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PROJECT PERFORMANCE AUDIT REPORT

THIRD YUGOSLAV RAILWAY PROJECT (LOAN 531-YU)

BELGRADE - BAR RAILWAY PROJECT

October 9, 1981

Operations Evaluation Department

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PROJECT PERFORMANCE AUDIT REPORT

THIRD YUGOSLAV RAILWAY PROJECT (Loan 531-YU)  
BELGRADE - BAR RAILWAY PROJECT

PREFACE

This report presents a performance audit of the Third Railway Project in Yugoslavia for which Loan 531-YU for the amount of US\$50 million equivalent was approved by the Board on March 21, 1968. The loan was closed and fully disbursed on December 31, 1975. The project was not completed, however, until 1978. The report consists of a Project Performance Audit Memorandum (PPAM) prepared by the Operations Evaluation Department (OED) and a Project Completion Report (PCR) prepared by the Europe, Middle East and North Africa Region.

The PPAM is based on the PCR, discussions with officials of the Federal Socialist Republic of Yugoslavia, the Socialist Republic of Montenegro, the Yugoslav Social Accounting Service and its audit branch in Titograd, the Community of Yugoslav Railways, the Railway Transport Organizations of Serbia and Montenegro, the Port of Bar Enterprise, the Belgrade - Bar Commerce Association and with Bank staff; the transcript of the Executive Directors' meeting of March 21, 1968, which considered the project, has been read and project files and documents have been reviewed. OED staff visited Yugoslavia in January/February 1981 to review project experience. The Yugoslav authorities' views have been fully taken into account in preparing the PPAM. The assistance to OED staff of the Yugoslav authorities is gratefully acknowledged. The draft audit was sent to the Federal Socialist Republic of Yugoslavia for comments in the normal course; however none were received.

In general, the PPAM agrees with many of the conclusions of the PCR, particularly with regard to the need for a large allowance for physical contingencies and the need for detailed contributions from marketing and operating experts in the early stages of planning a new railway line, which was the objective of this project. However, the analysis of the PPAM suggests that further preparation work would have been beneficial in helping to control cost overruns and that continued efforts by the Yugoslav authorities would be desirable to promote the use of the new line and to improve operations on the line and at the port of Bar, one terminus of the line. The PPAM also has some uncertainties concerning the appropriateness of the economic evaluation included in the PCR and it therefore cannot associate itself with the quantification attempted by the PCR. But, as it does not have an alternative calculation to offer, the PPAM does not challenge the rate of return in the PCR, which is 6-9%.



PROJECT PERFORMANCE AUDIT BASIC DATA SHEET  
THIRD YUGOSLAV RAILWAY PROJECT (LOAN 531-YU)  
BELGRADE - BAR RAILWAY PROJECT

KEY PROJECT DATA

<u>Item</u>	<u>Original Plan</u>	<u>Actual or Current Estimate</u>
Total Project Cost (US\$ million)	225.48	421.91
Overrun (%)	-	87.1
Loan Amount (US\$ million)	50	50
Disbursed )	50	50
Cancelled ) Jan. 31, 1981	-	-
Repaid )	-	11.61
Borrower's Obligation )	-	56.97/a
Date Physical Components Completed	12/19/72	12/19/78
Proportion Completed by Above Date (%)	-	43.5
Proportion of Time Overrun (%)	-	85.7
Economic Rate of Return (%)	8.5	6-9%/b
Return on Net Fixed Assets of CYR/c (%)	6 after 1972	0 - 2.3

Cumulative Estimated and Actual Disbursements  
(US\$ millions)

	<u>FY69</u>	<u>FY70</u>	<u>FY71</u>	<u>FY72</u>	<u>FY73</u>	<u>FY74</u>	<u>FY75</u>	<u>FY76</u>
(i) Estimated	9.22	18.16	27.98	39.82	50.00	50.00	50.00	50.00
(ii) Actual	4.35	12.77	20.45	31.40	42.12	46.83	49.14	50.00
% of (ii) to (i)	47	70	73	78	84	94	98	100

OTHER PROJECT DATA

<u>Item</u>	<u>Original Plan</u>	<u>Revisions</u>	<u>Actual or Est. Actual</u>
First Mention in Files or Timetable	-	-	02/15/66
Government's Application Negotiations	-	-	02/ /68
Board Approval	-	-	03/21/68
Loan Agreement Date	-	-	03/22/68
Effectiveness Date	-	-	08/01/68
Closing Date	12/31/73	-	12/31/75
Borrower	Investment Bank		
Fiscal Year of Borrower	Jan. - Dec.		
Follow-on Project Name	Fourth Yugoslav Railway Project		
Loan Number	1026-YU		
Amount	US\$93 million		
Loan Agreement	07/10/74		

/a Including US\$18.57 for exchange adjustment.

/b On basis of methodology adopted in PCR which audit does not accept but does not challenge in absence of alternative calculation.

/c Community of Yugoslav Railways.



MISSION DATA

<u>Item</u>	<u>Month/ Year</u>	<u>No. of Weeks/a</u>	<u>No. of Persons</u>	<u>Manweeks</u>	<u>Date Report Completed</u>
Identification	01/66	1	1	1	02/16/66
Preparation	06/66	3	1	1	07/13/66
Preappraisal and Appraisal	10/66	4	3	12	12/02/66
	07/67	3	4	12	08/21/67
	09/67	<u>1</u>	<u>1</u>	<u>1</u>	09/21/67/b
Sub-total		12	10	29	
Supervision I	04/68	1	1	1	06/21/68
Supervision II	09/68	1	2	2	11/19/68
Supervision III	03/69	1	2	2	04/03/69
Supervision IV	05/69	1	2	2	08/26/69
Supervision V	10/69	2	2	4	02/12/70
Supervision VI	03/70	1	3	3	05/27/70
Supervision VII	07/70	1	2	2	07/31/70
Supervision VIII	10/70	2	2	4	03/18/71
Supervision IX	04/71	1	2	2	05/14/71
Supervision X	09/71	1	2	2	09/27/71
Supervision XI	11/71	1	3	3	11/26/71
Supervision XII	09/72	1	2	2	10/18/72
Supervision XIII	10/73	1	1	1	01/22/74
Supervision XIV	09/74	1	2	2	10/09/74
Supervision XV	11/75	1	2	2	12/31/75
Supervision XVI	06/76	1	2	2	06/10/76
Supervision XVII	11/76	1	3	3	12/02/76
Supervision XVIII	03/78	<u>1</u>	<u>4</u>	<u>4</u>	04/24/78
Sub-total		20	39	43	
Completion	09/78	1	4	4	10/31/78

COUNTRY EXCHANGE RATE

Name of Currency (Abbreviation)	Din
Appraisal Year Average	US\$1 = 12.5
Intervening Years Average	
1970 - US\$1 = 12.5	1974 - US\$1 = 15.91
1971 - US\$1 = 15.17	1975 - US\$1 = 17.39
1972 - US\$1 = 17.00	1976 - US\$1 = 18.19
1973 - US\$1 = 16.19	
Completion Year, 1977/78	US\$1 = 18.30

/a Actual length of each mission was more than one week; however each mission included other Yugoslav railway project.

/b Date of grey cover Appraisal Report - March 6, 1968.



PROJECT PERFORMANCE AUDIT REPORT

THIRD YUGOSLAV RAILWAY PROJECT (LOAN 531-YU)  
BELGRADE - BAR RAILWAY PROJECT

HIGHLIGHTS

The purpose of the project was to build the remaining 372 km of new line of the 476 km railway route between Belgrade and Bar, the most southern port on the Adriatic coast of Yugoslavia. The project included installation of signalling and telecommunications equipment and stationary facilities for electric traction, but not locomotives and rolling stock which were financed separately. The line which runs through remote and difficult mountain terrain was completed and put into operation and represents a major achievement of Yugoslav technological forces. However, the project had a time overrun of 85% and a cost overrun of 87% in nominal terms, expressed in US\$ (or 140% expressed in dinars) and 52% in real terms, excluding the effects of inflation.

In its opening year the line carried only about one half of the freight traffic projected for that year and traffic growth has since then been further impaired by the disastrous earthquake of 1979 which was centered near Bar. The economic return at appraisal was estimated at 8 1/2% and it was reestimated in the PCR at 6-9%. This reestimate, however, uses a methodology which is different from the appraisal and with which the Audit does not fully agree. The Audit does not have an alternative calculation and therefore does not challenge a rate of return of 6-9% (PPAM, paras. 40-46).

No financial objectives were specified under the project for the new line. However, the Yugoslav railways as a whole were to achieve certain operational and financial improvements. Significant achievements resulted under the first category but not with respect to finances. Also, the project has contributed significantly to the socio-economic integration of the area traversed by it, and reflects the Yugoslav national concern for income equalization among different regions of the country.

Other points of particular interest are:

- appropriateness of covenants for the railways as a whole in a project devoted exclusively to one line (para. 8);
- the contributions of Bank supervision toward solution of technical problems under the project (para. 16);
- the desirability of full traffic and operational analyses to ensure the economic and traffic feasibility of the engineering design (paras. 16 and 19);
- the need for promotional effort to achieve traffic growth (para. 34); and
- the contribution of financial cost analysis to attainment of the traffic and operational objectives of the new line (para. 39).



PROJECT PERFORMANCE AUDIT MEMORANDUM

THIRD YUGOSLAV RAILWAY PROJECT (LOAN 531-YU)  
BELGRADE - BAR RAILWAY PROJECT

I. BACKGROUND

1. The Third Yugoslav Railway Project is special in several ways. At a time when railway networks were contracting all over the world, the line financed by the project was one of the few major new lines being built and it added about 5% to the total routes of the Yugoslav railways. It represented a signal engineering feat traversing a series of high mountain ranges and including the longest railway bridge in Europe. It fulfilled an ambition going back to the 19th century to connect Serbia by rail directly with the Adriatic Sea. It represents a major contribution toward national integration and improvement of the less developed regions of Yugoslavia, particularly south west Serbia and Montenegro, and fully reflects national policies for income equalization. Finally, it is the only one of five Bank railway projects in Yugoslavia which is devoted exclusively to the construction of a new line. Three other projects were devoted to the system as a whole while the first project financed the conversion from narrow to standard gauge of the line between Sarajevo, the capital of Bosnia - Herzegovina, and the Adriatic. All five projects and their current status are described briefly in Annex I.

2. Various schemes for the Belgrade - Bar line had been studied over the years but the matter was taken up seriously again after the Second World War at which time two routes were proposed, one known as "The Drina River Route" and the other "The Lim River Route". In 1951 a decision was made to follow the latter because it was 105 km shorter and because the Drina River valley was being reserved for electric power generating purposes. Then in 1952, construction was started on the two end sections, one from Belgrade to Vreoci and the other from Bar to Titograd, while at the same time more detailed studies were carried out on the very difficult intervening sections. Financing problems led to the suspension of works for a time but eventually the two sections were opened to restricted operation in 1958 and 1959 respectively. A new decision to proceed was made by the Federal Executive Council in 1961 and in the period 1961-65 about another 100 km of line and three major tunnels were under construction. In addition engineering for most of the rest of the line had been completed.

3. In 1965 the first approach to the Bank was made by the Yugoslav Investment Bank (YIB), the investor responsible at that time for financing the project on behalf of the Government. The main elements in the YIB justification were:

- (a) providing reliable access to an under-developed region having a high economic growth potential.
- (b) facilitating the movement of raw materials required by industry.

- (c) reducing the costs of transport between the Belgrade area and southwards and the Adriatic coast.
- (d) relieving pressure on existing Adriatic ports.

4. The Bank appraisal was made in 1966 and at the first attempt could only produce an economic rate of return of about 6%. It is clear from the internal Bank correspondence that, faced with (i) a Government decision to build the line (ii) some construction already completed and other in hand and (iii) final engineering completed for the balance, and therefore, little room for maneuver on construction standards or costs (even if possible), the Bank had difficulty in dealing with the low rate of return. First a decision was made to refuse a loan; then, on additional data being produced by YIB on possible agricultural benefits, a further appraisal was made on the agriculture and forestry aspects, as a result of which the rate of return became 8 1/2%. As a result the Bank management agreed to recommend a loan be made (of US\$50 million against a then construction estimated cost of US\$225 million) and this was approved at a Board meeting in March 1968. There were several questions at the meeting about the lower than normal rate of return but comments were also made about the additional intangible benefits of providing communication in a remote, poor area of the country and also of the special problems of federal states. The question was raised of whether a proper comparison was made with a highway alternative but it was pointed out that to carry the first year forecast traffic of 8 million tons of freight and 10 million passengers through this mountainous country a 4-lane highway would have been needed at about 2 1/2 times the railway construction cost and with operating costs 4 - 5 times that of the railway.

5. The project appraisal was made on the usual basis of reviewing the operating performance of the whole railway system. The economic section, however, concerned itself with the sphere of influence and traffic likely to be affected by the new railway line; this aspect is further pursued in the PCR (see para. 7.8). On the other hand the financial evaluation dealt with the Yugoslav railways as a whole and no reference is made either in the Appraisal Report, or in the PCR, to the possible financial effect of the new line on the Yugoslav railways, that is, the railways' situation "with" and "without" the new line. The Appraisal Report did not include a time phased construction program; nor did it deal with the likely method of operating the new line, for example, size and number of trains, size and number of crossing stations, yard facilities etc. The PCR comments (para. 3.15) that the basic line design and cost estimates were probably done by engineers without a sufficient contribution by operating and marketing specialists, and this seems to have been true.

6. Side letters to the Loan Agreement covered, apart from contractual and technical matters, general operational and financial conditions relating to the whole of the Yugoslav railway system and dealt with (i) reductions in staff, (ii) closing uneconomic lines, (iii) improving operating efficiency, (iv) achieving an operating return of at least 3-5% in 1970 and 6% in 1972 on net fixed assets and (v) obtaining an operating ratio of not more than 90% in 1970 and 83% in 1972. Such conditions would have been really more appropriate

to the Second Loan (395-YU) for the first major modernization program over principal lines of the system, but may have been inserted in the Third Loan because the earlier Second Loan covenants were all very general and, as regards operations and finance, only provided that the railways should be adequately maintained and operated.

7. The concept of the Project thus encompassed two rather different approaches, one which related to a single, quite self-contained project of the Yugoslav railways and the other which addressed the railway system as a whole. The accomplishments of the Project fell short of its ambitious goals in that:

- (a) The construction of this very difficult line was completed, though it cost more and took longer than expected and it now carries less traffic than forecast; and
- (b) Significant improvements in the overall operations (reduction of staff members and closure of uneconomic lines) of the Yugoslav railways were achieved but the railways failed to meet the financial targets in the side letters.

The question arises as to whether the Project did not attempt to accomplish too much and thus lay an excessive burden on Bank staff by expecting them to cover so many disparate objectives in one operation. It is true that Bank staff had tended to treat the various loans to the Yugoslav railways as though they were one operation and the system-wide aspects of this Third Project could be considered as no more than a redefinition of the general objectives formulated in the Second Railway Project. Moreover, some years later these objectives were once again redefined in the Fourth Project which amended the Third Project documents. But the activities financed under the Third Project (that is the new line) had little to contribute to solving the overall problems of the Yugoslav railways and there is some evidence that resources were, in fact, diverted from the modernization program to the Belgrade - Bar line construction.

8. The question of the dual set of objectives in the Third Project is part of a larger issue in the Bank's lending for Yugoslav railways: whether to deal with the system as a whole or with its individual parts. The constituent organizations of Yugoslav railways have a great deal of autonomy and widely varying standards of performance. The Appraisal Report for the Third Project indicated that one of the weakest units of the system was the Railway Transport Organization (RTO) Titograd most of whose business would be the southern 175 km of the Belgrade - Bar line. The Bank is choosing in its most recent project for railways in Yugoslavia to deal exclusively with another one of the weaker parts in the system, the RTO-Pristina which looks after the roughly 300 km of railway line in the autonomous province of Kosovo. A similar approach might have been appropriate for the Third Project. As indicated below (paras. 22-24) it is quite possible that had more attention under the Third Project been concentrated on the organizational problems of RTO - Titograd and RTO - Belgrade, (the RTO responsible for the northern half of the Belgrade - Bar line), some of the shortfall in traffic on the line could have been avoided.

9. A balanced analysis of the choice between the two approaches must await the completion of the Fourth and Fifth Railway Projects which dealt with Yugoslav railways as a whole. Such an analysis would assess the impact of the Bank's assistance to the Yugoslav railway system over some two decades. Meanwhile, the PCR (paras. 4.1-4.4 and 5.01-5.07) fairly summarizes the experience of the Third Project in relation to Yugoslav railways as a whole. The rest of this audit is limited to comments on the Belgrade - Bar line as such.

## II. PROJECT IMPLEMENTATION AND ACHIEVEMENTS

10. The main conclusion of the PCR was that the Belgrade - Bar line, with its 254 tunnels totalling 114 km in length and 234 bridges totalling 14.6 km in length, was a remarkable engineering achievement, of which Yugoslavia could be proud; and this opinion can be agreed. The new line has been well built and apart from the usual early minor troubles with any new construction there have been only two major problems since the line was opened to traffic, both slips and subsidence to embankments caused by water penetration. Both the construction time and construction cost of the line, however, were considerably underestimated as the difficulties of the work were not sufficiently appreciated initially. These might have been more closely assessed if more time and money had been spent on preliminary site investigations and drillings although with the difficulties of the terrain and access this may not have been possible.

11. The cost of the project was originally estimated at US\$225.5 million, while the actual cost was US\$421.9 million or an overrun of 87%. In Dinars, however, due to the decline in the Dinar value against the Dollar, over the period, the cost overrun came to 140%. The PCR attempts to assess the increase at constant prices and on that basis puts the cost overrun at about 52%; this in turn could be broken down as to about 42% due to cost overrun on the original works, 31% to additional works within the project, such as crossing stations and sidings, and 27% for works not foreseen, such as the need to meet changing Government regulations or local commune requirements, to adjust tunnel designs due to water and geological conditions, to add retaining walls, etc. The PCR assessment is that, overall, inflation accounted for about 63% of the Dinar 140% overrun, mainly due, of course, to the longer construction period than anticipated during a period of high inflation.

12. The cost overrun on the original planned substructure, permanent way and buildings only, came to 49% at constant prices and 76% on actual prices. The principal cost increase arose on the tunnels and here it is clear that the Yugoslav contractors employed started off with little knowledge and experience and with inadequate equipment for such work; they learnt as they went along and, while of ultimate benefit to the industry of Yugoslavia, the learning process may have been at the time of implementation and cost of the project. It might have been preferable for Yugoslav contractors initially to have

formed joint ventures with foreign firms with experience and equipment for the tunnelling work involved, as was done for some tunnels on early Bank highway projects. It would also have been useful for funds to have been provided for the purchase of some of the specialist equipment required; it seems that the Government realized this conclusion towards the end of the project and has enabled contractors to be supplied with specialist equipment for large tunnelling works now being carried out in the country.

13. As regards electrification, signalling and telecommunications, the cost overrun was about 54% on the constant price basis, but on actual costs was 138%. The cost overrun on other works was also about 132% on total cost, partly due to these works being carried out towards the end of the project (by which time prices had risen steeply) and partly due to works not originally allowed for but necessary for the effective completion and operation of the new line.

14. The PCR suggests that the allowances for contingencies in the original appraisal cost estimate were too low. The physical contingency allowance was 10% for possible increase in quantities and for unforeseen items; the PCR suggests there should be, with such difficult and complicated works, 15% for the former and 10% for the latter. This is largely a matter of judgement in the light of the amount of detailed engineering and site investigations carried out initially but in the case of the Belgrade - Bar railway, a total allowance of 20 - 25% would not have been out of place.

15. The price contingency allowed was 3% per year and while probably reasonable at the time was quite inadequate for the inflation actually experienced over an 8-year period (of rapid inflation) instead of a 4 to 5 year period as projected. The latter period was too optimistic but, on the other hand, the former might have been reduced to some extent if foreign contractors and equipment had been associated in joint ventures with local firms, initially, until this was found to be no longer necessary (para. 12).

16. It is clear that, as noted in the PCR, the Bank influence was useful (i) in bringing the whole scope of the project up to Bank standards, by reviewing the cost estimates, the financing plan, foreign currency requirements, etc.; (ii) in taking an indepth look at the economics of the project; and (iii) during the course of the project, in establishing effective and good relations with the Borrower and helping to solve many technical and financial problems. One matter that was perhaps not fully investigated in the Appraisal Report and the early stages of the project was the operational performance of the line, including the requirements for trains and train facilities to deal with the traffic forecast. Significant investments in addition to the line itself have been made and are still required to realize the full traffic potential, including a number of industrial sidings which are needed to make the railway competitive with road transport for particular traffic, the acquisition of specialized rolling stock for phosphate, and several connecting lines. The investment in rolling stock for the Belgrade - Bar line might possibly be reduced through more efficient utilization of the rolling stock which comes onto the line or is assigned to that region.

