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PROJECT PERFORMANCE AUDIT REPORT

MALAGASY REPUBLIC SECOND HIGHWAY PROJECT

(LOAN 570-MAG/CREDIT 134-MAG)

July 18, 1975

Operations Evaluation Department



PROJECT PERFORMANCE AUDIT REPORT

MALAGASY REPUBLIC SECOND HIGHWAY PROJECT (LOAN 570-MAG/CREDIT 134-MAG)

PREFACE

The Second Highway Project in the Malagasy Republic supported by the World Bank Group was partially financed by an IBRD loan (570-MAG) and an IDA credit (134-MAG), which were signed on November 12, 1968. The credit was fully disbursed in June 1971; the loan in October 1973. The purpose of this performance audit is to assess the extent to which the original project objectives were met and to analyze the role of the IBRD/IDA in meeting those objectives.

The audit is based on a review of: correspondence and reports in IBRD/IDA files (appraisal reports; economic reports; supervision reports; and construction progress reports) as well as discussions with IBRD/IDA staff members and Malagasy officials.

In September 1974, a two-week visit was made to the Malagasy Republic to update information and to discuss relevant issues.

The valuable assistance of the Government of the Malagasy Republic is gratefully acknowledged.



PROJECT PERFORMANCE AUDIT REPORT

MALAGASY REPUBLIC SECOND HIGHWAY PROJECT (LOAN 570-MAG/CREDIT 134-MAG)

PROJECT DATA

	<u>Loan 570-MAG</u>	<u>Credit 134-MAG</u>
Amount of Loan/Credit	US\$3.5 million	US\$4.5 million
Amount Disbursed	US\$3.5 million	US\$4.5 million
Dates of Loan/Credit Negotiations	September 19-27, 1968	
Date of Loan/Credit Agreement	November 12, 1968	
Original Effective Date	February 5, 1969	
Final Effective Date	April 1, 1969	
Original Closing Date	December 31, 1972	
Final Closing Date	October 1973	June 1971
First Supervision Mission	February 1969	
Final Supervision Mission	August 1974	

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Exchange Rates (Malagasy franc):

Through July 1969 ----- US\$1 = FMG 247  
August 1969 - November 1971 --- US\$1 = FMG 278  
December 1971 - January 1973 -- US\$1 = FMG 256  
February 1973 to present ----- US\$1 = FMG 230



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## PROJECT PERFORMANCE AUDIT REPORT

### MALAGASY REPUBLIC SECOND HIGHWAY PROJECT (LOAN 570-MAG/CREDIT 134-MAG)

#### SUMMARY

On November 12, 1968, the IBRD/IDA signed agreements to provide a US\$3.5 million loan (570-MAG) and a US\$4.5 million credit (134-MAG) to the Malagasy Republic to finance the foreign exchange cost of a US\$11.5 million highway project. This represented the IBRD/IDA's second involvement in highways in the country. The loan/credit became effective on April 1, 1969.

Project components included construction and bituminous paving of the Fanjakamandroso-Tsiroanomandidy Road (55 km) and Ambilobe-Ambanja Road (91 km); construction of the Onibe, Fanandrana, and Ambanja Bridges; and consultants' services for construction supervision. Detailed engineering of the Analavory-Arivotrimamo Road and feasibility studies of three roads were deleted from the project during negotiations as sufficient IDA funds were not available to cover them. Completion was about a year behind schedule because of design difficulties and construction delays. The December 31, 1972 closing date was met for the credit but extended one year for the loan because of construction delays on the Ambilobe-Ambanja Road and on the Ambanja Bridge.

The actual cost of the project was US\$15.2 million in contrast to the estimate of US\$11.5 million, including contingencies. This represented an overrun of some 30%, of which about half was due to price increases and half to quantity underestimates, mainly resulting from road base materials being of lower quality than expected. The overrun was financed in large part by the Government, but savings from the First Highway Project (Credit 90-MAG of 1966 for US\$10 million) also contributed to the financing.

