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No 83 50X1

ECONOMIC INTELLIGENCE REPORT

AN ECONOMIC ANALYSIS OF THE RAILROAD SYSTEM IN EAST GERMANY

CIA/RR ER 60-11
May 1960

CENTRAL INTELLIGENCE AGENCY

OFFICE OF RESEARCH AND REPORTS

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AN ECONOMIC ANALYSIS OF THE RAILROAD SYSTEM IN EAST GERMANY*

Summary and Conclusions

Rail transportation in East Germany in terms of operations and maintenance illustrates the Soviet practice of endeavoring to achieve maximum output from a railroad system with a minimum of material inputs. Through the postwar period, by dismantling the railroads for reparations, the USSR reduced the railroad route network to essentially a single-track system with the removal of about 13,000 kilometers (km) of track principally from double-track and triple-track sections. Track length had been reduced from 27,400 km in 1936 to 14,400 km in 1950, approximately 47 percent. Moreover, during the early years after World War II, only a sufficient number of locomotives and cars were repaired and kept in repair to meet the greatly reduced demands for traffic. In 1938, approximately 22 billion net ton-kilometers (tkm)** of freight traffic moved on the railroads of the East German area. In 1946, only 8 billion net tkm were moved, but performance had reached 16 billion net tkm by 1950.

Since 1952, performance of the East German railroads has increased steadily, to about 33 billion net tkm in 1958, an increase of about 100 percent. Additions to track length have amounted to about 12 percent -- 1,700 km -- so that in 1958 the railroads produced about 45 percent more net ton-kilometers with less than 60 percent of the rail track length available in the period before World War II (1938). Passenger traffic also has increased, although only moderately. Traffic was hauled with fewer locomotives and passenger cars than existed during the wartime period and about one-third more freight cars.

The density of freight traffic per kilometer of track in East Germany in 1958 was about 130 percent higher than 20 years previously as the result of the reduction in the length of the network and the increase in freight traffic. In 1956, freight carried had averaged 14,256 tons per route kilometer of railroad track. Comparable data for West Germany, Czechoslovakia, and Poland were 9,657, 11,317, and 9,765 tons per route kilometer, respectively. Passengers carried per route kilometer per year in 1956 were 69,312 in East Germany, 46,839 in West Germany, 40,249 in Czechoslovakia, and 39,702 in Poland.

* The estimates and conclusions in this report represent the best judgment of this Office as of 1 April 1960.

** Tonnages are given in metric tons throughout this report.

The average density of both freight and passenger traffic combined per available route kilometer in East Germany in 1956 made the East German system the most heavily used railroad system in either Eastern or Western Europe, exclusive of the USSR. This relationship has remained the same to the present time.

In spite of the considerable increase in performance of East German railroads since 1950, the financial results of operations through 1957 grew steadily worse. To halt the deteriorating financial situation, changes were made in tariff rates and rules in 1958 that should have done much to equate costs with earned revenue.

Factor inputs into the East German railroads for the period 1951-55 were as follows: (1) operating employees increased approximately 6 percent, with a computed increase of 26 percent in labor productivity from 1950 through 1955 and a planned increase of 14 percent in labor productivity for the years 1956-60, and (2) capital inputs were well below the planned levels, although productivity of capital rose an estimated 30 percent during 1951-55. The rise in capital productivity, in terms of traffic kilometers per unit of capital value, was due primarily to the underutilization of capital in the early years of the plan and to an increase of only 2.6 percent in the estimated net capital value of the railroads for the period. At present rates of growth in performance, the increase in capital productivity will be about 22 percent during 1956-60 with an estimated increase of 8 percent in net capital value, thus indicating a decline in the marginal productivity of capital additions to the railroad system. This decline is the result once again of underutilization of capital in early years and the fact that relatively little investment has gone into improved types of capital equipment or needed track capacity.

Materials in the form of parts for rolling stock, ties, rails, and auxiliary metal parts are in continuing short supply. Efforts to augment domestic supplies with imported materials have been partly successful, but the entire quantity of materials contracted from Soviet and other European Satellite sources has not been forthcoming.

The East German railroads generally have been able to handle the demands of both economic and military traffic, but because average demand is close to the capacity of the system, shortages of cars and yard congestion occur during periods of peak traffic demands in the fall and spring of the year. Accordingly, some delays in traffic are experienced during these periods, but eventually the railroads have been able to move all traffic offered. Operations are expected to continue in the current pattern through 1960, and complaints will continue to be voiced regarding the performance of the railroad

system. Moreover, the over-all traffic plan of the Second Five Year Plan (1956-60) calls for a demand in 1960 of about 68 billion tkm, or an increase of 32 percent above that of 1955 (29.9 percent in freight and 2 percent in passengers).

On the basis of past trends in utilization and the additions of capital, labor, and material inputs, it is estimated that the East German railroads at best will complete only about 70 percent of their planned goal for 1960. Carloadings are not growing at the rate originally set in the Second Five Year Plan. Failure to achieve the planned capacity for rail transport in 1960 is in large part a result of inability to meet other economic plans and will not impair general economic activity.

Development of a transportation plan for 1960-65 has been principally a matter of enthusiasm and exhortation in East Germany, but in general this plan does not contain the substance to remedy the problems currently being experienced in the extensive program of capital additions, repairs, and renovations. Rail operations, therefore, are expected to continue in the current pattern beyond 1960.

I. Introduction

The railroad network of East Germany is a prime example of the Soviet pattern of achieving maximum performance from the transportation system with a minimum of capital input. The role of the railroads in the economy of East Germany has been that of a necessary service, tolerated because there is no substitute and improved only to the extent necessary to meet the demands of vital economic and military traffic.

Because of their importance in the economic growth of East Germany, railroad facilities have been maintained and improved in relation to the general pattern of economic growth in other sectors. Endowed with few of the raw materials necessary for the manufacture of heavy equipment, the East German economy depends heavily on its own transportation system and that of adjacent countries to provide for the movement of necessary raw and semifinished materials in every stage of production.

Railroad service has kept pace with the growth of the rest of the East German economy as a result of a sustained policy of intensive utilization of equipment, enforced personnel policies, and

absorption of reserve capacity in every phase of rail operation. Recent levels of replacement of equipment and investment in new facilities represent a mining of earlier investment in the system that could lead to a serious reduction in the growth of capacity, if continued beyond 1960.

In the early stages of central planning in East Germany (1948-50), two alternatives for providing rail transport were available: (1) investment in new, modern railroad equipment possessing high technical efficiency or (2) increased utilization of available, less efficient equipment and continued reliance on additional increments to operational efficiencies for future increases in rail capacity.

The first choice would divert the burden of increased transportation capacity from relatively labor-intensive, low-output equipment and facilities to capital-intensive, labor-saving equipment. Such investment would seem to be the best long-run alternative for an economy with a planned heavy industrial bias that expects to have high-density, heavy-load traffic. The second alternative assumes some capital additions in quantity terms, but the major element of increasing capacity would come from intensified use of existing equipment and accelerated depletion of capital.

Since 1951 the East German government has followed a plan closer to the second alternative. This choice was a product of the following conditions:

1. Among the industries competing for investment funds in East Germany, rail transport could be given a relatively low priority and still accomplish the desired traffic movement by more intensive utilization of existing equipment.

2. There has been a disinclination to absorb the real cost of scrapping obsolete equipment, such as aging steam locomotives and rolling stock, in spite of the fact that the introduction of modern locomotives (electric or diesel-electric) would increase actual route capacity in areas of high density and would yield operating savings which would amortize the initial cost.

3. The existing capability of the railroad system of East Germany for moving military forces and equipment apparently is adequate to satisfy the USSR. With reorientation of the directional flow of economic traffic from east-west to north-south as a result of changes in internal traffic demand, some of the rail lines torn

up by the USSR have had to be replaced, but the east-west traffic capability remains adequate to provide substantial support for the military in the event of war. This consideration also may be a factor in limiting new additions to railroad line facilities.

4. The abundance of low-cost labor in relation to performance required per man-hour in the early years of the East German First Five Year Plan (1951-55) probably created a preference for a labor-intensive, capital-exploitive program. This situation has now been reversed, and a shortage of qualified personnel exists in the transportation industry. Wages and administrative costs both have risen, the latter sharply.

In view of the declining priority of investment in the transport sector, the additional tonnage carried by East German railroads has been the result of policies designed to extract a greater average output per unit of input of materials and labor.

II. Organization and Development of the Railroad System

A. Administrative Organization

The Ministry of Transport and Communications of East Germany is a complicated organization, dominated by details and by a paramount concern for problems of the railroad system as opposed to those of other carriers. The Minister of Transport and Communications, Eric Kramer, a former railroad official, has been retained in the position for many years as the best compromise between loyalty to the Communist Party and satisfactory technical knowledge of transportation. The First Deputy Minister under Kramer is the First State Secretary in charge of rail operations, thus reflecting the importance of the railroads as the dominant carrier.

There is a Soviet consultant attached to the Ministry of Transport and Communications* who serves as an adviser to the Minister on rail operations and acts as referent on military (particularly Soviet) movements requiring the use of rail service. Other branches of transportation have deputy ministers, each with equal status but subordinate to the Minister.

Under the Central Administration for Railroads there are five Main Administrations, each responsible for a particular phase

* See the chart, Figure 1, following p. 6.

of rail operations throughout the country. The country is divided into eight districts (Reichsbahn Directorates -- RBD's), each of which operates separately from the others but subordinate to the Central Administration. Coordination of RBD activity is handled by the five main administrations, which in turn get policy and coordination from the Central Administration and the Minister of Transport and Communications.

Subordinated agencies of the railroads operate directly under the Central Administration, with functional units in each RBD, and consist of social, supply, health, and other subsidiary functions intrinsic to rail operations.

Heavy repairs (other than standard maintenance) are separated from the Central Administration for Railroads and are supplied by an autonomous service agency from which the railroads purchase major repairs on locomotives and rolling stock.

Administrative personnel below the level of the Minister have changed numerous times during the period 1957-59, mainly to eliminate the more obviously incompetent and to move into positions of responsibility those Party members who can work with Kramer.

B. Characteristics of the Railroad Network

1. 1950

The physical damage from World War II and the postwar Soviet policy of dismantling almost all second tracks (on double-track lines) for reparations claims left the East Zone of Germany with virtually a single-track railroad system by 1950. As a result of this change, some of the less significant single-track routes were eliminated, and the major traffic flow was reoriented from predominantly east-west movement to north-south movement. The redirection of traffic from east-west to north-south came as a result of changes in the internal traffic pattern of East Germany and simultaneously achieved a degree of isolation from the Federal Republic of Germany by severing some east-west lines that formerly connected the two zones of the country.

2. Pattern*

The basic configuration of the East German railroad network has not changed appreciably from the pattern that existed before

* For a map of the railroad network of East Germany, see Figure 2, inside back cover.

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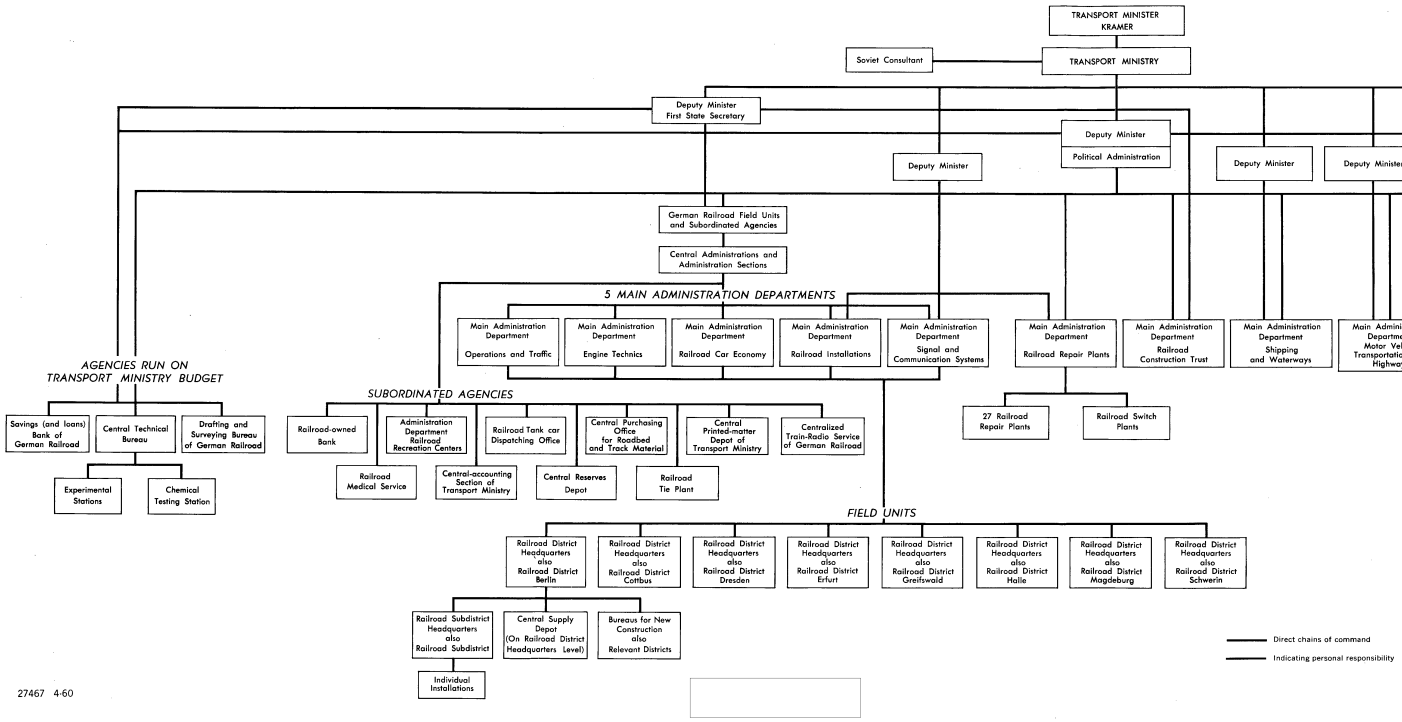
Figure 1

EAST GERMANY

ORGANIZATION OF THE MINISTRY OF TRANSPORT



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World War II, but its capacity was reduced considerably by dismantling for reparations. The railroad network is adequately dispersed and probably will have few new lines installed in the immediate future.

The railroad network of East Germany is oriented around two rail hubs -- one large, one small -- with spokes radiating to cover the traffic needs of outlying areas. The most important hub, Berlin, has radial lines going to all parts of the country but with a preponderance going toward the south into the heavy industrial areas. The second most important rail hub, Leipzig, is in the heart of the industrialized, southern portion of the country. From this point, double-track lines deploy to the other industrialized cities in the area, and single-track lines radiate to outlying districts forming a dense rail coverage. Other important rail hubs are Halle, Dresden, Magdeburg, and Chemnitz, all located in an elongated triangle comprising the area of heaviest concentration of domestic traffic.

Berlin and the industrial triangle to the south are both connected by rail with the Soviet and Polish mineral resources that are necessary to continued industrial production by East Germany. These rail lines to the sources of raw materials will become increasingly important as anticipated increases in traffic between East Germany and the USSR are realized. The capacity of several of these routes is to be increased by double tracking (largely restoration of removed second tracks) as soon as materials and labor become available.

The East German railroad network is complemented by a good system of inland waterways and a reasonably adequate network of long-distance highways and first-class and second-class roads.