17. Better traffic planning would have helped in defining capacity needs and would have provided a basis for determining which features of the design were essential to achieve capacity and which were not. Such an analysis was a prerequisite to a program to contain and reduce investment costs. The line as described in the Appraisal Report was to accommodate some 8 million tons of traffic in the opening year. However, no mention was made of the fact that density of traffic would vary widely on various portions of the line, with the highest tonnage being reached only near Belgrade. Nothing was said in the Appraisal Report and only a little in the PCR, about the operational and traffic capacity aspects of the new line. The timetable provides for six through passenger and five through freight trains daily in each direction with other freight trains provided between major centers. A diagram at Annex II shows the main services that are allowed for. If all are operated and with the present average net train load of 650 tons (as quoted by the Yugoslav railways), the freight capacity per year would be approximately 5 million tons towards the Belgrade end of the line and 3 million towards the Bar end. With higher maximum freight car axle loads (24 tons instead of 18 tons) and greater average loads per car (with more bulk traffic) the same train service, or slightly increased (with additional crossing loops brought into service), should be able to provide annual capacities of up to 8 million tons towards Belgrade and 4.5 million tons towards Bar. The former figure agrees with that given by RTO-Belgrade as the present maximum line capacity. The provision of centralized traffic control (CTC) could increase the capacity to 11 million tons, or more, per year, according to RTO-Belgrade. Thus, line capacity offers no constraint on the amount of traffic that can be carried for the foreseeable future.

18. In fact, the question arises whether some capacity creating investments could have been postponed to later stages of the line's development, particularly the installation of electric traction. Another opportunity for reducing investments is illustrated by the passenger facilities at Titovo Uzice. These facilities have been built temporarily pending a decision on the location of a permanent station but their simple design delineates a minimum low cost standard which covers the needs.

19. A detailed train operations analysis could also have focused trade-off calculations (traffic capacity against investment costs) and engineering effort on those sections of the line which would most likely yield substantial investment cost savings. Separate costs have not been computed for individual sections of this line as built. The Yugoslav railways believe and the Audit concurs that such a cost study would be most valuable for the design and control of future construction projects. But even without this information it is apparent that some sections were much more expensive than others, and frequently the high cost construction was incurred in the remote, less travelled sections. Tunnels which contributed most significantly to construction costs constituted about 25% of the length of the line overall but on some sections were nearly 50%. While the Bank's participation thus helped to define more accurately the dimensions of the project and the steps to implement it, the Bank's analysis perhaps did not go far enough to probe the accuracy and completeness of the design and cost estimates to ensure the line could operate as expected and to probe the areas which would be most sensitive to cost overruns and therefore deserved more engineering effort.

III. TRAFFIC PERFORMANCE AND PROJECTIONS

20. The traffic projected to be carried on opening of the Belgrade - Bar line and actually moving on the line in the first full year of operations is as follows (in millions):

	<u>Pass km</u>	<u>Tons</u>	<u>Ton-km</u>
Projected opening year (1973)	900	8,082	2,329
Actual opening year (1977)	756	NA	1,018

Freight tonnages for 1977 were not provided to the Audit but on the basis of an assumed average haul distance of about 250 km, this tonnage would be about 4 million tons or also about half of the projected amount. About 3.2 million of the projected ton-km were import and export traffic through the Port of Bar with the remaining 4.8 million being domestic movements. Two thirds of the import-export traffic was to have been diverted from the port of Ploce some 100 km northwest of Bar on the Adriatic, a diversion which has failed to materialize. Nearly all categories of traffic fell short of expectations but some relatively more than others, notably timber and wood products, cement, phosphate rock, cereal and agricultural products (Table 13 of PCR). The shortfall in passenger traffic was much less severe. Despite these short falls, the line carries a significant traffic volume, constituting about 5% of total traffic on the Yugoslav railways and considerably more than some of the smaller national railways the Bank has been financing.

21. There are several explanations for the shortfall in the opening year traffic: inadequate capacity at the Port of Bar, deficiencies in rail services, insufficient marketing of the new line and overestimates of potential traffic. The Appraisal Report assumed that major improvements would be needed at the Port of Bar to handle the projected import and export traffic of the Belgrade - Bar line and that these improvements would take the place of investments which would otherwise be required at other Adriatic ports notably at Ploce. The report therefore did not include the investments at Bar in the costs of the project. Moreover, the report indicated that the Government itself would make these investments. Eventually the Government sought the Bank's assistance for the work at Bar and in 1974 a loan was made of US\$38.4 million equivalent (1060-YU) for this purpose. This work was not finished by 1977 when the line came into full operation and obviously came later than was appropriate to the needs of the line. More intensive monitoring by the Bank and the Government of developments at Bar and earlier corrective action would have helped prevent this situation.

22. Some traffic that the port could have handled was not moved over the line because the railway lacked the necessary rolling stock. An example of this was the phosphate traffic which has been difficult to shift from Ploce to Bar and the new line unless specialized covered wagons are put into dedicated service. As indicated in para. 16 some of this investment might be avoided through more efficient utilization of existing rolling stock.

23. A more active promotional effort could also have helped to attract more traffic to the new line. For example, various types of international transit traffic to and from neighboring countries such as Roumania and Hungary require intergovernmental agreements and other arrangements to become effective. The Yugoslav authorities did take some actions to stimulate the use of the line but they were relatively ineffectual. The Belgrade-Bar Commerce Association was formed during the railway construction period to stimulate interest throughout the zone of influence in using the new line; representatives of the railway, the port of Bar, Government departments, local communes and enterprises provided the membership. It does not seem to have been very active for most of its life and the Bank had relatively little contact with it during project supervision. The Association is a business organization financed by members, to prepare studies where members have transport or any other problems that can be helped by joint discussions and actions. The Association is also responsible for discussions on international transit traffic. The Association still exists and is now taking a more active role.

24. Some of the shortfall in traffic during the line's inaugural period was due to overly optimistic projections. Firstly, it may have been unrealistic to expect that traffic would shift suddenly in such large amounts. Secondly, some potential traffic may have been anticipated, as coming to the line on the basis of its generation in the zone of influence and on the basis of lower line haul costs, without consideration of accessibility to the line and at additional cost and difficulties arising from shifting goods by road to the railhead. It is this type of analysis which caused the appraisal of the Port of Bar project in 1974 to assess a lower traffic potential through the port than had the 1968 appraisal of the Belgrade-Bar line. Another important action would have been a periodic reestimation of traffic during the construction period. However, such new traffic estimates were not made, though requested by the Bank.

25. The Belgrade - Bar appraisal had projected a rather modest growth of traffic after opening of the line:

	Freight Net ton-km (mill)	Passengers Pass.-km (mill)
1st year	2,329	900
5th year	2,841	954
10th year	3,284	985
15th year	3,679	1,021
20th year	4,029	1,044

This amounts to an annual increase over the first five years of about 4% for freight and 1% for passengers, and over the 20 years of less than 3% and 1% for the two types of traffic respectively. No comparison is possible between these forecasts and the actual growth of traffic because the normal evolution of traffic was interrupted by the disastrous earthquake of April 1979. Data on ton-km performance of the line are incomplete but are likely in 1980 to have been about the same as in 1977 or at most 20% higher. Passenger-km in 1980 were about 10% more than in 1977 (after a 10% drop in the year of the earthquake).

26. While the earthquake did not do much major damage to the railway (it was closed for only 13 days and most essential repairs have now been made), it did destroy most of the older installations in the Port of Bar and damaged to some extent the new works which were just about finished in 1979. As a result of the earthquake, the capacity of the port was reduced with consequent effects on the railway. Restoration work is being financed in part by a Bank loan (Loan 1769-YU). Most of the newer installations have been restored and the easier repairs carried out to the older assets, leaving the major reconstruction of wharf walls and storage sheds still to be dealt with. While the latter work was supposed to have been completed by 1983, it may now not be finished until 1985. The Audit gained the impression that some acceleration of restoration work at Bar might be possible and that other measures might be taken in the interim to increase the utilization of the port. In view of the critical contribution of the port to realization of the line's economic potential, the creation of a sense of urgency seems appropriate.

27. The Belgrade - Bar Commerce Association has made revised freight traffic forecasts (in tons, not ton-km) for the line which show that traffic would increase from 4.1 million tons in 1981 to 8.0 million tons in 1985. The latter figure is roughly equivalent to the appraisal opening year forecast of 2.3 billion ton-km. It is dependent on all work at Bar being completed by 1983 and an additional crossing loop being built near Titograd. The PCR projected that ton-km would reach 2.1 billion by 1984 which is close to the Commerce Association's 1985 forecast; however, if the works are delayed (a distinct possibility) freight traffic growth on the line would also be postponed. The Commerce Association is not concerned with passenger traffic and has not prepared new passenger forecasts for the line. The PCR projects that passenger-km will exceed 1 billion in 1981 and reach 1.067 billion by 1984 which does not seem out of reach in view of estimated 1980 traffic of 832 million passenger-km.

28. The occurrence of the earthquake has introduced an arbitrary element into the review of this project. It would not be reasonable to expect that traffic should reenter the same growth path that it was on before the earthquake and it would be impossible now to specify what part of the delay in traffic growth is attributable to project implementation and what part to the earthquake. Nor would it be fair to ignore clear evidence even before the earthquake that traffic was falling significantly below estimates. Under these circumstances it seems appropriate for the Audit (a) to examine whether the revised traffic forecasts are realistic, particularly in the light of individual shortfalls experienced thus far and (b) whether appropriate and effective promotional efforts are in hand to ensure that traffic forecasts are met.

29. Both the Belgrade - Bar Commerce Association (in its discussions with the Audit mission) and the PCR (about two years earlier and before the earthquake) projected that freight traffic would grow to over 2 billion ton-km by the mid 1980's, roughly double its present level. In fact, most of that growth, according to the PCR, would have been achieved already by 1980; this implied a growth by 1980 of 75% over 1977, whereas 1980 traffic (after the

earthquake) was about the same as in 1977. Neither the Belgrade - Bar Commerce Association nor the PCR projection was broken down by commodity;<sup>1/</sup> however, the Commerce Association indicated that roughly 54% of tons (no data provided for ton-km) would be traffic originating or terminating at Bar while the PCR suggested that as much as 60% of ton-km would be traffic diverted from Ploce port, that is moving through Bar. If allowance is made for the larger average haul on traffic associated with Bar port, the two percentages of 54% and 60% appear consistent with each other. They contrast sharply with the 1977 pattern indicated in the PCR when only 44% of the line's traffic in ton-km was diverted from Ploce. If the traffic targets set for the mid-1980's are to be met, therefore, diversion from Ploce port will need to be more effective than so far. Operational and capacity problems at Bar will have to be removed; in addition, other frictions relating to harbor dues and port services need to be overcome. While dues are supposed to be uniform at all Yugoslav ports some discretion in charging is possible (and may have an effect on shippers' decisions for bulky commodities) and the port of Bar authorities will need actively to seek high volume, low profit margin business. Port services (ships agents, bankers) are undeveloped at Bar and will have to be strengthened to overcome the reluctance of shipping companies to route vessels to Bar, particularly general cargo and container vessels.

30. Problems with regard to the Belgrade - Bar railway line will also have to be alleviated, particularly in view of the competitive advantage that accrues to Ploce from the fact that port is operated by RTO - Sarajevo (that is the railways of Bosnia - Herzegovina). There are problems with the supply of freight cars to the Port of Bar by RTO - Titograd. Under current Yugoslav practice, each regional railway organization owns its own fleet of locomotives and cars, with the Yugoslav railways as a whole providing the overall control and adjustments of revenues and hire charges. The freight car supply position, however, does not seem to be altogether satisfactory. The Yugoslav railways say that there is a general shortage, while RTO-Titograd, in particular, complains of shortages to uplift Bar port traffic; some potential traffic is being turned away, according to the port of Bar because the railway is unable to carry it. On the other hand RTO-Belgrade say that they help out RTO-Titograd from time to time, and, for example, have lent six sets of open cars for iron ore transport. The next 5-year plan makes tentative provision of some 500 additional freight cars for RTO-Titograd. As indicated in paras. 16 and 22, some of these investments might probably be avoided through more efficient utilization of rolling stock, particularly by amending the rules for car sharing. Another problem affecting car supply seems to be that the predominantly dry bulk import traffic from Bar requires open cars while the main export traffic of finished products requires covered cars; thus there is a considerable amount of empty haulage. The use of containers for the latter, which could then be placed in open cars has not been developed much as yet;

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<sup>1/</sup> The calculations by commodity on page 1 of Annex 2 of the PCR do not tally with the total traffic growth data and cannot therefore be used as a commodity forecast.

only about 200 per month are carried in and out of Belgrade at present. But the Belgrade - Bar Commerce Association are to have meetings with enterprises to assess and encourage container transportation and to push measures for greater container use, especially consolidation of containers into large lots to make them more attractive to ship operators.

31. Improvement of operating practices on the Belgrade - Bar line would also help divert more traffic to it. According to reports available the general operations on the line do not have a good reputation among users and potential users; the operations are said to be poor and inefficient, with not enough coordination between port and railway. (Passenger train operations also leave something to be desired; most through trains Belgrade - Bar, or return, can be up to several hours late on arrival in winter; the popular ones are over-crowded and the cleanliness of the cars is not good.)

32. Even though individual forecasts by commodity were not provided to the audit mission, it was clear that the Commerce Association was conducting its promotional campaign along systematic lines and targeted to particular elements of traffic. For example, the problem of importing phosphate rock through the Port of Bar is to be studied jointly with the port, railways and users and employing consultant assistance, in order to try to set up a coordinated scheme, possibly as a joint venture. The traffic is at present handled with inadequate facilities and storage at the ports of Ploce and Sebenik and is forecast to reach 1 million tons per year. Phosphate handling equipment was originally to have been installed at the port of Bar under Loan 1060-YU but this was not done because the RTO-Titograd did not have funds to purchase the special bulk freight cars required and also, it is said, because the tariffs that could be charged were not adequate to port or railway.

33. While the Commerce Association has introduced a new sense of direction to the marketing effort, it did not indicate the priorities for this work. Now that the cost of the line has become a sunk investment, increased utilization of the line would be highly desirable as long as marginal costs are covered. Nevertheless, some elements of new traffic are relatively more profitable (financially or economically) or have significantly more potential of lifting the economic development of the region. For instance, at the time of appraisal 64% of the traffic on the new line was estimated in the opening year to be diverted from Ploce port but this 64% would be contributing less than 5% of the benefits attributable directly to rail traffic. The reason for this small contribution to benefits is that the Belgrade - Bar operating costs were only slightly lower than those for the Ploce route; the former route was shorter but also steeper. (In the PCR, for unexplained reasons, this disparity has been narrowed considerably). On the other hand, traffic diverted from road, representing 17% of total traffic, was expected to contribute nearly double this percentage (31%) to total traffic generated benefits. Thus, meeting the targets for diversion from Ploce would seem to have a lower priority. Similarly, creation of new traffic by location of industry along the line would seem to have more significance than diverting traffic from another mode with slightly higher costs.

34. The Audit concludes that the revised traffic forecasts for the Belgrade - Bar line will not be met unless the Belgrade - Bar Commerce Association continues and intensifies its promotional work and unless operations at the port of Bar and along the Belgrade - Bar line are further improved. These efforts will only succeed if detailed targets are established and plans put into operation which specify how these targets are to be achieved. In view of the inherent difficulties it seems reasonable to expect some slippage in the existing traffic forecasts.

#### IV. FINANCIAL PERFORMANCE

35. Financial targets were specified in this Third Project only for the Yugoslav railways as a whole, not for the Belgrade - Bar line. These targets were not met for causes adequately explained in the PCR (para. 5.01 and following) and as indicated above (para. 9) no further comment will be made here on these system-wide aspects of the Third Project. However, a brief review is made of the financial aspects of the Belgrade - Bar line itself.

36. The funds for the construction of the Belgrade - Bar line were provided by a variety of sources within Yugoslavia, but principally the Federal Government (directly, through the Yugoslav Investment Bank or through the World Bank which in turn channelled its funds through the Yugoslav Investment Bank) and the Governments of the Republic of Serbia and of Montenegro (which used their own or borrowed moneys for this purpose (PCR para. 5.08 - 5.10)). These funds were made available as grants to RTO-Belgrade and RTO-Titograd. The Bank Loan interest and repayment charges are thus met from Federal funds and the RTOs Belgrade and Titograd act as operators only, providing and renewing the equipment and also the track material after the initial installation.

37. There was no provision in the Loan Agreement for Loan 531-YU for the keeping of separate accounts for the Belgrade - Bar line after opening of service. Requests were made during the later supervision of the loan for such separate accounts to be kept but nothing was done. In the case of RTO-Belgrade, representatives have stated that an attempt was made but it was found too difficult to separate out Belgrade-Bar data from the system accounts and construction costs for allied works. In the case of RTO-Titograd, the problem is simpler because the system there consists only of the Montenegro section of the Belgrade - Bar line (175 km) plus the branch line to Niksic (55 km); therefore the RTO-Titograd financial statements reflect principally the operating performance of the main line. The results for the years 1977-79 have been as follows (dinar millions):

<u>Year</u>	<u>Total Revenue</u>	<u>Working Expenses</u>	<u>Depreciation</u>	<u>Operating Expenses</u>	<u>Interest Charges</u>	<u>Balance + (-)</u>
1977	282.4	283.2	86.2	369.4	5.2	( 92.2)
1978	250.9	289.3	128.2	418.0	20.1	(286.1)
1979	616.6/a	509.7	137.9	647.6	18.6	( 49.6)

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/a Includes 214.0 compensation for tariff increases withheld.

Thus, so far, the RTO-Titograd has operated on a balance roughly with working expenses but at a loss when depreciation and other charges are taken into account and has made no contribution to improvements or return on the capital invested by the Government. The position may change once the Bar port traffic can be increased and if the RTO-Titograd can meet the consequent freight car requirements.

RTO-Belgrade had overall, the following results (dinar millions):

Year	Total Revenue	Working Expenses	Depreciation Depreciation	Operating Expenses	Interest Charges	Balance + (-)
1977	3253.7	3276.7	877.1	4153.8	321.3	(1131.4)
1978	5422.8/a	3925.6	1101.2	5026.8	395.5	( 0.5)
1979	6274.5/b	4977.1	1333.4	6310.5	485.2	( 521.2)

/a Includes 1371.0 compensation for tariff increases withheld.

/b Includes 1669.2 compensation for tariff increases withheld.

Thus, overall, RTO-Belgrade, including its portion of the Belgrade-Bar line, has not been doing any better than the RTO-Titograd.

38. When data on traffic revenues and operating revenues per traffic unit (passenger-km plus net ton-km) are considered for the Yugoslav railways as a whole and for RTO-Belgrade and RTO-Titograd, the following are the figures:

	1977	1978	1979
Traffic units - All Yugoslavia (mill)	32,494	33,824	36,059
- RTO-Belgrade (mill)	6,456	6,891	7,313
- RTO-Titograd (mill)	375	440	479
Revenue per traffic unit			
- All Yugoslavia (Dn)	0.65	0.80	0.93
- RTO-Belgrade (Dn)	0.50	0.79	0.86
- RTO-Titograd (Dn)	0.75	0.80	0.93
Operating costs per traffic unit (excl. interest charges)			
- All Yugoslavia (Dn)	0.67	0.76	0.88
- RTO-Belgrade (Dn)	0.64	0.73	0.86
- RTO-Titograd (Dn)	0.99	1.17	1.35

Costs per traffic unit on RTO-Titograd are higher than on the larger RTO-Belgrade and on the railways as a whole; this is mainly due to the small size of its operation and to the average line gradients being high. Revenues, on the other hand, are based on tariffs which are common to the whole railways<sup>1/</sup> and which until a recently instituted exception in one area have not taken account of local variations of conditions. An exception has been made in

<sup>1/</sup> At the time of appraisal the RTO's had been given their own rate making authority with the intention of covering their respective costs but the RTO's Skopje and Titograd were allowed to charge lower prices until 1970 at which time they were to eliminate the divergence between prices and costs.

1980, after Bank representations, in the case of the RTO-Kosovo where a special tariff increase of 33% (by adding that percentage to charging kilometers) was added to a nationally agreed tariff increase. The Yugoslav railways are reported to be now studying the allocations of revenues and some resolution of the RTO-Titograd problem may be suggested, perhaps on the lines of that already agreed for RTO-Kosovo.

39. In addition, a Railway Costing study was completed in 1979 (and financed under the Eighth Highway Project, Loan 1377-YU). The consultant's report and proposals were mostly accepted and approved in the second half of 1979 by the Yugoslav railways and the constituent regional organizations. The proposed costing system takes account of the complex arrangements of separate and independent units in the form of Basic Organizations of Associated Labor (a basic unit under Yugoslavia's self-management system) which charge for their services to one another and which together make up the RTO's. The study is comprehensive and provides, inter alia, for the determination of costs of services by line, commodity and type of service. The modified accounting code is now being considered by the RTO's and the Yugoslav railways are being urged by the Bank to speed the implementation at all RTO's. These reforms should eventually lead to a revised costing system. A further step is that assurances have been given to the Bank by Federal, Republic and Province Governments of their intention to reduce and eventually eliminate the freight compensation payments such as those noted above in the tables at para. 37. The Bank has also requested that a study be made of the compensation issue so that a clear statement can be made of future compensation policy against overall Government policy. These developments coupled with traffic growth give some indication that the financial performance of the Belgrade - Bar line will improve. The revised costing system would also prove very useful in development of a marketing and pricing strategy for the Belgrade - Bar line.