The economic rate of return for the Fanjakamandroso-Tsiroanomandidy Road estimated at audit is 21%, or well above the 13% appraisal estimate, because the cost overrun was compensated by a substantial traffic increase. On the Ambilobe-Ambanja Road, the range of the audit rate of return is 6%-8% and 8%-11% (depending on the figures used), as compared with the appraisal estimate of 8%. If account is not taken of higher oil prices and traffic increases that will probably follow improvement of the southern link from Ambanja to Antsohihy, the substantial cost overrun together with the traffic level close to appraisal expectations result in a rate of return of 6% and 8%, depending on the figures used. But if account is taken of these factors, the rate of return rises to 8% and 11%, respectively.

The rate of return on the Onibe and Fanandrana Bridges (13%) is roughly as expected at appraisal (16% and 12%, respectively) because the combined cost overrun was largely offset by traffic increases. However,

the rate of return at audit is lower than at appraisal for the Ambanja Bridge (4% versus 9%) because the actual cost was more than double the estimate whereas traffic increased only slightly.

Developmental benefits from the project roads and bridges are difficult to identify precisely, but population and production have increased in the influence areas. In addition, social and administrative links on a year-round basis have been provided, an important factor in a country where regions had remained largely isolated because of difficult topography.

Due to the limits of the audit, the distribution of project benefits could not be investigated thoroughly, but the system of fixed transport rates which has been introduced on a regional basis would imply that transport enterprises pass on only part of the savings from the investments to producers and consumers. However, a question has arisen recently as to how far the rate regulations are in fact followed.

The IBRD/IDA made a positive contribution to the project by encouraging the Government to: select components of high economic priority; employ consultants for technical assistance; maintain the professional standard and strength of the highway administration; and introduce economic criteria into the selection of investments for the 1969-73 Highway Development Plan.

In retrospect, however, it is doubtful whether the Ambilobe-Ambanja Road should have been included in view of its low expected rate of return (8%) and the risk associated with the project. The audit rate of return is over 10% for this road, which accounts for 54% of the project investment, only under very optimistic assumptions. Given the scarce resources available for investment, a more detailed study of alternatives should have been explored and a more comprehensive study of the main north-south road in the country, of which the Ambilobe-Ambanja Road is one section, should have been made.

The project's impact could have been improved if transport regulation problems had been investigated fully and if more IBRD/IDA supervision had been provided to help avoid some of the design and construction problems.

## PROJECT PERFORMANCE AUDIT REPORT

### MALAGASY REPUBLIC SECOND HIGHWAY PROJECT (LOAN 570-MAG/CREDIT 134-MAG)

#### BACKGROUND

Since independence in 1960, the Government of the Malagasy Republic has been endeavoring to develop viable connections between regions and between widely separated economic and social centers. Development has been impeded, however, by the early stage of economic development, the small size of the regional economy and low population density, as well as by high construction costs due to rugged topography and scarcity of suitable construction materials due to difficult geological conditions. Only earth roads, impassable in rainy weather, have joined the northern and part of the western regions with the rest of the country, and mere trails have linked these regions with the south (see map). The Government has been increasing road investments and maintenance expenditures since 1964, but only a few sections of the primary road network have been brought up to modern standards while inland connections remained poor, road alignments located badly, and structures obsolete.

The Government wished to improve this situation by providing a primary road network to connect the main economic and social centers. Therefore, it decided that roads and bridges should be constructed in the northern, central, and eastern regions where population density as well as agricultural output and potential were highest. In 1966, the Government asked the IBRD/IDA for assistance in preparing a project that would represent the organization's second investment in Malagasy highways. The project was identified by the Permanent Mission in Eastern Africa and comprised construction and paving of two road sections, construction of seven bridges, detailed engineering of four road sections, and feasibility studies of three road sections. In 1967, the Government submitted an application to the IDA for a credit to help finance the project.

Between November 1966 and December 1967, three missions from the Permanent Mission in Eastern Africa visited the country to assist in preparation and to assess the applications. As a result, the Government withdrew applications for three bridges because of insufficient economic justification and initiated a feasibility study for a fourth bridge, to be financed under the ongoing First Highway Project (Credit 90-MAG of 1966 for US\$10 million). In addition, the Government decided that detailed engineering should be carried out on only one of the original four road sections.