3. Length

The total route length of rail lines in East Germany in 1958 was 16,093 kilometers (km).* Of this total, 1,318 km were narrow gauge (less than 4 feet 8-1/2 inches) and 14,775 km were standard gauge (4 feet 8-1/2 inches). 1/** Approximately 1,475 km of the standard-gauge route have two or more tracks, and at the end of 1958 approximately 160 km were electrified.***

* The latest year for which significantly complete data are available on East German railroads is 1958.

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*** For analysis of the structure of East Zone railroads, see Appendix A. For a comparison with other railroad systems, see Tables 5 and 6, Appendix C, pp. 38 and 39, respectively, below.

C. Demand for Rail Transport Service

1. Importance of Railroads as a Means of Transport

Railroads are the major carrier of inland freight and passenger traffic in East Germany. In 1958, railroads carried 48.4 percent of all tons originated and 82.1 percent of all ton-kilometers, motor transport carried 48.3 percent of all tons originated but only 11.3 percent of all ton-kilometers, and inland water transport carried 3.3 percent of all tons originated in 1958 and 6.6 percent of all ton-kilometers.*

The relative growth of the two major carriers (railroads and motor transport) under the First Five Year Plan (1951-55) was approximately equal. The 5-year trend showed an increased ton-kilometer performance but at a decreasing rate. During the first 3 years of the East German Second Five Year Plan (1956-60), the railroads continued to grow but at a decreasing rate. Motor transport, however, increased ton-kilometer performance at a faster rate than the railroads. Data on tons originated show a different pattern of growth.* Loadings of both motor and rail carriers were growing at an increasing rate, with motor carriers growing faster than railroads.

The disparity between the rate of growth of tons originated and of ton-kilometers is a result of the declining average length of haul by motor carriers -- from 22.3 km in 1950 to 18.8 km in 1957. The efforts of the East German planners to divert short-haul traffic from the railroads to motor carriers apparently have been somewhat successful.

2. Commodity Composition of Freight Traffic

The nature and composition of freight traffic in East Germany remained relatively consistent through the period 1950-58 with few changes of significant magnitude. Coal and coke, the major commodities in rail freight traffic, increased from 42.7 percent of the total of tons loaded in 1950 to 46.3 percent of the total in 1958.**

The second major commodity grouping -- other industrial and agricultural products -- represented 21.2 percent of total loadings in 1950 and 12.7 percent of the total in 1958. The sharp decline

* See Table 7, Appendix C, p. 40, and the charts, Figures 3 and 4, following p. 8, below.
** See Table 8, Appendix C, p. 42, below.

Figure 3

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EAST GERMANY

Indexes of the Growth of Ton-Kilometers, by Mode of Inland Transport

1950-58

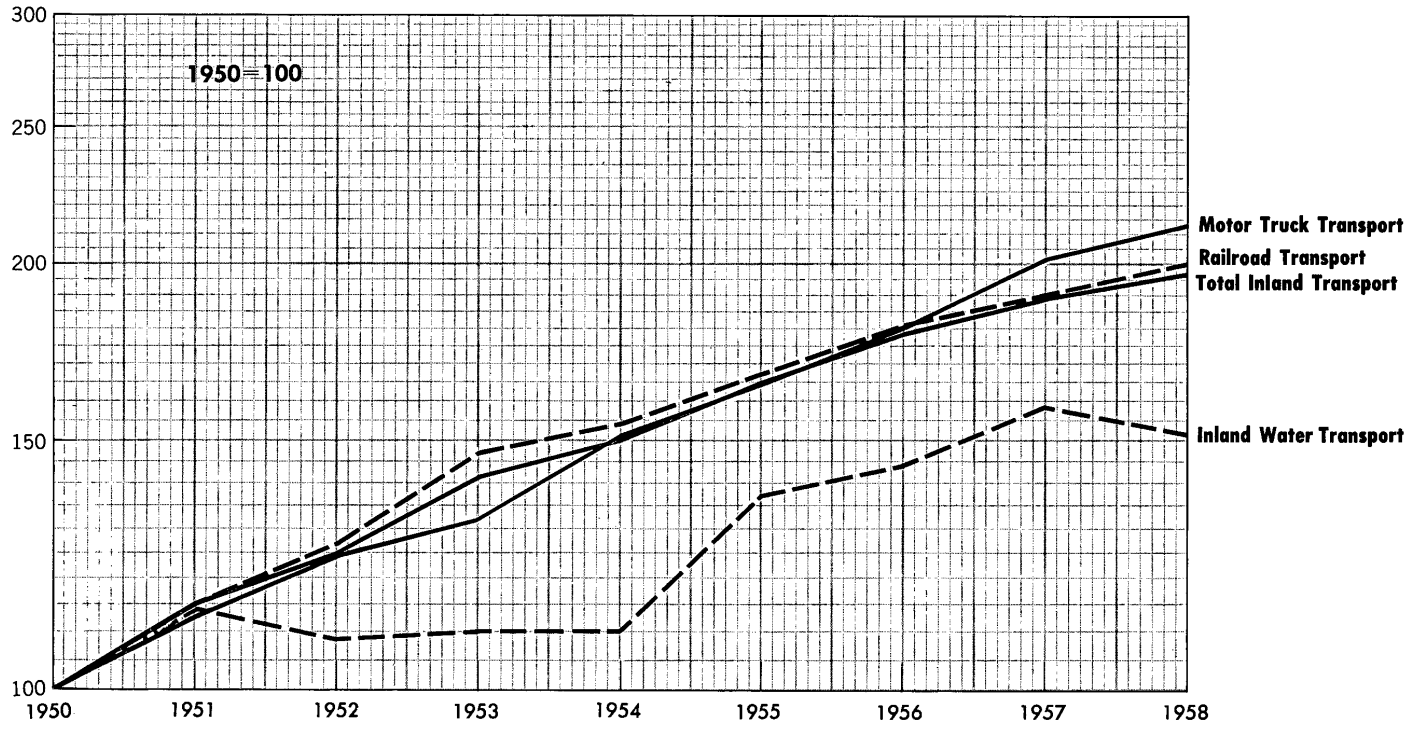

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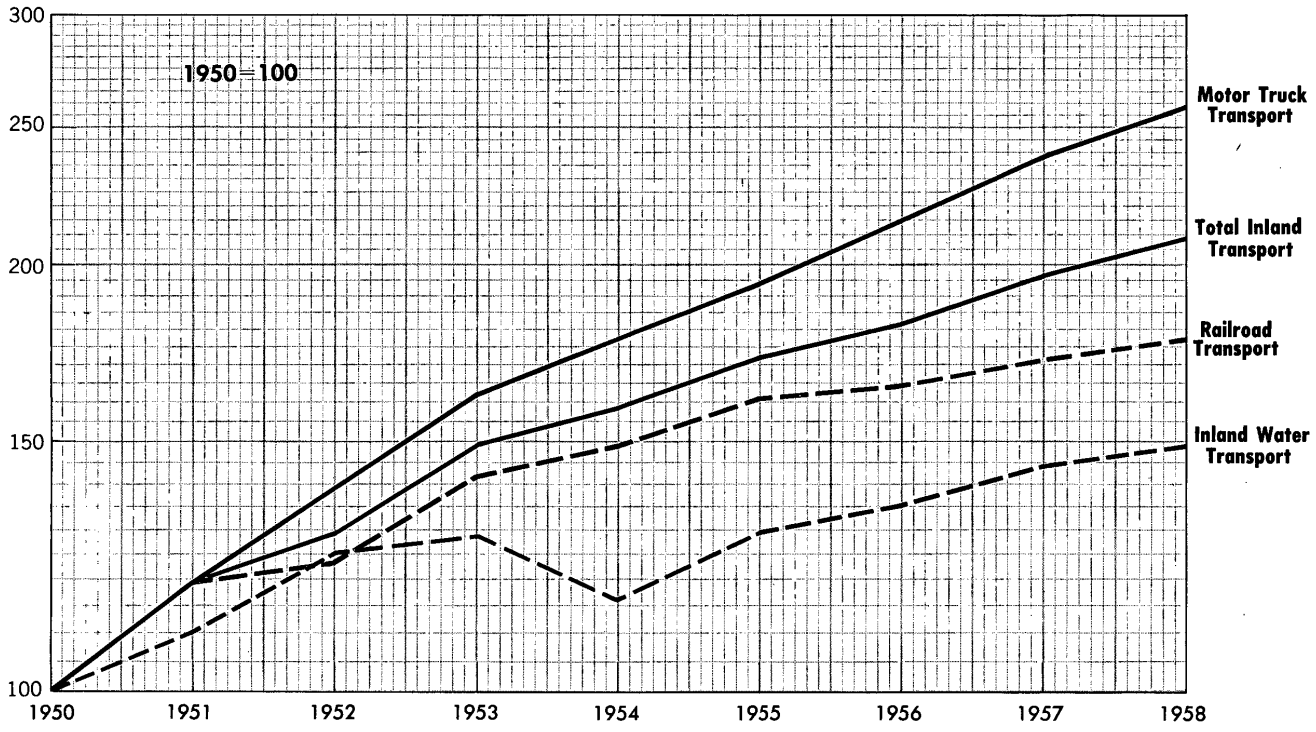
Figure 4

EAST GERMANY

Indexes of the Growth of Tons Carried, by Mode of Transport

1950-58



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is explained in part by the introduction of a "piece goods" category in 1952 that accounted for almost one-half of the decline. The absolute tonnages in other industrial and agricultural products retained the same ratio of loadings after 1952.

The third most important commodity group, building materials (excluding cement), continued to represent a fairly consistent percentage of total loadings.

3. Demands of Foreign Traffic

Foreign freight received at the border that is destined for domestic consumption is included as part of total tons carried when such freight crosses the border into East Germany. Transit traffic is believed to be included in the figure for total tons carried, although East Germany does not indicate what proportion of total freight traffic that transit traffic represents.*

Although foreign loadings generally have been less than 10 percent of total loadings, there is an implication of increasing imports and perhaps an implication that domestic production is becoming more heavily dependent on foreign sources. Foreign loadings increased from 6.6 percent of total tons originated in 1950 to about 10 percent of the total in 1958.** Although this increase is difficult to discern, it becomes more apparent when seen in terms of the growth of import tonnage alone. This increase was more than twice that of domestic tons or of total tons hauled during the same period.

4. Demands of Passenger Traffic

Passenger traffic has changed little during the period 1950-58. In terms of the number of passengers carried, the increase was only 3 percent in comparison with the 9-year period, although passenger kilometers increased 15 percent during the period, indicating a gradual increase in the average distance each passenger traveled.

Although the total number of passengers has not grown appreciably since 1954, the density of passenger trains remains high and contributes to make the East German railroad system one of the most intensively used systems in Europe in terms of the average number of trains per route kilometer.

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* For a comparison of the relative growth of tons of domestic freight originated and tons of foreign freight received, see Table 9, Appendix C, p. 43, below.

** For a comparison of rates of growth of domestic loadings and of foreign loads coming into East Germany through border stations, see the chart, Figure 5, following p. 10.

D. Expansion of the Railroad System

The relative maturity and the uniform distribution of the East German railroad network tend to reduce the need for new routes. The situation in Berlin in 1948-49 caused East Germany to decide to construct a new outer railroad ring around the city in order to circumvent Allied control, and the construction of the Schwarze Pumpe project (a coke-chemical plant utilizing low-grade lignite) required construction of a new railroad line to service it. Aside from these two projects, construction of new railroad lines in East Germany has been kept to a minimum.

Most main lines, however, have such heavy traffic that alternative routes involving longer distances have to be used to relieve them. 2/ Rail facilities have been expanded to meet increased demands of traffic. Thus increases in track capacity that were added during 1950-58 have come from double tracking and from reinstallation of some double track removed by the USSR. High-density traffic has been aided further by electrification of lines, by increases in rolling stock and locomotives, by heavier loading, and generally by more intensive utilization of existing equipment.

Any efforts at expansion probably will be confined to annual additions to the following projects, the rate of completion being largely determined by the priority of each project.

1. Double Tracking

Double tracking has been limited to stretches of line on which there is high-density traffic, such as Leipzig-Dresden, Halle-Songehausen-Nordhausen, 3/ Gothe-Neudietendorf, Leipzig-Torgau-Falkenburg, 4/ and some lines to the expanding ports of Wismar and Rostock. The new double track has been laid on roadbeds that remained after Soviet seizures for reparations. Annual additions to double track have been small, but future additions may be greater because traffic is expected to continue to grow and present capacity is very close to the present demand for traffic.

2. Electrification

Electrification has been limited to the rail line between Halle, Magdeburg, Leipzig, and Rosslau. Eighty-six km of this line were under electric operation at the end of 1957, 5/ and an additional section of 74 km became operable in 1958. 6/ This stretch of track originally was electrified and double tracked but was reduced to single-track steam operation by dismantling for reparations in 1946 and 1947. The electrification, therefore, is basically a replacement

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Figure 5

EAST GERMANY

Comparison of Rates of Growth Between Domestic Tons Originated and Foreign Tons Carried by Railroads

1950-58

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effort and does not portend large-scale conversion of East German railroads to electric traction.

The Second Five Year Plan calls for an increase of electrified line to a total of 400 km by the end of 1960, 7/ although this plan probably will not be achieved. The plan substantially exceeds demonstrated ability for construction in recent years.

3. Expansion of the Park of Rolling Stock

Additions to inventory of 17,000 new freight cars, an unknown number of double-decker passenger cars, and 485 locomotives originally were planned for 1956-60.* 8/ These targets are considerably higher than the annual rate of new car acquisitions made in the past, and, in the light of previous performance, the possibility of fulfilling such a plan for acquisition seems remote. Failure to increase the rate of car replacement in an aging car park (the average age being from 30 to 35 years) will lead to accelerated depreciation of existing cars and locomotives through more intensive use.

4. Expansion of Internal Reserves

Increases in the capacity of the railroad system of East Germany have depended on improvement in operating efficiency and will be reflected in improved operating ratios.** Attempts to make rational use of the inherent advantages of each of the modes of transportation through schemes to shift short-haul freight and less than carload lots of freight to highway transport and to shift certain bulk freight to inland water transport was primarily directed at relieving future expenditure for added rail capacity.

The Second Five Year Plan provides that inland transport carry 32 percent more goods in 1960 than in 1955. 9/ The plan also calls for more intensive utilization of rolling stock by the reduction of the amount of cross-haul traffic, of uneconomic long-haul traffic, and of the turnaround time of freight cars. Loading and unloading practices are planned on an around-the-clock, 7-day week schedule, with a total increase of 4.9 percent in the average load per car during the 5-year period. 10/

The improvement of operating efficiency should enable the railroad system of East Germany to increase over-all capacity to some degree, with little capital outlay. The result, however, will be continued depletion of what little reserve is left in the system.

* See Table 10, Appendix C, p. 44, below.
** For an explanation of operating ratios, see Appendix B.

5. Conclusions

Future expansion of facilities and inventory of the railroad system of East Germany will depend on increases in the quantity and the quality of labor, the availability of necessary material inputs, and the cooperation of shippers and railroad men in improving the operating indexes. Train density is so great on this essentially single-track system that rerouting traffic to avoid congestion on main lines is standard practice. This situation calls for restoration to main lines of significant amounts of second track removed for reparations to the USSR. Electrification of the rail lines of very high traffic density would be advantageous, and more flexibility and reserve operating capacity in signaling facilities and dispatching techniques can be achieved and would be useful.