#### V. ECONOMIC PERFORMANCE

40. The economic evaluation at appraisal was based on quantified benefits directly attributable to the new railway line. In the first full year of operations these benefits were estimated to be about Dn. 214 million, all but Dn 9 million of which were based on traffic (freight and passenger) diverted to or generated by the new line. The costs estimated at that time to complete the project (that is, including Dn. 217 million of physical contingencies but excluding prior sunk costs of Dn. 300 million) were Dn. 2,391 million. For purposes of the economic return calculation the costs of the project also included conversion of the connecting line Cacak to Pozega from narrow to standard gauge; it did not include the cost of motive power and rolling stock, which was instead accounted for under depreciation allowance in operating costs, and the costs of improvements at the port of Bar, which were excluded on the ground that similar improvements would have been needed at Ploce in any event. On that basis, the first year benefits were expected to be somewhat

less than 10% of the costs of the project. The total cost and benefit streams (not reproduced in the report) yielded a return of 8.5% on the basis of a four year construction period.

41. The actual development of traffic benefits has been lower than forecast at appraisal, if the unit value of benefits at appraisal is applied to the opening year (1977) traffic (Table II, Annex 3). Nevertheless, a shortfall of about one half the traffic would have produced a shortfall of benefits of only one fourth. This is explained by the relatively large contribution to total benefits from traffic diverted from road transport and narrow gauge railway where the shortfall was relatively less than for traffic diverted from Ploce port. Nevertheless, it is clear that using the original quantification of benefits the rate of return would have been reduced simply due to reduction in benefits. Additional reductions in the rate of return would accrue from the fact that in real terms the project cost about 50% more than estimated (para. 3.14 of PCR) and that full operation of the line started in 1977, not 1973. The Audit did not have the data to recalculate the economic return on this basis.

42. The PCR recalculated the economic return not only by reference to traffic benefits but also by estimating the value of induced economic activity attributable to the new line. The calculation of traffic benefits was based essentially on the analysis used at appraisal but it shows a more gradual build up of traffic after opening of the line. Annex 3 provides a comparison of traffic benefits as shown in the Appraisal Report (Table I) and as forecast in the PCR for 1984, the year when the PCR projections came closest to the appraisal opening year forecast in traffic units, (Table III). The benefits in Table III are based on data in the PCR which were converted from 1977 to 1968 prices by applying the Industrial Producers' Price Index. The total benefits in Table I and III are just about the same as the original estimate of opening year benefits. However, the structure of these benefits has changed with more than half the PCR benefits being accounted for by diversion of rail traffic through Ploce port, as against about 5% previously estimated. The Audit was unable to find an explanation for this change, but the Yugoslav authorities would undoubtedly find it useful to determine this question more precisely to establish the relative profitability (financial and economic) of various categories of potential traffic. It might also be noted that a small part (about 6%) of the PCR benefits are from "generated" traffic which might be considered to overlap the quantification for induced regional activity.

43. In contrast to the appraisal analysis which was based primarily on traffic benefits, the bulk of the benefits shown in the PCR are benefits other than those attributable to traffic, that is, the benefits due to induced economic activity. They are never less than 55% of total benefits in any one year and account for nearly 70% of the (undiscounted) value of total benefits. The PCR quantification of regional development benefits was made along the following lines:

- (a) it covered the two main production sectors (i) manufacturing, mining and quarrying and (ii) agriculture in the ten communes of Western Serbia and in Montenegro;
- (b) it assumed that growth in these sectors was faster for several years after the railway became certain than it would have been had the line not been built, that is, growth in the two sectors was 9% per year in the period 1974-79 (actual) and 7% per year in the period 1980-85 instead of an assumed 3% per year during these years and that growth thereafter would be 3% per year, with the railway, on a higher base and 3% per year, without the railway, on a lower base;
- (c) it assumed that the differential performance in these sectors over the period 1974-2002 was attributable to total investments in them of about Dn 47 billion in 1977 prices over the period 1970 to 1976 to which was added investment in the railway line of about Dn 12 billion over the period 1967-77 and that the railway investment thus accounted for about one fifth of the assumed additional growth (the proportion of railway investment in combined manufacturing, mining and quarrying and in railway investment).

The PCR argued that the line induced some manufacturing, mining and quarrying activities to locate in the line's area of influence and that the consequent increase in regional prosperity created additional demand and production in agriculture as well. The evidence regarding the location decisions of plants is anecdotal and only a great deal of research could clearly determine that these were established or expanded because of the line. Moreover, in many instances the line may only have been a contributive rather than the decisive factor in the location decision. The observed increase of growth after 1973 in manufacturing, mining and quarrying in Montenegro may also have had many causes. The difference in growth because of the line could thus be very well more or less than what is assumed by the PCR. It is even possible that the causal connection between the construction of the line and regional growth cannot be established in this case. The Audit cannot therefore associate itself with the quantification attempted in the PCR. At the same time, the Audit has no alternative calculation to offer and therefore does not challenge the PCR rate of return which at the lower end of the estimate is a little above 6%.

44. The pattern of growth and change can, however, be documented and that pattern spanned the period of building the Belgrade - Bar line and before and beyond.

- (a) Population - Between 1969 and 1979, Montenegro grew by 13% and Serbia (proper) by 7%;
- (b) Urbanization - Between 1971 and 1979, the proportion of urban population in the whole population rose from 34 to 44% in Montenegro and from 41 to 50% in Serbia (proper) and the proportion of persons

employed in agriculture fell from 35 to 26% in Montenegro and from 44 to 35% in Serbia (proper). Between 1969 and 1979 the towns along the line grew rapidly as indicated in the number of persons employed in the production sectors:

	<u>1969</u>	<u>1979</u>
Titograd	18,318	32,176
Cetinje	3,922	5,988
Kotor	4,848	5,120
Niksic	11,725	17,534
Cacak	18,353	28,539
Titovo Uzice	15,008	21,941
Valjevo	14,836	24,116

(c) Agricultural growth in Montenegro and Serbia ('000 tons)

	<u>1969</u>	<u>1979</u>
Wheat	2,902	2,729
Corn	5,141	6,818
Other grains	377	505
Vegetables	1,385	1,553
Sunflower	355	460
Sugar beet	2,543	4,532

(d) Montenegro growth

GDP growth: above national trend after 1967.

GDP in manufacturing, mining and quarrying: 10.5% p.a. between 1973 and 1977, above national trend.

GDP in agriculture: 5.2% p.a. between 1972 and 1977, above national trend.

Thus over the past decade or more, economic activity increased in the corridor and the area became more urbanized. Transportation activities necessarily had to increase for both production and consumption reasons and only the question remained how the demand would be met most economically.

45. In this mountainous terrain road and rail provide virtually the only feasible alternative for most movements and as the intensity of traffic and the density of settlement rise the cost advantages of railway as a mass mover of people and goods become greater. Under this view, transport is provided as part of the development process and the railway is built as the least cost alternative for certain movements. The approach of the appraisal report, rather than the regional approach of the PCR, thus seems to provide a more manageable tool for determining when to build the railroad. It attempts to project what traffic would move on the line and assign some value to those

services. The area had already been made reasonably accessible by narrow gauge lines and by roads, improvements which probably did represent major advances and the basis for structural transformations of society and which might appropriately have been the subject of a regional income analysis. After these improvements had been made, the new line did no more than reduce costs and improve services and opened the possibility for certain transport intensive activities.

46. The Audit notes that under common experience new railway lines are quite feasible if their potential traffic is as much as 6 million traffic units per km, which was the traffic projected at appraisal for the Belgrade - Bar line. The Audit concludes therefore that generally the projected traffic would have provided a reasonable basis to proceed with construction of the Belgrade - Bar line but the low return calculated at appraisal gave a clear signal that the line was exceptionally expensive and the project very sensitive to cost increases. More effort might profitably have been spent on reducing the risks of overrun, both in physical work and in time, rather than in establishing with somewhat greater precision that the return was a low 8 1/2% rather than a slightly lower 6%. Such an effort might have prevented not only an undue decline in the rate of return but more importantly an unnecessary expenditure of resources. More attention to possible overruns might also have persuaded the Government to examine the cost controls of the project more carefully and to insist on execution according to a more detailed plan.

## VI. CONCLUSIONS

47. The Belgrade - Bar railway project was an important element in a program to redress regional disparities in Yugoslavia. Its successful completion represents a signal achievement of Yugoslavia's technological forces. The rapid growth of the area served by the line provides adequate opportunity for useful employment of this investment.

48. These conclusions stand even though the line carried in its first full year of operations half the projected freight and 85% of the projected passenger load and even though the project had major cost and time overruns. These problems were only partly inherent in the project and could have been reduced. Perhaps the major lesson of this experience, as of the Second Yugoslav Railway Project (see para. 3(b), Annex 1, page 21), relates to the initial importance of adequate preparation of all aspects of complex railway projects. A major effort would have been appropriate on the part of both the Yugoslav authorities and the Bank to examine every aspect of the project in relation to costs including further engineering investigations and more

detailed planning, examination of further phasing of the investment, particularly features relating to capacity such as passing loops and electrification, and reviews of all contractual arrangements, particularly the qualification and development of contractors.

49. The planning of operations and marketing of the line also afforded opportunities for reducing the initial shortfall of traffic. Traffic since 1979 has been affected by the consequences of the earthquake. Additional promotional efforts are now in hand. However, more could be done, and more active efforts to improve operations on the line and at the port of Bar and to complete restoration works at the port offer the best promise for achievement of traffic projections.

50. The economic return of this project is low, possibly only about 6%. The low return reflects the foregoing problems. However, the 1979 earthquake also is affecting the economic performance of the project. The return must be seen in perspective, moreover, as it does not include important unquantifiable benefits such as the integration of different regions and their more rapid modernization which will continue into the future.

PROJECT PERFORMANCE AUDIT MEMORANDUM

THIRD YUGOSLAV RAILWAY PROJECT (LOAN 531-YU)

1. The five railway loans in Yugoslavia have been as follows:
  - (a) First: Loan 316-YU US\$35 million; made in 1963 to assist in the conversion of 195 km of track from Sarajevo to Ploce from narrow to standard gauge, with electric traction and modern signally and communications; completed in 1970, with a delay of four years.
  - (b) Second: Loan 395-YU US\$70 million; made in 1964 to help finance the modernization of the main lines traversing Yugoslavia between the Austrian/Italian and Greek borders; it included electrification, signally, telecommunications and marshalling yards and ran into major difficulties, as a result of which the loan disbursement was not completed until 1972 but with large sections of the program uncompleted.
  - (c) Third: Loan 531-YU US\$50 million; made in 1968 to help finance the construction of 370 km of the Belgrade - Bar new line, with electrification, signalling and telecommunications for the entire length of 475 km; the new line was opened in 1976, with full project completion in 1977, about five years later than the original forecast.
  - (d) Fourth: Loan 1026-YU US\$93 million; made in 1974 after the preparation of a comprehensive development and financing plan by the Yugoslav railways, with the aid of consultants, to help complete the original modernization program, and to help continue with other electrification, signalling and telecommunications and marshalling yard works, the replacement of old locomotives and cars and the reconstruction of tracks in poor condition; the construction of two short mining-industrial lines, the conversion to standard gauge of the Pozega-Cacak link to the Belgrade - Bar line and (depending upon feasibility studies and finance) two lines in Macedonia to connect to foreign countries, were also included; none of the locomotives, rolling stock or new lines were financed by the Bank loan; the project was due for completion at the end of 1975 but the loan was actually closed at the end of 1980.
  - (e) Fifth: Loan 1534-YU US\$100 million; made in 1978, to help the 1978-80 Investment Plan, intended to continue the modernization of the railways, so as to improve their efficiency and competitiveness; components are continuation of track and station overhaul and reconstruction, signalling and telecommunications, traction and rolling stock, and some additional electrification; the Bank loan is mainly to finance track materials for about 1000 km of track overhaul and 50 km of track reconstruction; completion is due at mid-1982.

2. Following the severe earthquake in coastal Montenegro in April 1970, a further loan (Loan 1976-YU) of US\$14 million was made in November 1979, to assist in the repair of affected railway substructures, tracks, bridges, tunnels, buildings, drainage, electrical equipment, etc., on RTO Titograd. These repairs have been mostly carried out.

3. The Project Performance Audit Report for the Second Railway Project No. 563 SecM74fd-764, November 11, 1974, concluded that its long implementation period was due to:

- (a) factors following the 1965 political and organizational changes in Yugoslavia, setting in motion a vicious circle; a deteriorating financing situation delayed investments and made them more expensive; the railways' efficiency could not improve fast enough to react to road competition; thereby traffic was lost which resulted in deteriorating finances; and inflation added to the difficulties;
- (b) the problems of too ambitious a program for the managerial, technical and financial resources available, being compounded by inadequate costing and unrealistic schedules; the project preparation seemed to have been insufficient; and
- (c) the fact that three loans on hand at the same time and these probably competed for the same technical and financial resources.

PROJECT PERFORMANCE AUDIT MEMORANDUM  
THIRD YUGOSLAV RAILWAY PROJECT (Loan 531-YU)

Timetable Pairs of Trains

	Passenger			Freight		
	6 No.	5 No.		2	3	3
Belgrade						
Vreoci						
Valjevo						
Pozega						
Prijepolj				3		3
Briel Polje						
Titograd			3			
Bar						

Note on Freight Capacity of Line

1. With average train net load at 650 tons as given by RTO-Belgrade and average number of axles about 100, capacity is calculated below:

(a) Towards Belgrade end:

through 5 trains x 2 x 650	=	6,500 tons per day
With 300 operating days per year		
assured then tonnage per year	=	1.95 million
Limited: 8 trains x 2 x 650	=	10,400 tons per day
and tonnage per year	=	3.12 million
Total tonnage per year	=	5.07 million

(b) Towards Bar end:

through 5 trains x 2 x 650	=	6,500 tons per day
and tonnage per year	=	1.95 million
Limited: 3 trains x 2 x 650	=	3,900 tons per day
and tonnage per year	=	1.17 million
Total tonnage per year	=	3.12 million

2. Thus, maximum traffic volume, with present service, varies from 3 million to 5 million tons per year, in Montenegro and Serbia respectively.

3. The average net train load is relatively low and if increased - say to 1,000 net ton train load - then carrying capacity could increase to the range 4.5 to 8 million tons.

4. From data provided by RTOs Belgrade and Titograd and Port of Bar it seems clear that for through traffic Belgrade - Bar, constraint is Port of Bar whose capacity is presently 2 million tons per year and is intended to be 4-5 million tons per year after completion of works being financed under Bank loan to repair earthquake damage (Loan 1768-YU). These works were scheduled for completion in 1983 but Port of Bar is talking of end 1985 or even later.

5. Local traffic is reported by RTO-Belgrade at 3 million tons in 1980, rising to 4 million tons in 1984-85.

6. Altogether, traffic in 1980 on the line varied from 1.5 million at Bar to 2.5 million tons for RTO Titograd as a whole - to 3-4 million tons in southern Serbia to 6 million tons towards Belgrade. Port of Bar traffic could increase to 3 million tons by more effort to accept additional cargo, especially phosphate (of which up to 1 million tons available).

7. Line capacity is no constraint although RTO-Titograd complain of shortage of freight cars for loading at Bar.

PROJECT PERFORMANCE AUDIT MEMORANDUM

THIRD YUGOSLAV RAILWAY PROJECT (LOAN 531-YU)

TRAFFIC AND BENEFITS IN 1968 PRICES FOR SELECTED YEARS

I. Appraisal Report Forecast for Opening Year (1973)

	<u>Traffic/a</u>		<u>Traffic Benefits/b</u>	
	<u>Freight ton-km</u>	<u>Pass. Pass-km</u>	<u>Freight Dn</u>	<u>Pass. - Million</u>
Diverted from rail traffic through Ploce port	1,491	-	10	-
Diverted from road transport	317	360	65	32
Diverted from narrow gauge railway	79	90		37
Generated	443	450	45	16
Total	2,329	900		205

/a Traffic, data are based on the appraisal report Annex A which did not however, include a separate ton-km figure for diversion from narrow gauge railway. That figure was derived by assuming that diversion of freight from road transport included diversion from narrow gauge railway and that they had the same relation to each other as diversion of passengers from road transport to diversion of passenger from narrow gauge railway.

/b The benefits were calculated on the same 1968 prices as the investment costs.

II. Appraisal Report Unit Benefits Applied to Actual Opening Year Traffic (1977)

	<u>Traffic</u>		<u>Traffic Benefits</u>	
	<u>Freight ton-km</u>	<u>Pass. Pass-km</u>	<u>Freight Dn</u>	<u>Pass. - Million</u>
Diverted from rail traffic through Ploce port	443	-	3	-
Diverted from road transport	263	302	53	27
Diverted from narrow gauge railway	78	76		34
Generated	233	378	24	13
Total	1,017	756		154

III. PCR Forecast for Traffic and Traffic Benefits in 1984

	<u>Traffic</u>		<u>Traffic Benefits</u>	
	<u>Freight</u> <u>ton-km</u>	<u>Pass.</u> <u>Pass-km</u>	<u>Freight</u> <u>Dn</u>	<u>Pass.</u> <u>Million</u>
Diverted from rail traffic through Ploce port	1,261	-	112	-
Diverted from road transport	385	426	40	22
Diverted from narrow gauge railway	95	107		30
Generated	348	533		13
<b>Total</b>	<b>2,089</b>	<b>1,067</b>		<b>217</b>



PROJECT COMPLETION REPORT

YUGOSLAV RAILWAY PROJECT (LOAN 531-YU)

BELGRADE-BAR LINE CONSTRUCTION

I. INTRODUCTION

1.1 The project was the completion of the 476 km of standard gauge single track electrified line between Belgrade and Bar (MAP I) including construction of 372 km of new line in very difficult mountainous terrain, together with installation of signalling, telecommunication and electric traction equipment. The work was originally planned to be carried out between January 1966 and the end of 1972. Included in the project, but excluded from the cost estimates and Bank finance was the supply of motive power and rolling stock. The project was to provide a direct transportation link between the developed central region of Yugoslavia and the coast, replacing the previous circuitous, high cost, narrow gauge lines, and to help in the advancement of the under-developed regions of Southwestern Serbia and Montenegro.

1.2 Total Bank lending to the transport sector prior to this project had amounted to US\$150 million, US\$45 million for two railway projects and US\$105 million for two highway projects. At the present time, Bank lending to the transport sector has totalled about US\$1,000 million consisting of about US\$500 million for ten highway projects, US\$348 million for five railway projects, US\$108 million for two pipeline projects, and US\$44 million for the Port of Bar Project, which complemented the Belgrade-Bar Railway Project. This does not include loans for rehabilitation of transport infrastructure following the earthquakes of early 1979 totalling US\$85 million.

1.3 Plans for construction of the Belgrade-Bar line stem from 1890 but political problems prevented its construction for many years. Consideration of construction came up again after World War II, but only in August 1951--after many studies of the alignment were undertaken--did the Economic Council approve a rail connection from the city of Beograd to Valjevo-Tito Uzice-Byelo Polje-Titograd and Bar. Further years were to pass before, after more studies and detailed engineering, construction commenced in 1966.

1.4 Of the line length of 476 km, 301 km is located in Serbia and 175 km in Montenegro. The axle load is 22 tons and the line is designed for speeds from 75 km/h up to 120 km/h. The maximum grades in these mountainous alignments are 16% between Beograd and T. Uzice, 18% between T. Uzice and Priboj and 25% between Titograd and Byelo Polje. The lowest point of the line is at Bar at 3 meters above sea level; the highest point at Kolasin is 1,032 m. above sea level. The total number of tunnels gives a clear picture of the

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Note: A very considerable degree of cooperation and assistance in the compilation of this report was received from the Borrower who prepared data concerning traffic and costs as well as writing a short memorandum on the construction experience and economic effects.

complexity of the line: 254 tunnels with a total length of 114,437 m. This means that 24% of the line is situated in tunnels. The longest tunnels are at Sozina (6,170 m.), Zlatiba (6,169 m.), Tribesica (5,170 m.) and Goles (4,949 m.). A very considerable engineering achievement is the "Mala Ryeka" bridge (498 m. long and 200 m. above the river) with spans of 81.2, 92.8, 150.8, 92.8 and 81.3m. The total number of passenger and passing stations is about 50. The electrification system is 25,000 V.A.C. The main line has branch from Titograd to Niksic, Priboj to Visigrad and Pozega to Cacak.

1.5 Completion of the line which was scheduled for the end of 1972, was achieved with diesel traction in mid-1976 and with electric traction in mid-1977. Cost estimate of the line was US\$225.5 million (Dn. 2,818 million) but actual costs totalled US\$422 million (Dn. 6,750 million). The Bank loan was US\$50 million).

1.6 The line was severely damaged by the earthquake in Montenegro of April/May 1979 and reconstruction is being assisted by a Bank loan of US\$ 14 million. Works under this new project are, of course, not within the scope of this report.

