period of one year.

Section III : Cooperation with the Secretariat
of the Commission

Article 3 :

In conformity with the decision taken by the Commission at its third session, the secretariat of the Commission shall cooperate with the Committee in the performance of duties devolving upon the Committee.

Section IV : Terms of Reference

Article 4 :

The committee shall encourage, co-ordinate, direct and supervise planning and studies in respect of operations for developing hydraulic resources in the lower Mekong basin. For this purpose it shall :

- (a) prepare and submit to the participating Governments plans for coordinating research, studies and field operations.
- (b) on behalf of the participating Governments, request special financial and technical assistance, and receive and administer autonomously any financial and technical assistance which may be forthcoming within the framework of the United Nations Technical Assistance Programme, or from the specialized agencies or friendly Governments.^{1/}

1/ It is understood that the provisions of this sub-paragraph shall enter into force as soon as each of the four participating Governments shall have individually notified the Chairman of the Technical Assistance Board that it has expressly authorised the Committee to request technical assistance on its behalf for developing the lower basin of the Mekong.

- (c) submit or recommend to the participating Governments any proposals concerning the utilisation of the main course of the river for the development of hydraulic resources.

Section V: Sessions

Article 5:

- 1) Subject to the provisions of the present Statutes, the Committee shall adopt its Rules of Procedure.
- 2) Meetings of the Committee shall take place with the participation of all member countries.
- 3) Decisions of the Committee shall be taken unanimously.
- 4) At each meeting, the Executive Secretary of the Commission or his representative shall submit oral or written statements on matters under consideration.

Section VI: General Provisions

The Committee shall submit reports to the participating Governments as well as annual reports to the Commission. On its recommendation, such reports, or summaries thereof, may be communicated to other governments or international organizations.

Article 7:

The Committee may invite representatives of governments or specialized agencies to attend meetings in the capacity of observers.

Article 8:

1. It is understood that, although the Governments shall take action through the Committee on all technical matters coming within the terms of references of the Committee, the provisions of the present Statutes shall not affect, replace or in any way modify agreements in respect of the Mekong, which are at present in force or which may later be concluded between the Governments concerned.

2. Amendments to the present Statute may be proposed by any of the participating States. They shall be studied by the Committee and shall take effect as soon as they have been approved by all the participating Governments.

Rules of Procedure (E/CN.11/475)

Adopted at its first session^{1/} by the Committee for the Co-ordination of studies on the lower basin of the Mekong^{1/}.

Section I - Sessions

Rule 1:

The Committee shall meet regularly three times a year in ordinary session.

In addition, the Committee may be convened in special session at any time at the request of one or more of its members, or at the request of the Executive Secretary of the Commission.

Rule 2:

At least four weeks before the beginning of a session, the Executive Secretary of the Commission shall send out notification of the date of the session, together with the provisional agenda and the relevant basic documents.

Rule 3:

Unless the Committee decides otherwise, all meetings shall be in private.

Section II - Co-operation with the Secretariat of the Commission.

Rule 4:

The Committee may ask the Executive Secretary of the Commission to make the necessary arrangements with a view to consultation, and

^{1/} Based on a draft drawn up at the meeting of the Preparatory Committee of the Four Governments held on 17 September 1957.

and in particular to prepare documents, organize meetings and draft minutes.

Section III - General provisions

Rule 5:

In respect of any eventuality for which no provision is made in the present Rules of Procedure, the appropriate provisions of the Rules of Procedure of the Economic Commission for Asia and the Far East shall apply, in so far as they may be deemed suitable for the purposes of the Committee.