In February 1968, a mission from headquarters visited the country to appraise the revised project proposal. Components would be (a) construction and bituminous paving of the Fanjakamandroso-Tsiroanomandidy Road (55 km) and Ambilobe-Ambanja Road (91 km); (b) construction of the Onibe, Fanandrana, and Ambanja Bridges; (c) detailed engineering of the Analavory-Arivotrimamo Road; (d) feasibility studies of the Lac Alaotra-Vavatenina Road; Moramanga-Tamatave Road, and Tananarive-Fianarantsoa Road; and (e) consultants' services for construction supervision of the Ambilobe-Ambanja Road and the three bridges. Supervision of the Fanjakamandroso-Tsiroanomandidy Road would not be included in the project because the Government felt that its Central Technical Service, assisted by the Public Works Laboratory, was qualified to carry out the work. The appraisal mission stated that this arrangement would be adequate.

The road sections and bridges would be constructed on existing primary roads. The Fanjakamandroso-Tsiroanomandidy Road was a section of National Road 1 (RN 1). Construction would improve connections between Tananarive, the capital, and Tsiroanomandidy, an important marketing center in the agriculturally rich midwest. The Ambilobe-Ambanja Road was a section of National Road 6 (RN 6), and construction would improve links with the north, western shore, and central plateau. Both roads would be paved with bitumen.

The Onibe and Fanandrana Bridges would be constructed on National Road 2 (RN 2), linking the main port of Tamatave with areas to the north and south along the eastern coast. The bridges would improve road connections of the port with the hinterland by eliminating bottlenecks because ferries were the only means of crossing the Onibe and Ivondro Rivers. The Ambanja Bridge would be constructed on RN 6 to eliminate the bottleneck at the Sambirano River resulting from use of a collapsible wooden bridge in the dry season and a ferry in the wet season.

Negotiations were held in September 1968. Financing was discussed in detail because IDA replenishment had been delayed and sufficient IDA funds were not available for the project. Therefore, a joint loan/credit was proposed unless timely replenishment occurred. The Malagasy delegation accepted the blend so that the project would not be delayed, but asked that IDA funds be disbursed before IBRD funds. The delegation further obtained an assurance that a proper balance of IBRD/IDA lending would be restored for future projects if and when IDA funds were replenished.

As a consequence of the change in financing, the delegation requested that the costs of detailed engineering (one road section) and feasibility studies (three road sections) be deleted from the project.

The Government intended to approach the UNDP for funds, or, if the UNDP refused, to provide them itself.

In addition to covenants on financing, uses of consultants and contractors, design standards, and vehicle dimensions and axle loads, covenants on highway maintenance and administration were discussed. Regarding the maintenance covenant, the Transportation Projects Department supported a detailed clause. But the Working Party discussed similar cases and decided that a general clause would be sufficient.

Regarding administration, the IBRD/IDA concluded that, considering the good performance of the Malagasy highway services, the draft loan and credit agreements would not contain a provision on strengthening of highway administration. Instead, a supplemental letter provided that the professional standard and strength of highway administration should be maintained at appropriate levels by increasing the number of nationals in professional positions and other technical positions. The letter also provided that national talent should be developed by promoting technical education and training as well as career incentives.

Finally, another supplemental letter required the Government to undertake to introduce economic criteria into the selection of investments for the Five-Year Highway Development Plan of 1969-73.

The agreed components of the Second Highway Project are shown in Table 1. Their cost was estimated at US\$11.5 million (FMG 2,843 million), including contingencies. The foreign exchange component was estimated at 70%, or US\$8 million (FMG 1,990 million). An IBRD loan of US\$3.5 million and an IDA credit of US\$4.5 million were provided to cover the foreign exchange cost. The loan was for a 30-year term, including 10 years of grace, at 7% interest, and the credit was for the usual terms. Lending documents were signed on November 12, 1968. The loan/credit became effective on April 1, 1969 after an extension from February 1 to allow time for the IBRD/IDA to obtain clarification of the legal opinion from Malagasy authorities.

#### PROJECT IMPLEMENTATION

Bids for construction of the roads were received in August 1968 and for the bridges in October 1968. Contracts for the roads and for consulting services were signed in April 1969. Contracts for the Onibe and Fanandrana Bridges were signed in September 1969 and for the Ambanja Bridge in October 1969. The long time span between receipt of bids and signing of contracts was because of the Government's delay over studying the bids. Construction was largely completed in December 1972. The closing date

of December 31, 1972 was met for the credit, but extended one year for the loan because of construction delays on the Ambilobe-Ambanja Road and on the Ambanja Bridge. At appraisal, construction contracts had been expected to be awarded around the end of 1968 and work to be started in April 1969 and completed by the end of 1971. The names of firms selected as well as estimated and actual completion dates are shown in Table 1.