## II. PROJECT PREPARATION AND APPRAISAL

2.1 The project had its origin in informal discussions between the General Manager of the Yugoslav Investment Bank (YIB) and the Director of the World Bank's European Operations Department during the 1965 Annual General Meeting in Washington. The Government's approach to the Bank was formalized in a letter of February 15, 1966 from the General Manager of the YIB, the agency responsible for the investment, requesting financial assistance with the program of construction of the electrified Belgrade-Bar line.

2.2 At that stage, two sections of the proposed 476 km line, 51 km south of Belgrade and 53 from Tito to Bar, were already in service. A further 100 km and three major tunnels were under construction. Engineering had been completed for the remainder of the line excepting two sections of 30 km and 15 km. Completion of construction was scheduled for the end of 1972.

2.3 The estimated total cost of the line was US\$213 million equivalent (Dn. 2,680 million) of which US\$25 million equivalent (Dn. 3.0 million) had already been incurred prior to 1966. Of the remaining US\$188 million equivalent (Dn. 2,350 million) the Government hoped to finance US\$80 million through the proposed Bank loan.

2.4 The justification put forward by the YIB in support of the proposed investment was that it would:

- (i) provide reliable access to an under-developed region with a high economic growth potential;
- (ii) facilitate the movement from the areas served by the line of raw materials required by Yugoslav industry;

- (iii) reduce the transport distance from the industrial areas around Belgrade, Nis and Skopje to the nearest port on the Adriatic coast; and
- (iv) relieve pressure on existing Adriatic ports.

It is likely, however, that long standing historical, political and national factors were important determinants of the decision to build the line. The extent to which the objectives at (i) and (iv) were valid and are being achieved is examined in Section VII.

2.5 A feasibility study which was submitted by YIB was regarded as unsatisfactory, particularly in its failure to take into account the cost of expanding facilities of the port of Bar which appeared inadequate to handle the estimated rail traffic. This viewpoint was an important factor in the Bank's subsequent decision to finance the Port of Bar Project under another loan. The Government was, however, advised in April 1966 of the Bank's willingness in principle to assist in financing the project for the railway line and in mid-1966 a mission visited Yugoslavia to seek further details.

2.6 The mission's preliminary conclusion was that if the line were justified, its justification would lie in the potential transport cost savings between the industrial areas and the coast referred to in (iii) of paragraph 2.4 above. But it was thought that, owing to an over-estimation of traffic and an under-estimation of construction costs, the rate of return would be substantially less than the 12% predicted by the YIB. Further data on its development potential were, therefore, requested in preparation for an appraisal mission in October 1966.

2.7 The appraisal mission provisionally estimated, pending receipt of the requested data, that the rate of return on the project would be 6%, possibly rising to 8% when additional information on transit traffic were provided. The Bank decided that this did not meet its criteria for lending and that evidence was required, in the awaited complementary data, of the line's additional economic development potential.

2.8 Meanwhile, two decisions, based on the appraisal mission's findings, were taken by the Working Party. These were that works of a difficult and inaccessible nature unlikely to attract international contractors, amounting to some 15% of total costs, would be confined to domestic bidding and that if a loan were to be made, given the lengthy construction schedule with its concentration of expenditures towards the end of the period, Bank financing should, initially at least, be confined to the earlier stages of construction to avoid premature commitment: a loan of US\$30 million for the period 1967 through 1969 was proposed in accordance with this principle, instead of the US\$80 million spread over the entire construction period as originally requested by the YIB. Concern was also expressed by the Working Party at the increasing Government subsidies to the railways arising largely from a reluctance to raise rates and fares sufficiently to keep up with costs: this was to become recurring theme throughout the preparation and implementation of subsequent Bank railway projects in Yugoslavia, with the Government yielding reluctantly to Bank pressure to reduce revenue deficits through tariff increases.

2.9 Receipt of the supplementary material from the YIB failed to convince the Transportation Projects Department that the rate of return would be significantly above the 6% originally estimated. The Department therefore took the view that the proposed project was not economically justified, and at least 8 years premature. This view was endorsed by the Loan Committee in March 1967, and it was decided not to proceed with the loan.

2.10 The question of the project was reopened in May 1967, after receipt of a further more favorable, evaluation from the YIB. A review at the level of the Office of the Director of Projects concluded that, while there were still doubts concerning the investment, the new data justified a decision to explore the matter further. In view of the emphasis on potential agricultural benefits, it was decided to send a further mission to Yugoslavia, including staff from the Agricultural projects Department, to substantiate the YIB's claims.

2.11 This mission re-evaluated agricultural and forestry benefits, took into account other benefits not previously considered and revised the estimate of the economic return on the project to "close to 8%". The Yugoslav Government and the YIB were informed by cable on August 25, 1967 that the Bank was now satisfied as to the general economic justification for the Belgrade Bar Railway and invited to send representatives to Washington in September for pre-negotiation discussions. A list of engineering and financial data which were to be supplied or updated for the appraisal, was sent to Yugoslavia and a Bank financial analyst visited Belgrade in September to assist in the preparation of this data. On his return he reported the need of Yugoslav Railways as a whole for improved revenues over the project period in order to achieve an adequate financial rate of return. This issue was subsequently addressed at negotiations. Since a loan of \$30 million would represent a small participation in the project and would result in very small disbursements during the early years, it was proposed now to increase the loan to \$50 million (25% of project cost) to be disbursed over the five years, 1968-72. This was subsequently agreed by the Loan Committee.

2.12 The first draft of the Appraisal Report was issued in November 1967 and after refinement of estimated benefits showed an estimated rate of return of 8.5% on the project.

2.13 Loan negotiations with the Yugoslavs took place early in February 1968. The following key agreements were made: The railways would improve their rate of return on fixed assets from 0.2% in 1967 to 3.5% by 1970 and 6.0% by 1972 to permit contribution towards capital investment in replacement assets after covering debt service and working capital requirements. To achieve this primary objective, measures would be taken to (a) reduce the labor force, (b) close redundant lines, (c) improve operating efficiency. The Government would take any necessary action to enable the railways, whose discretion to change tariffs was strictly limited, to adjust rates and fares promptly in relation to costs and to attain the other stated objectives. (The railways were already proposing to reduce their labor force from 140,950 at the end of 1966 to 121,000 by the end of 1975.) Finally, the procurement and operation of electric motive power and rolling stock required for the

efficient utilization of the line, during construction and for one year following, would be included in the project (though not to be financed by the Bank loan).

2.14 The Loan Agreement was signed on March 22, 1968. Estimated total cost of the project including contingencies averaging 19.7% per annum (but net of the locomotives and rolling stock, which were to be provided from the railways' own funds) was US\$211 million equivalent (Dn. 2637 million) covering the period from January 1, 1968 to project completion, scheduled for the end of 1972. Cost from beginning of construction in 1966 to 1972 was estimated to be US\$225.5 million (Dn. 2818 million) (see Table 1). These costs are of the same order of magnitude as the original estimates cited in Paragraph 2.3. The foreign exchange component was estimated to be between US\$24 million and US\$70 million, depending on the respective shares of international and local contractors in the construction. The Bank loan of US\$50 million was to be repaid over 25 years, including a six-year grace period corresponding to the line construction period and first full year of operation. The proposed schedule of disbursements, based on a disbursement rate of 23.7% of certified expenditures during the project period, is shown in Table 2.

### III. PROJECT IMPLEMENTATION AND COSTS

3.1 The construction of the Belgrade-Bar line started in 1966 with the Directorate for the Construction of the Belgrade-Bar line as the executing agency. The directorate, staffed mainly by engineers and administrative staff transferred from RTE <sup>1/</sup> Belgrade, provided project management of a high standard which contributed very largely to the successful conclusion of the project. The loan became effective in August 1968. At that time a large part of the detailed engineering was completed. The involvement of the Bank in the beginning of the implementation of this project did not result in interruption in the execution of works. The impact of the Loan Agreement and side letters was mainly the establishment of procurement guidelines, a revised basic cost estimate, a financing plan for the project and a requirement for additional technical and operational studies by consultants. The technical studies required concerned geological conditions, engineering and construction of four tunnels, construction of the Mala Ryeka viaduct, and of the Prijepolje-Gostun section. Agreement was also reached for consultants' assistance on operations and engineering for the Gostun marshalling yard and Priboj junction. Additional side letters established the status of the Investment Bank, operational improvements to be achieved by CYR, <sup>2/</sup> and investments to be made in the Port of Bar.

3.2 No significant changes were made in the scope of the project as a result of the Bank's involvement. The amendments which were made to the original design of what was, from the technical point of view, a very difficult and complicated project can be considered as normal and refer to:

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<sup>1/</sup> Railway Transport Enterprise.

<sup>2/</sup> Community of Yugoslav Railways.

- (a) construction of alternative alignments on certain short sections of the line as a consequence of detailed geological and engineering reconnaissance on site;
- (b) changes in length, in the statical system or other modifications of bridge and viaduct designs in the original detailed engineering documentation due to changes in site conditions;
- (c) changes in types and quantity of protective works, lengths of retaining walls;
- (d) changes in design of tunnels due to higher pressures encountered than expected and construction of special linings;
- (e) adjustment of the alignment over about 25 km, resulting from the construction of a hydroelectric power plant;
- (f) changes of layout of stations to improve operating efficiency and an increase in the number of industrial sidings to attract more traffic.

3.3 The physical changes mentioned under (a)-(e) can be considered normal for a civil work of this magnitude and should be covered in large part by the physical contingencies.

3.4 The changes and additions mentioned under (f) stem probably from the fact that the basic design and estimate were made by a team of engineers without sufficient contribution by operating and marketing specialists. The total project should be defined in terms of all works required--including the passenger and freight facilities to operate the forecast freight and passenger traffic. The distinction was more between a Phase I consisting of the original layout and works described under (a)-(e) and a Phase II consisting of the additional works mentioned under (f). But because all works of Phases I and II are essential to achieve the forecast traffic, both phases are included in the review of costs of the line. In Annex 1 the Phase II additions are listed. In the total cost estimate of the project some related investments were excluded. These are needed for an efficient operation of the actual or forecast traffic, but because of expropriation problems <sup>1/</sup> they are planned for a later stage. These related investments are (a) additional tracks in Titograd for handling and shunting of freight wagons for Titograd-Niksic and for the Port of Bar; (b) passenger facilities in Bar for cleaning and catering of the international and local trains and the related extension of too small a station building, and (c) additional tracks in Bar for shunting and placing of freight wagons for the Port of Bar.

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<sup>1/</sup> In some cases residential properties had to be acquired and pulled down to make way for construction of railway facilities. This could not be done until the railways had arranged for the provision of alternative residential accommodation.

3.5 All the additions are justified. The new tracks, in both Titograd and Bar were required in any case but are particularly needed at the present time to assist with the very heavy reconstruction traffic which has followed the earthquake of April 1979 and construction is being pressed forward. The earthworks for the passing stations will be completed with excess earth already put on one side at quite low cost and will give capacity benefits in the future. The final design and construction at an earlier stage of Tito Uzice and Prijepolji passenger stations was not possible because of expropriation problems. Both towns so far have temporary stations. The branch lines Titograd-Niksic (57 km) and Cacac-Pozega (32 km) converted in 1967 and 1977 respectively from narrow to standard gauge and although not a part of the project contribute substantially to the freight traffic on the Belgrade-Bar line.

3.6 With traffic of 14 million gross tons forecast for the first full year of operation, electrification of the line appeared well justified. In fact, traffic in 1977 (the first full year of operation) averaged just over 7 million gross tons. At the beginning of 1979, electrification of a railway line normally became justified in Yugoslavia when traffic became of the order of 12 million gross tons per annum; this threshold value decreases with increases in oil prices. In the case of the Belgrade-Bar line, there were special factors favoring electrification: the line has numerous tunnels (adding up to nearly a quarter of its length) and steep grades, and it would have been substantially more costly to electrify the line entirely under traffic than mainly during construction. Given the good prospects of traffic growth, the likely increase in oil prices and the easy availability of hydroelectric power, electrification is unlikely to have been a serious disadvantage.

3.7 The overall completion of the project was delayed in total by about five years. The timetable at appraisal for completion of the project and the beginning of operations compared with the actual achievement is as follows:

<u>Section</u>	<u>Plan</u>	<u>Actual</u>
(i) Vreoci-Valjevo (40 km) without electric traction and final signaling	end of 1968	Nov. 29, 1968
(ii) Resnik-Vreoci-Valjevo-T. Uzice without electric traction but with final signaling (164 km)	end of 1970	July 25, 1972
(iii) Electric traction between Resnik and Titovo Uzice (164 km)	end of 1972	Diesel traction May 1976 Electric traction June 1977
(iv) Titovo Uzice-Titograd Bar with electric traction and final signaling, i.e., completion of the project (242 km)	end of 1972	Final signaling end of 1978

3.8 The reasons for these delays were almost entirely of a technical nature, and resulted from an underestimate of the difficulties which would be encountered in building a railway line through such extremely difficult terrain. Taking into consideration the complex nature of the works, the often very difficult access to the construction sites and the geological difficulties encountered, and the fact that all major civil works <sup>1/</sup> were carried out by Yugoslav contractors with sometimes limited experience and modest equipment, a construction period of about 10 years to put the whole line into operation was not unreasonable. Many physical problems which were encountered, could not have been identified in advance. Work on several tunnels was substantially delayed because of very high water pressure and by flooding with huge quantities of water. Contractors had to solve these problems with changes in technology and organization of excavation and concreting. Such was the case in the Goles tunnel with 12,500 lit./min. water and in the Tribeslca tunnel with 8,000 lit./min. flooding. Other technical problems were unexpectedly high ground pressures in the tunnels of "Petrovac," "Sopotmica" and "Mili." In the difficult section Tito Uzice-Gostun where about 90 tunnels are located, 10 of the tunnels were only completed in 1973, 10 in 1974 and the "Sopotmica" tunnel (1,942 m) and the "Mili" tunnel (2,258) were completed only in 1975. Construction time for each of 6 long tunnels (over 2,000 m) was five years. It was the time required for these massive civil engineering works which contributed mainly to the late completion of the project. Other causes of delay were the replacement of a contractor on the "Ostroera II" section because of unsatisfactory progress, and replacement of another contractor on the Lastra-Razana section for similar reasons following a walkout of personnel demanding better pay. In general, however, the performance of contractors was very satisfactory. Management and supervision by the Borrower were of a high standard.

3.9 The construction of this large project had major effects upon the area planning in the communes crossed by the line. However, because of local interests the issue of construction permits was often delayed for considerable periods. Legal problems regarding property rights were often dealt with by the respective departments in the communes in ways which were less than equitable for the railways. For these reasons, the Borrower had on many occasions to request the assistance of the Republican authorities in solving the problems. A typical example of such behaviour was when the line was being taken through Titovo Uzice, where the Commune assembly and town planner demanded investments far in excess of those originally planned. Generally, whenever the line was to be taken through any urban area, the Directorate had to exert additional efforts in order to solve local problems. All of these problems required time and extra funds. Most of the extra funds were provided by the Republics. In any future project in Yugoslavia requiring construction over a wide area, formal assurances should be obtained from the Republican or Provincial Governments concerned that anticipatory action will be taken to avoid planning or other related difficulties with local authorities which might otherwise delay the execution of the project.

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<sup>1/</sup> Contracts were let by ICB to prequalified contractors but there was little international interest (see Table 3).

3.10 It was agreed with the Borrower that contracts in excess of US\$100,000 equivalent (for buildings in excess of US\$300,000) to be financed out of the loan should be awarded on the basis of ICB while contracts for the supply of ballast and sleepers might be awarded on the basis of domestic competitive bidding, according to the Bank's "Guidelines." Bidders for contracts for earthworks, bridges, tunnels, etc., were prequalified. A period of at least 45 days was allowed for this prequalification, and a period of at least 60 days was allowed for submission of bids.

3.11 All construction requirements were dealt with by ICB. The Borrower is of the opinion, however, that the procedures from the advertisement for prequalification to the signing of the contract and the contractor's possession of site were too lengthy and that possible shortening should have been considered. In this project these procedures normally took six months. The borrower suggests that it would have been better to have had a prequalification procedure carried out for the whole project at the same time, and for this to have been followed by individual contract biddings with the approval of the Bank needed solely for the results of the bidding and for the contract. This however would have been quite impractical for contracts which were to be awarded over the course of several years. Procedures for prequalification of bidders, and for time allowed for submission of bids for complex works in remote areas seemed lengthy to the Borrower but were quite necessary for a project of this magnitude. Even with proper procedures for prequalification two contractors had to be replaced. Particularly in the context of the ten year period which was necessary for construction, procurement procedures do not appear to have been too cumbersome (Table 3).

3.12 Progress reports containing information concerning physical progress, revised cost estimates, financing, major problems, etc., were generally good.

3.13 An analysis of over 100 contracts awarded in 1971, 1973, 1974 and 1975, with total value of about US\$140 million, has revealed that for the civil works, all bidders were domestic. International bids were only submitted for equipment for electrification, signaling, rails and track fastening (see Table 3); here also in most cases the Yugoslav bidders were successful.

3.14 The cost of the project was originally estimated at Dn. 2,818.5 million (US\$225.5 million). Actual cost was Dn. 6,750.6 million (US\$421.9 million).

Actual Cost	Appraisal estimate	Overrun	Overrun %
-----	US\$ million-----	-----	-----
421.9	225.5	196.4	87

Details of local and foreign costs by major components are compared to the appraisal estimate at Table 4. At Table 1 costs in dinars are shown by major component and years to show a total cost overrun of 140%.

Actual Cost	Appraisal estimate	Overrun	Overrun %
-----Dn million-----			
6,750.6	2,818.5	3,932.1	140

The difference between the two percentages for the overrun is due to changes in the dollar/dinar exchange rate which was US\$1=Dn 12.50 at the time of appraisal and US\$1=Dn 18.30 in 1978. Table 1, however, shows that over 60% of the total project expenditure was incurred after 1972, the year for which project completion was forecast at appraisal, and since the period of the project was one of rapidly rising costs in Yugoslavia, much of the cost overrun is due to inflation. At Table 5 an attempt is made to illustrate this by reducing expenditure figures to 1966 levels by means of the Yugoslav Industrial Producers' Price Index and comparing these figures to the appraisal estimate reduced by the amount of financial contingencies. Totals from this table are summarized below:

Total cost	Cost reduced to 1966 constant prices	Appraisal estimate	Overrun	Overrun %
-----Dn millions-----				
6,751	3,904	2,573	1,331	52

Insofar as the Industrial Producers' Price Index gives a fair guide to the increase in cost of investments over the project period, it can be said that there was a cost overrun of about 52% (Dn 1,465 million or 52% of Dn 2,818 million) due to physical contingencies--works whose complexity and cost were not foreseen or were under-estimated (e.g. tunnels), additional works necessary within the project but which were not in the original estimate (e.g. industrial sidings) and Phase II items (e.g. works necessary at a later stage such as extra passing tracks and passenger stations). A breakdown of the cost overrun given by the Yugoslavs, which appears to understate the inflationary element, apportions the physical cost overrun as follows:

	%
Cost overruns on existing works	42
Additional works within the project	31
Phase II works (passenger stations, etc.)	<u>27</u>
	<u>100</u>

The balance of the cost overrun, about Dn 2,470 million or 63% of the total overrun on this very approximate basis, may be said to be due to inflation. This resulted in part from the inadequacy of the 3% per annum financial contingencies included in the appraisal estimate but was principally due to the much greater length of the construction period than had been foreseen.

3.15 By far the biggest part of the cost overrun (about Dn 2.5 million or 62% of the total) was incurred on the civil works for the reasons already given. It is clear that an allowance of 10% for physical contingencies for a project of this complexity through such difficult country was far too hopeful. An allowance of 25% made up of 15% for extra works (landslide protection, water emergencies, additional access roads to work sites, etc.) and 10% for unforeseen items (passing stations, industrial sidings, etc.) would have been more appropriate. It seems likely that a bigger input from operations and marketing personnel, as opposed to engineering personnel, at the design stage of the project would have resulted in the inclusion in the original project of many of their unforeseen items.

3.16 Assistance from Yugoslav consultants with the technical problems relating to the difficult geological situations in tunnels and to the design and supervision of the unique Mala Ryeka bridge was of great value and contributed substantially to the putting into operation of a safe railway system. It is the Borrower's opinion that this can also be said of the assistance given by Bank staff who were accompanied on occasions by a technical consultant during their supervision missions. Among other things, during appraisal and supervision missions the layout of stations and signaling were discussed and modified, solutions were found to electrification problems and many meetings were held with the construction directorate which contributed to the successful completion of the project. Again to quote the Borrower, all those who participated in the project, the staff of the Investor, design staff and consultants, supervising staff of Borrower and of the Bank, contractors and suppliers of miscellaneous materials and equipment, all gained considerable and valuable experience through the project for the Belgrade-Bar railway line. In the construction field in Yugoslavia successful experience with the Belgrade-Bar railway project serves as a very high reference.