The planning organization of the Ministry of Transport and Communications of East Germany must be acutely aware of the delays and consequent cost of current operations of the railroads. The planners also must be aware of the need for greater investment as well as for improved operating indexes. These same planners constantly plan in terms of goals that are unattainable because of the priorities given to inputs in other sectors. With the given alternatives and with current East German industrial goals, the choice has been to exploit the available capital structure of the railroads (and other nonindustrial sectors) in favor of industrial objectives. Should rail transportation become a significant and costly bottleneck to industrial expansion, the structure of priorities may be expected to change. Additional funds would have to be invested in the railroad network to assure its satisfactory performance. If domestic resources were not adequate to remedy the situation, greater external aid from the Soviet Bloc would have to be forthcoming.

III. Rail Operations and Utilization of Facilities

A. Comparative Utilization of Facilities

Rail operations in East Germany emphasize rapid turnaround of transport equipment. The railroad system is characterized by a high density of train movement with relatively low net loads per freight train and frequent passenger train service. This type of rail operation requires both an efficient dispatcher and an efficient car control system, with the essential ingredient for success being coordination and smoothness of all the operating phases.

The above operational procedure leads to a high average density of freight trains per route kilometer per day -- approximately 16 trains in East Germany compared with 7 in Czechoslovakia and 14 in

Poland. For a railroad system using steam locomotion that has approximately 10 percent of its length double tracked and only 1 percent electrified, the East German railroad system has very high train density. The performance of East German railroads on the basis of tonnage per route kilometer per year for 1956 is 14,256 tons compared with 11,317 for Czechoslovakia, 9,765 for Poland, and 9,657 for West Germany.*

The basic test of performance of any railroad system, however, is that of freight ton-kilometers in relation to the total railroad network for a period of time. In such a comparison the freight ton-kilometers per route kilometer per year of the East German railroad system is about 77 percent of that of the Czechoslovak railroad system and about 90 percent of that of the Polish railroad system. East Germany, considering its small size and its method of operation, has one of the most intensively used railroad systems in the Soviet Bloc and certainly one that is more intensively used than the railroad systems of Western Europe.

B. Utilization of Rolling Stock

The working freight car park of the East German railroad system on the average is adequate to meet domestic demands for loadings, although there are localized and temporary shortages of particular types of cars. These shortages result from problems of distribution rather than of an insufficient supply of cars. Shortages of most types of cars do occur during peak traffic periods (normally March through May and September through December) when the greatest volume of carloadings occurs. Requirements for cars during these peak periods are met by withdrawing cars from economic and military reserve parks and by holding more foreign cars on the system. In recent years the management of East German railroads has found it more and more difficult to return such reserve cars to their parks, indicating that there is a growing need for more working freight cars than are maintained on the average.** The use of foreign cars may be easily accomplished, if such cars are available, through rental agreements. In the short run, such a policy is a less expensive means of providing the necessary cars to meet peak load traffic than investment in new cars would be.

The plan for 1956-60 calls for the addition of 17,000 new freight cars to the East German car park. To meet this goal, the annual rate of acquisition would have to average 3,400 cars. During the first three quarters of 1957, only 1,704 freight cars, 11/ or

* For additional comparisons, see Tables 5 and 6, Appendix C, pp. 38 and 39, respectively, below.

** See the chart, Figure 6, following p. 14, and Table 9, Appendix C, p. 43, below.

one-half of the requirements to fulfill the annual plan, were added to the car park. [redacted] 50X1 failure to fulfill plans for acquisition of cars has been a normal occurrence in past years, and unless commitments by countries of the Soviet Bloc to export cars are changed or unless production is increased, there is small possibility of East Germany acquiring its planned number of new freight cars by 1960.

IV. Relationship of the Transport Sector to the Economy as a Whole

There has been a direct, almost coincidental, relationship in the rates of growth of transportation and of industrial output in East Germany, with a very high positive correlation.*

A. Transportation Price Policies

The rate and fare schedules of the East German railroads are believed to be largely a result of historical precedent. From 1949 through 1957, no major adjustments were made either in freight rates or in passenger fares, although costs during the same period increased sharply. Efforts to bring revenues in line with costs, principally through attempts to decrease operating costs, have been unsuccessful.

In September 1957 the Minister of Finance issued an order instructing railroad officials to increase freight rates in 1958 in order to raise the revenues from rail transportation by 90 million DME** above the level of 1957. 12/ In execution of this directive, a new system of freight rates, which was to become effective on 1 January 1958, was set up. 13/ The essential features of this new system are as follows:

1. A basic rate of 20 DME is charged for each axle of the car regardless of the commodity to be shipped or the distance that it is to move.

2. Each car is to be weighed at the dispatching station (or at a station en route) at a charge of 5 or 6 DME. The previous charge was 1.60 DME.

3. The number of classes of tariff are reduced to a maximum of 10, of which Classes I and II are reserved for special rates on favored commodities. Rates run from 1 pfennig per ton-kilometer for Class I to 10 pfennigs per ton-kilometer for Class X.

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* See the chart, Figure 7, following p. 14.

** Deutsche Mark East (East German marks). Values of DME in this report are expressed in current marks and may be converted to dollars at the rate of exchange of 4.2 DME to US $1.

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Figure 6

EAST GERMANY

Comparison Between the Average Number of Freight Cars Needed to Carry Railroad Tons Originated and the Average Number of Freight Cars Available

1950-57

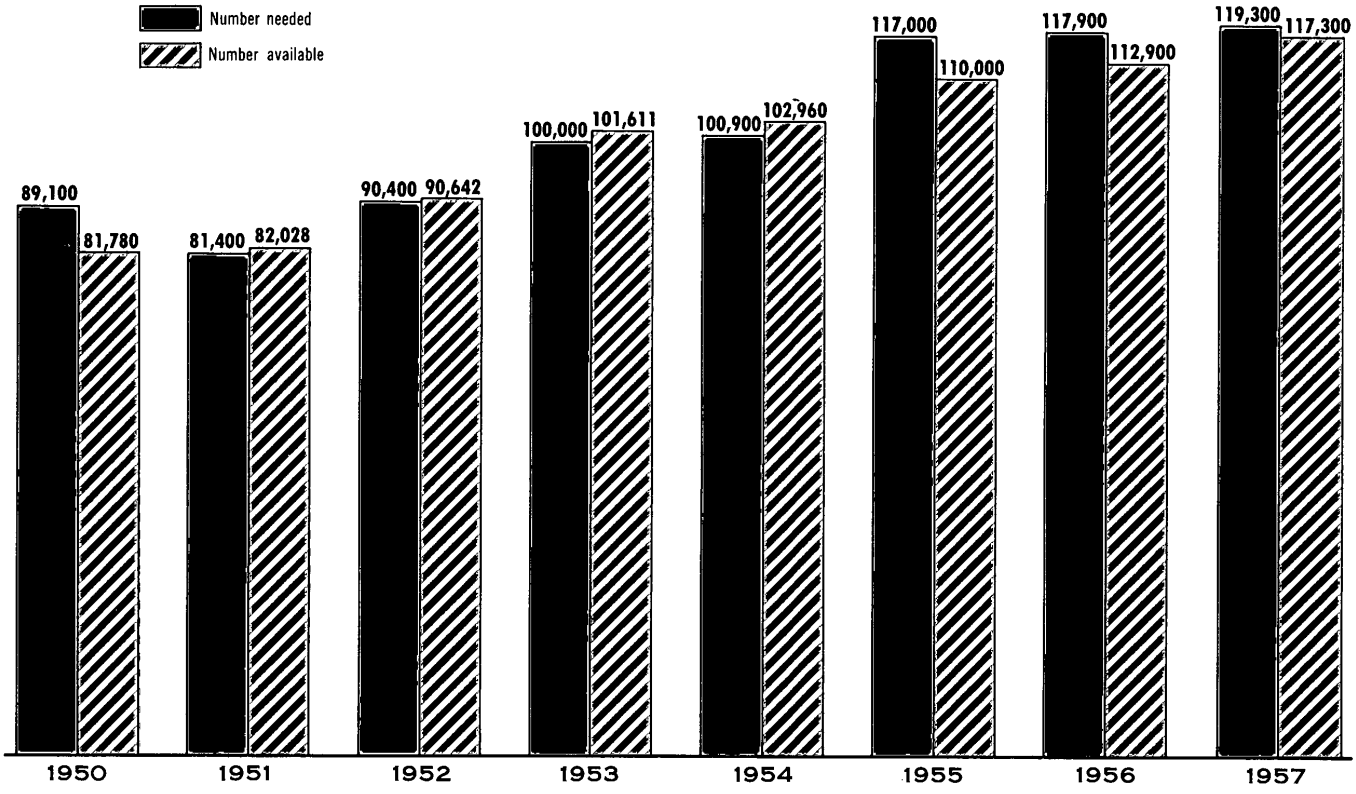

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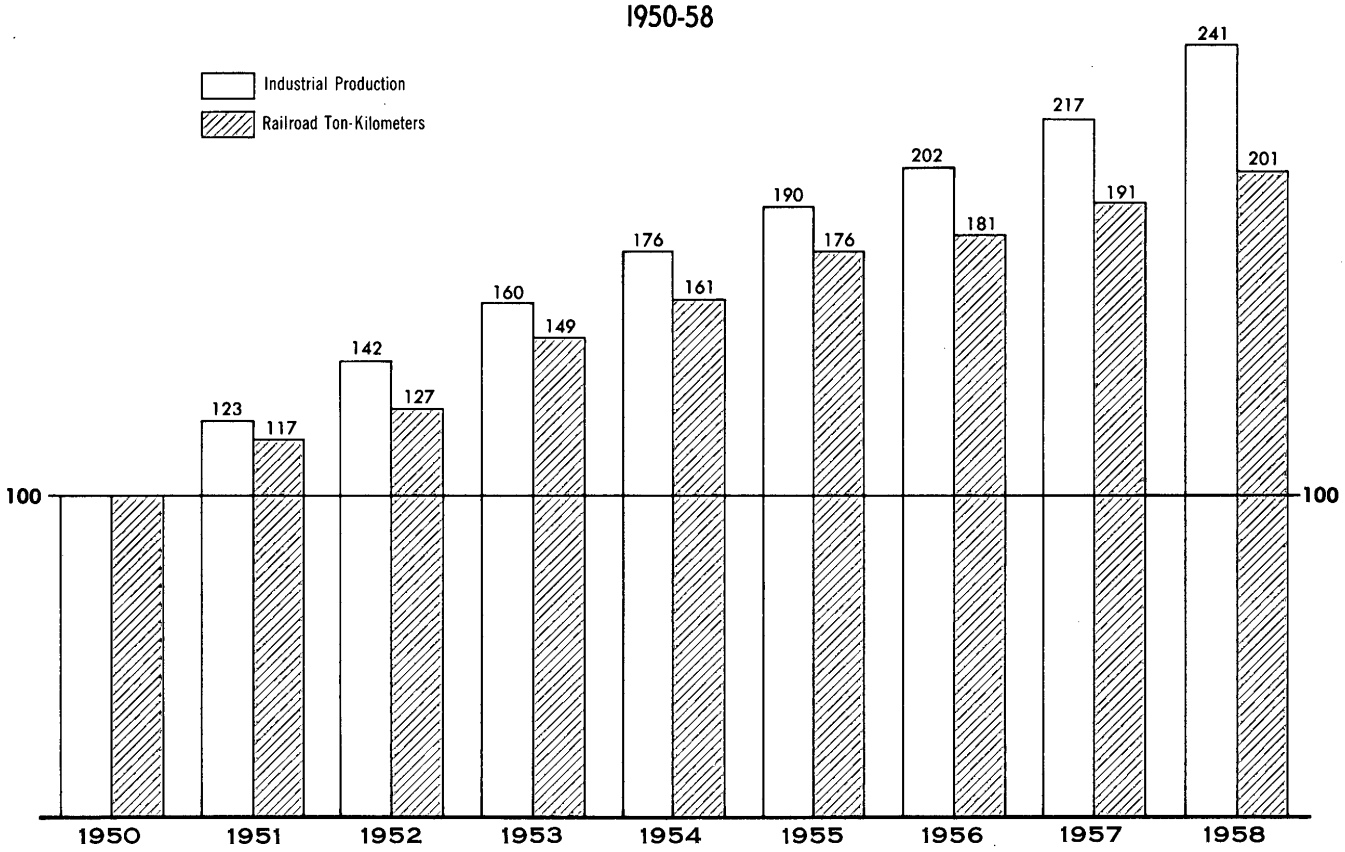
Figure 7

EAST GERMANY

Relationship of the Index of Industrial Production to the Index of Railroad Ton-Kilometers

1950-58



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4. Zones of freight distances are established for computing distance of each haul.

5. A wide variety of special rates on such items as fertilizers, coal, milk, and animals is discontinued, 14/ and the postal system is charged higher rates.

6. Rebates are given to those consignors who can ship trainload lots of 80 axles or more from one area to another with little need for classification and handling in freight yards. 15/ These rebates are designed to accommodate bulk shippers of coal, coke, ores, fertilizers, and perhaps the uranium ore shipped to the USSR and provide a convenient device to decrease rates on domestic freight if shippers of bulk commodities can organize consignments in 80-axle (or more) train lots to a single consignee. These consignments reduce considerably the handling costs en route, and the savings are passed on to consignors as an incentive to ship in large quantities.

The reasons given for these charges in freight classes and rates are numerous: the need to increase total revenue derived from railroad service, diversion of certain types of freight to other modes of transport, convenience and simplification of computing freight rates by shippers, and better utilization of freight loading space. The major impact of the changes is going to be a higher cost to shippers for transportation service and a closer equating of railroad cost with railroad revenue.

The new changes in rail freight rates are not a radical departure from the system formerly used. They represent a simpler classification but still incorporate a computation of rates on the basis of weight, distance, and commodity carried. The charge per axle may reduce the tendency of shippers to order more capacity than they need to insure getting a fixed amount of space required. This charge should exert its greatest influence in reducing the use of rail service for short hauls. Indeed the net effect of the rate changes has been to increase the individual charge per year by a fixed amount that will have the effect of improving the position of the long-distance user.

B. Effect of Transportation Prices on the Economy

Under the First Five Year Plan the subsidization of railroads and other carriers had the effect of spreading the cost of transportation among enterprises and individuals with little regard to the degree to which these groups used transport services. Thus transport prices favored heavy users of the transportation system,

and in turn the transportation system was subsidized by groups that provided the bulk of state revenue. Such practices, not uncommon in many Western European countries where transportation is a government-owned service, do not diminish the over-all cost to an economy of transportation services but do distribute that cost among the economic sectors somewhat differently than would prevail if users were required to bear their full share of the cost.

The major effect of such subsidy payments on the transportation system may well be caused by the operators themselves who, faced with a seemingly uneconomic ratio between cost and revenue, attempt to make the situation appear more favorable by cutting away at those costs that in the long run are necessary but in the short run may be deferred. Such costs include maintenance of facilities and reserve for depreciation. Reduction of these expenditures tends to increase the hazard of current operations and to defer replacement of equipment but does not reduce the cost of transport operation, rather deferring what is logically a current cost to future years.