Fanjakamandroso-Tsiroanomandidy Road (RN 1)

The contractor, who had a good reputation, had to overcome difficulties with construction on National Road 4 (RN 4) under the First Highway Project before starting construction of this road. These difficulties meant that the contractor's equipment was tied up and could not be transferred to the Fanjakamandroso-Tsiroanomandidy Road as soon as expected. Construction finally was started in November 1969 and was scheduled to be completed within two years, in accordance with the original completion date of April 1971. A field laboratory, financed under the loan/credit, was operated by Government staff to test building materials and soils for this road. Tests on base materials proved them to be of lower quality than expected, and the pavement structure had to be redesigned. Consequently, the contract was amended in June 1970 to include the new design and to reflect a cost increase of about 15%.

Construction was completed satisfactorily in December 1972. Although the last supervision mission stated that construction quality was adequate and no failures were apparent, settlement of the embankment adjacent to the bridge abutments has become evident. This settlement is due to the design of the abutments, which is very economic but requires frequent maintenance. Because of this condition, traffic has to reduce speed substantially.

Ambilobe-Ambanja Road (RN 6)

Construction of this road began in October 1969. In March 1970, a study by the Public Works Laboratory found that local materials were of much lower quality than expected and were not suitable for use as originally designed. Consequently, new materials were investigated and the pavement structure for different road sections was redesigned. Earthworks for some sections also were redesigned as a result of unfavorable climatic conditions during construction. The original contractual completion date of June 1971 was revised to August 1972 in light of the design changes. Work was completed in December 1973 after the contractor had mobilized sufficient new construction equipment.

According to IBRD/IDA supervision missions, work was completed satisfactorily. In fact, however, the quality and finish of the bituminous surface is unsatisfactory. Some potholes have appeared and need to be repaired before

becoming worse. An August/September 1974 mission of the IBRD/IDA asked the Government to investigate the reasons for the failures, to make the necessary repairs promptly, and to watch closely the performance of the road.

### Bridges

Onibe and Fanandrana (RN 2). Three construction alternatives were considered for the two bridges. A two-lane bridge at Onibe and a one-lane bridge at Fanandrana were selected as the most economical solutions. The supervisory consultants analyzed bids for the bridges. After reviewing the analysis with the Government, the IBRD/IDA concurred with the consultants that the contract should be awarded to the lowest bidder.

Construction began on the Onibe Bridge in July 1969 and on the Fanandrana Bridge in January 1970. During construction, imperfections appeared in the quality of the concrete in some prestressed beams (porosity near the cables) and of the bituminous pavement. The imperfections were corrected by the contractor, and the construction quality and finish are satisfactory. Construction of the Onibe Bridge was completed in July 1971 and of the Fanandrana Bridge in July 1972, instead of March 1972 as estimated at contract signing.

Ambanja (RN 6). Bidding was on a design-construction basis, and bids were received for truss-type and suspended span-type bridges. Although costs were lower for the suspended-span type than for the truss-type, the latter was selected because the former was technically unacceptable. The supervisory consultants also analyzed the bids for this bridge. Construction began in May 1970. Delays occurred because the consultants had to redesign the steel structure to meet wind loading requirements and because changes in the European steel market resulted in slow supply. In June 1971, the contract was amended, extending the completion date from June 1971, estimated at contract signing, to August 1972. Work was completed in September 1973, and the construction quality and finish are satisfactory.

### Consulting Services

According to supervision reports, the quality of construction supervision of the Fanjakamandroso-Tsiroanomandidy Road by Government staff was satisfactory as were the quality, qualifications, and experience of the consultants supervising construction of the Ambilobe-Ambanja Road and Onibe, Fanandrana, and Ambanja Bridges. The consultants' cooperation with Government staff was good. Due to construction delays on the Ambilobe-Ambanja Road and on the Ambanja Bridge, the contract for consulting services was extended from October 1971 to November 1972. Services were completed in December 1972.