#### IV. OPERATING PERFORMANCE

4.1 The improvement in the operation of Yugoslav Railways has been an ongoing process during five Bank-financed railway projects, the third of which was for the construction of the line from Belgrade to Bar. The operational performance of the railways is generally satisfactory (see Tables 6 and 7), and statistics show that many aspects of operational efficiency are comparable with other European railways.

4.2 Table 6 shows that during construction of the Belgrade-Bar line (a) steam locomotives were replaced by diesel locomotives; (b) considerable improvement in the availability of rolling stock was achieved; (c) many un-economic lines were closed; (d) the number of staff was reduced; and (e)

the number of traffic units per employee was substantially improved, from 211 to 275.9.

4.3 The forecast for Yugoslav Railways at appraisal showed a picture of steadily increasing traffic, freight traffic was to increase at an average rate of 4.4% per year and passenger traffic at a rate of 2.9% per year. In fact, neither of these forecasts was achieved, although growth in freight traffic was encouraging and for several years was above the forecast. From 1968 to 1974 total exports from Yugoslavia trebled while the gross domestic product rose by 50%. Railway freight traffic increased by 40% in volume during this period or on average by nearly 6% per year (see Table 8). Most of the increase was in bulk commodities including ores, metal products and petroleum and derivatives. In 1975 and 1976, however, chiefly as a result of the economic difficulties which beset Yugoslavia and most of Europe after the oil crisis of 1973/74, freight traffic declined and it was not until 1977, with the economy moving forward more strongly, and with a national transport policy outlined in social agreements covering transport policy and the role of the railways, <sup>1/</sup> that freight traffic again resumed this upward trend with an increase in the year of 5.7%. Over the ten-year period 1967-77 freight traffic has increased in volume at an average rate of 3.1% per year. Coal, ores and concentrates, metals and products provided the largest traffic volumes throughout the period but coal, although still the largest single traffic, declined by an average of 2% per annum throughout the period while ores and concentrates and metals and products showed healthy annual growth rates of 4.5% and 6.8%. The largest commodity growth rate during the period was shown by petroleum and derivatives raising it from sixth to fourth place in traffic volumes.

4.4 Although passenger traffic had grown at an annual average rate of 5.6% over the decade up to 1966 it had already levelled out and was showing signs of decline in 1966 and 1967, and the growth forecast at appraisal of 2.9% per year (based on the experience of the previous decade but with insufficient allowance for the large increase in travel by bus and private car which was to come) was far too optimistic. In fact, passenger traffic reduced by an average of about 1% per year between 1967 and 1976 and it was only in 1977, principally as a result of the traffic on the Belgrade-Bar line that passenger traffic showed a welcome increase of 5.2%. In total, traffic increased over the ten years 1967-77 at an average annual rate of 1.9% in comparison to the 3.8% growth rate which had been forecast.

4.5 The Belgrade-Bar line carries 28-33 trains per day in Montenegro and 38-45 trains per day in Serbia. Due to growing passenger traffic both for business and tourism, additional passenger trains have been scheduled for the line. The total number of passenger trains per day is now 14 in Montenegro and 16 in Serbia. The average passenger train speed over the

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<sup>1/</sup> Social Compact on the Transportation Policy of Yugoslavia and Social Agreement on Economic and other Measures to Provide Normal Economic Conditions for the Railways (June 1977).

470 kilometers is about 55 km/h, which is reasonable given the mountainous nature of the terrain with many curves and steep gradients. Completion of signaling and other works, which will permit the removal of speed restrictions, will improve the average speed to about 60 km/h. The capacity of the line appears adequate for the foreseeable future. Between Belgrade and Bar there are 47 stations 1/ with another two planned at Gradac and Samari for the near future. The average distance between two passing tracks for the entire line will then be approximately 9.5 km. All passenger stations but one between Belgrade and Bar have at least three electrified tracks. An analysis of the 1978 timetable between Pozega and Priboj indicates that the eight passing tracks between those two places are used for a total of about 60 timetabled crossings per day. In many stations, the third passing track is rarely timetabled for normal passing operations, but is provided for use when traffic peaks or disturbances occur, and during track maintenance. Optional timetable openings between two stations from two to four hours per day for mechanical track maintenance can be obtained by temporary changes in the timetable, such as rescheduling or cancellation of certain trains. As the line capacity appears adequate, any proposals for increasing it should be studied closely.

4.6 Efficiency will be improved after some time, because the first years' extra inspection and guarding of the line and critical points by Permanent Way staff will be eliminated. Mechanical track maintenance equipment has already given considerable savings in track maintenance costs by reducing the number of track maintenance staff per km from 4 to 0.5 on the new line. Passenger train and freight wagon handling will be more efficient after completion of additional tracks and facilities in Titograd and Bar.

## V. FINANCIAL PERFORMANCE

5.01 Financial objectives agreed by the railways under side letter to the Loan Agreement were to achieve operating ratios of 90% by 1970 and of 83% or better by 1972 and to obtain rates of return on net fixed assets of 3.5% by 1970 and of 6% by 1972 and thereafter. The railways were also at all times to maintain an adequate cash position. To achieve the financial objectives the labor force was to be reduced, uneconomic lines were to be closed, operating efficiency was to be improved, and prompt adjustments were to be made to rates and fares as costs necessitated. Between 1966 and 1975 staff was reduced from 140,951 to 119,960, slightly bettering the commitment given at appraisal. From 1968 to 1978, 2,450 kms of lines were closed (21% of the network route length at the time of appraisal). Operational efficiency as measured by rolling stock availability and utilization fluctuated but has improved over the whole period to the present time (see Table 6).

5.02 At Table 9 the operating results of the railways for the years 1968 to 1977 are compared to forecasts made at appraisal for the years up to

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1/ Including technical stations, used for passing only.

1975, while at Table 10 and 11 Cash Flow Schedules and Balance Sheets are similarly compared. Comparison between the two sets of figures is difficult since the appraisal forecasts are at constant 1967/68 prices, while during the period between 1968 and 1977 the Producers' Price Index for Industrial Goods (PPI) rose on average by 13% per year. To give an easier comparison, analyzed below are the actual revenue and expenditure for the years 1968 (year of appraisal) and 1977 together with the appraisal forecast for 1975 (the last year for which a forecast was given at the time of appraisal). The figures for each year are expressed as costs per traffic unit and to eliminate the effects of inflation from the comparison, the 1977 costs per unit are shown in column (5) reduced to 1967/68 currency levels by means of the PPI.

Revenue and Expenditures

	<u>1968</u>		<u>1977</u>			<u>1975</u>		
	<u>Actual</u>		<u>Actual</u>			<u>Forecast</u>		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dn (mil- lion)	Dn <sup>1/</sup> per TU	Dn (mil- lion)	Dn per TU <sup>1/</sup> Current price	Constant price	Vari- ation (5)/(2) %	Dn (mil- lion)	Dn <sup>1/</sup> per TU
<u>Revenue</u>								
Passenger	961	.093	3,012	.288	.096	+3	1,185	.088
Freight	2,707	.165	11,601	.522	.174	+5	4,070	.176
Other	888	.033	4,270	.131	.043	+30	670	.018
Sub-total	4,556	.171	18,883	.578	.192	+12	5,925	.162
Subsidies and CO1 payments <sup>2/</sup>	-	-	5,229	.161	.054	-	-	-
Total	4,556	.171	24,142	.739	.246	+44	5,925	.162
<u>Expenditure</u>								
Wages	1,790	.067	8,388	.257	.086	+28	1,571	.043
Fuel & elec.	437	.016	1,229	.037	.012	-25	427	.012
Other materials	340	.013	1,556	.048	.016	+23	141	.004
Other expenses	1,462	.055	6,712	.205	.068	+24	1,506	.041
Total working expense	4,029	.151	17,885	.547	.182	+20	3,645	.100
Depreciation	618	.023	4,578	.140	.047	+104	1,036	.028
Total operating expense	4,647	.174	22,463	.687	.229	+32	4,681	.128
Operating ratio: before subsidy	102		119				79	
after subsidy			93					
Rate of return: before subsidy	neg.		neg.				6.7	
after subsidy			2.5					

<sup>1/</sup> Passenger revenue is expressed as revenue per Passenger-Km. Freight revenue is expressed as revenue per Net Ton/Km. All other revenue and expenditure figures are per traffic unit (passenger/Kms + Net Ton/Kms).

<sup>2/</sup> See para. 5.03

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Revenue and Expenditures

	<u>1968</u>		<u>1977</u>			<u>1975</u>		
	<u>Actual</u>		<u>Actual</u>			<u>Forecast</u>		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dn (mil- lion)	Dn <sup>1/</sup> per TU	Dn (mil- lion)	Dn per TU <sup>1/</sup> Current price	Constant price	Vari- ation (5)/(2) %	Dn (mil- lion)	Dn <sup>1/</sup> per TU
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Operating ratio: before subsidy	102		119				79	
after subsidy			93					
Rate of return: before subsidy	neg.		neg.				6.7	
after subsidy			2.5					

<sup>1/</sup> Passenger revenue is expressed as revenue per Passenger-Km. Freight revenue is expressed as revenue per Net Ton/Km. All other revenue and expenditure figures are per traffic unit (passenger/Kms + Net Ton/Kms).

<sup>2/</sup> See para. 5.03

5.03 From the revenue comparison above (column (6) ) it can be seen that in real terms, tariff revenues per unit for freight and passenger traffic varied little over the period 1968-77. Nevertheless, total revenue per traffic unit increased by 44% in real terms over the period as compared to an increase of 32% in unit operating costs. The greater increase in revenue as compared to costs, however, was achieved only as a result of increasing government subsidy payments from 1973 onwards and from their replacement later by compensation payments from Communities of Interest (COIs). In 1977 such payments amounted to Dn 5,259 millions or 22% of total revenues.

5.04 Not only did operating unit costs fail to reduce to the levels indicated by the 1975 forecast, they increased, at constant prices, by 32% over those of 1968. The increase arose mainly from increases in wages and depreciation charges. During the period 1968-77 there was real increase in wages in Yugoslavia (measured by movements in the wages and consumer price indices) of 28%. Railway workers shared fully in this rise in the standard of living, in fact the increase in average earnings (in real terms) for railway workers during the same period was 32%. This increased both the wages figure in the table above and the total of other expenses, of which wages is a large constituent through the cost of maintenance. The increase in depreciation charges results from the acquisition of more expensive and sophisticated assets, as instanced by the switch from steam as the main tractive power at the time of appraisal to diesel and to electricity at the present time. It reflects also, however, periodic revaluations of fixed assets and a more realistic depreciation policy under which estimated service lives of assets were reduced to satisfactory levels. The reduction in unit cost of fuel shown in the table resulted also from the transfer from steam locomotives to more fuel efficient diesel and electric traction.

5.05 Neither the operating ratio nor the rate of return target has been achieved in any year since appraisal. This was partially due to lower traffic figures (total traffic after 1971, fell increasingly below the forecast although freight traffic exceeded the forecast in 1972 and again in 1974) but mainly because as described above, freight rates and passenger fares failed to keep up with rising costs. This was particularly so in the difficult economic conditions in Yugoslavia and Europe which followed the oil crisis of 1973-74. In 1974 the railways' operating costs per traffic unit rose by nearly 30% and a deficit of Dn 1.0 billion (US\$61 million) resulted. An attempt was made to remedy this situation by tariff increases of 21.8% in June 1974 and of 22% in January 1975 but declining traffic and further inflation caused a 32% increase in operating cost per traffic unit in 1975 and a deficit of Dn 2.0 billion (US\$118 million). A policy of strict controls over prices introduced by the Federal Government with the intention of controlling inflation, at this time brought a halt to the railways' efforts to seek viability through tariffs and further tariff increases have been limited, although these are now intended to cover current inflation and to make some inroads into past inflation.

5.06 Under an agreed national transport policy, Communities of Interest (COIs) have now been formed for each railway enterprise (RTE) and consist of the RTE and the economic organizations which are its users. The COIs form the prime link between the railways and the economy and have responsibilities

for the development and implementation of railway policies covering traffic, financing and investment plans. COI traffic related payments which are fixed in advance, paid currently to the railways, and which have a strong incentive element have now replaced Government subsidies and provide railways with the working capital which they require.

5.07 The financial covenants related to Yugoslav Railways as a whole and provided targets to be aimed at with the objective of improving the railways' financial position through increased operational efficiency and through increases in tariffs. The targets were calculated to enable the generation of internal funds to service debt and to make a proper contribution towards capital investment. The targets appeared appropriate in the circumstances which prevailed but did not anticipate the reductions in traffic, the increases in costs and the Government's reluctance to raise tariffs which were to result from the difficult economic conditions of 1974 and after. However, even before this time the targets were not being achieved though staff members had been reduced, lines closed and traffic had increased. This was principally because of increases in wages and the fact that, despite constant Bank pressure, tariffs were not raised sufficiently to compensate for the consequent cost increases. One lesson to be learned is that the achievement of planned improvements in operational efficiency may not of itself result in lower operating costs. Adequate allowance must be made for the likelihood of cost increases from other causes such as, in this case, real increases in staff wages which may offset the cost reducing effect of much of all of the increased operating efficiencies if not countered by adequate tariff adjustments. A further lesson (which is well known but is reinforced by events here) is that the reluctance of government to raise tariffs, when faced with difficult economic or political circumstances, despite covenants which obligate them to do so, should not be underestimated.

5.08 By a Federal law of 1966, 85% of the estimated cost of the project (without motive power, rolling stock, or the extension of the Port of Bar) was to be provided by the Federal Government, 8% by the Republic of Serbia and 7% by the Republic of Montenegro, the latter two for investments in their own territories. These funds were made available in the form of grants to RTE Belgrade and RTE Titograd who were the two investors. The Bank loan to the Yugoslav Investment Bank, which was to provide 23% of the funds required, covered part of the Federal Government's contribution. Legislation passed in 1966 assured the raising of the Federal share from taxes for a period of five years up to the end of 1970.

5.09 In 1971, at the end of this five-year period, because of constitutional reforms and inflation, the Republic of Serbia took over responsibility for the provision of the balance of the Federal Government's share of construction costs in Serbia. At the same time both Republics became responsible for funds required for cost overruns but the Federal Government agreed to provide loans to Montenegro to cover these costs. In April 1972 a law was passed by the Serbian Government and in May 1972 a Federal law was passed which assured estimated finance required up to the end of 1974 for, respectively, the Serbian and Montenegrin sections of the line. In 1974 revised cost estimates for the completion of the line were prepared and the Serbian Government again undertook

to provide the additional funds required for its part of the line. For the Montenegrin section funds required were assured by loans from the National Bank of Yugoslavia and from inter-republican sources.

5.10 The total funds needed for the construction were supplied as shown below:

Source of funds	Line section		
	Serbia	Montenegro	Total
	-----Dn millions-----		
Federal Government	1,093	888	1,981
Republican Governments	<u>2,854</u>	<u>1,915</u>	<u>4,769</u>
	<u>3,947</u>	<u>2,803</u>	<u>6,750</u>

Finance was not a constraint in the construction of the line. For the less-developed Republic of Montenegro, loan funds were made available by both the Federal Government and by other Republics on very low terms. On those occasions when legislation to provide needed funds took some time, then interim funds were made available by local banks. All funds were made available to the RTEs as grants. The construction of the line was, throughout the construction period, regarded as a project of high priority and funds were made available accordingly.

5.11 Disbursements which were made as a percentage of total expenditures, commenced in the first quarter of FY 1969. The disbursement percentage which was originally 23% was reduced to 11% in June 1973 and remained at that rate until final disbursement was made in the second quarter of FY 1976. Table 12 compares appraisal estimate to the actual schedule of disbursements.

## VI. INSTITUTIONAL DEVELOPMENT

6.1 The appraisal report did not concern itself with the need for institutional improvements as did those for the Second and Fourth Railway Projects which paralleled it. It noted that "the railways staff is competent, the management is capable and the handling of traffic, operations and technical matters is efficient." It did, however, refer to the need for better coordination of investments in transport. Nevertheless, during the period of the project substantial progress was made in the institutional development of the railways with the establishment of:

- (a) a Federal Committee for Transport and Communications;
- (b) secretariats or committees for transport in most Republics and Provinces;
- (c) strengthening of the role of CYR;

- (d) detailed action plans in all RTEs and CYR;
- (e) a consultants' study in 1971 with an in-depth look at all operating and financial matters concerning Yugoslav Railways; and
- (f) Communities of Interest for RTEs.

The result of these institutional developments during the period of construction of the Belgrade-Bar line although not directly related to this project, has been very encouraging. Today, the standards of Yugoslav Railways compare to those of any modern railway. Financial policy under the Social Agreement for Economic Measures, and in cooperation with the Communities of Interest, is sound; many uneconomic lines have been closed; a good costing system is being developed and operational performance is very satisfactory.

6.2 Considerable institutional benefit arose through the work of the Directorate for the Construction of the Belgrade-Bar line. This Directorate, as its name suggests, was responsible for all aspects of construction of the line. It produced project management of a very high calibre dealing successfully with designers, consultants, supervising staff, contractors and suppliers of equipment as well as with Government authorities responsible for financing the work. The directorate's task is now completed and it no longer functions as a separate unit, most of its staff having returned to the service of RTEs Belgrade and Titograd. The very considerable experience which they gained in planning and executing a large scale engineering project goes with them and enhances the capabilities of those organizations.

## VII. ECONOMIC REEVALUATION

### General Approach

7.1 The Third Railway Project Appraisal Report of March 1968, forecast that, in the first full year of operation of the Belgrade-Bar Railway, then expected to be 1973, freight traffic would amount to 2,329 million net ton-kms and passenger traffic to 900 million passenger-kms. In 1977, the actual full first year of service, freight traffic totalled only 1,018 million net ton-kms and passenger traffic 756 million passenger-kms. The actual costs of the project were Dn 6,751 million 1/ (US\$422 million equivalent), compared with Dn 2,818 million (US\$225 million equivalent) 2/ estimated in the Appraisal Report. The economic return was originally estimated at 8.5 percent.

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1/ Includes additional works, some still in progress, amounting to Dn 521 million not specified in the original project but largely essential to the realization of forecast benefits.

2/ The US\$ comparisons reflect frequent changes in exchange rates over the 1973-77 period.

7.2 The original economic evaluation must be qualified in two important respects. Firstly, it made no allowance for a transitional period during which potential rail traffic would transfer gradually from other modes. Current experience on the line demonstrates this to be necessary and such an allowance is therefore made in this reevaluation. Secondly, the appraisal did not attempt to quantify the additional economic activity to be generated in the area served by the line. Since part of this activity was certainly due to the building of the line, the quantification of generated regional output is attempted in this reevaluation. The economic reevaluation, therefore, falls into two parts: an assessment of the potential cost saving to "normal" traffic, both by diversion from road transport and alternative rail routes, and an evaluation of estimated net increases in the Gross Domestic Product (GDP) of Montenegro and Western Serbia generated by the construction of the Belgrade-Bar Railway.

### Freight Traffic

7.3 Compared at Table 13, are freight traffic figures forecast at appraisal for 1973 <sup>1/</sup> (forecast as first full year of operation) and actual figures for 1977, the first full year of operation. The table shows actual freight traffic volume of 1,018 million NTKms compared to the forecast of 2,329 million NTKms. Rail traffic in cereals, other agricultural products, timber and wood products is much less than forecast. This appears to be because collection and distribution requirements in many cases make these products more suitable for road transport. Low growth performances have therefore been predicted for these items. In the case of the heavier categories of freight, enquiries showed that the completion of additional loading facilities and yard capacity, including yard capacity in the Port of Bar, should result in a considerable transfer to the line from the Belgrade-Ploce line and from other modes. This has been allowed for in the forecast with the main transfer taking place over the period of the present development plan up to 1980. Methodological Note 1 in Annex 2 shows individual growth rates. The resultant total freight volumes forecast are shown at Table 14. An overall growth rate of 10% p.a. is forecast until 1980, plus the transfer by the year of the present phosphate rock traffic (452 million NTKms) from the much longer Ploce route as adequate yard capacity becomes available. Growth rate of 4% p.a. is forecast after 1980.

7.4 To evaluate benefits freight traffic has been divided between the two main categories of "generated by the line construction" and "other". Diversion of traffic is from road, from narrow gauge lines now replaced and from the rail and river/rail links to Ploce. Alternative forecasts have been made for the proportion of traffic diverted from road falling into the "generated" and "other" categories. Hypothesis 1 assumes that generated traffic is 45% of the diverted road traffic (as assumed at appraisal) while Hypothesis 2, because of the upsurge in economic activity in the area,

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<sup>1/</sup> Approximated from tons in the appraisal forecast.

assumes generated traffic to be 66.7% of diverted road traffic. (Annex 2 Methodological Note 2 gives the principles for allocation to categories.) The resultant estimates are shown at Table 15.

### Passenger Traffic

7.5 Demand for passenger transport on the highly scenic Belgrade-Bar line has been high and particularly during the holiday season trains have had capacity loadings. Supply constraints in availability of coaching stock prevented the achievement of the appraisal estimate for the first full year of service, passenger volume was 756 million PKms compared to the appraisal forecast of 900 million PKms, but with the increasing popularity of the Montenegro coast as a holiday resort, the railway forecast increased passenger traffic averaging 9.1% p.a. for the next two years with sharp reductions in growth rates thereafter falling to 1% p.a. after 1984. The resulting forecast are shown at Table 16.

