

Document of
The World Bank

FILE COPY

FOR OFFICIAL USE ONLY

Report No. 2545

PROJECT PERFORMANCE AUDIT REPORT

RWANDA FIRST, SECOND AND THIRD HIGHWAY PROJECTS

(CREDITS 196-RW, 196-1-RW, 299-RW AND 475-RW)

June 13, 1979

Operations Evaluation Department

This document has a restricted distribution and may be used by recipients only in the performance of their official duties. Its contents may not otherwise be disclosed without World Bank authorization.

PROJECT PERFORMANCE AUDIT REPORT

RWANDA FIRST, SECOND AND THIRD HIGHWAY PROJECTS
(CREDITS 196-RW, 196-1-RW, 299-RW AND 475-RW)

Table of Contents

	<u>Page No.</u>
<u>PREFACE</u>	iv
<u>PROJECT PERFORMANCE AUDIT BASIC DATA SHEETS</u>	v-vii
<u>HIGHLIGHTS</u>	viii
<u>PROJECT PERFORMANCE AUDIT MEMORANDUM</u>	
<u>I. Background</u>	1
<u>II. Project Results</u>	2
1. The First Highway Project	2
2. The Highway Maintenance Project	4
3. The Third Highway Project	5
<u>III. Main Issues</u>	6
1. Inadequate Project Preparation	6
2. Highway Maintenance Program	8
3. Loan Covenants	8
<u>IV. Conclusions</u>	9
<u>ATTACHMENT I - PROJECT COMPLETION REPORT, CREDITS 196-RW and 196-1-RW</u>	
I. Introduction	10
II. Project Appraisal	11
III. Project Execution	11
A. Completion of Road Design and Bidding	11
B. Road Construction	12
C. Evolution of the Construction Contract Cost	14
D. Purchase of Road Maintenance Equipment	17
E. Modification of Project Contents	17
F. Financing and Disbursements	18
G. Performance of Contractor, Consultants and Borrower	19

	<u>Page No.</u>
IV. Economic Reevaluation	20
A. Appraisal Expectations	20
B. Developments since Appraisal	21
C. Recalculation of Rate of Return	21
V. Observance of Credit Covenants	22
VI. Role of Association	22
VII. Conclusions	23

ANNEXES

I. Amendments of Project Contents	24-25
II. List of Projects' Goods and Disbursements	26
III. Disbursements Summary as of 3/31/78	27
IV. Kigali-Gatuna Average Daily Traffic	28
V. Economic Vehicle Operating Costs: Kigali-Gatuna	29
VI. Recalculation of Economic Return: Kigali-Gatuna	30

ATTACHMENT II - PROJECT COMPLETION REPORT, CREDIT 299-RW

I. Background	31
II. Project Preparation and Appraisal	31
III. The Project	32
IV. Cost Estimates and Finance	33
V. Project Implementation	34
A. Implementation Progress	34
B. Technical Assistance	34
C. Procurement of Equipment	35
D. Workshops	35
E. Reorganization of DRB	36
F. Training	37
G. Road Maintenance and Improvement	38
H. Cost of the Project	39
I. Disbursement	40
J. Observance of Credit Covenants	40
K. Performance of Consultant and Borrower	41
VI. Economic Reevaluation	41
A. Prior Justification	41
B. Development since Appraisal	42
C. Recalculation of Rate of Return	42
VII. Conclusions	43

ANNEXES

I. Equipment Procured under the Project	44
II. Mechanized Road Improvement and Maintenance Units	45
III. Regravelling and Improvement Program and Progress	46
IV. Disbursement Summary as of July 31, 1978	47
V. Average Daily Traffic	48
VI. Economic Vehicle Operating Costs	49
VII. Recalculation of Economic Return	50

ATTACHMENT III - PROJECT COMPLETION REPORT, CREDIT 475-RW

I. Introduction	51
II. Project Preparation	51
III. Project Appraisal	52
IV. Project Implementation	53
A. Completion of Detailed Engineering	53
B. Civil Works	54
C. Cost of Works	54
D. Technical Assistance and Training	55
E. Engineering of Kigali-Ruhengeri-Cyanika Road	56
F. Review of Design of the Kigali-Gatuna Road	56
G. Changes in Project Contents	56
H. Financing and Disbursements	57
V. Performance of Contractor, Consultant and Borrower	58
VI. Economic Re-evaluation	58
VII. Observance of Credit Covenants	60
VIII. Role of the Association	60
IX. Conclusion	61

ANNEXES

I. Ruhengeri-Gisenyi Road - Design Standards and Road Descriptions	62
II. Progress of Improvement, Ruhengeri-Gisenyi Road	63
III. Modifications of Project Contents	64-65
IV. Disbursement Summary as of December 31, 1977	66
V. Economic Vehicle Operating Costs	67
VI. Recalculation of Economic Return	68