### PROJECT COSTS

The actual project cost of US\$15.2 million (FMG 3,676 million) represents an increase of 32% in foreign currency terms and 29% in local currency terms over the US\$11.5 million (FMG 2,843 million) appraisal estimate which included contingencies. The difference is the result of fluctuations in the exchange rate of the United States dollar against the Malagasy franc. To avoid complications due to these fluctuations, estimated versus actual project costs are shown in local currency in Table 1.

The total cost overrun (excluding contingencies) is about 50%. About 52% of the overrun can be attributed to quantity changes, and 48% to price increases. Therefore quantity increases imply a cost overrun of about 26%, while price increases imply a cost overrun of 24%. The contingencies included in the project cost estimate, 10% for quantities and 5% for prices, were clearly inadequate, particularly those for prices.

The cost overrun was financed in large part by the Government, but savings from the First Highway Project of US\$303,643.40 (FMG 63,153,786) also contributed to the financing.

### ECONOMIC ANALYSIS

Economic justification of the Second Highway Project at appraisal had been based on considerable reductions in transport costs and generation of important developmental benefits. The justification was reevaluated for this audit using actual construction costs, actual traffic figures,<sup>1/</sup> and new estimates of savings in vehicle operating costs derived by BCEOM in 1972<sup>2/</sup> (Table 2). These new estimates were based on a detailed empirical study of vehicle operating costs in the Malagasy Republic,<sup>3/</sup> while the appraisal estimates in some cases were just interpolations based on studies in neighboring African countries and were incomplete both with regard to different vehicle types and road conditions. Unfortunately, the information available in the appraisal report does not permit a comparison of

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1/ Future traffic development has been assumed to continue at the same growth rates as stated in the appraisal report. Benefits to normal traffic have been valued at 100% of road user savings and benefits to induced traffic at 50% of road user savings.

2/ BCEOM, Feasibility Study of the Antsohihy-Ambanja Road, July 1972.

3/ Taking into account traffic composition, load factors, vehicle lifetime, insurance premiums, etc.



vehicle operating costs with the new BCEOM estimates, mainly because relevant information is lacking or different vehicle types are indicated. The new BCEOM estimates seem to be more reliable than the appraisal estimates; they have therefore been used in the estimation of the audit rate of return.<sup>1/</sup>

The proportion of the total investment devoted to each project component and a comparison of rates of return as estimated at appraisal and at audit are:

	Proportion of Total Investment %	Rate of Return	
		Appraisal Estimate ----- % -----	Audit Estimate
Fanjakamandroso- Tsiroanomandidy Road	28	13	21
Ambilobe-Ambanja Road	54	8	) 6 - 8 <sup>/a</sup> ) 8 - 11 <sup>/b</sup>
Onibe Bridge	) ) 12	16	) ) 13
Fanandrana Bridge	)	12	)
Ambanja Bridge	6	9	4

<sup>a/</sup> Based on BCEOM's figures of vehicle operating costs.

<sup>b/</sup> Based on figures used for the appraisal of the proposed Fourth Highway Project.

Cost overrun percentages are shown in Table 1 and average daily traffic in 1972 and 1973, in Table 3.

The economic rate of return for the Fanjakamandroso-Tsiroanomandidy Road estimated at audit (21%) is well above that at appraisal (13%) because the cost overrun (11%) was compensated by a substantial traffic increase<sup>2/</sup> - 437 vehicles per day (vpd) in 1972 versus 140 vpd projected at appraisal.<sup>2/</sup>

<sup>1/</sup> Yet another set of estimates of vehicle operating costs has been recently prepared by the Bank in connection with the appraisal of the proposed Fourth Highway Project. These estimates are based on SETEC's "Etudes de Factibilite Routiere." A direct comparison between these and the BCEOM estimates is also difficult because of the different vehicle types used and the fact that the two estimates refer to different years. However, since these new estimates indicate higher cost savings than the BCEOM study, both estimates have been applied in the audit of the Ambilobe-Ambanja Road, which has the lowest return.

<sup>2/</sup> The difference between actual and projected traffic is probably because existing traffic on the road was underestimated at appraisal, as indicated by more elaborate traffic counts now available, and because the effects on traffic of linking a departmental administrative center (Tsiroanomandidy) with the capital may genuinely have been underestimated. The actual traffic increase, as compared with the base year figures, essentially related to passenger traffic.