### Benefits of Transport Cost Savings

7.6 Operating costs on the Belgrade-Bar line for freight and passenger traffic for 1977 were calculated at Dn 0.542 per NTKm and Dn 0.389 per PKm. Calculated savings as compared to transport by the old narrow gauge railway lines are due to differences in unit costs which are estimated to have been about 2.5 times higher on the narrow gauge lines due to low traffic volumes and operating efficiencies (Annex 2 Methodological Note 3). Savings for diversions from Belgrade-Ploce rail route arise from considerably reduced transit mileage offset by slightly lower costs per TKm on the Ploce route because of flatter terrain. Half of the full potential benefits are taken for generated traffic for which the Danube-Ploce route is considered the best alternative. For calculation of savings as compared to road transport, average road traffic costs of Dn 0.889 per ton/km and Dn 0.506 per passenger/km have been used (Annex 2 Methodological Note 4). The former is based on a vehicle fleet of which 2/3 is assumed to be 22 ton truck/trailers with 75% loading with the balance of goods carried by 9.5 ton trucks with similar loading. Passenger costs assume a standard 45 seater bus with 75% seat occupancy. No benefit has been taken for generated freight traffic since this is included under benefits of increased regional GDP. Half benefits are included for generated passenger traffic. A very conservative estimate of benefits for traffic prior to 1976 on the northern section of the line has been included. Estimated benefits from transport cost savings are shown at Table 17.

### Induced Economic Activity

7.7 Until the railway was built much of Montenegro and Western Serbia was relatively isolated. However, the rate of growth in the manufacturing, mining and quarrying sector of Montenegro, which had remained at about 3% per annum until 1973, rose after that time to an average annual rate of 0.5%, well above the national average. A similar pattern of development has taken place in the Serbian communes through which the Belgrade-Bar line passes. Increased pace of development is due primarily to a number of large enterprises which

established operations in the area or expanded existing operations in anticipation of the availability of rail transport facilities. Enquiries have established that this location or expansion of facilities would not have taken place without the prospect of reliable rail transport. Agricultural output in Montenegro also rose sharply during this period, from 0.2% to 5.2% per annum, outstripping the growth rate for Yugoslavia as a whole. While rail communication is not likely to have been a direct factor in causing this growth in the agricultural sector, it may be assumed to have contributed indirectly in that the increased industrial development and prosperity of the area contributed to a larger local demand for agricultural produce. The quantitative evaluation of the induced economic benefits of the construction of the railway line has been conservatively limited to the manufacturing, mining and quarrying and to the agricultural sectors.

#### Measurement of Benefits of Induced Economic Activity

7.8 For measurement of benefits, the "with" case assumes that the manufacturing, mining and quarrying sector will maintain its present 8.1% average annual growth rate through 1980 and then continue upto 1985 at the 7% rate forecast for the economy as a whole. The "without" case assumes that sector output increases for this period (1974-85) would remain at the pre-1973 actual of 3% annual growth. For agriculture it is estimated in the "with" case that the 5.2% annual growth rates continues to 1985; the "without" case estimates output increasing at 4.7% p.a. until 1985. Forecasts of contributions of the two sectors to GDP over the period, for the "with" and "without" cases are shown at Table 18.

7.9 For the apportionment of the benefits in the manufacturing, mining and quarrying sector, between the railway and other causes, the rather arbitrary basis of capital investment has been taken. On this basis about 20% of the benefits of the additional activity in the manufacturing, mining and quarrying sector may be attributed to the railway construction. For the agricultural sector, since investment in the sector has been negligible the whole of the benefits could be attributed to the railway construction; however, only 20% is attributed in this case also. Estimated benefits are arrived at by applying growth patterns as described above to current levels to output in Montenegro and Western Serbia. The 'benefits' are frozen at the 1985 level, conservatively assuming full capacity utilization of the railways by 1985; the 1985 annual benefits were continued for project life of 25 years (upto 2003). This implies zero growth rate in both "with" and "without" situation.

#### Cost-benefit Streams

7.10 Tables 19 and 20 present the costs and benefit streams, expressed in 1977 prices. A project life of 25 years is assumed. Since about 35% of total investment cost is in tunnels, and since the life of many other components exceeds 25 years, a salvage value of the initial investment has been assumed in the 26th year (2003).

### Economic Return Estimate

7.11 As shown in Table 20, the economic return from the project is 9.2%, assuming the more unfavorable hypothesis (hypothesis 2) concerning the ratio of diverted road traffic to generated traffic. The return would be about 10% if the more favorable hypothesis 1 is assumed. A sensitivity analysis shows that if the induced development benefits were only half of what is estimated, the project (hypothesis 2) would yield a return of 6.4%.

### Conclusion

7.12 With the removal of bottlenecks in yard capacity, the completion of necessary industrial sidings and additional facilities in the Port of Bar, the railway line will play a rapidly increasing role in the economies of Montenegro and Serbia. The prediction of the appraisal report that further intangible benefits would arise through the increased safety and reliability of an all weather transport route through the country from Belgrade to Bar need not be doubted. While the economic justification for the line rest largely on the economic activity generated by the prospect of availability of rail service, and the estimates of all quantified benefits can be regarded only as approximations, the investment in the construction of the Belgrade-Bar Railway line on the basis of this reevaluation is judged to be economically viable and optimal.

## VIII. BANK PERFORMANCE

8.1 The Bank became involved in this project at a stage when a large part of the detailed engineering, cost estimates, timetable of works and traffic forecasts had already been completed by the Borrower. Some aspects of construction--such as tunnels--were already underway, and specifications for other contracts were ready for tendering. During the appraisal missions the Bank was instrumental in bringing the whole scope of the project up to Bank standards by reviewing (a) the cost estimates, (b) the financing plan, (c) estimates of foreign currency, etc. At this stage, the Bank was also responsible for an in-depth look at the economics of the project with special emphasis on an agricultural survey to assess the share of agricultural products as part of the traffic forecast.

8.2 What was considered by the Yugoslavs to be the time consuming nature of Bank procurement procedures including prequalification of contractors has drawn criticism from them (para. 3.11). These procedures were necessary in a project which was really exceptional in its complexity and magnitude. The necessity for prequalification and subsequent ICB would naturally have seemed irksome to the Directorate for Construction who were working under pressure and who had been operating under simpler local procedures. Even with pre-qualification, however, two contractors failed to meet necessary standards and mass prequalification for the whole project as has in retrospect been

suggested, was not a practical proposal. Procurement procedures appear to have worked reasonably well, and there does not appear to be any cause for change from experience in this project.

8.3 The Bank should, however, have ensured a more realistic project timetable since a five-year schedule for completion of such a large and complex project in most difficult terrain was too optimistic. A 10% physical contingency allowance for a normal civil engineering construction is generally adequate. It was quite clear that difficulties to be encountered here were likely to be well beyond those of a normal construction. A 25% allowance for physical contingencies would not have been unreasonable and this could have been incorporated also into the timetable. With a prestige project such as this, pressures will always exist to project an optimistic time schedule but the Bank should be prepared to insist on realism in this respect. At the time of appraisal, the layout and design of station tracks with loading and unloading tracks and industrial sidings to attract the forecast traffic had not been completed. The reason for this is not known--perhaps the marketing specialists' input to the design of the line was insufficient, or perhaps the location of the sidings had not at that stage been decided but this was another reason for increasing the time factor.

8.4 During supervision missions the Bank established effective and good relations with the Borrower and helped in solving both financial and technical problems. Cooperation was good between the Government, the Borrower, the Bank, the Yugoslav consulting institutes and technical specialists from universities.

## IX. CONCLUSIONS

### Main Conclusions

9.1 The Belgrade-Bar railway line is a remarkable engineering achievement of which Yugoslav engineers and contractors can be justly proud.

9.2 That from the commencement of the project in 1968 to the opening of the line to service took eight years, instead of the 4 to 5 years forecast, must be attributed to the immense difficulties which resulted from the geological structures which were met in the construction of the line. Although the assistance of well-qualified consultants for all the major engineering works was assured by side letter to the Loan Agreement, it is clear that in the early stages the difficulties of tunnel construction in particular were not fully appreciated. This resulted in a large underestimate of the cost of the project and also of the time required for its completion. Whether the extent of the difficulties encountered would have been foreseen by additional consultancy assistance at an earlier stage is doubtful but it is quite apparent that a greater allowance should have been made for physical contingencies in the appraisal forecast for a project of this size and complexity. The cost overrun was due to (a) an insufficient appreciation of the engineering difficulties which would be encountered in the construction of the line which

resulted in a longer construction period and in additional costs, (b) a rate of cost inflation which could not be predicted at the time of appraisal, the effect of which was multiplied by the longer construction period, (c) failure to allow in the original plans and design for all the industrial sidings, station tracks and facilities which would be necessary to haul the traffic which was forecast. Nevertheless, the cost (at 1977 prices) of approximately US\$1.7 million per kilometer for the construction of 372 kms of new line (including electrification and other facilities) through this difficult terrain does not appear unreasonable.

9.3 The traffic on the line in the first full year of operation was little over half that which was forecast for the first full year at appraisal. However, since the original forecast did not allow for a transitional period for a transfer of potential rail traffic from other modes, and since many large enterprises which located in the area in anticipation of the completion of the railway line have relied in the interim period on road transport it may reasonably be expected that traffic growth for the next few years will exceed the growth trend forecast at appraisal. The removal of loading and unloading bottlenecks and the completion of facilities at the Port of Bar will aid this growth. Although there must be a degree of uncertainty at this early stage in predicting the ultimate benefits which will result from the construction of the line, it is clear that economic justification must be based mainly on the economic activity generated by the prospect and availability of rail service rather than on transport cost savings. The estimates which have been made of both sorts of benefits, although necessarily at this stage approximations, are nevertheless conservative. On the basis of these estimates the investment in the construction of the railway line may be judged on reevaluation to be economically viable and to show an economic rate of return about 9%.

9.4 Although the operational performance of Yugoslav Railways improved, financial performance was below the appraisal projections because of inadequate tariff increases during a period of rapid cost inflation.

9.5 Adequate government funding was forthcoming for the project and lack of fund was not a cause of delay.

#### Recommendations

9.6 Any future project requiring civil work of this magnitude through this type of terrain should include an allowance for physical contingencies of at least 15%.

9.7 A project such as this for a new railway line should have a major input into its planning from an early stage from marketing and operating experts. A contingency allowance should also be included for unforeseen terms such as additional industrial sidings and passing stations.



PROJECT COMPLETION REPORT

YUGOSLAV RAILWAY PROJECT (LOAN 531-YU)

Actual and Appraisal Estimates of Cost 1966-78  
(Current Prices)

	1966/67 <sup>/1</sup>	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	Total 1966-78
-----DN Million-----													
<b>Serbia (Resnik-Gostun):</b>													
Substructure	71.1	67.5	160.6	190.6	288.5	358.5	306.8	366.3	265.8	61.9	26.5	167.5	2,331.6
Permanent Way	2.7	27.9	24.8	29.0	18.0	48.0	54.8	14.1	103.5	56.3	24.2	120.6	523.9
Buildings	-	3.6	0.6	3.4	5.3	7.0	5.5	19.1	14.0	27.3	26.7	22.7	135.2
SS and TT	-	0.6	14.1	19.7	13.8	10.1	36.5	7.6	39.6	33.6	27.4	83.5	286.5
Electrification	-	0.5	2.6	10.2	32.2	14.0	11.5	8.3	66.3	86.0	58.9	61.1	351.6
Other Works	8.0	17.0	19.8	20.4	23.0	21.5	19.2	32.9	24.6	27.8	20.2	83.8	318.2
Subtotal	<u>81.8</u>	<u>117.1</u>	<u>222.5</u>	<u>273.3</u>	<u>380.8</u>	<u>459.1</u>	<u>434.3</u>	<u>448.3</u>	<u>513.8</u>	<u>292.9</u>	<u>183.9</u>	<u>539.2</u>	<u>3,947.0</u>
<b>Montenegro (Gostun-Bar):</b>													
Substructure	37.7	40.2	117.7	170.4	234.4	391.8	293.3	159.3	142.3	51.7	34.4	56.8	1,730.0
Permanent Way	-	-	-	-	4.3	44.5	31.4	51.3	56.0	62.2	4.1	-	253.8
Buildings	-	-	-	-	-	-	0.1	23.4	27.8	25.4	15.4	6.6	98.7
SS and TT	-	-	-	-	-	-	27.9	32.0	40.9	63.3	36.5	70.0	270.6
Electrification	-	-	-	-	-	0.6	0.2	0.4	25.7	124.3	124.5	37.7	313.4
Other Works	8.4	5.0	8.6	14.5	13.9	14.1	16.0	11.4	16.6	8.8	7.6	12.2	137.1
Subtotal	<u>46.1</u>	<u>45.2</u>	<u>126.3</u>	<u>184.9</u>	<u>252.6</u>	<u>451.0</u>	<u>368.9</u>	<u>277.8</u>	<u>309.3</u>	<u>335.7</u>	<u>222.5</u>	<u>183.3</u>	<u>2,803.6</u>
Total Serbia & Montenegro	<u>127.9</u>	<u>162.3</u>	<u>348.8</u>	<u>458.2</u>	<u>633.4</u>	<u>910.1</u>	<u>803.2</u>	<u>726.1</u>	<u>823.1</u>	<u>628.6</u>	<u>406.4</u>	<u>722.5</u>	<u>6,750.6</u>
Appraisal Estimates	181.4	272.9	457.8	514.0	552.0	840.4	-	-	-	-	-	-	2,818.5
-----US\$ Million-----													
Total Serbia & Montenegro	<u>10.2</u>	<u>13.0</u>	<u>27.9</u>	<u>36.7</u>	<u>41.8</u>	<u>53.5</u>	<u>49.6</u>	<u>45.6</u>	<u>47.3</u>	<u>34.6</u>	<u>22.2</u>	<u>39.5</u>	<u>421.9</u>
Appraisal Estimates	14.5	21.8	36.6	41.1	44.2	67.3	-	-	-	-	-	-	225.5

<sup>/1</sup> Expenditure prior to project.

Source: Yugoslav Railways

PROJECT COMPLETION REPORT

YUGOSLAV RAILWAY PROJECT (LOAN 531-YU)

Total expenditures for the Belgrade-Bar Railway Project after January 1, 1968, as estimated by the Railway Transport Enterprises, Belgrade and Titograd, forming the basis of percentage disbursement of the Bank Loan.

(Amounts in US\$ million equivalent)

	<u>Cost Estimate</u> <u>3/22/1968</u>	<u>Allocation</u> <u>of Proceeds</u> <sup>/1</sup>	<u>Disburse-</u> <u>ment %</u> <sup>/2</sup>
1. Earthworks and structures	114.0	26.2	23
2. Tracks			
a. Procurement of rails, points and crossings, and accessories	6.9	1.6	23
b. Laying of tracks, and procurement of ballast and sleepers	15.1	3.5	23
3. Buildings	5.6	1.3	23
4. Procurement and installation of signaling and telecommunication equipment	11.2	2.6	23
5. Procurement and installation of equipment for electric traction	12.6	2.9	23
6. Services of foreign consultants	0.9	0.2	23
7. Acquisition of land, engineering, supervision and others	7.7	1.8	23
8. Contingencies	<u>37.0</u>	<u>9.9</u>	27
	211.0	50.0	23.7

/1 No actual disbursements per category are recorded.

/2 Per July 11, 1975, disbursement percentage, 11%.



PROJECT COMPLETION REPORT

YUGOSLAV RAILWAY PROJECT (LOAN 531-YU)

Actual and Appraisal Estimates of Project Cost 1966-78

%	Works	-----Actual Cost-----			-----Appraisal Estimate-----			Cost Overrun %
		Local DNm.	Foreign <sup>/2</sup> US\$m.	Total <sup>/1</sup> US\$m.	Local DNm.	Foreign <sup>/4</sup> US\$m.	Total <sup>/1/3</sup> US\$m.	
33	Substructure	2721.3	86.6	262.5	1250.0	48.5	148.5	76.8
40	Permanent Way	466.6	18.8	46.9	240.6	8.9	28.1	66.9
15	Buildings	198.8	2.0	13.6	84.8	0.2	7.0	94.3
50	SS & TT	278.5	16.3	32.5	69.1	8.3	13.8	135.5
40	Electrification	399.0	15.0	37.6	98.2	7.8	15.7	139.5
10	Other Works	409.8	2.9	28.8	139.1	1.3	12.4	132.3
	<b>Total</b>	<b>4474.0</b>	<b>141.6</b>	<b>421.9</b>	<b>1881.8</b>	<b>75.0</b>	<b>225.5</b>	<b>87.1</b>

<sup>/1</sup> Conversion of local currency for the Appraisal Estimate is at US\$1 = 12.50 Dinars and for actual costs is at the dinar rates applicable to US\$1 in each year as follows:- 1966-70 = 12.5; 1971 = 15.17; 1972 = 17.00; 1973 = 16.19; 1974 = 15.91; 1975 = 17.39; 1976 = 18.19; 1977 and 78 = 18.30

<sup>/2</sup> Includes estimates of indirect foreign currency costs.

<sup>/3</sup> Appraisal cost estimate includes both physical and financial contingencies.

<sup>/4</sup> Maximum Foreign exchange component.

Source: Yugoslav Railways and Mission Estimates.

PROJECT COMPLETION REPORT

YUGOSLAV RAILWAY PROJECT (LOAN 531-YU)

Actual and Appraisal Estimates of Project Cost 1966-78 at 1966 Constant Prices

	-----Expenditure----- at Current Prices /1		-----Expenditure at 1966 Constant Prices /1-----						
	DNm.	US\$m. /2	Actual /3	Appraisal /4	Overrun	Actual /2 /3	Appraisal /4	Overrun	Overrun %
			-----DN Million-----			-----US\$ Million-----			
Substructure	4061.6	262.5	2641.7	1708.5	933.2	211.3	136.7	74.6	54.6
Permanent Way	777.7	46.9	397.9	316.2	81.7	31.8	25.3	6.5	25.8
Buildings	233.9	13.6	98.4	77.3	21.1	7.9	6.2	1.7	27.3
SS & TT	557.0	32.5	242.7	155.3	87.4	19.4	12.4	7.0	56.3
Electrification	665.0	37.6	262.8	173.8	89.0	21.0	13.9	7.1	51.2
Other Works	455.4	28.8	260.7	142.3	118.4	20.9	11.4	9.5	83.2
<b>Total</b>	<b>6750.6</b>	<b>421.9</b>	<b>3904.2</b>	<b>2573.4</b>	<b>1330.8</b>	<b>312.3</b>	<b>205.9</b>	<b>106.4</b>	<b>51.6</b>

/1 Actual expenditure includes works categorized as Phase II and other additional works not in Appraisal Estimate.

/2 Conversion of local currency for the Appraisal Estimate is at US\$1 = 12.50 Dinars and for actual costs is at the dinar rates applicable to US\$1 in each year as follows:- 1966-70 = 12.5; 1971 = 15.17; 1972 = 17.00; 1973 = 16.19; 1974 = 15.91; 1975 = 17.39; 1976 = 18.19; 1977 and 78 = 18.30.

/3 Actual expenditure reduced by the Industrial Producers price index factors applicable in each year.

/4 Appraisal Estimate without financial contingencies.