MAPS

Rwanda, International Transport Connection (IBRD 2830R4)
Rwanda (Third Highway Project), Main Road Network (IBRD 10473)
Rwanda (Highway Maintenance Project), Main Road Network
(IBRD 2809R3)

PROJECT PERFORMANCE AUDIT REPORT

RWANDA FIRST, SECOND AND THIRD HIGHWAY PROJECTS
(CREDITS 196-RW, 196-1-RW, 299-RW AND 475-RW)

Preface

This report presents a performance audit of three highway projects in Rwanda. The First Highway Project was supported by Credit 196-RW for US\$9.3 million and by Supplemental Credit 196-1-RW for US\$9.5 million. Credit 196-RW was closed fully disbursed in December 1977 and Credit 196-1-RW is almost fully disbursed with a small balance of US\$0.3 million which is expected to be disbursed by September 1979. The Highway Maintenance Project supported by Credit 299-RW for US\$3.0 million was closed fully disbursed in December 1978 and the Third Highway Project supported by Credit 475-RW for US\$6.3 million was closed fully disbursed in December 1977. The audit memorandum is based on the three Project Completion Reports (PCRs) - Attachments I, II and III - prepared by the Bank Group's Eastern Africa Regional Office, discussions with Bank staff, review of project files and the minutes of the Board of Executive Directors' meetings which considered the projects.

An OED mission visited Rwanda in November 1978 to discuss the issues related to the project with the Borrower. Particular points made by the Borrower relate to the reorganization of maintenance work, the difficulty experienced in providing counterpart funds, the growth of traffic along the project roads and their development impact. These views have been reflected in the audit memo. In addition, a draft version of this report was sent to the Borrower for comment but no reply was received. The assistance provided by the Government of Rwanda is gratefully acknowledged.

The audit has reservations on some of the PCR's conclusions and it adds some analysis of the difficulties encountered during implementation especially on the consequences of inadequate project preparation. It also expands on the difficulties in achieving the road maintenance objectives and on the realism of some loan covenants and comments on traffic growth and the road as a catalyst to development.

PROJECT PERFORMANCE AUDIT BASIC DATA SHEET
FIRST HIGHWAY PROJECT (CREDIT 196-RW AND 196-1-RW)

KEY PROJECT DATA

Item	Original Plan	Actual or Current Estimate
Total Project Cost (US\$ million)	10.9	28.1 /a
Overrun (X)		157
Credit Amount (US\$ million)		19.0 /b
Disbursed Cr. 196-RW		9.47/b
Cr. 196-1-RW		9.3
Undisbursed Cr. 196-RW	As of 5/31/79	-
Cr. 196-1-RW		0.2
Repaid		-
Outstanding Cr. 196-RW		9.47/b
Cr. 196-1-RW		9.3
Date Physical Components Completed	04/73	10/31/77
Proportion Completed by Above Date (X)	43	100
Proportion of Time Overrun (X)		95
Economic Rate of Return (X)	13	13

Cumulative Estimated and Actual Disbursements
(US\$ Million)

	FY71	FY72	FY73	FY74	FY75	FY76	FY77	FY78	FY79
(i) Estimated	1.6	5.6	8.9	9.3	9.3	13.7	17.3	18.8	19.0
(ii) Actual	0.2	0.4	2.2	5.7	9.3	12.2	17.8	18.2	18.8
X of (ii) to (i)	12.5	7.1	24.7	61.3	100.0	89.1	102.8	96.8	98.9

OTHER PROJECT DATA

Item	Credit 196-RW		Supplemental Credit 196-1-RW	
	Original Plan	Actual	Original Plan	Actual
First Mention in Files	-	-	-	-
Government's Application	-	-	-	-
Negotiations	-	4/28/70	-	12/75
Board Approval	-	6/11/70	-	12/75
Credit Agreement	-	6/17/70	-	12/19/75
Effectiveness	9/15/70	9/14/70	-	2/18/76
Closing Date	9/30/74	12/31/77	-	9/30/79
Borrower	Republic of Rwanda			
Executing Agency	Ministry of Public Works			
Fiscal Year of Borrower	January 1 to December 31			
Follow-on Project	Third Highway Project (Credit 475-RW)			