On the Ambilobe-Ambanja Road, the difference between the audit rate of return (6%-8% and 8%-11%, depending on the figures used) and the appraisal estimate (8%), is the consequence of higher oil prices and of traffic increases that will probably follow improvement of the southern link from Ambanja to Antsohihy. If these factors are not taken into account, the substantial cost overrun (52%) together with the traffic level close to appraisal expectations (201 vpd in 1972, only slightly above the 195 vpd appraisal estimate), results in a rate of return of 6% and 8%, depending on the figures used. But if these factors are taken into account, the rate of return rises to 8% and 11%, respectively.

For the Onibe and Fanandrana Bridges, the audit estimate of a 13% combined rate of return on construction is in the range of the appraisal estimates of 16% and 12%, respectively. This was because the combined cost overrun (28%) was largely offset by traffic increases (in 1972, on Onibe Bridge, 306 vpd versus 260 vpd projected and on Fanandrana Bridge, 173 vpd versus 120 vpd projected). The estimated return of 4% at audit on construction of the Ambanja Bridge is considerably below the 9% at appraisal because the actual cost was more than double the estimate (211%) whereas traffic increased only slightly (in 1972, 147 vpd versus 135 vpd projected).

In 1973, about two-thirds of traffic on the project roads and bridges was composed of cars and buses and one-third, pickups, trucks, and trailers (Table 4). For the Fanjakamandroso-Tsiroanomandidy Road, this conflicted with appraisal expectations that cattle production would increase significantly and that large cattle trailers would comprise an important share of new traffic from Tsiroanomandidy to market in Tananarive. These expectations were not realized because cattle production did not increase as expected due to new cattle diseases and government restrictions on cattle export and, therefore, trailer traffic could not develop. In 1972, of the 58,400 cattle transported from Tsiroanomandidy to Tananarive, 35,400 were on hoof for the entire distance, 22,400 on hoof part of the distance and in trailers for the rest, and 600 in 10-ton trucks for the entire distance.<sup>1/</sup>

The preponderance of cattle transport on hoof between Tsiroanomandidy and Tananarive has resulted because of the freight rate structure and the poor condition of the Analavory-Arivotrimamo section, which was not improved under the project. Freight rates are structured so that truck transport is profitable only if return freight from Tananarive to Tsiroanomandidy can be guaranteed. With transport heavily in the direction of Tananarive, many small firms cannot guarantee return freight and are charged one-way rates that are 60%-70% higher than when return freight is guaranteed. Consequently, the freight rate charges make truck transport of cattle from Tsiroanomandidy to Tananarive unprofitable for firms that cannot guarantee return freight. As to the condition of the Analavory-Arivotrimamo section, its narrow and winding alignment prohibits use by cattle trailers. Only 10-ton trucks operating at slow speed and high cost can maneuver on it.

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<sup>1/</sup> Even if all of the cattle had been transported the entire distance in trucks, only about 8 trucks/day would have been needed.

Detailed engineering and construction of this section were included in the Third Highway Project (Loan 876-MAG/Credit 351-MAG of 1973 for US\$30 million). However, because of substantial cost overruns the design standards have been revised and the completion of the works is included in the proposed Fourth Highway Project, which was appraised in April 1975.

In regard to the appraisal expectation that the project roads and bridges would contribute to the economic development of the areas in which they were located, population and production have increased in those areas, but the amount of the increases attributable to the investments is difficult to identify precisely. Another important contribution of the roads and bridges has been to provide social and administrative links on a year-round basis between areas of the country that had been seasonally isolated, an impact reflected in the larger than expected growth in car and bus traffic.

Although the distribution of project benefits could not be investigated thoroughly due to the limits of the audit, indications are that part of the benefits from the investments have not been passed on to producers and consumers. This is as a result of a system of fixed transport rates, introduced in April 1969 by the Government in the Province of Diego Suarez (site of the Ambilobe-Ambanja Road and Ambanja Bridge).<sup>1/</sup> Under this system, freight rates and passenger fares on paved roads were set 20% and 33% lower, respectively, than on earth roads. But these differentials are much lower than the savings in vehicle operating costs under the same circumstances (Table 2). As a consequence, transport enterprises would seem to pass on only part of the savings to producers and consumers. At present, the Government is aware that certain anomalies exist in the sector and intends to carry out a study of the transport regulation in the country.