Source: Yugoslav Railways

PROJECT COMPLETION REPORT  
YUGOSLAV RAILWAY PROJECT (LOAN 531-YU)  
Selected Operating Statistics of CYR 1968-77

	Unit	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
<b>I. Length of Line - Total</b>											
Standard Gauge	km	10,688	10,456	10,289	10,417	10,399	10,319	10,319	9,995	9,967	9,967
Narrow Gauge	km	9,178	9,161	9,189	9,235	9,355	9,354	9,353	9,350	9,619	9,619
	km	1,510	1,295	1,097	1,062	1,045	966	645	348	348	348
<b>II. Traffic</b>											
Passenger - km	Million	10,284	10,470	10,939	10,566	10,578	10,578	10,429	10,284	9,942	10,459
Net m. ton-km	"	16,371	17,691	19,253	19,653	19,179	20,448	23,081	21,637	21,017	22,225
Passenger gross m. ton-km	"	13,800	14,378	14,758	14,959	15,299	15,796	15,871	16,021	16,089	16,086
Freight gross m. ton-km	"	35,359	37,706	40,463	41,647	41,210	43,246	47,544	43,853	42,051	44,741
Total gross m. ton-km	"	49,159	52,084	55,221	56,606	56,509	59,042	63,415	59,874	58,140	60,827
Total gross m. ton-km per km of line	Million m. ton	4.60	4.98	5.37	5.48	5.43	5.67	6.15	5.99	5.8	6.1
<b>Cross M. ton-km by Type of Fraction</b>											
<b>Standard Gauge</b>											
Steam	Million	22,380	22,378	19,004	15,630	12,933	9,808	5,716	4,571	3,774	3,107
Diesel	"	18,868	10,860	18,704	18,748	18,478	22,514	26,811	23,496	21,530	21,703
Electric	"	5,186	7,661	15,067	11,878	22,240	26,085	27,813	28,607	29,672	32,753
Self-Propelled	"	1,334	1,205	1,549	1,499	1,479	2,104	2,477	2,749	2,922	3,107
<b>Narrow Gauge</b>											
Steam	"	1,124	865	741	487	278	216	161	116	57	30
Diesel	"	-	-	34	256	380	368	345	259	141	87
Self-Propelled	"	55	99	121	107	102	92	92	76	44	40
<b>III. Traction Stock</b>											
<b>Standard Gauge</b>											
Steam Locomotives	No.	1,285	1,216	1,080	971	871	677	560	556	427	353
Availability	%	73.3	75.0	74.0	70.6	68.8	68.7	77.1	83.0	68.3	78.0
Diesel Locomotives	No.	320	354	461	506	576	718	738	754	760	790
Availability	%	82.2	83.0	83.8	80.0	77.8	78.4	81.4	86.4	94.1	94.8
Electric Locomotives	No.	122	162	202	236	287	301	309	321	364	389
Availability	%	73.7	65.2	83.4	83.3	77.4	75.4	83.9	86.9	97.3	93.4
Diesel Car Sets	No.	13	13	16	16	16	30	51	70	83	80
Availability	%	50.0	37.8	50.6	46.3	31.3	89.0	88.4	81.0	71.7	95.2
Electric Car Sets	No.	26	26	26	27	27	26	26	40	40	50
Availability	%	71.9	71.6	70.0	66.0	70.4	73.0	94.0	92.6	93.1	86.1
Rail Buses	No.	241	253	265	267	266	263	264	259	257	257
Availability	%	84.1	83.9	85.4	84.2	84.6	89.0	93.8	96.6	94.7	97.6
<b>Narrow Gauge</b>											
Steam Locomotives	No.	269	216	171	139	97	80	68	59	19	16
Availability	%	54.3	57.0	62.8	51.2	40.8	63.7	90.8	87.1	78.5	75.0
Diesel Locomotives	No.	-	-	12	17	38	40	40	40	39	10
Availability	%	-	-	82.5	83.2	94.6	62.5	65.0	60.0	50.0	100.0
Diesel Car Sets	No.	11	12	12	12	12	12	12	12	5	3
Availability	%	85.0	83.3	85.0	85.4	77.5	66.7	65.0	73.0	80.0	100.0
<b>IV. Rolling Stock</b>											
Passenger Cars - /1	No.	4,040	4,002	3,986	3,900	3,837	3,749	3,579	3,572	3,479	-
Standard Gauge	"	3,520	3,557	3,618	3,582	3,538	3,465	3,310	3,396	3,339	3,272
Narrow Gauge	"	520	445	368	318	299	284	269	176	140	-
Seating Capacity S.G.	Thousands	230.2	234.4	237.2	234.8	233.8	229.9	219.8	219.0	219.9	216.6
" " N.G.	"	16.7	14.7	12.3	11.0	10.8	10.3	9.9	6.6	5.6	-
Total Seating Capacity	"	246.9	249.1	249.5	245.8	244.6	240.2	229.7	225.6	225.5	216.6
Freight Cars:	No.	64,618	63,330	62,261	61,869	61,350	59,426	59,191	54,806	51,228	49,265
Standard Gauge	"	58,889	58,069	57,621	57,828	57,423	55,709	55,645	52,327	49,448	47,756
Carrying Capacity	Thous. tons	1,304.2	1,348.9	1,397.7	1,501.9	1,615.3	1,693.0	1,696	1,820	1,805	1,807
Average Car Capacity	tons	22.1	23.2	24.3	26.0	28.1	30.4	30.5	34.7	36.5	37.9
Narrow Gauge	No.	5,729	5,231	4,640	4,041	3,927	3,717	3,546	2,479	1,780	1,509
Carrying Capacity	Thous. tons	71.3	65.6	61.8	53.8	56.8	54.7	52.0	36.0	27	-
Average Car Capacity	tons	12.4	12.5	13.3	13.3	14.5	14.7	14.5	14.3	15.2	-
<b>V. Utilization of Traction and Rolling Stock</b>											
Engine-km per engine day available:											
<b>Passenger Traffic S.G.</b>											
Steam Locomotives	km	253	248	245	239	N.A.	223	214	209	203	202
Diesel Locomotives	"	593	615	577	549	456	510	499	426	390	413
Electric Locomotives	"	617	590	666	701	654	713	678	650	718	643
Diesel Railcars	"	653	772	760	711	N.A.	775	617	575	479	315
Electric Railcars	"	489	494	476	472	N.A.	428	475	447	427	487
Rail Buses	"	408	402	423	440	N.A.	530	386	416	404	350
<b>Passenger Traffic N.G.</b>											
Steam Locomotives	km	199	182	184	172	144	166	166	110	58	-
Diesel Locomotives	"	-	-	229	276	222	262	218	198	311	226
Diesel Railcars	"	253	324	354	361	307	297	331	336	214	398
<b>Freight Traffic S.G.</b>											
Steam Locomotives	km	173	170	160	155	N.A.	150	137	137	145	138
Diesel Locomotives	"	336	330	315	313	290	297	280	270	245	264
Electric Locomotives	"	393	389	394	411	420	421	414	401	368	414
<b>Freight Traffic N.G.</b>											
Steam Locomotives	km	163	162	159	165	129	153	74	75	99	33
Diesel Locomotives	"	-	170	198	189	165	176	192	199	171	153
Passenger km per passenger car	Million km	2.6	2.6	2.7	2.7	2.8	2.8	2.9	2.8	2.8	3.2
Passenger km per seat	Thous. km	41.7	42.0	43.8	43.0	43.2	44.0	47.4	45.6	44.1	48.3
Net ton-km per freight car	"	253	279	309	318	313	344	390	395	410.3	451.1
Net ton-km per capacity of fleet	"	11.9	12.5	13.2	12.6	11.5	11.7	13.2	11.6	11.5	12.3
Avg. load per freight car loaded	m. ton	17.0	17.3	18.0	18.6	19.3	20.4	21.5	22.0	22.0	23.0
Turnaround time of freight cars	days	4.9	5.1	5.4	5.4	5.6	5.6	5.5	5.5	5.2	5.0
<b>VI. Staff in BOALS Constituting Basic RTEs (incl. CYR staff)</b>											
CYR staff	No.	126,513	125,512	120,695	120,747	120,044	117,121	118,165	119,960	119,394	118,456
Employees per km of line	"	11.8	12.0	11.7	11.7	11.5	11.3	11.3	11.9	11.9	11.9
Traffic Units per employee	"	211	224	250	250	248	265	289	267	259.3	275.9
Total staff, including all BOALS associated with RTEs	"	135,095	133,982	133,902	135,479	134,544	132,502	137,492	140,096	140,978	137,942

/1 Includes self-propelled cars.

Source: Yugoslav Railways

PROJECT COMPLETION REPORTYUGOSLAV RAILWAY PROJECT (LOAN 531-YU)Comparison with European Railways for 1975

	<u>Unit</u>	<u>Yugoslavia</u>	<u>Britain</u>	<u>Italy</u>	<u>France</u>	<u>Poland</u>	<u>Greece</u>
Total line length	km	10068	18144	16077	34255	29266	2476
Passenger kms .	million	10285	30256	36332	50447	42819	1553
Pass. kms per km of line	thousand	1021	1667	2259	1472	1463	627
Pass. kms per train km	passngrs.	136.6	87.7	170.9	188.0	228.9	113.3
Net ton kms	million	21638	20990	14885	63473	127505	931
Net ton per km of line	thousand	2149	1157	926	1853	4357	376
Net ton kms per train km	tons	420.0	191.6	223.3	299.0	550.0	211.6
Staff	number	137120 <u>a/</u>	253765	223705	281679	358428	12594
Traffic units per employee	thousand	232.8	201.9	228.9	404.4	475.2	197.2
No. of staff per km of line	number	13.6	14.0	13.9	8.2	12.2	5.1

a/ This is composed of 120,754 employees in BOALs making up basic RTEs and CYR, and 16,366 employees in other BOALs associated with the RTEs. However, the CYR institutes for design and publicity, and sleeping car and printing BOALs, with a total staff of 2976, have been excluded from this comparison although they are included in Table 6.

Source: Community of Yugoslav Railways from UIC Yearbook for 1975.  
October 1977

Project Completion Report

Yugoslav Railway Project (Loan 531-YU)

Actual and Forecast Traffic - Community of Yugoslav Railways 1968-77

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
<u>I. Freight traffic.</u>										
(a) Tonnage (thous. tons)										
Actual	68,409	70,200	75,404	75,630	72,339	74,516	81,506	77,730	73,726	77,432
Forecast	70,496	72,300	74,292	76,851	79,948	86,199	89,257	93,095	-	-
(b) Average haul (km)										
Actual	239.3	252.0	255.3	259.8	265.1	274.4	283.2	278.3	285.1	287.0
Forecast	241	241	241	239	239	248	248	248	-	-
(c) Commodities (net ton/km)										
Actual:										
Coal	3,715	3,734	3,522	3,489	3,180	3,111	3,204	3,233	3,165	3,163
Petroleum & derivatives	877	1,119	1,076	1,201	966	1,220	1,458	1,650	1,708	1,829
Ores & concentrates	1,623	1,652	1,813	1,698	1,998	2,325	2,758	2,693	2,511	2,444
Non-metals	592	689	978	988	898	897	961	843	747	768
Metals & products	1,508	1,751	1,999	2,092	2,224	2,550	2,895	2,872	2,399	2,724
Wood	1,139	1,247	1,412	1,377	1,329	1,398	1,627	1,276	1,261	1,388
Building material	1,295	1,440	1,303	1,319	1,070	1,018	1,263	1,093	872	993
Cement	370	424	653	629	604	666	734	511	395	508
Fertilizers	662	701	582	616	585	642	735	683	591	732
Cereals	679	650	820	983	935	983	933	506	883	802
Other commodities	3,515	3,882	4,694	4,866	5,028	5,283	6,058	5,920	6,259	6,625
Less than car-loads	396	402	401	389	361	353	455	354	226	249
Total	16,371	17,691	19,253	19,647	19,178	20,446	23,081	21,634	21,017	22,275
Forecast	16,993	17,430	17,915	18,358	19,119	21,324	22,160	23,078	-	-
<u>II. Passenger traffic:</u>										
(a) Passengers (thousand)										
Actual	182,947	163,216	157,016	145,594	141,238	136,598	134,926	129,079	126,493	123,546
Forecast	197,432	201,183	205,407	210,131	215,959	228,485	233,283	238,182	-	-
(b) Average journey (km)										
Actual	56.3	64.2	69.7	72.6	74.9	77.4	77.5	79.6	78.6	84.6
Forecast	55.3	55.6	55.8	56.1	56.3	56.4	56.6	56.8	-	-
(c) Volume (passenger km million)										
Actual	10,284	10,470	10,940	10,566	10,579	10,578	10,461	10,281	9,941	10,458
Forecast	10,918	11,185	11,461	11,788	12,158	12,886	13,204	13,529	-	-
<u>III. Traffic units</u> (million net ton-km + million passenger km)										
Actual	26,655	28,161	30,193	30,213	29,757	31,024	33,542	31,915	30,958	32,683
Forecast	27,911	28,615	29,376	30,146	31,277	34,210	35,364	36,607	-	-

Source. Yugoslav Railways

TABLE 8

Project Completion Report

Yugoslav Railway Project (Loan 531-YU)

Actual and Forecast Revenues and Expenses - Community of Yugoslav Railways

1968 - 1977

	1968		1969		1970		1971		1972		1973		1974		1975		1976	1977	
	Actual	Estimated	Actual	Forecast	Actual	Forecast	Actual	Forecast	Actual	Forecast	Actual	Forecast	Actual	Forecast	Actual	Forecast	Actual	Actual	
----- DN Million -----																			
Operating revenue																			
Passenger	961	877	1,102	923	1,254	950	1,413	1,034	1,521	1,055	1,847	1,128	2,136	1,155	2,475	1,185	2,563	3,012	
Freight	2,707	2,755	2,957	2,903	3,667	2,985	4,538	3,212	5,326	3,352	6,361	3,773	8,045	3,911	9,943	4,070	10,266	11,601	
Other 1/	888	784	1,110	776	1,176	751	1,670	712	1,625	713	2,187	714	4,376	667	6,007	670	8,495	9,529	
Total	<u>4,556</u>	<u>4,416</u>	<u>5,169</u>	<u>4,602</u>	<u>6,097</u>	<u>4,686</u>	<u>7,621</u>	<u>4,958</u>	<u>8,472</u>	<u>5,120</u>	<u>10,395</u>	<u>5,615</u>	<u>14,557</u>	<u>5,733</u>	<u>18,425</u>	<u>5,925</u>	<u>21,324</u>	<u>24,142</u>	
Operating expenses	1,790	1,467	2,032	1,453	2,290	1,434	2,824	1,406	3,419	1,432	3,776	1,484	4,721	1,527	6,117	1,571	7,494	8,388	
Wages and salaries	437	420	437	402	512	408	562	342	575	352	692	391	1,015	405	1,193	427	1,150	1,229	
Fuel and electricity	340	123	320	125	434	129	608	132	711	136	769	136	1,179	139	1,369	141	1,411	1,556	
Other materials	1,462	1,381	1,692	1,378	1,723	1,378	2,378	1,358	2,644	1,371	3,014	1,450	4,096	1,481	5,890	1,506	5,985	6,813	
Other working expenses	4,029	3,391	4,481	3,358	5,009	3,349	6,372	3,238	7,349	3,291	8,251	3,461	11,011	3,552	14,569	3,645	16,040	17,986	
Subtotal working expenses	<u>618</u>	<u>684</u>	<u>854</u>	<u>733</u>	<u>735</u>	<u>751</u>	<u>831</u>	<u>851</u>	<u>1,489</u>	<u>893</u>	<u>1,783</u>	<u>1,001</u>	<u>2,926</u>	<u>1,017</u>	<u>2,907</u>	<u>1,036</u>	<u>4,278</u>	<u>4,578</u>	
Depreciation	4,647	4,075	5,135	4,091	5,744	4,100	7,203	4,089	8,838	4,184	10,034	4,462	13,937	4,569	17,476	4,681	20,318	22,564	
Total operating expenses	-	-	-	-	-	-	-	-	-	-	90	-	4	-	8	-	4	101	
Less: Subvention for uneconomic lines	4,647	4,075	5,135	4,091	5,744	4,100	7,203	4,089	8,838	4,188	9,944	4,462	13,933	4,569	17,468	4,681	20,314	22,463	
Net operating expenses	(91)	341	34	511	353	586	418	869	(366)	936	451	1,153	624	1,164	957	1,244	1,010	1,679	
Net operating revenue	72	46	96	48	155	57	285	60	385	54	414	54	504	46	835	44	850	1,116	
Fixed charges:	83	85	73	88	-	91	-	94	-	97	-	101	-	102	-	104	-	-	
Interest on loans	155	131	169	136	155	146	285	154	385	151	414	155	504	148	835	148	850	1,116	
Payment for fixed assets	(246)	210	(135)	375	197	438	133	715	(751)	785	37	998	120	1,016	122	1,096	160	563	
Total fixed charges																			
Net surplus (deficit)																			
Ratios																			
Net working expenses/Operating revenue	%	88	77	87	73	82	71	88	65	87	64	79	62	76	62	79	62	75	74
Net operating expenses/Operating revenue	%	102	92	99	89	94	88	95	82	104	82	96	79	96	80	95	79	95	93
Net operating revenue/Fixed charges	Times	(0.6)	2.6	0.2	3.8	2.3	4.0	1.5	5.6	0.9	6.2	1.1	7.4	1.2	7.4	1.1	8.4	1.2	1.5
Wages & salaries/Gross working expenses	%	44	43	45	43	46	35	44	43	47	34	46	43	43	33	47	43	47	47
Depreciation/Operating revenue	%	14	15	13	16	12	16	11	17	18	17	18	20	22	16	17	20	19	19
Rate of return on average net fixed assets in use	%	(0.8)	2.9	0.3	3.9	3.0	4.3	2.1	6.2	-	6.5	1.5	7.1	2.1	6.5	2.3	6.7	1.8	2.5

1/ Other revenue from 1973 onwards includes Government subsidies or compensation as follows

----- DN Million -----  
237                      1,159                      2,129                      4,741                      5,750

Source: Yugoslav Railways and Appraisal Report

Project Completion Report  
Yugoslav Railway Project - (Loan 531-YU)  
Actual and Forecast Balance Sheets - Community of Yugoslav Railways

	-----1968-----		-----1969-----		-----1971-----		-----1973-----		-----1975-----		1976	1977	
	Actual	Estimated	Actual	Forecast	Actual	Forecast	Actual	Forecast	Actual	Forecast	Actual	Actual	
-----DN million-----													
Fixed Assets: <sup>/1</sup>													
Operating Assets (gross)	23,630	25,531	24,332	27,354	57,160	29,302	60,624	34,347	121,841	37,343	133,213	170,573	
Less Accumulated Depreciation	12,681	13,192	13,112	13,772	28,644	15,071	30,739	16,680	68,013	18,353	74,425	94,734	
Net Fixed Assets in Use	10,949	12,339	11,220	13,582	28,516	14,231	29,885	17,667	53,828	18,990	58,788	75,839	
Work in Progress	1,791	1,059	2,782	696	6,396	826	7,408	721	5,064	715	6,867	10,754	
Social Standard Assets <sup>/2</sup>	135	343	131	444	251	664	224	933	916	1,334	1,058	1,635	
Other Non-Current Assets <sup>/3</sup>	-	-	-	-	1,006	-	1,206	-	1,814	-	1,545	3,654	
Net Current Assets													
Current Assets:													
Cash	772	662	1,051	640	165	762	506	969	404	1,267	1,307	3,492	
Inventories	256	380	256	335	513	355	623	367	1,135	380	1,239	1,470	
Debtors, etc.	2,181	913	2,042	807	2,276	824	3,523	858	7,797	860	13,472	19,294	
Subtotal	3,209	1,955	3,349	1,782	2,954	1,941	4,652	2,194	9,336	2,507	16,018	24,256	
Less: Current Liabilities	1,637	1,238	1,546	1,115	2,188	1,118	2,306	1,141	6,111	1,146	10,946	17,038	
Total Net Current Assets	1,572	717	1,803	667	766	823	2,346	1,053	3,225	1,361	5,072	7,218	
Total Assets	<u>14,447</u>	<u>14,458</u>	<u>15,936</u>	<u>15,389</u>	<u>36,935</u>	<u>16,544</u>	<u>41,069</u>	<u>20,374</u>	<u>64,847</u>	<u>22,400</u>	<u>73,330</u>	<u>99,100</u>	
Financed by:													
Debt	2,615	2,596	3,829	2,884	6,322	2,865	10,110	2,896	11,360	2,959	14,124	22,794	
Equity	<u>11,832</u>	<u>11,862</u>	<u>12,107</u>	<u>12,505</u>	<u>30,613</u>	<u>13,679</u>	<u>30,959</u>	<u>17,478</u>	<u>53,487</u>	<u>19,441</u>	<u>59,206</u>	<u>76,306</u>	
Total	<u>14,447</u>	<u>14,458</u>	<u>15,936</u>	<u>15,389</u>	<u>36,935</u>	<u>16,544</u>	<u>41,069</u>	<u>20,374</u>	<u>64,847</u>	<u>22,400</u>	<u>73,330</u>	<u>99,100</u>	
Ratios:													
Current Assets to Current Liabilities	Times	2.0	1.6	2.2	1.6	1.4	1.7	2.0	1.9	1.5	2.2	1.5	1.4
Current Assets (less inventories) to Current Liabilities	Times	1.8	1.3	2.0	1.3	1.1	1.4	1.7	1.6	1.3	1.9	1.4	1.3
Debt to Equity	%	18/82	18/82	24/76	19/81	17/83	17/83	25/75	14/86	18/82	13/87	19/81	23/77
Cash to Cash Operating Expenses	%	19.2	19.5	23.5	19.1	2.6	23.5	6.2	28.0	2.8	34.8	8.2	19.5
Net Current Assets (less cash) to Cash Operating Expenses	%	19.9	1.6	16.8	0.8	9.4	1.9	22.5	2.4	19.4	2.6	23.5	20.8

<sup>/1</sup> In addition to the periodic revaluation of assets and accumulated depreciation, a law in 1975 requires annual revaluations of any class of assets where index movement is 10% or above in the year.