The immediate impact of the new freight rates will be a larger domestic freight bill. This larger freight bill will certainly be accompanied by many internal readjustments in prices (factor costs) because of the increase in the percentage of total industrial costs represented by transportation charges. Industries that formerly occupied favored positions because of preferential freight rates may now find that they can no longer maintain the price structure of 1957, absorb increased freight charges, and still show a profit.

This change will mean an increase in cost for every industry that uses rail transport. This higher cost will temporarily disrupt the established patterns of factor costs, and the planning organization will have to make internal price adjustments to compensate for the distortions that will result.

The changes that do occur in the price structure will affect the production function of each industry that uses significant quantities of transportation as a component part of its processes. The nature of the manufacturing process will determine whether or not each plant can substitute inputs with a lower relative transport cost into its production. In most industries, substitution will not be possible, and the increased cost will have to be absorbed or passed on in the form of higher prices. No matter what the final effect of increased transportation costs is, a close approximation of railroad revenue with real costs should enable East German planning authorities to assess more accurately the position of transportation as an economic sector in the East German economy.

C. Financial Returns of Railroad Enterprise

Information available on the financial status of East German railroads shows that deficits have occurred from rail operations every year since 1951, if profits are computed on the basis of plan expectations. A computation based on actual revenue derived minus incurred costs (it is not known whether these costs are current operating costs or total costs) shows that deficits from rail operations have occurred in every year since 1953. Deficits have increased steadily since 1953, and the annual subsidy required from central government sources has become a very significant proportion of total revenues, reaching 29 percent of railroad revenue derived from all sources and expended in 1957.*

The annual cost of total rail operations to the East German economy may be expressed by comparing total incurred cost with total earned revenue, thus reflecting the total gross subsidy required from central budgetary sources to keep the railroads in operation.** This comparison contains all costs from current operations, including reserves for obsolescence and depreciation plus annual capital charges and expenses, and can be referred to as the gross operating ratio.*** This ratio in 1956 was 134, indicating that 134 DME were incurred as costs to the economy for every 100 DME of earned revenue.

The net operating ratio, which includes only current operating expenses exclusive of annual capital charges and expenses, was 118. These operating ratios are compared with the operating ratios of railroads of Western European countries in Table 2.****

Because of different internal financing arrangements, the differences between the two ratios for each country are accounted for by the annual capital charges and expenses that are included in the gross operating ratios. For East Germany this annual difference is equal to the amount of net capital expense incurred during the given

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* The total revenue in 1957 was comprised of earned revenue of 2,600 million DME, government subsidy on current account of 601 million DME, and 482 million DME for capital investment, for a total of 3,683 million DME collected and expended by the railroads.

** See Table 1, which follows on p. 18, below, and the chart, Figure 8, following p. 18.

*** Gross operating ratio as defined above should be distinguished from net operating ratio, which is a measure commonly used to express a quick, although crude, picture of the current financial position of a railroad. A ratio higher than 100 indicates that current operating expenses are higher than earned revenue. For a complete explanation of the concept of gross operating ratio, see Appendix B.

**** Table 2 follows on p. 18.

Table 1

Composition of the Financial Balance of Railroads in East Germany a/
1956

Item	Million Deutsche Mark East	Percent of Total
Operating expenses	2,949	88
Capital charges and expenses b/	398	12
Total cost	3,347	100
Earned revenue	2,506	75
Subsidy	841	25
Total revenue	3,347	100

a. See Tables 11, 12, 18, and 19, Appendix C, pp. 46, 47, 55, and 56, respectively, below.
b. See Table 16, Appendix C, p. 52, below.

Table 2

Operating Ratios of Selected Railroads in West European Countries and East Germany
1956

Railroad	Operating Ratios	
	Gross	Net
East German Railroad System a/	134	118
West German Federal Railroad b/	132	105
Austrian Federal Railroad b/	129	129
French National Railroad b/	109	105
Swedish State Railroad b/	103	99

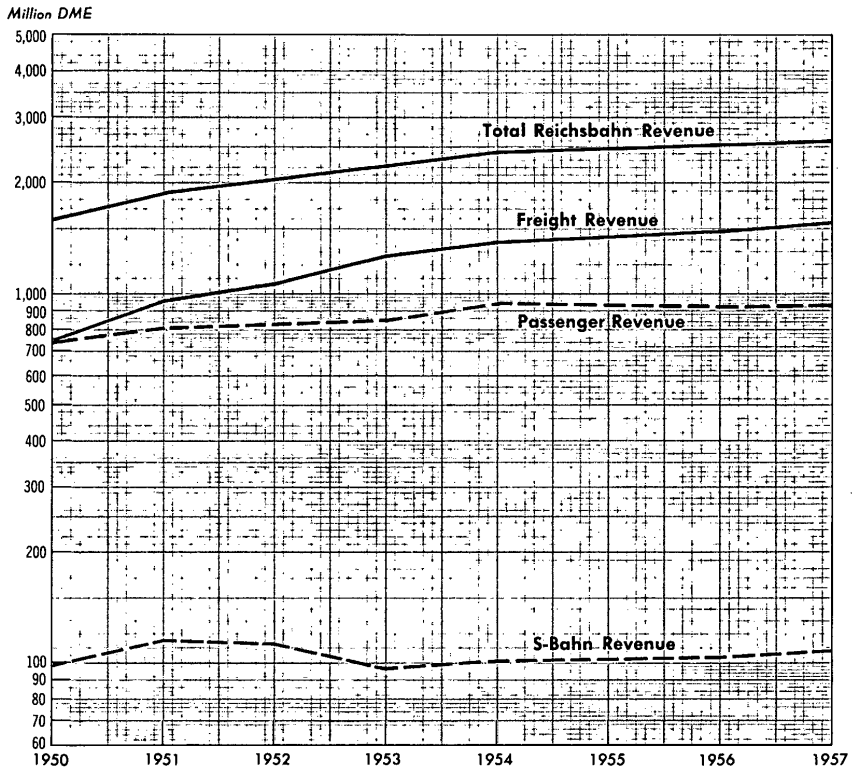
a. See Appendix B.
b. 16/

Figure 8

EAST GERMANY

Revenue of Railroads, by Type of Service

1950-57



27471 4-60

operating year; for other countries, capital charges from previous periods also may be added. For a period of time this disparity in computation would not affect the comparison.

D. Labor Situation in the Transportation Industry

Rapid growth in labor productivity is the device that East German planners hope will provide the increased capacity needed on East German railroads through 1960 and probably through 1965. An article on the prospect for the railroads for 1961-65 in the official railroad newspaper of East Germany states: "There should be no doubt about the fact that the Deutsche Reichsbahn /East German railroads/ cannot count on a larger number of workers and employees until 1965 and that the higher tasks can only be solved by an increase in the productivity of work." 17/ The objective and problem of all East German rail operations is to rationalize the available working force into a system whereby the available equipment is continuously used in assembly-line fashion on an around-the-clock, 7-day week schedule.*

The necessity for the continued intensive organization and use of labor arises from the shortage of qualified personnel for skilled positions and the consequent necessity of using those unskilled laborers available in positions for which they can seldom be properly prepared. Because of general labor shortages and problems of replacing employees lost through attrition of one form or another, administrative reorganizations and employee innovations have been introduced in both the East German First and Second Five Year Plans, each ostensibly designed to make the role of labor in greater railroad capacity an increasing proportion of the total.

1. Results of Intensive Labor Practices

The effects of the reorganization of operations to utilize both men and equipment more efficiently have not been up to original expectations. Deputy Minister for Transport Robert Menzel wrote on 16 December 1958 that it is "quite clear that organizational shortcomings in the Deutsche Reichsbahn /East German railroads/ have reached a point which calls for drastic countermeasures." 18/ Continuing, he pointed out that in spite of achievements in gaining high loading capacity in tons, the quality of handling both cars and freight is low.

* For a breakdown of the total labor force in transportation and of the wages paid for the years 1950-56, see Tables 13 and 14, Appendix C, pp. 49 and 50, respectively, below.

The serious increase in delayed arrivals of trains, the increasingly high rate of damage to cars and freight, the multitude of work competitions, and the extensive number of shunting operations per average distance moved are all outward manifestations of the drive for greater performance per man-hour and the overriding emphasis on increases in quantity. The real economic cost is increasing rapidly. The rate of damage to cars in the Schwerin railroad district rose in 1958 more than one-third above the rate of damage noted in the first half of 1957. 19/

Other evidence of the effects of the intensive pressure on railroad personnel is the growing incidence of illness, which in itself may be a passive form of counteracting the long working hours that are often required (mostly unpaid) in spite of a legal maximum 45-hour week. In the first quarter of 1958 the average absenteeism because of illness alone rose to 9.8 percent of the railroad working force; the average for 1955 was 5.8 percent. At any given time, approximately 29,000 employees are absent because of illness. The annual loss in man-hours from this type of absenteeism, the loss of hours from normal vacation leave, and the actual loss of men through defection to West Germany compound an already serious shortage of personnel that the East Germans themselves concede does not have an immediate solution.

Although increases in labor productivity have occurred recently, the significance of such increases in terms of man-hours is difficult to assess, for the total number of hours, including all overtime hours, required to complete the work is not available. The emphasis on performance in quantity evidently has had an adverse effect on the quality of work performed, thus reducing to a degree the advantages of increased productivity.

2. Labor Productivity

Although the total labor force on the railroads has declined since 1954 and currently is believed to be about the same number employed in 1953, these losses of personnel have been mitigated to a degree by quantitative improvements (apparently at the cost of quality) in average performance per employee. The average performance per operating employee in 1951 was 176,300 traffic km per year; by 1957 it had increased to 239,900 traffic km, an increase of 36 percent in comparison with 1951.*

Between 1954 and 1957, East Germany achieved an increase of about 5 percent in average annual performance per operating employee while sustaining a reduction of 5 percent in the number of operating employees for the period.

* See Table 15, Appendix C, p. 51, below.

Future increases in the productivity of railroad operating personnel will depend primarily on the performance of those operating and service personnel employed in railroad construction, maintenance, and repair and on technical improvements in railroad equipment. Turnaround time, average load per car, speed between stops, and total tons per train often depend on factors not involving operating employees, maintenance crews, repair mechanics, loading and unloading labor, and shippers.

For the above reasons and because of the currently high average number of man-hours worked per employee per week, future increments in labor productivity must come increasingly from labor-saving additions to the capital plant rather than from the further reorganization of labor practices.

E. Program for Capital Equipment of the Railroads

Of the 55 billion DME scheduled for investment in the East German economy during 1956-60, about 5.9 billion DME are allotted to transportation. Investment in transportation during 1956-60 can be summarized as follows*:

Planned Investment for All Transportation and Telecommunications	Million DME
Transportation	
Railroads, approximately 65 percent of total transportation (an average of 770 million DME per year)	3,848
Other transport, 5-year period (an average of 400 million DME per year)	2,052
Subtotal	5,900
Telecommunications (approximately 10 percent of total)	700
Total	6,600

* For more detailed analysis of investment relationships, see Table 16, Appendix C, p. 52, below.

1. Investment in Railroads

At the current rate of investment, East Germany will not be able to fulfill the investment planned in railroad transportation under the Second Five Year Plan (1956-60). In order to achieve under the plan the investment of 3,848 million DME in railroads, the average annual rate of investment would have to equal 770 million DME. In 1956, investment was planned to be 673 million DME, or approximately 100 million DME too low on an average annual basis. The investment plan of 1956 was fulfilled by only 59.1 percent, with an actual expenditure of 398 million DME, or 275 million DME below the plan. In order to compensate for this lack of fulfillment in the first year of the Second Five Year Plan, investment for the remaining 4 years would have to be programed at an average annual rate of 863 million DME, a goal far beyond the capability of East Germany unless that country drastically changes the structure of investment priorities.

Estimated investment in railroads under the Second Five Year Plan is not expected to be more than 68 percent of the original plan figures of approximately 3,848 million DME. On this basis it is estimated that maximum investment in railroads will not be more than 2,620 million DME for the 5-year period and that minimum investment could be as low as 2,000 million DME.

If the plan is fulfilled by 68 percent (2,620 million DME), this figure in itself will represent an increase of 65 percent, a considerable increase in absolute terms above actual investment under the First Five Year Plan (1951-55). This figure, however, will represent a decrease in the share of total investment allocated to the railroad system by East Germany.

The proportion of net investment in railroads to total investment in East Germany for the First and Second Five Year Plans is shown in Table 3.*

In spite of a proportional decline in relation to total investment, investment in railroads in 1956-60 will represent a sizable increase above that of 1951-55. An increasingly larger proportion of actual capital expenditure, however, will be invested in capital maintenance, capital repairs of over-age locomotives and rolling stock, and extensive replacement of track instead of in capital acquisition or formation.

* Table 3 follows on p. 23.

Table 3

Net Investment in Railroads as a Percent of Total Investment in East Germany a/ 1951-55 and 1956-60

	Percent of Total	
Investment	1951-55	1956-60
Planned	7.0	7.0
Actual	5.5	4.8 (Estimated)

a. From Table 16, Appendix C, p. 52, below.

Evidence of the increasing necessity for an accelerated program for replacement of track is that plan announcements for 1961-65 call for doubling the track renovations under the Third Five Year Plan (1961-65). 20/ The renovation plan is designed to eliminate the slow-speed stretches that currently act as a bottleneck and are a prime contributor to the increasing number of late train arrivals.

Plans for renovation of tracks include installation of heavier rail so that loadings of 21 tons per axle would be permissible on all main lines. Such an improvement would permit heavier trains and would contribute significantly to increased capacity for tonnage.

The considerable discrepancy between planned and accomplished renovations and additions to capital equipment from 1948 to 1958 has been a major factor in the limited improvement in the capital structure of the railroads. Much of this discrepancy has come from the inability of the Ministry of Transport and Communications of East Germany to procure the quantities of materials and finished capital equipment necessary to utilize fully the investment funds provided. The problem has resolved itself (particularly in the early years of the First Five Year Plan) into one of inability to procure the planned investment goods rather than a problem of getting a sufficient allotment of funds with which to buy these goods. Under the Second Five Year Plan (1956-60), both the allotment of funds and the procurement of materials have become increasingly serious problems. This situation results from two conditions: (a) the need of East Germany to put heavy investments in sorely lagging sectors of the economy, such

as electric power and coal, and (b) the fact that the capital structure of the railroad system is falling further and further behind the level necessary to maintain some equilibrium with the demands placed on it. Future plans, therefore, will require proportionately larger outlays to attain given requirements for capacity than would have been necessary in previous planning periods simply because of the necessity for large-scale replacements of existing capital equipment. Future outlays of capital will not add greatly to total numbers of freight cars, although capacity will increase if there is sufficient substitution of new 4-axle cars with capacities of 25 tons to 30 tons or more for 2-axle cars of 15-ton to 20-ton capacity. Because industrial shipping arrangements are geared to the smaller cars, the East German railroads will have to create the prerequisites for the employment of these cars. 21/

2. Material Inputs

A major problem confronting the East German railroad system (in the past and the present) is obtaining materials in sufficient quantities to maintain adequately and to improve the railroad network and rolling stock. War damage and reparations for the USSR left a single-track railroad system that was adequate to haul the 38.7 billion combined freight and passenger kilometers in 1951. In 1958, however, combined freight and passenger kilometers had increased about 40 percent and yet were being carried on about 12 percent more track capacity than was available in 1951.*

Much of the track structure in current use has not been adequately maintained or replaced since before World War II. This condition has been one of the principal causes of the accelerated rate of rail breaks, which in turn have been the result of a "patchwork" maintenance program largely dictated by shortages of necessary materials.