Item	Month/Year	No. of Weeks	No. of Persons	Manweeks	Date of Report
Appraisal	12/69	1.1	2	1.1	12/23/69
Supervision 1	11/70	.1	1	.1	11/30/70
Supervision 2	11/70	.4	2	.8	12/17/70
Supervision 3	04/71	.6	1	.6/c	06/10/74
Supervision 4	02/72	.6	1	.6	03/06/72
Supervision 5	07/72	.7	1	.7	08/16/72
Supervision 6	01/73	1.4	2	2.8/c	02/23/73
Supervision 7	03/73	1.5	3	4.7/d	04/23/73
Supervision 8	03/74	1.9	1	1.9/d	Not in files
Supervision 9	08/74	.7	1	.7/d	Not in files
Supervision 10	11/74	1.5	3	4.4	01/16/75
Supervision 11	02-03/75	1.5	1	1.5/d	04/25/75
Reappraisal	05/75	3.0	3	9	06/25/75
Supervision 12	11/75	1.4	1	1.4/d	01/12/76
Supervision 13	02/76	1.4	1	1.4/d	04/12/76
Supervision 14	06/76	1.7	2	3.4/e	08/02/76
Supervision 15	12/76	1.3	1	1.3/d	01/28/78
Supervision 16	03-04/78	2.7	2	5.4/f	05/05/78
Supervision 17	06/78	0.9	1	0.9/g	07/12/78

COUNTRY EXCHANGE RATES

Name of Currency	Rwanda Franc (FRW)
Appraisal Year Average	US\$1 = FRW 92.59
Intervening Years	
Average	US\$1 = FRW 92.11
Completion Year	US\$1 = FRW 92.08

- /a Including Saudi Development Fund Loan participation of US\$4.41 million and Belgian contribution of US\$1.0 million for local costs.
 /b Includes exchange adjustment of US\$170,000.
 /c Includes time spent on preparation of Highway Maintenance Project.
 /d Includes supervision of Second and Third Highway Projects.
 /e Includes supervision of Second and Third Highway Projects, preparation of a Fourth Highway Project and a Transport Sector Memo.
 /f Includes supervision of Second, Third and Fourth Highway Project.
 /g Includes supervision of the Fourth Highway Project.

PROJECT PERFORMANCE AUDIT BASIC DATA SHEET

HIGHWAY MAINTENANCE PROJECT (CREDIT 299-RW)

KEY PROJECT DATA

<u>Item</u>	<u>Original Plan</u>	<u>Actual or Current Estimate</u>
Total Project Cost (US\$ million)	5.1	7.2
Overrun (%)	-	41
Credit Amount (US\$ million)	3.0	3.0
Disbursed)	-	3.0
Undisbursed)	-	-
Repaid) As of May 31, 1979	-	-
Outstanding)	-	3.0
Date Physical Components Completed	6/76	12/77
Proportion Completed by Above Date (%)	75	100
Proportion of Time Overrun (%)		25
Date Physical Components Completed	6/76	12/77
Proportion Completed by Above Date (%)	75	100
Proportion of Time Overrun (%)		25
Economic Rate of Return (%)	28	27

Cumulative Estimated and Actual Disbursements
(US\$ Million)

	<u>FY73</u>	<u>FY74</u>	<u>FY75</u>	<u>FY76</u>	<u>FY77</u>	<u>FY78</u>	<u>FY79</u>
(i) Estimated	0.8	1.7	2.5	2.9	3.0	3.0	3.0
(ii) Actual	-	0.01	0.4	2.5	2.8	2.95	3.0
% of (ii) to (i)	-	0.6	16.0	86.2	93.3	98.3	100.0

OTHER PROJECT DATA

<u>Item</u>	<u>Original Plan</u>	<u>Actual</u>
First Mention in Files or Timetables		11/16/66
Negotiations		01/24/72
Board Approval		03/21/72
Credit Agreement		04/19/72
Effectiveness		01/15/73
Closing Date	12/31/76	12/31/78
Borrower	Republic of Rwanda	
Executing Agency	Ministry of Public Works	
Fiscal Year of Borrower	January 1 to December 31.	

MISSION DATA

<u>Item</u>	<u>Month/Year</u>	<u>No. of Weeks</u>	<u>No. of Persons</u>	<u>Manweeks</u>	<u>Date of Report</u>
Preparation	06/71	.3	1	.3	6/10/70
Appraisal	07/71	2.0	3	6.0	03/07/72
Supervision 1	01/73	1.4	2	2.8/a	02/23/73
Supervision 2	03/73	1.5	3	4.7/b	04/23/73
Supervision 3	03/74	1.9	1	1.9/b	Not in files
Supervision 4	06/74	1.1	1	1.1	07/19/74
Supervision 5	08/74	1.7	1	1.7/b	Not in files
Supervision 6	02-03/75	1.5	1	1.5/b	04/25/75
Reappraisal	05/75	1	3	3	06/25/75
Supervision 7	11/75	1.4	1	1.4/b	01/12/76
Supervision 8	02/76	1.4	1	1.4/b	04/12/76
Supervision 9	06/76	1.7	2	3.4/c	08/02/76
Supervision 10	12/76	1.3	1	1.3/b	01/28/77
Supervision 11	03-04/78	2.7	2	5.4/d	05/05/78

COUNTRY EXCHANGE RATES

Name of Currency	Rwanda Franc (FRW)
Appraisal Year Average	US\$1 : FRW 92.0
Implementation Years	US\$1 : FRW 92.11
Completion Year	US\$1 : FRW 92.08

/a Includes supervision of First Highway Project and preparation of the Third Highway Project.