<sup>/2</sup> Housing, clinics and other social assets

<sup>/3</sup> Includes statutory reserve funds

Source: Yugoslav Railways

**Project Completion Report**  
**Yugoslav Railway Project (Loan 531-YU)**  
**Actual and Forecast Cash Flow<sup>1</sup> - Community of Yugoslav Railways**

	-----1968-----		-----1969-----		-----1970-71-----		-----1972-73-----		-----1974-75-----		1976	1977
	<u>Actual</u>	<u>Estimated</u>	<u>Actual</u>	<u>Forecast</u>	<u>Actual</u>	<u>Forecast</u>	<u>Actual</u>	<u>Forecast</u>	<u>Actual</u>	<u>Forecast</u>	<u>Actual</u>	<u>Actual</u>
-----DN Million-----												
<b>Cash Requirements:</b>												
Capital Investment	1,464	1,634	2,219	1,456	5,366	2,580	7,116	3,478	7,979	3,910	5,606	5,855
<b>Debt Service:</b>												
Interest	155	131	169	136	440	117	831	108	1,339	90	850	1,116
Repayments	63	131	99	165	759	384	1,902	341	2,943	342	1,896	2,025
	218	262	268	301	1,199	501	2,733	449	4,282	432	2,746	3,141
<b>Changes in Working Capital<sup>2</sup></b>	<u>(163)</u>	<u>4</u>	<u>(293)</u>	<u>(28)</u>	<u>922</u>	<u>34</u>	<u>1,548</u>	<u>23</u>	<u>1,605</u>	<u>20</u>	<u>1,525</u>	<u>2,077</u>
<b>Total Cash Requirements</b>	<u>1,519</u>	<u>1,900</u>	<u>2,194</u>	<u>1,729</u>	<u>7,487</u>	<u>3,115</u>	<u>11,397</u>	<u>3,950</u>	<u>13,866</u>	<u>4,362</u>	<u>9,877</u>	<u>11,073</u>
<b>Cash Available:</b>												
Own Funds: <sup>3</sup>												
Operating Revenue	(91)	341	34	511	771	1,270	85	1,891	1,581	2,202	850	1,116
Depreciation	618	684	654	733	1,566	1,602	3,269	1,894	5,833	2,053	4,278	4,578
Other Receipts	-	-	-	-	-	-	344	-	329	-	-	2,306
Subtotal	527	1,025	688	1,244	2,337	2,872	3,698	3,785	7,743	4,255	5,128	8,000
<b>Loans and Credits:</b>												
Grants	-	-	-	-	-	-	2,213	-	2,026	-	1,004	513
IBRD Loan 531-YU	-	-	-	-	-	-	-	-	-	-	-	-
Other Foreign and Domestic	917	910	1,785	463	4,264	365	5,827	372	3,995	405	4,648	4,745
Subtotal	917	910	1,785	463	4,264	365	8,040	372	6,021	405	5,652	5,258
<b>Total Cash Availability</b>	<u>1,444</u>	<u>1,935</u>	<u>2,473</u>	<u>1,707</u>	<u>6,601</u>	<u>3,237</u>	<u>11,738</u>	<u>4,157</u>	<u>13,764</u>	<u>4,660</u>	<u>10,780</u>	<u>13,258</u>
Cash Surplus (Deficit) for Period	(75)	35	279	(22)	(886)	122	341	207	(102)	298	903	2,185
Cash at Beginning of Period	847	627	772	662	1,051	640	165	762	506	969	404	1,307
Cash at End of Period	772	662	1,051	640	165	762	506	969	404	1,267	1,307	3,492
<b>Ratios:</b>												
Internal Financing of Cap. Expenditures %	37.4	44.3	19.6	68.2	20.5	85.9	N11	89.3	24.9	89.6	N11	10.2
Debt Service Coverage (Own Funds/Debt Service) Times	2.4	3.9	2.6	4.1	1.9	5.7	1.4	8.4	1.8	9.8	1.9	2.5

<sup>1</sup> The Cash Flow figures in each period do not reconcile directly and Balance Sheet figures due to the incidence of non-cash accounting adjustments.

<sup>2</sup> Changes in Working Capital include contributions to statutory reserve funds and to development funds (e.g. power development).

<sup>3</sup> Assumes receipt in the years 1976 and 1977 of compensation due in each year.

PROJECT COMPLETION REPORT

YUGOSLAV RAILWAY PROJECT (LOAN 531-YU)

BELGRADE-BAR LINE CONSTRUCTION

Accumulated Disbursements - US\$ million equivalent

1968-1975

<u>IBRD Fiscal Year and Quarter</u>	<u>Actual</u>	<u>Appraisal /1 Estimate</u>	<u>Disburse- ments as % of Appraisal Estimate</u>
<u>1968/69</u>			
Sept. 30, 1968	1.71		
Dec. 31, 1968	2.57	5.02	51%
Mar. 31, 1969	3.34		
June 30, 1969	4.35		
<u>1969/70</u>			
Sept. 30, 1969	7.14		
Dec. 31, 1969	8.70	13.44	65%
Mar. 31, 1970	10.67		
June 30, 1970	12.77		
<u>1970/71</u>			
Sept. 30, 1970	14.00		
Dec. 31, 1970	16.65	22.90	73%
Mar. 31, 1971	18.21		
June 30, 1971	20.45		
<u>1971/72</u>			
Sept. 30, 1971	22.11		
Dec. 31, 1971	25.73	33.06	78%
Mar. 31, 1972	27.41		
June 30, 1972	31.40		
<u>1972/73</u>			
Sept. 30, 1972	33.03		
Dec. 31, 1972	35.23		
Mar. 31, 1973	38.70		
June 30, 1973	42.12	50.00	84%
<u>1973/74</u>			
Sept. 30, 1973	43.43		
Dec. 31, 1973	44.52		
Mar. 31, 1974	45.80		
June 30, 1974	46.83	50.00	94%
<u>1974/75</u>			
Sept. 30, 1974	47.56		
Dec. 31, 1974	48.66		
Mar. 31, 1975	48.97		
June 30, 1975	49.14	50.00	98%
<u>1975/76</u>			
Sept. 30, 1975	49.36		99%
Dec. 31, 1975	50.00	50.00	100%
	Dec. 31, 1975	Dec. 31, 1973	

/1 Appraisal Report did not contain quarterly figures.

TABLE 13

Freight Traffic on Belgrade/Bar Line in First  
Full Year of Operation

	(million net ton-kms)		
	(1)	(2)	(3)
	Appraisal Forecast	Actual Traffic	(2) as % of (1)
	1973 <u>1/</u>	1977	
Coal and Coke	274	165	60
Oil and Oil Products	103	71	68
Ores and Concentrates	84	207	246
Non-Metals	196	37	19
Metallurgical Products	147	165	112
Timber and Wood Products	160	29	18
Cement	163	22	13
Building Materials	98	80	81
Fertilizers	80	52	65
Phosphate Rock	273	7	3
Cereals	387	26	8
Agricultural and Other Products	664	157	24
Total	<u>2,329</u>	<u>1,018</u>	

1/ Approximate in that net ton-kms were derived from tons given in Appraisal Report by application of a uniform average journey length for all commodity groups.

TABLE 14

BELGRADE-BAR FREIGHT TRAFFIC: REVISED FORECASTS  
(million net ton-kms)

	<u>Appraisal Forecast</u>	<u>Revised</u> <sup>1/</sup> <u>Forecast</u>
1973	2,329	-
1974	2,424	-
1975	2,522	-
1976	2,624	594
1977	2,731	1,018
1978	2,841	1,122
1979	2,924	1,235
1980	3,010	1,786
1981	3,098	1,857
1982	3,189	1,932
1983	3,284	2,009
1984	3,360	2,089

1/ Assumes total phosphate rock traffic of 452 million net ton kms transferred to Belgrade-Bar by 1980.

BELGRADE-BAR FREIGHT TRAFFIC FORECAST: BREAKDOWN BY MODAL CATEGORIES  
(million net-ton kms)

	Diverted from Narrow Gauge Lines (1)	Diverted from Belgrade- Ploce Rail Route (2)	Diverted from Danube-Ploce Rail-River Route (3)	Generated Best Alternative Danube-Ploce Rail-River Route (4)	Diverted from Road Transport/ <sup>1</sup>		Generated Best Alternative Being Road Transport	
					Hypothesis I (5)	Hypothesis II (6)	Hypothesis I (7)	Hypothesis II (8)
1977	78	424	19	19	263	(159)	215	(319)
1978	80	483	21	21	284	(172)	233	(345)
1979	82	546	24	24	307	(186)	252	(373)
1980	85	1043	27	27	332	(201)	272	(403)
1981	87	1086	29	29	344	(209)	282	(417)
1982	90	1132	30	30	357	(217)	293	(433)
1983	92	1178	32	32	371	(225)	304	(450)
1984	95	1228	33	33	385	(233)	315	(467)

<sup>1</sup> See paragraph 7.4 and Annex 2, Methodological Note 2c.

TABLE 16

BELGRADE-BAR PASSENGER TRAFFIC : REVISED FORECAST  
(million passenger Kms)

	<u>Appraisal Forecast</u>	<u>Revised Forecast</u>
1973	900	-
1974	911	-
1975	921	-
1976	932	-
1977	943	756
1978	954	825
1979	960	900
1980	966	958
1981	973	1001
1982	979	1032
1983	985	1052
1984	991	1067

BELGRADE-BAR RAILWAY

YUGOSLAVIA

Transport Cost Savings  
(Dn. millions)

	Narrow gauge Lines	Belgrade-Ploce Rail	Danube-Ploce River/Rail		Diverted Road Freight		Road Passenger		Disposal of Narrow Gauge Track	TOTAL	
			Diverted	Generated	Hypoth. I	Hypoth. II	Diverted	Generated		Hypoth. 1	Hypoth. 2
1974	66.1	-	-	-	19.3	11.7	11.1	5.6	12.0	106.5	114.1
1975	67.0	-	-	-	20.1	12.2	11.5	5.8	-	96.5	104.4
1976	67.9	62.6	2.8	1.4	45.1	27.2	22.6	11.3	-	195.8	213.7
1977	69.7	107.3	4.8	2.4	77.3	46.7	44.2	22.1	-	297.2	327.8
1978	71.4	122.2	5.3	2.7	83.5	50.6	48.3	24.2	-	324.7	357.6
1979	73.2	138.1	6.1	3.1	90.3	54.7	52.7	26.4	-	354.3	389.9
1980	75.9	263.9	6.8	3.4	97.6	59.1	56.2	28.1	-	531.9	493.4
1981	77.6	274.8	7.3	3.6	101.1	61.4	58.0	29.3	-	552.3	512.6
1982	80.4	286.4	7.6	3.8	105.0	63.8	60.4	30.2	-	573.8	502.6
1983	82.2	298.0	8.1	4.0	109.1	66.2	61.5	30.8	-	593.7	550.8
1984	84.8	310.7	8.3	4.2	113.2	68.5	62.5	31.3	-	615.0	570.3
1985-2003*											

\* NCTE: The above savings, conservatively frozen at the 1984 level, are assumed to continue for the project life of 25 years (upto year 2002).

BELGRADE-BAR RAILWAY

Estimated and Forecast Contributions of Area Served by  
Belgrade-Bar Line to Gross Product 1974-2002  
 (million dinars at 1977 prices)

	<u>Manufacturing, Mining &amp; Quarring Sector</u>				<u>Agricultural Sector</u>			
	<u>With Line</u>	<u>Without Line</u>	<u>Benefit</u>	<u>Share due to Railways</u>	<u>With Line</u>	<u>Without Line</u>	<u>Benefit</u>	<u>Share due to Railways</u>
1974	5,912	5,266	646	129	2,145	2,145	-	-
1975	5,800	5,334	466	116	2,301	2,246	55	10
1976	6,216	5,432	784	156	2,603	2,351	252	50
1977	7,762	5,582	2,180	436	2,627	2,462	165	33
1978	8,390	5,782	2,608	521	2,763	2,578	185	37
1979	9,072	6,048	3,024	605	2,907	2,699	208	41
1980	9,806	6,230	3,576	715	3,059	2,839	220	44
1981	10,600	6,415	4,185	837	3,218	2,987	231	46
1982	11,340	6,610	4,730	946	3,384	3,142	242	48
1983	12,134	6,810	6,102	1,220	3,561	3,305	256	50
1984	12,988	7,015	5,973	1,195	3,746	3,477	269	54
1985	13,894	7,230	6,664	1,332	3,941	3,658	283	56
1986-2002 Annual	13,894	7,230	6,664	1,332	3,941	3,658	283	56

Sources: Yugoslavia Statistical Yearbooks and Mission Estimates

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BELGRADE-BAR RAILWAY

Total Estimated Benefits

(Dn. million at constant 1977 prices)

<u>Year</u>	<u>Transport Cost Saving</u>		<u>Induced Economic Activity</u>
	<u>Hypothesis 1</u>	<u>Hypothesis 2</u>	
1974	114	107	129
1975	104	97	126
1976	214	196	206
1977	328	297	469
1978	358	325	558
1979	390	354	646
1980	532	493	759
1981	552	513	883
1982	574	532	994
1983	594	551	1270
1984	615	570	1249
1985	615	570	1388
1986-2002	615	615	1388
Annual	-	-	-



PROJECT COMPLETION REPORT

YUGOSLAV RAILWAY PROJECT (Loan 531YU)

Additions to the Project

- A Superstructure of additional works completed with surplus earth at minor extra cost.
- a/ Establishment for passing stations Gradac and Samari section Valjevo-Kosjeric.
  - b/ Embankment for three tracks and tracks for car maintenance.
  - c/ Embankment for passing station Uzice at section Pozega T. Uzice.
  - d/ Earth works for T. Uzice passenger station.
  - e/ Embankment for passing stations Branesko and Ribnica at section T. Uzice-Priboj.
  - f/ Embankment for passing stations Pribojska at section Priboj-Prijepolji.
  - g/ Earthworks for Prijepolje passenger station.
  - h/ Embankment for passing station Branesko at section Prijepolje-Gostun.
  - i/ Embankment for Krusevo passing station at section Bijelo Polje-Kolasin.
  - j/ Embankment for passing station Zlatica at section Kolasin-Titograd.
  - k/ Some earthworks at Bar.
- B Works completed after opening of the line to increase capacity, and station buildings.
- a/ Station tracks and tracks for car maintenance.
  - b/ Passenger station at Prijepolje and T. Uzice.
  - c/ Passing tracks at Gradac and Samari.
  - d/ Tracks at Pozega in relation with the connection to the Cacak-Pozega branch line.

Total of A and B about Dn 520 millions.

C Related works to attract freight traffic.

a/ Industrial sidings at Valjevo, Kosjine for cement plant at Pozega, at Slojino, at Priboj for a car factory, loading and unloading facilities in Prijepolje for coal, cement and other goods, tracks and loading and unloading facilities at Krusero.

b/ Some tracks at Titograd and Bar awaiting the final construction of yards and port tracks.

Total costs of C about Dn 575 millions.

BELGRADE-BAR RAILWAY

YUGOSLAVIA

Economic Reevaluation: Methodological Notes

Methodological Note 1

Average annual growth rates applied to individual commodity groups in forecasting total freight traffic for 1977-1980 transitional period (see para 7.3).

Coal & coke	13.3%	Cement	9.6%
Oil & oil products	10.2	Building materials	8.8
Ores & concentrates	12.0	Fertilizers	7.8
Non-metals	14.1	Phosphate rock	13.3
Metallurgical products	10.1	Cereals	7.2
Timber & wood products	14.0	Agricultural & Other products	3.5

METHODOLOGICAL NOTE 2

Breakdown of total freight traffic forecasts according to alternative modes.

a. Traffic Diverted from Narrow Gauge Lines. The appraisal estimate of divertible traffic on narrow gauge railways in the area of the proposed Belgrade-Bar line was based on fairly detailed statistics. The original estimate of 73.8 million net ton kms in 1973 has, therefore, been adopted and extended to 1977 assuming an average annual increase of 1.4% corresponding to that for total RTE Belgrade freight traffic. It is estimated that, with the increasing prosperity of Montenegro and Western Serbia, this annual growth rate would have doubled to 2.8% between 1977 and 1984, had the narrow gauge lines remained the sole means of rail transport in the area, to yield a total of 95 million net ton kms in 1984.

b. Traffic Diverted from Other Rail Routes. The official traffic estimates indicate that 1.0 million tons of freight from outside the area served by the line, i.e., from Belgrade and beyond, were transported on the line in 1977. As most of this was conveyed over the entire length of the line to or from the Port of Bar, it is estimated that the 462 million net ton kms equivalent would have transferred from other rail routes, primarily Belgrade-Ploce. Annual increases in this category of traffic have been determined as a residual after deducting from the total freight forecasts the estimates for traffic diverted from narrow gauge lines and from road (see below). It is assumed that the traffic diverted from other rail routes is composed of Belgrade-Ploce rail traffic and Danube-Ploce rail-river traffic in the same proportions as estimated in the appraisal evaluation and that the latter is, similarly, equally divided between existing divertible and generated traffic, these proportions remaining constant throughout the 1977-1984 evaluation period. Assuming a wholesale transfer of phosphate rock traffic in 1980, the whole of the transferred traffic is assigned to the "Belgrade-Ploce Rail" category.

c. Traffic Diverted from Road. It is estimated that some 3.1 million tons of freight originating or terminating in the area served by the line and with an average journey of 154 kms was diverted from road or narrow gauge lines in 1977. This yields an equivalent of 478 million net ton kms for the diverted road element. A high 8.1% annual increase, equivalent to that for the current growth rate of manufacturing and extractive industry in the area is taken for this category of traffic up to 1980, with a decline to 4%, the average for all freight traffic, from 1980 to 1984. The re-evaluation mission was unable to estimate with any certainty the proportion of traffic diverted from road, which was "normal" in the sense that it would have materialized even without the rail investment and that which would be generated by the rail but for which the best alternative mode would be road. But it is believed, in view of the pattern of economic development in the area, that the generated share exceeds the 45% taken in the appraisal evaluation; on the other hand, it is thought that it would not exceed 66.7%. These two alternatives are, therefore, taken as alternative hypotheses in allocating the total freight traffic amongst the two sub-categories.

METHODOLOGICAL NOTE 3

Estimation of Operating Costs on Narrow Gauge Lines.

Although no detailed cost data are available it appears that the appraisal estimate of narrow gauge line operating cost, which was averaged over both freight and passenger services, may possibly have contained invariable elements that might appropriately have been excluded. On the other hand, it is assumed in the present re-evaluation that the narrow gauge lines are only relevant as regards freight traffic, in that the passenger traffic was more likely to have transferred gradually to road transport leaving freight to support a higher proportion of fixed costs. In view of these uncertainties, the resolution of which lies beyond the resources of the present re-evaluation, narrow gauge line operating costs have conservatively been reduced to 2.5 times those on the Belgrade-Bar line.

METHODOLOGICAL NOTE 4

Computation of Road Vehicle Operating Costs

1. Definitions of road types assumed:

Type A. Mildly Hilly Terrain

	<u>Gradients</u>	<u>Curvature</u>	<u>Basic Speed</u>
Type A. Mildly Hilly Terrain	2-3%	30-50°	64 k.p.h.
Type B. Hilly Mountainous Terrain	3-5%	50-70°	56 k.p.h.
Type C. Mountainous Terrain	5%	70°	48 k.p.h.

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Sources: Guideline for Highway Feasibility Studies, Highway Advisory Services for Yugoslavia, 1974. Development of Road Network in SAP Kosovo, 1477-1990, Institut za Puteve-Beograd, Sept. 1978.

2. Operating cost of 22-ton truck/trailer on:

Type A road	Dn.	10,389	
Type B road	Dn.	13,773	
Type C road	Dn.	19,109	
Average (Type A - 50%; Type B - 25%; Type C - 25%)	Dn.	13,430	
Cost per net ton km (75% Load factor)	Dn.	0,814	
Operating cost of 9.5 ton truck on:			
Type A road	Dn.	6,221	
Type B road	Dn.	7,365	
Type C road	Dn.	9,780	
Average (Type A - 50%; Type B - 25%; Type C - 25%)	Dn.	1,038	7,397
Cost per net ton km (75% Load factor)	Dn.	1,038	

Average cost per net ton km (22-ton truck/trailer - 66.7%;

9.5-ton trucks - 33.3%): Dn. 0,889

Operating cost of Mercedes 45-seat bus on:

Type A road Dn. 13,410

Type B road Dn. 18,423

Type C road Dn. 23,060

Average (Type A - 50%;

Type B - 25%;

Type C - 25%) Dn. 17,076

Cost per passenger (75% seat

occupancy factor) Dn. 0,506

METHODOLOGICAL NOTE 5

In the 13 Serbian communes estimated to fall within the area of influence of the section of the Belgrade-Bar line constructed under the project, employment in the manufacturing, mining and quarrying sector is twice as high as in the whole of Montenegro, indicating that Serbia may have benefitted twice as much as Montenegro. On the other hand, the closer the communes lie to Belgrade and the main areas of economic activity, the more important are the effects of extraneous factors on development. Serbia's double weighting is, therefore, halved in the present analysis, to give it equality with Montenegro, on the principle that the northern most commune gains a negligible marginal benefit from the railway, while the southern most gains the full theoretical benefit. On the same marginal principle Serbia is awarded half the weighting of Montenegro for agriculture, since the respective populations, which are the principal sources of demand for agricultural produce, are virtually the same.



# YUGOSLAVIA BELGRADE-BAR RAILWAY AND MAIN TRANSPORT ROUTES IN ZONE OF INFLUENCE

Ostrel      Sombor      Subotica Sremski Karlovci      Zrenjanin      Zrenjanin

IBRD 2143R (PCR)