The shortage of materials stemmed from Soviet confiscation of all available maintenance materials during 1946-49, when the tracks were being dismantled. Subsequently the First Five Year Plan for reconstructing 2,300 km of track was only about 5 percent completed by the end of 1953. 22/ In 1954 and 1955, 450 and 772 km, respectively, of track reconstruction were scheduled. 23/ Actual completion in those 2 years is not known but is estimated to have been 150 to 200 km of track per year.

The First Five Year Plan for reconstruction of track was largely underfulfilled. The reconstruction of track seems to be

* See Appendix A.

programed on a smaller average annual rate of increase than it was during the first plan period in spite of the need for greatly accelerated reconstruction. Current planned reconstruction of railroad track is about 250 to 300 km per year, with hopes of completing an average of 350 km of track annually under the Second Five Year Plan. This planned figure is 110 km less than that planned for 1950-55 and represents about one-half of the normal annual addition of 770 km recommended by a commission appointed in 1953 to determine what capital additions should be made to the railroads from 1956 through 1960.*

Availability of material is one of the major problems currently facing the East German railroads. This desperate lack has forced a policy of "patching" for current maintenance and a virtual moratorium on replacement of significant quantities of rail line. The situation has reached the point at which limited line capacity and yard capacity are making it unprofitable to add large amounts of rolling stock because of the inability of the railroads to handle the additional numbers without causing increased periods of congestion.

The prospects of any large-scale improvements in the supply of materials are almost wholly dependent on increases in supply coming from outside sources, probably from the Soviet Bloc. With the exception of the USSR, which fulfills a greater proportion of its export commitments to East Germany than does any other country, few countries have been willing or forced to supply the quantities of material needed by the East German railroads.

3. Future Prospects for Inputs

If replacements and additions of railroad equipment and rolling stock can more than compensate for the rate of deterioration plus the increased traffic demands, the current operating difficulties of the railroads can be solved. There is no evidence that these operating difficulties are being solved. On the contrary, many breaks in the rails, late train arrivals, damaged freight, labor problems, inefficient repairs, and shortages of materials are increasing.

In an address to senior officials of the Ministry of Transport and Communications in January 1959, the Minister, Eric Kramer, criticized the above problems as the "calamitous conditions prevailing within our railways in some fields." 24/ Calling for support from senior officials and threatening "functionaries who are not living up to socialist efficiency," 25/ Kramer predicted that a

* See Table 17, Appendix C, p. 54, below.

solution to the outmoded and careless methods would be worked out. Although he was speaking primarily of shortcomings of personnel and physical deterioration of equipment on the railroads, he was implying that solutions to shortages of factor inputs have not as yet come forth.

Problems of administration, capital, and labor have grown more complex as traffic demands have increased. With no apparent change in the fundamental economic approach to solving shortages of rail transport, these problems can be expected to remain largely unsolved in the next few years.

V. Interrelationships of Capital and Labor Productivity

If the volume of traffic increases in accordance with the directives of the original Second Five Year Plan (1956-60), performance in traffic kilometers will increase 32 percent above that of 1955.* In absolute terms this figure means that the volume of traffic in 1960 may equal approximately 68 billion traffic kilometers (the volume in 1955 equaled 51.6 billion traffic kilometers), 76 percent greater than the volume in 1951.

Discounting such intangible factors as large increases in administrative efficiency, there are only three ways that East Germany could hope to gain the desired performance of 68 billion traffic kilometers by 1960: (1) by increasing labor productivity sharply and making large additions to the operating labor force while holding capital relatively stable, (2) by making large net additions to the capital structure of the railroads in the form of labor-saving equipment (a difficult task in 2 or 3 years), and (3) by increasing both capital and labor, maintaining the approximate ratio of capital to labor that existed under the First Five Year Plan (1951-55), and hoping for a combined increase in productivity to equal the desired performance in traffic kilometers.

By 1960, according to its own announcements, East Germany has planned to increase labor productivity 14 percent -- no increases in the labor force being mentioned -- and to provide twice the volume of funds for investment that were provided under the First Five Year Plan. These planned factor increases are supposed to achieve the expected performance in traffic kilometers. It is estimated, however, that the plan for doubling investments will not be fulfilled.

Therefore, by interposing computed index values of estimated labor and capital inputs for 1960 into a formula involving the

* See Table 15, Appendix C, p. 51, below.

coefficients of each (as derived from the correlation),* it can be shown that the plan for traffic kilometers for 1960 is beyond the expected capacity of the railroads. Indications are that the level of performance will be between 60 billion and 62 billion traffic kilometers, or approximately 6 billion to 8 billion traffic kilometers fewer than the plan goal. The planned growth in factor productivity and additions is not adequate to fulfill the traffic plan.

Because the investment plan is not expected to be fulfilled, the assumption is that the ratio between capital and labor will remain relatively constant during the period 1958-60, with neither factor likely to increase sharply during such a short period of time. In view of existing labor conditions, the possibility of large increases in the operating labor force in the remaining years of the Second Five Year Plan are extremely remote, and East German officials indicate that no relief can be expected until 1965. Therefore, expansion of either labor numbers or of labor productivity sufficient to fulfill the plan for traffic kilometers by 1960 seems unlikely.

Capital productivity under the Second Five Year Plan is more difficult to assess than labor productivity because of the inherent difficulties in finding the total capitalized value of the real assets of the railroads. From an announced figure of capitalized value of 7,774 million DME in 1951, 26/ net capital additions show an approximate increase of 5 percent in capital value for the 7-year period ending in 1957.** The net annual additions to the capital structure were extrapolated to 1960 on the basis of estimates of the expected fulfillment of investment plans for the 5-year period.

The estimated fulfillment of the plan for investment for 1956-60 is a maximum of 68 percent. This estimate may be too high because of the increasingly severe situation in supply of materials and the actual fulfillment of only 59 percent of the investment plan for 1956. Each of these two factors would tend to indicate that intensive problems still exist in expanding investment outlays.

The productivity of railroad capital in 1960 should be approximately 7,900 traffic kilometers per unit of capital,** 59 percent above that for 1951 and about 22 percent above that for 1956. The increase of 22 percent is 8 percent less than the rate of growth of 30 percent in capital productivity in the last 4 years of the First Five Year Plan.

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* See Appendix D.

** See Table 15, Appendix C, p. 51, below.

Although performance of traffic kilometers per unit of capital by 1960 is expected to grow, at the most, 59 percent above that of the base year 1951 (instead of 76 percent), the relative efficiency of capital in the two plan periods will have changed considerably. From 1951 to 1955 an increase of 3 percent in total capital value (a measure of capital additions) was associated with an increase of 30 percent in capital productivity. For 1956-60 an increase of 8 percent in total capital value (on the basis of an estimated degree of fulfillment of the investment plan) will be associated with an estimated increase of 22 percent in capital productivity. This situation may be indicative of two things: (1) in the early years of the First Five Year Plan the available supply of capital was utilized to only a fraction of its capability as economic carloadings were well below existing railroad capacity, and (2) the marginal productivity of the type of capital addition being made is decreasing, indicating that the additions to capital have only been increased quantities of the same inefficient equipment (that is, steam locomotives of the type used on the railroads for 30 years with few technical improvements and 2-axle cars of the same average capacity). In spite of larger total capital additions, the decreasing marginal productivity of each capital unit has kept the railroads from achieving proportional increases in capacity from each given unit of capital invested. This fact indicates a need to invest in capital equipment of higher technical efficiency, such as electric or diesel locomotives; large quantities of double track; expanded yards and sidings; and improved, labor-saving signaling mechanisms.

In part the plan calls for just such investment, but the investment outlays are so much larger for such equipment -- and improved equipment now constitutes such a small proportion of the total -- that the greater marginal productivity of the new equipment probably will have little aggregate effect in the plan period 1956-60.

If the domestic supply situation improves or if large amounts of external aid are forthcoming, increased investment in technically efficient equipment will be possible, and this investment will eventually counterbalance the preponderant, technical inefficiency of existing equipment. All statements concerning the 1961-65 plan indicate that much of the modernized equipment will become available during the period of the Third Five Year Plan. If so, technical efficiency and total capacity of the East German railroads will be greatly enhanced.

APPENDIX A

PREWAR AND POSTWAR STRUCTURE OF THE RAILROADS IN EAST GERMANY

In 1936 the area now called the East Zone of Germany had about 19,400 route kilometers of track (see Table 4*). The estimated length of track of this system at that time was approximately 27,400 km of standard-gauge track and about 2,000 km of narrow-gauge track.

Dismantling by the USSR for reparations during 1946-49 was reported to have been about 13,000 km of railroad track. The dismantling left approximately 13,200 route km -- about 12,000 km of single-track line and about 1,200 km of line with two or more tracks -- and a total length of track of approximately 14,400 km, excluding sidings and narrow-gauge line. The amount of dismantling done on sidings, spur lines, and narrow-gauge lines probably never will be known, but the damaging effect to the total capacity of the system came largely from reducing the length of lines with two or more tracks from an estimated 8,000 km in 1936 to 1,200 km in 1950. Soviet dismantling resulted in a total reduction of about 32 percent in route kilometers, or 6,200 km. The total reduction in length of track was approximately 47 percent, or approximately 13,000 km.

In 1957, East Germany had about 14,789 route km of track, of which 10 percent, or about 1,479 km, was double track, leaving approximately 13,310 km of single-track line. These figures would indicate that in the period 1950-57 about 1,310 km of single-track line and about 279 km of double-track line had been restored or newly constructed, thus yielding an average of approximately 227 km of new construction for each of the 7 years. Actual construction, however, was concentrated largely in the years 1954-57.

* Table 4 follows on p. 30.

Table 4

Composition of the Standard-Gauge Railroad Network in East and West Germany a/ 1936, 1950, and 1957

Kilometers

Item	East Germany	West Germany
	1936	
Single track b/	11,400	17,970
Two or more tracks b/	8,000	12,600
Total b/	19,400	30,570
Track length c/	27,400	43,200
	1950	
Single track	12,000 d/	17,970 e/
Two or more tracks	1,200 d/	12,600 e/
Total	13,200 d/	30,570 e/
Track length c/	14,400 f/	43,200
	1957	
Single track	13,310 g/	17,897 h/
Two or more tracks	1,479 g/	12,546 h/
Total	14,789 g/	30,443 h/
Track length c/	16,300	43,000

a. Excluding pre-World War II German areas outside the present zonal boundaries.

b. 27/. In 1936 the area now known as West Germany had 30,570 route kilometers (km), and the area of East Germany had 19,400 route km. The distribution of lines with single track and with two or more tracks was based on the percentage distribution of West German track existing in 1957.

c. Derived by adding the length of lines with single track plus two times the length of track with two or more tracks, which gives a minimum track length. There is a greater track length in each of the 3 years, but it is impossible to derive because of the lack of information on lines with three or more tracks.

Table 4

Composition of the Standard-Gauge Railroad Network in East and West Germany a/ 1936, 1950, and 1957 (Continued)

d. In 1945-46, 6,200 route km, or 36.6 percent of total route length, was dismantled by the USSR. Most of this dismantling was reported as removal of the second track on double-track lines. Single-track lines were therefore estimated at 12,000 km and lines with two or more tracks as 10 percent of the single-track line.

e. Assumed to be the same as in 1936.

f. [redacted] "By March 1947, 11,800 kilometers of railroad tracks had been dismantled in the Russian Zone of Germany. Additional dismantlings reported variously as between 1,200 and 3,000 kilometers are to continue." Deducting the minimum total of dismantled track (11,800 + 1,200) of 13,000 km from the total track length in 1936 of 27,400 km, a track length of 14,400 km is derived. These derived data agree with the data as derived by using footnote c, above. 50X1

g. [redacted] a total route length of 14,789 km. Lines with double track were estimated at 10 percent of the total (1,479), leaving 13,310 route km of single-track lines. 50X1

h. 30/. Including sidings, the total track length was reported as 70,158 km.

APPENDIX B

CONTENT AND USE OF OPERATING RATIOS

The concept of operating ratios was used in this report in an attempt to indicate the relative cost of the railroad, over a period of time, in relation to its own earning power and to the economy. The net operating ratio is useful for a fiscal comparison of the earned revenue and current operating expenses of the railroads and shows the amount of external subsidy required to cover the current operating deficit. This ratio indicates the drain on central budgetary sources caused by operating expenses being larger than revenue and shows that the rate structure is not compensatory.

The net operating ratio, however, does not reflect the capital costs (a portion of capital repairs and all additions other than replacements) that are necessarily attributable to railroad operation. Such capital costs are not included in the current operating accounts, at least not insofar as the capital additions are concerned. It is true that in the current operating account there is a payment to "amortization" that ostensibly covers annual depreciation and obsolescence of rolling stock and right-of-way. This sum can be considered as comprised primarily of capital depleted in production of the transport services for that year and is therefore a current cost item.

The problem remaining is to attribute the cost of capital additions on an annual basis and to derive a reasonable idea of the total annual cost of railroad service to the economy. This derivation, called the gross operating ratio, is identical to the concept used by the International Union of Railways and will show the annual current cost plus the annual capital cost of rail operations in East Germany.

1. US Practice

Comparable US concepts of operating ratios are derived as follows (with hypothetical percentages to indicate the portion of total cost each represents):

Earned Revenue	Percent	Total Cost	Percent
Freight	70	Current operating costs (labor, materials, and taxes)	81 (net)
Passenger	25	Depreciation and obsolescence	4 (net)
Other	5	Capital payments (principal and interest	9
		Distributable profit	6 (net)
Total	100	Total	100 (gross)

Therefore, the current net operating ratio (N) is 91, and the gross operating ratio (G) is 100.

The current operating costs (including depreciation, obsolescence, and profits) do not require an explanation. The problem is how capital payments arise, the reason for their existence, and discovering a comparable Communist counterpart.

If a US railroad borrowed $100 million to buy 50 locomotives in a given year and for the next 25 years* (the life of the locomotive) repaid the loan, the annual capital (principal) payments excluding interest, would be $4 million. On the assumption that the total investment was made in the first year, the full capacity of the 50 locomotives would become available immediately. During the service life of the locomotive, there are made capital repairs that increase the length of serviceable life and add something to the annual capital expense. This same principle would apply to roadbed and facilities.

The interest charge does not exist (as such) in a Communist country. Therefore, the problem is how to allot capital charges on an annual basis in a Communist economy such as that of East Germany so as to cover these same financial outlays.

2. East German Practice

In East Germany, current operating expenses contain an amount that ostensibly covers obsolescence and depreciation. Railroad capital equipment is added and paid for on an annual basis from fiscal receipts of the economy.

The acquisition of 50 locomotives in East Germany, if cumulated at the rate of 2 a year for 25 years, would add 50 locomotives to the inventory as in the US example. Annual capital charges, which represent principal only -- there is no interest as such -- are, in the East German example, payments from current revenue from various sources and are expended from investment funds during the fiscal period. The annual payment ($4 million) would equal the cost of two locomotives in each year in the US or in East Germany, with one difference -- East Germany is on a "cash-and-carry" basis, whereas the US uses credit. In East Germany the expenditure is called investment, in the US, capital charges. In the US the expenditure is allotted over a period of years once the locomotives are received.