#### ROLE OF THE IBRD/IDA

The IBRD/IDA played an important role in the Second Highway Project. It encouraged the Government to select components of high economic priority for financing with scarce resources and to postpone others. It also convinced the Government to supplement the capacity of the Roads Department with consulting services, which provided technical assistance. In addition, it encouraged the Government to maintain the professional standard and strength of the highway administration by increasing the number and training of nationals. Finally, the IBRD/IDA influenced the Government to introduce economic criteria into the selection of investments for the 1969-73 Highway Development Plan.

In retrospect, however, the IBRD/IDA should have paid closer attention to transport regulation in the country. For example, a study

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<sup>1/</sup> Some question has arisen recently as to how far these regulations are actually followed, so that the industry may be more competitive and benefits more widely disseminated than the regulations suggest.

should have been made of the establishment of the structure of rates and fares applied in the Province of Diego Suarez. This maybe significant now insofar as the Government is apparently thinking of imposing fixed rates throughout the country. Also, the IBRD/IDA could have looked in more detail into the transport problems in the Tsiroanomandidy-Tananarive corridor, where the Tsiroanomandidy-Fanjakamandroso and Analavory-Arivotrimamo sections are located. Preparation of detailed engineering for the latter was included in the original proposal by the country, but withdrawn when not enough IDA funds were available. The work was finally carried out under the Third Highway Project four years later.

Eight supervision missions were mounted between loan/credit signing and the final closing date, or an average of one every nine months. Given the IBRD/IDA's awareness that investment in the project was risky, more frequent supervision would have been expected, especially in 1970 and 1971 (only one visit was made in each of these years when major design and construction problems occurred). This probably would have resulted in more advice being provided, which could have reduced delays in contract awards and construction, as well as more on-site inspections being made, which could have identified possible construction defects. However, although more on-site inspections were not within the capacity of IBRD/IDA, the problems should have been noted by supervision missions.

One aspect of the project that supervision missions apparently did not follow up thoroughly was the Government's progress in increasing technical education and training programs as well as career incentives in highway administration.

### CONCLUSIONS

Construction of the roads and bridges under the Second Highway Project has been successfully completed, but with a 29% cost overrun in local currency terms due to design difficulties, construction delays, and price increases. These elements, as well as changes in traffic from expectations, are reflected in the discrepancy between the range of the rates of return on the individual components at audit (4%-21%) and at appraisal (8%-16%). The cost overrun suggests that the 5% allowance at appraisal for price increases was inadequate.

In retrospect, it is doubtful whether the Ambilobe-Ambanja Road should have been included in view of the low expected rate of return (8%) and the risk associated with the project. As it turned out, the audit rate of return is over 10% for this road, which accounts for 54% of the total project investment, only under very optimistic assumptions. Given

the scarce resources available for investment, a more detailed study of alternatives should have been explored and a more comprehensive study of RN 6, which was intended to provide an all-weather link between Diego Suarez and the rest of the island, probably should have been made. The Ambilobe-Ambanja Road is just one link in that road and failure to improve other sections has prevented further traffic growth. In addition, transport regulation problems should have been investigated fully as existing regulations will already reduce the potential impact of some of the investments. Finally, more supervision should have been provided by the IBRD/IDA to help avoid design and construction problems.



PROJECT PERFORMANCE AUDIT REPORT

TABLE 1

MALAGASY REPUBLIC SECOND HIGHWAY PROJECT (LOAN 570-MAG/CREDIT 134-MAG)

Project Costs, Completion Dates, and Contractors/Consultant

<u>Project Component</u>	<u>Cost /1</u>			<u>Completion Date</u>		<u>Contractor/Consultant</u>
	<u>Estimated /2</u> -----FMG million-----	<u>Actual</u>	<u>Overrun</u> %	<u>Estimated at</u> <u>Contract Signing</u>	<u>Actual</u>	
Construction and Bituminous Paving: Fanjakamandroso-Tsiroanomandidy Road	907	1,006	11	April 1971	December 1972	Société des Grandes Travaux de l'Est (SGTE) and Nationale de Terrassements, Routes et Ouvrages d'Art (CITROA)
Ambilobe-Ambanja Road	1,239	1,881	52	Original Contract: June 1971 Amended: August 1972	December 1973	Murri Frères
Construction:						
Onibe Bridge	171 )	)	)	March 1972	July 1971	SGTE
Fanandrana Bridge	153 )	) 324	) 416	March 1972	July 1972	SGTE
Ambanja Bridge	92	194	111	Original Contract: June 1971 Amended: August 1972	September 1973	Société de Construction des Batignolles
Consultants' Services	146	179	23	Original Contract: October 1971 Amended: November 1972	December 1972	Rhein - Ruhr Ingenieure Gesellschaft MBH
Price Contingency	135	-	-			
Total	<u>2,843</u>	<u>3,676</u>	29			

/1 Shown in local currency only to eliminate the influence of exchange rate fluctuations.

/2 Physical contingencies have been added to the estimated cost of each component.

Sources: Ministry of Public Works, Directorate of Public Works, Central Technical Service, Progress Reports, and IBRD/IDA Supervision Reports.

TABLE 2

## PROJECT PERFORMANCE AUDIT REPORT

MALAGASY REPUBLIC SECOND HIGHWAY PROJECT (LOAN 570-MAG/CREDIT 134-MAG)

Vehicle Operating Costs

<u>Vehicle</u>	<u>Road Surface</u>		<u>Savings</u>	
	<u>Earth</u>	<u>Paved</u>	<u>per Vehicle-km</u>	
	<u>FMG per vehicle-km</u>		<u>FMG</u>	<u>%</u>
Cars	25.6	15.7	9.9	39
Buses	64.3	35.7	28.6	44
Pickups 1-3.5 tons	13.3	9.8	3.5	26
Trucks 3.5-10 tons	52.5	33.7	18.8	36
Trucks Over 10 tons	105.0 <sup>/1</sup>	52.3	52.7	50
Trailers	157.5 <sup>/1</sup>	93.3	64.2	41

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<sup>/1</sup> Estimates.

Source: BCEOM, Feasibility Study of the Antsohihy-Ambanja Road,  
July 1972.



PROJECT PERFORMANCE AUDIT REPORTMALAGASY REPUBLIC SECOND HIGHWAY PROJECT (LOAN 570-MAG/CREDIT 130-MAG)Average Daily Traffic, 1972 and 1973

<u>Project Component</u>	<u>1972</u>		<u>1973</u>
	<u>Estimated</u>	<u>Actual</u>	<u>Actual</u>
	<u>-----vehicles per day-----</u>		
Fanjakamandroso-Tsircanomandidy Road (RN 1)	140	437 / <sup>1</sup>	437
Ambilobe-Ambanja Road (RN 6)	195	201 / <sup>1</sup>	201
Onibe Bridge (RN 2)	260	306	347
Fanandrana Bridge (RN 2)	120	173	170 / <sup>2</sup>
Ambanja Bridge (RN 6)	135	147 / <sup>1</sup>	147

/1 Traffic counts were made on RN 1 and RN 6 in 1971 and 1973. The figures shown for 1972 are from the 1973 count. They were not reduced by an annual growth factor because traffic in 1971 was higher than in 1973.

/2 Post No. 17A.

PROJECT PERFORMANCE AUDIT REPORT

MALAGASY REPUBLIC SECOND HIGHWAY PROJECT (LOAN 570-MAG/CREDIT 134-MAG)

Traffic Composition, 1973

<u>Project Component</u>	<u>Cars</u>	<u>Buses</u>	<u>Pickups 1-3.5 tons</u>	<u>Trucks 3.5-10 tons</u>	<u>Trucks Over 10 tons</u>	<u>Trailers</u>	<u>Total</u>
Fanjakamandroso-Tsiroanomandidy Road	35	32	16	17	0	0	100 <u>/1</u>
Ambilobe-Ambanja Road	42	21	21	13	1	2	100 <u>/2</u>
Onibe Bridge	59	8	18	9	3	3	100 <u>/3</u>
Fanandrana Bridge	35	23	21	21	0	0	100 <u>/4</u>
Ambanja Bridge	63	12	17	6	0	2	100 <u>/5</u>

/1 Based on figures of first and second traffic counting campaign and extrapolated from previous years for the third campaign.

/2 Post No. 8D, halfway between Ambilobe and Ambanja.

/3 Post No. 9A, the first counting post north of the bridge.

/4 Post No. 17A.

/5 Post No. 12D, the first counting post south of the river.

# MALAGASY REPUBLIC HIGHWAY SYSTEM