* In practice, US railroads probably would write off such equipment in the minimum number of years allowable by tax law, but this practice does not change the comparability between the systems.

If East Germany met all of the incurred cost of the railroads from current, earned revenue, the relation of cost to revenue would be approximated by the following:

Earned Revenue	Percent	Total Cost	Percent
Freight	65	Current operating costs	90
Passenger	30	Capital payments (taken from investment funds)	10
Other	5		
Total	100	Total	100

Therefore, the current net operating ratio is 90, and the gross operating ratio is 100, with no subsidy required.

In substance the above form agrees precisely with US practice. If earned revenue were not sufficient to cover either current expenses or long-run capital expenses, the relation of cost to revenue would be as follows:

Earned Revenue	Percent	Total Cost	Percent
Freight	65	Current operating costs (including depreciation, obsolescence, and taxes)	118
Passenger	30		
Other	5		
Total	100	Subtotal	118
Subsidy on current account	18		
Net total	118	Net total	118
Subsidy on capital account	16	Capital charges (investment)	16
Gross total (earned revenue plus total subsidy)	134	Gross total	134

Therefore, the current net operating ratio is 118, and the gross operating ratio is 134.

This accounting method is still identical with US concepts except that two subsidies occur -- one on current account and one on capital account. By considering the East German "investment" figure as a capital charge on an annual basis and then relating this figure to annual earned revenue, the operating ratios become meaningful. The necessity for a subsidy does not change the concept of operating ratio as long as current costs and total costs (current costs plus capital charges) are always related to earned revenue.

The net operating ratio shows the operating condition of the railroads and their cost to the economy on current account. The gross operating ratio shows not only the deficit (or cost to the economy) from current operations but the deficit from annual capital charges (investment expenditures) as well.

APPENDIX C

STATISTICAL TABLES

Table 5

Comparison of Railroad Systems in Selected European Countries a/
1956

Item	East Germany	West Germany	Czecho-slovakia	Poland	Hungary
Dispersion					
Square kilometers per railroad route kilometer	7.3	7.9	9.7	13.4	11.3
Average performance					
Thousand ton-kilometers per railroad route kilometer	2,006	1,790	2,603	2,235	985
Thousand passenger kilometers per railroad route kilometer	1,530	1,248	1,415	1,596	1,093
Thousand traffic kilometers per railroad route kilometer	3,536	3,037	4,018	3,831	2,078
Thousand traffic kilometers per employee	176	177	271	291	135
Traffic kilometers per capita	2,924	1,883	3,979	3,811	1,743
Thousand ton-kilometers per employee	100	104	176	170	64
Average traffic density					
Tons per route kilometer	14,256	9,657	11,317	9,765	7,391
Tons per track kilometer	12,960	6,908	9,450	6,587	4,890
Passengers carried per route kilometer	69,312	46,839	40,249	39,702	36,880
Passengers carried per track kilometer	63,009	33,502	33,610	26,781	24,400

a. Data are derived from Table 6, p. 39, below. All tonnages in this table are given in metric tons.

Table 6

Basic Data on Railroads in Selected European Countries a/
1956

Item	Unit	East Germany	West Germany	Czechoslovakia	Poland	Hungary
Area	Square kilometers	107,862	245,359	127,859 b/	311,730	93,030 b/
Total population	Thousand persons	17,832	49,995	13,297	27,680	9,861
Route length of standard gauge railroad	Kilometers	14,745	31,000	13,168	23,198	8,270
Total railroad employees	Persons	296,959	532,000	195,200 b/	305,700	127,300
Passenger kilometers	Million	22,560	38,676	18,628	37,030	9,040
Net ton-kilometers	Million	29,573	55,478	34,279	51,840	8,146
Traffic kilometers	Million	52,133	94,154	52,907	88,870	17,186
Tons carried	Thousand	210,207	299,374	149,020	226,523	61,124
Length of line with two or more tracks	Kilometers	1,450	12,342	2,601	7,387	930
Length of electrified line	Kilometers	145	2,382	278	533	372
Average length of haul	Kilometers	141	185	230	229	133
Total track length	Kilometers	16,220	43,340	15,769 c/	34,390 c/	12,500
Passengers carried	Million	1,022	1,452	530	921	305
Average turnaround time of freight cars	Days	3.55	5.3 d/	4.4 d/	5.2	4.6 e/
Average load per freight car	Tons	15.66	13.40 d/	16.60 d/	18.46	14.70 e/
Tons carried per freight car per year	Units	1,633 f/	925 f/	1,378 f/	1,296 f/	1,166 f/

a. Unless otherwise indicated, all data are from the 1956 yearbooks of the respective countries. All tonnages in this table are given in metric tons.
b. 31/
c. Estimated on the basis of the length of single track plus two times the length of lines with two or more tracks.
d. 32/
e. 33/
f. One year (365 days) divided by turnaround time and multiplied by the average load per freight car.

Table 7

Distribution of Inland Freight in East Germany, by Mode of Transport a/*
1936 and 1946-58

Year	Total Inland Transport (Million)	Railroad Transport		Motor Transport		Inland Water Transport	
		Million	Percent of Total	Million	Percent of Total	Million	Percent of Total
	Ton-Kilometers						
1936	27,400	22,100 b/	80.7	800 b/	2.9	4,500 c/	16.4 c/
1946	10,000 d/	8,100 e/	81.0 d/	N.A.	N.A.	N.A.	N.A.
1947	11,200 d/	9,100 e/	81.0 d/	N.A.	N.A.	N.A.	N.A.
1948	13,300 d/	10,800 e/	81.0 d/	1,500	11.2	1,000 c/	7.8 c/
1949	17,200 d/	13,900 e/	81.0 d/	1,700	10.1	1,600 c/	8.9 c/
1950	18,588	15,064	81.0	1,945	10.5	1,579	8.5
1951	21,289	17,291	81.2	2,201	10.3	1,797	8.5
1952	23,188	19,077	82.3	2,404	10.4	1,707	7.3
1953	26,419	22,112	83.7	2,569	9.7	1,738	6.6
1954	27,869	23,182	83.2	2,945	10.6	1,742	6.2
1955	30,584	25,222	82.5	3,194	10.4	2,168	7.1
1956	33,094	27,334	82.6	3,492	10.6	2,268	6.8
1957	35,049	28,635	81.7	3,916	11.2	2,498	7.1
1958	36,646	30,101	82.1	4,147	11.3	2,398	6.6

* Footnotes for Table 7 follow on p. 41.

Table 7

Distribution of Inland Freight in East Germany, by Mode of Transport a/
1936 and 1946-58
(Continued)

Year	Total Inland Transport (Million)	Railroad Transport		Motor Transport		Inland Water Transport	
		Million	Percent of Total	Million	Percent of Total	Million	Percent of Total
	Tons Carried						
1946	91.5 d/	54.9 e/	60.0 f/	N.A.	N.A.	N.A.	N.A.
1947	124.1 d/	73.2 e/	59.0 f/	N.A.	N.A.	N.A.	N.A.
1948	151.9 d/	88.1 e/	58.0 f/	N.A.	N.A.	N.A.	N.A.
1949	175.4 d/	100.0 e/	57.0 f/	N.A.	N.A.	N.A.	N.A.
1950	225.8	128.5	56.9	87.3	38.7	10.0	4.4
1951	267.8	153.2	57.2	103.7	38.7	11.0	4.1
1952	291.3	158.3	54.3	120.5	41.4	12.5	4.3
1953	336.4	182.3	54.2	141.3	42.0	12.8	3.8
1954	357.1	191.4	53.6	154.1	43.1	11.6	3.3
1955	389.5	207.5	53.3	169.1	43.4	12.9	3.3
1956	411.1	210.2	51.1	187.4	45.6	13.5	3.3
1957	443.2	220.3	49.7	208.5	47.0	14.4	3.3
1958	468.6	227.2	48.4	226.5	48.3	14.9	3.3

a. Excluding ocean and air transport. All tonnages in this table are given in metric tons. 50X1

b. 35/

c. Residual.

d. Totals for ton-kilometers and tons carried are estimated by using railroad transport percentages as the basis of the estimate.

e. 36/

f. These percentage figures are estimated at a declining rate of percentage point per year. It is expected that these might actually be higher because of the lack of gasoline for truck transport. An error of plus or minus 10 to 15 percent is assumed.

Table 8

Freight Carried by Railroads in East Germany, by Type of Commodity a/
1950 and 1955-58

Commodity	1950		1955		1956		1957		1958	
	Thousand Metric Tons	Percent of Total	Thousand Metric Tons	Percent of Total	Thousand Metric Tons	Percent of Total	Thousand Metric Tons	Percent of Total	Thousand Metric Tons	Percent of Total
Coal and coke	50,677	42.7	85,648	46.5	87,751	46.9	92,521	47.5	92,662	46.3
Ore	5,028	4.2	2,144	1.2	1,947	1.0	1,822	0.9	1,894	1.0
Other mining products	751	0.6	1,310	0.7	1,731	0.9	1,926	1.0	2,063	1.0
Metals			6,458	3.5	6,687	3.6	6,979	3.6	7,517	3.8
Scrap metal			2,065	1.1	2,219	1.2	2,148	1.1	2,368	1.2
Chemicals (excluding fertilizers and tar products)	3,885	3.3	5,173	2.8	5,260	2.8	5,142	2.6	5,392	2.7
Fertilizers	5,734	4.8	7,934	4.3	8,277	4.4	8,295	4.3	8,679	4.3
Mineral oils and tar products	1,234	1.0	4,194	2.3	4,694	2.5	5,001	2.6	5,408	2.7
Building materials (excluding cement)	13,084	11.0	20,546	11.1	21,884	11.7	23,751	12.2	25,990	13.0
Cement			2,839	1.5	3,072	1.7	3,025	1.6	2,863	1.4
Wood	5,528	4.7	5,390	2.9	5,039	2.7	4,830	2.5	4,516	2.3
Grains and legumes	2,132	1.8	1,781	1.0	1,771	0.9	1,486	0.8	1,301	0.7
Potatoes	2,291	1.9	1,511	0.8	1,347	0.7	1,257	0.6	1,183	0.6
Sugar beets	2,448	2.1	3,161	1.7	2,561	1.4	3,441	1.8	3,896	1.9
Sugar	781	0.7	852	0.5	661	0.4	686	0.4	883	0.4
Other industrial and agricultural products	25,194	21.2	25,442	13.8	24,419	13.1	24,742	12.7	25,439	12.7
Piece goods	N.A.		7,921	4.3	7,702	4.1	7,608	3.8	8,025	4.0
Total	118,767	100.0	184,369	100.0	187,022	100.0	194,660	100.0	200,079	100.0

a. 37/. Standard gauge only.

Table 9

Freight Carried and the Average Number of Freight Cars Required for Each Type of Traffic in East Germany 1950-58

	1950	1951	1952	1953	1954	1955	1956	1957	1958
Freight carried, by type a/	Thousand Metric Tons								
Total tons carried	128,504	153,214	158,287	182,257	191,437	207,514	210,207	220,335	227,199
Foreign tons received	8,487	12,398	13,798	17,075	19,162	21,753	20,377	22,155	23,604
Total tons originated b/	120,017	140,816	144,489	165,182	172,275	185,761	189,830	198,180	203,595
Tons originated (standard gauge)	118,767	139,920	143,248	163,866	170,953	184,369	187,022	194,660	200,079
Tons originated (narrow gauge)	1,250	896	1,241	1,316	1,322	1,392	2,808	3,520	3,516
Average number of freight cars required, by type of traffic	Units c/								
For total traffic carried	95,400	88,600	99,000	110,300	112,100	130,800	130,600	132,700	136,100
For total tons originated (standard and narrow gauge)	89,100	81,400	90,400	100,000	100,900	117,000	117,900	119,300	122,000
For total foreign tons received	6,300	7,200	8,600	10,300	11,200	13,700	12,700	13,300	14,100
For tons originated (standard gauge only)	88,200	80,900	89,600	99,200	100,100	116,200	116,200	117,200	119,900
Average working car park d/	81,780	82,028	90,642	101,611	102,960	110,000	N.A.	117,300	N.A.

a. Including domestic, export, import, and transit freight traffic. [redacted] 50X1

b. Tons originated includes only the tons of freight loaded in East Germany and does not include foreign freight tons received.

c. Unless otherwise indicated, data were computed by dividing the annual tonnage by the average tons carried per freight car per year, which were as follows: 1950, 1,347 metric tons; 1951, 1,730 metric tons; 1952, 1,599 metric tons; 1953, 1,652 metric tons; 1954, 1,707 metric tons; 1955, 1,587 metric tons; 1956, 1,610 metric tons; 1957, 1,661 metric tons; and 1958, 1,669 metric tons. 50X1

d. Reported actual average working freight car park, standard gauge only. [redacted] Data for 1957 are as of March.

50X1

Table 10

Inventory of Rolling Stock of Railroads in East Germany
1946-58

Units

Year	Locomotive Park					Freight Car Park			Total Passenger Car Park
	Total	Operating	Serviceable	In Repair	Damaged	Total [a]/*	Operating	In Repair	
1946	7,645 [b]	4,508 [c]	3,395 [b]	1,113 [b]	3,137 [b]	106,800 [b]	65,600 [b]	15,100 [d]	17,095 [e]
1947	7,575 [b]	5,056 [c]	2,943 [b]	2,113 [b]	2,519 [b]	94,900 [b]	57,400 [b]	9,600 [d]	6,860 [e]
1948	7,015 [b]	4,557 [c]	2,960 [b]	1,597 [b]	2,458 [b]	88,500 [b]	68,225 [f]	7,400 [d]	N.A.
1949	7,009 [g]	4,827 [h]	2,374 [g]	2,453 [g]	2,182 [i]	92,500 [g]	75,850 [j]	7,765 [g]	7,696 [e]
1950 [k]	6,762	4,770	3,378	1,392	1,992	99,801	81,780	8,494	7,799
1951 [k]	6,456	4,850	3,142	1,708	1,606	101,647	82,028	9,722	8,111
1952 [k]	6,384	4,922	3,055	1,867	1,462	137,900	90,642	16,586	9,015
1953 [k]	6,230	5,119	3,529	1,590	1,111	136,674	101,611	8,220	10,179
1954 [k]	6,476	5,561	4,056	1,505	915	142,220	102,960	10,024	10,507
1955	N.A.	N.A.	N.A.	N.A.	N.A.	145,669 [l]	110,000 [k]	11,761 [l]	N.A.
1956	6,478 [m]	5,564 [m]	3,898 [m]	1,666 [m]	914	145,585 [n]	N.A.	N.A.	N.A.
1957	6,020 [o]	N.A.	3,200 [o]	N.A.	N.A.	146,000 [p]	117,300 [m]	14,000 [p]	N.A.
1958	5,670 [q]	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

* Footnotes for Table 10, follow on p. 45.

Table 10

Inventory of Railroad Rolling Stock in East Germany
1946-58
(Continued)

a. The total freight car park is composed of the number of cars in operation, the number of cars undergoing repairs, and an unknown number of cars that are either in a pool of damaged cars or in a nonoperative reserve.
b. 41/
c. Total park minus damaged park.
d. 42/
e. 43/
f. 44/
g. 45/
h. Serviceable park plus locomotives in repair.
i. Total park minus operating park.
j. 46/
k. 47/
l. 48/. Information as of August 1955.
m. 49/. Information as of 30 September 1956.
n. 50/. The total planned freight car park for 1956 was to have been 159,000 cars, with the working freight car park equal to 129,982 cars; for 1957 the planned freight car park was to have been 136,114 cars.
o. 51/
p. 52/
q. 53/

Table 11

Revenue of Railroads in 1950-57 and Revenue Required to Meet Expenditures in 1958 in East Germany by Type of Service

Year	Freight Revenue: Million Current Deutsche Mark East [a]	Freight Revenue: Average [b] (Current Deutsche Mark East per Ton-Kilometer)	Freight Revenue: As a Percent of Total Revenue	Passenger Revenue: Million Current Deutsche Mark East [a]	Passenger Revenue: Average [c] (Current Deutsche Mark East per Ton-Kilometer	Passenger Revenue: As a Percent of Total Revenue	Municipal Railroad Revenue: Million Current Deutsche Mark East [a]	Municipal Railroad Revenue: As a Percent of Total Revenue	Total Revenue (Million Current Deutsche Mark East)
1950	753.8	0.046	47.2	745.3	0.040	46.6	98.9	6.2	1,598.0
1951	954.8	0.050	50.9	803.9	0.041	42.9	116.4	6.2	1,875.1
1952	1,064.9	0.051	52.8	837.9	0.040	41.5	114.2	5.7	2,017.0
1953	1,270.4	0.052	57.4	846.0	0.041	38.2	96.6	4.4	2,213.0
1954	1,368.1	0.052	56.7	944.4	0.041	39.1	100.2	4.2	2,412.7
1955	1,435.4 [d]	0.050 [e]	58.0	939.1 [d]	0.041 [e]	37.9	101.5 [f]	4.1 [f]	2,476.0
1956	1,478.6 [d]	0.050 [e]	59.0	925.0 [d]	0.041 [e]	36.9	102.8 [f]	4.1 [f]	2,506.4
1957	1,559.4 [d]	0.050 [e]	60.0	934.2 [d]	0.041 [e]	35.9	106.6 [f]	4.1 [f]	2,600.2
1958 [g]	2,468.2 [h]	0.061 [i]	70.8	877.4 [d]	0.041 [e]	25.2	139.4 [j]	4.0 [j]	3,485.0

a. [redacted] 50X1

b. Unless otherwise indicated, freight revenue divided by ton-kilometer performance, from Table 19, p. 56, below. All tonnages in this table are given in metric tons.

c. Unless otherwise indicated, passenger revenue divided by passenger kilometer performance, from Table 19, p. 56, below.

d. Estimated by applying performance data from Table 19, p. 56, below, to the estimated average revenue.

e. Estimated on the basis of data for 1950-54.

f. Estimated as 4.1 percent of total revenue.

g. Estimated requirements.

h. Composed of 1,989.2 million Deutsche Mark East (DME) from freight charges, 426 million DME from a charge of 20 DME per axle for every car loaded, and 53 million DME from a charge of 5 DME for car weighing. For a discussion of increased rates, see p. 14, above.

i. Average revenue per ton-kilometer necessary to provide the 1,989.2 DME for freight charges.

j. Assumed to be 4.0 percent of total revenue.

Table 12

Profit and Loss Statement for Railroads in East Germany
1955-57

Constant Prices in Million 1955 Deutsche Mark East

Item	1955 Current Cost 1955	1955 Percent of Total Current Cost	1956 Increase Above 1955 (Percent)	1956 Current Cost 1956	1956 Percent of Total Current Cost	1957 Increase Above 1956 (Percent)	1957 Current Cost 1957 a/*	1957 Percent of Total Current Cost
Wages of operating employees (not including repair) b/	952	34	1	959	33	6	1,014	32
Social cost and wage tax	120 c/	4	4	125 c/	4	4	130 d/	4
Administration wages e/	223	8	3	230	8	3	237	8
Amortizations	298 f/	11	7	320 f/	11	8	346 g/	11
Rolling stock repair costs								
Labor h/	234			276			290	
Materials	86			104			158	
Total	320	12	19	380	13	18	448	14
Cost of expendable materials	320 i/	12	19	380 i/	13	18	448 j/	14
Coal for locomotives and differential	185 i/	7	3	190 i/	6	4	198 k/	6
Individual expenses l/	95	3	5	100	3	5	105	3
Taxes m/								
Transport	145			146			151	
Turnover	5			5			5	
Total	150	5	1	151	5	3	156	5
Cost of railroad's own freight n/	70	3	6	77	3	4	80	2
Directors' fund o/	36	1	3	37	1	5	39	1
Total current operating cost	2,769	100	6	2,949	100	8	3,201	100
Total earned revenue p/	-2,476		1	-2,506		3	-2,600	
Subsidy or loss	293			443			601	
Net operating ratio q/	112			118			123	

* Footnotes for Table 12 follow on p. 48.

Table 12

Profit and Loss Statement for Railroads in East Germany
1955-57
(Continued)

a. Estimated.
b. 55/. Including salaries of operating employees and apprentices.
c. 56/
d. Estimated as 4 percent greater than in 1956.
e. 57/
f. 58/. Depreciation of fixed assets and rent.
g. Estimated on the basis of an increase slightly greater than that between 1955 and 1956 of 7 percent. The increase of 1957 above 1956 was estimated to be 8 percent.
h. 59/. The wages of labor employed in the repair of rolling stock were derived by subtracting the wages of operating and administrative employees from the total wage bill.
i. 60/. Plan.
j. Projected through 1957 on the basis of an 18-percent increase above 1956. The figure for 1956 was 19 percent greater than that for 1955.
k. Four percent greater than that of 1956. This increase was about 1 percent greater than that of 1956 above 1955. In 1957, greater quantities of coal were used, and although the coal was of a lower grade and thus less expensive, the volume more than made up for the decrease in unit cost.
l. 61/. Projected to 1957 on the basis of a 5-percent increase.
m. 62/. Transport tax in 1955 was equal to 0.0028 Deutsche Mark East (DME) per traffic kilometer. Turnover tax was 3.5 percent of transport tax. Total transport taxes for 1956 and 1957 were computed by multiplying ton-kilometers by 0.0028 DME and then taking 3.5 percent of the result as turnover tax.
n. 63/. In 1955 the cost of the railroad's own freight was equal to 0.0028 DME per ton-kilometer operated. This cost also was used for 1956 and 1957.
o. 64/. Computed as 2.5 percent of the total wage bill.
p. See Table 11, p. 46, above.
q. Total operating cost divided by total revenue.

Table 13

Transport Employees in East Germany, by Mode of Transport a/
1950-56

Year	Total Personnel	Operating Personnel	Apprentice Personnel	Other Personnel
	All Transport			
1950	331,398	241,064	11,585	50,155
1951	362,826	248,436	17,136	58,255
1952	385,908	265,885	22,008	63,087
1953	406,490	283,013	23,632	64,651
1954	421,610	294,971	22,129	71,365
1955	416,320	323,270	20,483	72,567
1956	417,581	324,327	18,444	74,810
	Of Which: In Repair Work			
1956	71,097	49,541	7,337	14,219
	Railroad Transport			
1950	252,492	204,003	9,258	39,231
1951	279,061	219,286	14,223	45,552
1952	293,263	225,180	17,871	50,212
1953	298,295	232,416	18,943	46,936
1954	306,490	236,850	17,227	52,413
1955	298,894	232,297	16,289	50,308
1956	296,959	229,289	14,252	53,418
	Of Which: In Repair Work			
1956	53,428	38,586	4,835	10,007
	Main Administration for Shipping			
1956	9,995	6,998	578	2,419
	Private Transport			
1956	19,084	17,333	110	1,641

a. 65/. Data are from official East German sources. Total personnel for 1950-54 does not equal the sum of the components, but no explanation is given for this discrepancy.

Table 14

Wages and Salaries of Transport Employees in East Germany by Mode of Transport a/ 1950-56

Million Current Deutsche Mark East

Year	Wages and Salaries: Total Personnel	Operating Personnel	Apprentice Personnel	Other Personnel
	All Transport			
1950	1,073.8	777.9	9.6	189.8
1951	1,315.1	947.1	13.8	243.2
1952	1,488.2	1,047.4	18.5	289.6
1953	1,676.8	1,209.0	21.4	308.9
1954	1,876.0	1,346.1	19.9	374.7
1955	1,904.9	1,528.6	19.2	345.5
1956	1,998.2	1,596.9	17.0	356.9
	Railroad Transport			
1950	826.6	664.8	8.2	153.6
1951	1,026.8	818.6	12.0	196.1
1952	1,140.6	892.7	15.8	232.1
1953	1,257.9	1,007.3	18.1	232.4
1954	1,391.7	1,090.2	16.4	285.1
1955	1,408.4	1,117.3	15.9	275.2
1956	1,465.5	1,166.9	13.7	285.0
	Motor Transport			
1956	209.0	166.7	2.4	39.9
	Main Administration for Shipping			
1956	49.9	37.0	0.6	12.3
	Private Transport			
1956	71.1	64.5	0.1	6.5

a. 66/. Data are from official East German sources.

Table 15

Product, Capital/Output, and Labor/Output Ratios for 1951-57 with the Estimated Annual Totals for 1958-60 Required to Fulfill the Plan for Railroads in East Germany

	Product			Capital			Labor			
Year	Million Traffic Kilometers [a]		Index	Capitalized Value [b] (Million Current Deutsche Mark East)	Ton-Kilometers per Unit of Capital [c]	Index	Operating Employees [d]	Ton-Kilometers per Operating Employee [e]		Index
1951	38,654	Actual 4-Year Increase 34 Percent	100.0	7,774	4,972	100.0	219,286	176,272	Actual 4-Year Increase 26 Percent	100.0
1952	41,621		107.7	7,738	5,379	108.2	225,180	184,834		104.9
1953	44,905		116.2	7,762	5,785	116.4	232,416	193,210		109.6
1954	48,983		126.7	7,878	6,218	125.1	236,850	206,810		117.3
1955	51,613		133.5	7,979	6,469	130.1	232,297	222,185		126.0
1956	52,133	Planned 5-Year Increase 32 Percent	134.9	8,060	6,468	130.1	229,289	227,368	Planned 5-Year Increase 14 Percent	129.0
1957	53,972		139.6	8,140	6,630	133.3	225,000	239,875		136.1
1958	54,223		140.3	8,280	6,549	131.7	225,000	240,991		136.7
1959	61,176 [f]		158.3	8,401	7,282	146.5	225,000	247,141 [g]		140.2
1960	68,129 [h]		176.3	8,624	7,900	158.9	225,000	253,291 [g]		143.7

a. Unless otherwise indicated, passenger kilometers plus net freight ton-kilometers are from Table 19, p. 56, below. All tonnages in this table are given in metric tons.
b. See Table 18, p. 55, below.
c. Traffic kilometers divided by capitalized value.
d. Data for 1951-56 are from Table 13, p. 49, above. Operating employees for 1957-60 are estimated to have been about 225,000. Actual data for 1957-60 may decline, making the possibility of plan completion even more remote.
e. Unless otherwise indicated, traffic kilometers divided by operating employees.
f. Interpolated between the actual performance for 1958 and the 1960 Plan.
g. Data for 1960 were estimated by applying the planned increase of 14 percent for labor productivity; data for 1959 were interpolated.
h. 67/. Of the increase in total traffic kilometers, 29.9 percent was to be freight ton-kilometers and 2 percent passenger kilometers.

Table 16

Estimated Investment in Railroads Compared with Total Investment and Investment in Transport in East Germany First (1951-55), Second (1956-60), and Third (1961-65) Five Year Plans

Million Current Deutsche Mark East

Plan	Total Investment	Investment in Transport		Investment in Railroads		
	Five Year Total	Five Year Total	Yearly Totals	Estimated Planned Investment	Percent of Plan Fulfilled	Actual Investment
First Five Year Plan (1951-55)						
1951	28,600 e/	2,403 f/	N.A.	281 a/	70 b/	197 b/
1952				329 c/	80 d/	263 a/
1953				464 g/	80 g/	371 g/
1954				466 h/	81 h/	376 h/
1955				460 i/	82 i/	378 i/
Total	28,600	2,403	N.A.	2,000	79	1,585
Second Five Year Plan (1956-60)						
1956	55,000 p/	5,900 q/	1,036 j/	673 k/	59 l/	398 l/
1957			1,060 m/	689 n/	70 o/	482 o/
1958			1,075 r/	700 n/	70 o/	490 o/
1959			1,344 s/	886 n/	70 o/	620 o/
1960			1,385 s/	900 n/	70 o/	630 o/
Total	55,000	5,900	5,900	3,848	68	2,620
Total Third Five Year Plan (1961-65)	N.A.	8,850 t/	N.A.	5,785 u/		N.A.

a. Estimated on the basis of data for 1950 and 1952.
b. 68/
c. Plan.
d. The railroad investment plan was 74 percent fulfilled on 30 November 1952. The estimated completion by the end of the year was 80 percent.

Table 16

Estimated Investment in Railroads Compared with Total Investment and Investment in Transport in East Germany
First (1951-55), Second (1956-60), and Third (1961-65) Five Year Plans
(Continued)

e. 69/
f. Total investment in transport and telecommunications minus 10 percent estimated as having been invested in post and telecommunications equals actual investment in transport.
g. Estimate based on reported data for 1954 and 1955.
h. 70/
i. 71/
j. 72/
k. 73/. Transport investment in 1956 was to be 46.4 percent above that in 1955; taken to mean above the plan for 1955.
l. 74/
m. Estimated. No investment plan is available for 1957.
n. Sixty-five percent of the total investment in transport.
o. Estimated as 70 percent of plan. If the scarcity of material becomes worse, 70 percent may be too high.
p. 75/
q. [redacted] investment in transportation and telecommunications would be 13 percent of total economic investment -- 6.6 billion Deutsche Mark East (DME) is 13 percent of 51 billion DME, the estimated "planned" investment in economic means of production for the 5 years. Transportation is estimated to represent 90 percent of total investment in transportation and telecommunications. 50X1
r. 77/
s. Total investment plan for the 3 years 1956-58 equaled 3,171 million DME. The difference between the 1956-58 data and the 5-year plan was divided arbitrarily into 1,344 million DME for 1959 and 1,385 million DME for 1960.
t. Estimated on the basis of planned investment in railroad for 1960-65.
u. 78/. Railroad investment under the Third Five Year Plan was to be 50 percent greater than under the Second Five Year Plan.

Table 17

Proposed Additions to Line Capacity of Railroads in East Germany a/
1956-60

	New Line		Replacement of Track b/		Reconstruction of Second Track		Construction of Station Track		Miscellaneous Track		Total Track	
Year	Kilometers	Million Current Deutsche Mark East	Kilometers	Million Current Deutsche Mark East	Kilometers	Million Current Deutsche Mark East	Kilometers	Million Current Deutsche Mark East	Kilometers	Million Current Deutsche Mark East	Kilometers	Million Current Deutsche Mark East
1956	50.5	103.5 c/	770	200.2	413.0	106.5	97	138.5	90	18	1,420.5	566.7
1957	69.5	29.5	770	200.2	773.5	204.1	72	102.9	30	12	1,715.0	548.7
1958	76.0	57.0	770	200.2	535.0	136.0	29	42	20	8	1,430.0	443.2
1959	216.0	124.0	770	200.2	177.0	48.0	22	37	20	8	1,205.0	417.2
1960	150.0	67.0	367	95.4	136.0	34.0	15	28	20	8	688.0	232.4
Total	562.0	381.0	3,447	896.2	2,034.5	528.6	235	348.4	180	54.0	6,458.5	2,208.2
Average Per Year	112	76	689	179	407	106	47	70	36	11	1,292	442

a. 79/. These data do not represent the Second Five Year Plan (1956-60) as finally accepted, but represent the best judgment of a commission of railroad experts as to the actual needs of the railroads for the years shown. The totals in this table are much larger than those agreed on in the actual plan (see p. 12, above).
b. The cost was computed on the basis of an average unit cost estimated to be equal to that of reconstructing second track, or 260,000 Deutsche Mark East per kilometer.
c. The average cost per kilometer of new line in 1956 (2.05 million Deutsche Mark East -- DME) appears to be unusually large in relation to the average unit cost for subsequent years (0.42 million DME in 1957, 0.75 million DME in 1958, 0.57 million DME in 1959, and 0.45 million DME in 1960).

Table 18

Estimated Value of Capital Stock of Railroads in East Germany a/
1951-60

Year	Gross Capital Value b/ (Million Current Deutsche Mark East)	Net Investment c/ (Million Current Deutsche Mark East)	Amortization		Net Annual Addition f/ (Million Current Deutsche Mark East)	Net Capital Value g/ (Million Current Deutsche Mark East)	Index of Net Capital Value
			Percent d/	Million Current Deutsche Mark East e/			
1951	7,774	197	3.0	233	-36	7,774	100.0
1952	7,969	263	3.0	239	+24	7,738	99.5
1953	8,232	371	3.1	255	+116	7,762	99.8
1954	8,603	376	3.2	275	+101	7,878	101.3
1955	8,989	378	3.3	297	+81	7,979	102.6
1956	9,367	398	3.4	318	+80	8,060	103.7
1957	9,765	482	3.5	342	+140	8,140	104.7
1958	10,247	490	3.6	369	+121	8,280	106.5
1959	10,737	620	3.7	397	+223	8,401	108.1
1960	11,357	630	3.8	432		8,624	110.9

a. All data are subject to an error of plus or minus 5 percent.
b. 80/. Data are as of the first of the year.
c. See Table 16, p. 52, above.
d. The amortization rate (amortization is here regarded as provision for depreciation) is estimated for 1950-54 on an increasing basis of 0.1 percent per year -- the experience found in 1955, 1956, and 1957, when amortization equaled 3.3, 3.4, and 3.5 percent, respectively. 81/ Data for 1958, 1959, and 1960 were projected on the same basis of 0.1 percent per year. This increase coincides with a growing awareness by the East Germans of the increase in real costs in terms of depreciation.
e. Amortization rate (percent) multiplied by gross capital value.
f. Net investment minus amortization.
g. 82/. Data are as of the first of the year and are derived by subtracting the net annual additions from the net annual capital value for the previous year.

Table 19

Annual Statistics for Railroad Transport in East Germany a/
1950-58

Item	1950	1951	1952	1953	1954	1955	1956	1957	1958
Million net freight ton-kilometers	16,350	19,127	20,820	24,376	26,351	28,708	29,573	31,187	32,824
Million tariff ton-kilometers	15,064	17,291	19,077	22,112	23,182	25,222	27,334	28,635	30,101
Thousand tons carried	128,504	153,214	158,287	182,257	191,437	207,514	210,207	220,335	227,199
Average daily carloadings (tons)	21,186 b/	25,271 b/	27,840 b/	32,072 b/	33,775 b/	N.A.	33,500 c/	34,000 c/	N.A.
Average length of net haul (kilometers) d/	127	125	132	134	138	138	141	142	144
Average length of tariff haul (kilometers) e/	117	113	121	121	121	122	130	130	132
Turnaround time (days)	4.12	3.46	3.47	3.38	3.25	3.53	3.55	3.51	3.47
Average net tons per train	15.2 f/	16.4 f/	15.2 f/	15.3 f/	15.2 g/	15.35 h/	15.66 h/	15.66 h/	15.97 h/
Million passenger kilometers	18,576	19,527	20,801	20,529	22,632	22,905	22,560	22,785	21,399
Million passengers carried	954	1,006	1,056	997	1,008	1,016	1,022	1,011	980
Average passenger distance traveled (kilometers) i/	19.5	19.4	19.7	20.6	22.5	22.5	22.1	22.5	21.8

a. All tonnages in this table are given in metric tons.
b. 84/
c. 85/
d. Net ton-kilometers divided by tons carried.
e. Tariff ton-kilometers divided by tons carried.
f. 86/
g. 87/
h. 88/
i. Passenger kilometers divided by passengers carried.

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APPENDIX D

MULTIPLE CORRELATION BETWEEN THE INDEX OF TOTAL TRAFFIC KILOMETERS, CAPITAL PRODUCTIVITY, AND LABOR PRODUCTIVITY 1951-57

Problems of multiple correlation always involve three or more variables, one dependent variable (the value that is to be estimated) and two or more independent variables which for one reason or another may have some significance in estimating the value of the dependent variable. In many problems, there are numerous factors that are interrelated and have some influence in considering the value of the dependent factor, not as a causal force but as an interrelationship.

Because the independent factors do not all have the same relationship to the dependent factor, the relationship of each must be weighed according to its contribution to the total of the independent factors. Only a multiple correlation can derive the coefficients of regression that are the correct weights of each of the independent factors in their relation to the dependent factor after the influence of each of the other factors has been considered or eliminated. In this way the ability to predict the level of the dependent factor from given levels of the independent factors can be determined.

In this problem, two independent factors were considered to have extensive relationships to the level of total traffic kilometers (ton-kilometers added to passenger kilometers): (1) capital productivity, which has as its component parts the total amount of capital for use, the efficiency of the capital goods used (for example, steam locomotive power, aging rolling stock, and older types of signaling) along with some measure of the increasing efficiency of the capital goods being acquired, and (2) labor productivity, which considers the total number of employees, average productivity per employee, and probably some measure of the efficiency of the administration and organization. The linear multiple correlation for the three factors -- total traffic kilometers (the dependent factor), capital productivity, and labor productivity (the independent factors) -- showed that the degree of relationship was high enough to permit the use of capital and labor productivity in predicting the approximate capacity of the railroads in 1960 in terms of total traffic kilometers.

Two separate correlations were run, one from the original data and one from the indexes of the data available or estimated for the years 1951 through 1957. Data for 1958 were not used in the

correlation inasmuch as the values for labor and capital inputs were considered to be tentative. Both of these correlations produced the same basic result. The correlation coefficient was found to be sufficiently high to be used quite accurately for forecasting if the assumption is made that the relative weights (the coefficients of capital and labor productivity) will not be changed drastically during the period 1958-60 by disproportionate additons to either capital or labor supplies. The estimate is that no disproportionate additions can be made during the period, although some change is bound to occur.

To show what portion of any given increase in total traffic kilometers is directly attributable to the increase in productivity of capital and labor for the given years, the following values were assigned in the multiple correlation problem, using the indexes of

x = total traffic kilometers (TTKM), dependent factor

y = capital productivity
z = labor productivity
} independent factors

The multiple correlation coefficient was found to be high,* with

$$R = 0.98$$

The coefficient of determination was

$$R^2 = 0.96$$

The computed coefficients of y and z for the linear multiple regression equation Yc = a+by+cz are

$$b = 0.5384$$

$$c = 0.6106$$

Substituting the coefficients b and c in the regression equation with the constant "a" equal to -13.97, the value of total traffic kilometers (the unknown Yc) for any year can be approximated. For example, for 1956 the estimate of TTKM capability can be derived as follows:

* There are two indigenous factors that contribute to the high degree of correlation. The primary factor is the amount of autocorrelation in the economic series, and the other is the use of ton-kilometers in all three of the variables. The exact degree of stochastic relationship existing in this problem is therefore difficult to interpret.

$$Yc\ (TTKM) = -13.97 + 0.5384\ (130.1) + 0.6106\ (129.0)$$

$$Yc = 134.85\ (\text{index of TTKM, base year 1951})$$

This value (Yc) differs from the actual index (134.9) by about 0.1 percent.

On the assumption that the ratio of capital to labor productivity is relatively constant for 1958-60 and by the application of the estimated increases (index) of capital productivity and labor productivity, the estimate of TTKM capability for 1960 can be derived as follows:

$$Yc = -13.97 + 0.5384\ (158.9) + 0.6106\ (143.7)$$

$$Yc = 159.3\ (\text{index of TTKM, base year 1951})$$

Thus TTKM capability in 1960 would be approximately 62 billion ton-kilometers instead of the required 68 billion ton-kilometers. On the basis of annual growth in traffic kilometers during 1951-57, a total of 6 billion traffic kilometers would indicate that East Germany is 2 to 3 years behind the 5-year planned rate of increase in total traffic capacity.

The results of the above correlation and its projection to 1960 are subject to separate check by projecting the growth in traffic kilometers on the basis of an average annual rate of growth.

If the average annual rate of growth during the period 1951-57 is computed, the following results are achieved:

Year	Million Traffic Kilometers	Annual Rate of Growth (Percent)
1951	38,654	5.7
1952	41,621	5.7
1953	44,905	5.7
1954	48,983	5.7
1955	51,613	5.7
1956	52,133	5.7
1957	53,972	5.7
1958	57,048	5.7 (Projected)
1959	60,300	5.7 (Projected)
1960	63,737	5.7 (Projected)

On this basis the capacity for 1960 would be about 64 billion traffic kilometers, or 4 billion traffic kilometers less than set forth in the plan. This computation is not too conclusive, however, because a declining average annual rate of growth was noted in the years after 1954, and the actual increase between 1957 and 1958 was only 0.5 percent. Projections also were made on the basis of the average annual increases between 1954 and 1957, as follows:

Year	Million Traffic Kilometers	Annual Rate of Growth (Percent)
1954	48,983	3.3
1955	51,613	3.3
1956	52,133	3.3
1957	53,972	3.3
1958	55,753	3.3 (Projected)
1959	57,593	3.3 (Projected)
1960	59,494	3.3 (Projected)

On the above basis, traffic kilometers are more than 8 billion less than the planned goal of 68 billion traffic kilometers. The latter method, which reflects a recent rate of growth of 3.3 percent, is believed to be closer to the actual rate than the rate of 5.7 percent computed for the years 1951-57.

Data on plan fulfillment for 1958 indicate a 5.2 percent rate of growth in freight traffic and a decrease of 6 percent in passenger traffic above that of 1957, thus giving some support for using the latter figure for the years 1959-60.

No definitive explanation can as yet be provided on the actual reasons behind the apparent discrepancy between planned traffic goals for the railroads in 1960 and the trend of annual performance. At best, the plan can be estimated as being slightly more than 1 year (approximately 4 billion traffic kilometers) behind the anticipated 1960 schedule. By 1960, in all probability, there will be a lag of slightly more than 2 years (8 billion traffic kilometers) behind the 1960 goal.

In the absence of large quantities of freight that have not been shipped (there was a considerable backlog at the end of 1958, but it was eventually moved), it can be assumed that the lag is due to the fact that demands in rail traffic have not been as high as anticipated (that original plans of industrial demands were wrong) or that other modes of transport have taken over much of the increased traffic

burden of the railroads. In view of the increase in motor transport traffic kilometers of 14 percent in 1958 above that of 1957, the logical assumption would seem to be that the demands on rail traffic have not grown to the proportions originally anticipated in 1955 by East German planners and that some shifts of traffic to motor transport have taken place.

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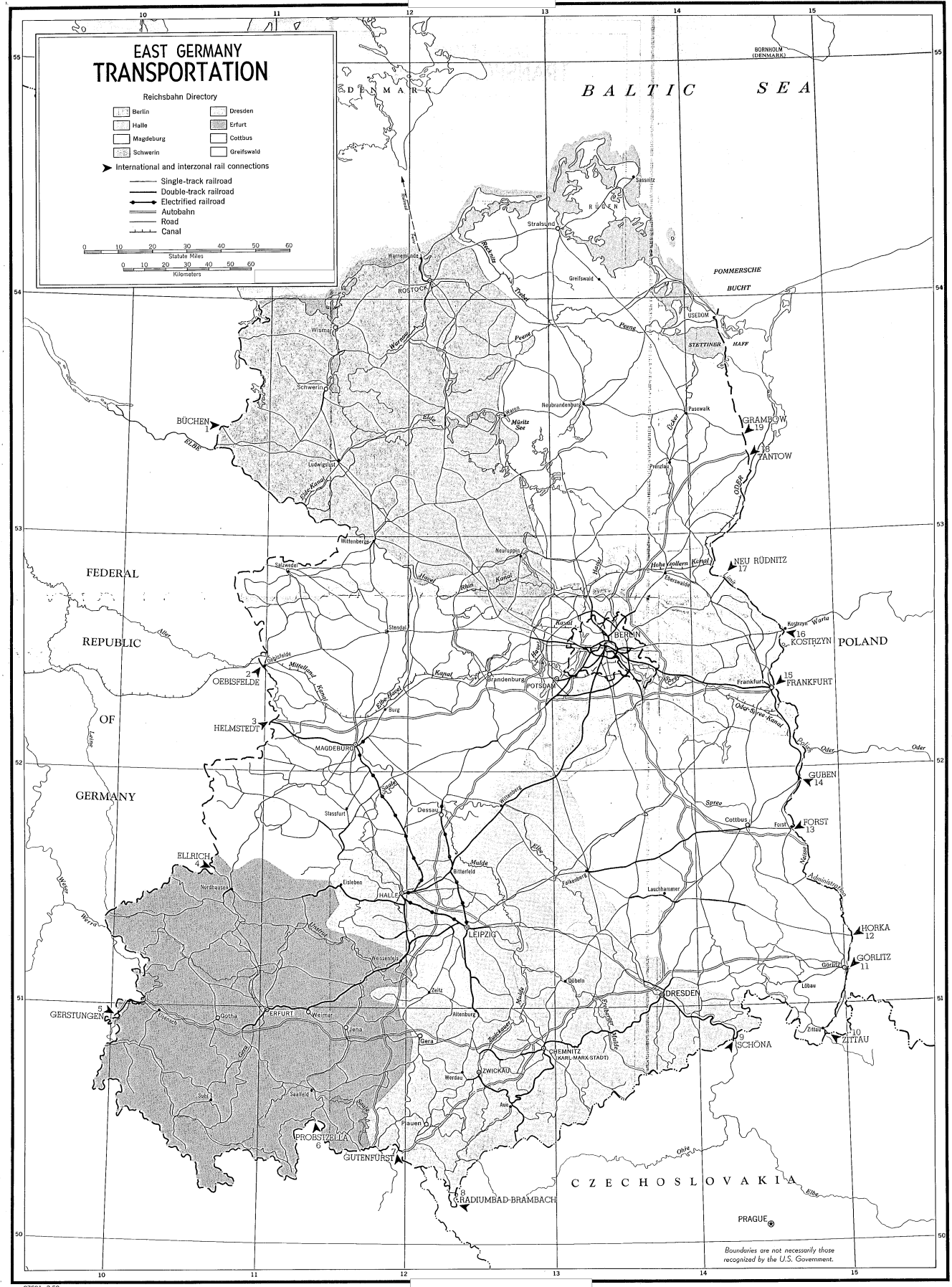
Figure 2



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