/b Includes supervision of First and Third Highway Projects.

/c Includes supervision of First and Third Highway Projects, preparation of a Fourth Highway Project and a Transport Sector Memo.

/d Includes supervision of First, Third and Fourth Highway Projects.

PROJECT PERFORMANCE AUDIT BASIC DATA SHEET

THIRD HIGHWAY PROJECT (CREDIT 475-RW)

KEY PROJECT DATA

Item	Original Plan	Actual or Current Estimate
Total Project Cost (US\$ million)	7.7	8.9
Overrun (%)	-	16
Credit Amount (US\$ million)	6.3	6.3
Disbursed)	-	6.3
Repaid) As of May 31, 1979	-	-
Outstanding)	-	6.3
Date Physical Components Completed	4/76	6/77
Proportion Completed by Above Date (%)	30	100
Proportion of Time Overrun (%)		67
Economic Rate of Return (%)	18	18

Cumulative Estimated and Actual Disbursements
(US\$ Million)

	FY75	FY76	FY77	FY78
(i) Estimated	2.7	5.8	6.3	6.3
(ii) Actual	0.9	2.3	6.2	6.3
% of (ii) to (i)	33.3	39.7	98.4	100.0

OTHER PROJECT DATA

Item	Original Plan	Actual
First Mention in Files or Timetables		11/16/66
Government's Application		1966
Negotiations		11/08/73
Board Approval		05/28/74
Credit Agreement		06/05/74
Effectiveness		10/14/74
Closing Date	6/30/77	12/31/77
Borrower	Republic of Rwanda	
Executing Agency	Ministry of Public Works	
Fiscal Year of Borrower	January 1 to December 31	
Follow on project	Fourth Highway Project (Credit 769-RW)	

MISSION DATA

Item	Month/Year	No. of Weeks	No. of Persons	Manweeks	Date of Report
Identification	11/72	1	2	2	11/22/72
Preparation	01/73	1.4	2	2.8/a	02/23/73
Appraisal 1	03/73	1.5	3	4.7/a	04/23/73
Appraisal 2	03/74	1.9	1	1.9/a	Not in files
Supervision 1	08/74	.7	1	.7/a	Not in files
Supervision 2	02-03/75	1.5	1	1.5/a	04/25/75
Reappraisal	05/75	1	3	3	06/25/75
Supervision 3	11/75	1.4	1	1.4/a	01/12/76
Supervision 4	02/76	1.4	1	1.4/a	04/12/76
Supervision 5	06/76	1.7	2	3.4/b	08/02/76
Supervision 6	12/76	1.3	1	1.3/a	01/28/77
Supervision 7	03-04/78	2.7	2	5.4/c	05/05/78

COUNTRY EXCHANGE RATES

Name of Currency	Rwanda Franc (FRW)
Appraisal Year Average	US\$1 = FRW91.14
Implementation Years	
Average	US\$1 = FRW92.11
Completion Year	US\$1 = FRW92.08

/a Includes supervision of First and Second Highway Projects.

/b Includes supervision of First and Second Highway Projects, preparation of a Fourth Highway Project and a Transport Sector Memo.

/c Includes supervision of First, Second and Fourth Highway Projects.

PROJECT PERFORMANCE AUDIT REPORT

RWANDA FIRST, SECOND AND THIRD HIGHWAY
PROJECTS (CREDITS 196-RW, 196-1-RW, 299-RW AND 475-RW)

Highlights

The First, Second and Third Highway Projects were among the first Bank Group operations in Rwanda, a landlocked country with one of the world's lowest per capita GNPs. The road works financed by these IDA credits have been implemented with considerable delays and cost overruns. The reestimated rates of return range between 13%-27%, which are in line with the appraisal estimation. The cost overruns were offset by gasoline price increases - larger vehicle operating cost savings - and much higher traffic than anticipated on the country's road system. (The traffic increase on the major road built under the First Project was particularly large - 6-1/2 times the projected volume.) The projects have helped to substantially improve Rwanda's internal road network which at appraisal consisted largely of unengineered earth or gravel roads. One road will also improve Rwanda's links with neighboring countries and a coastal port once border facilities are constructed.

The execution of the three highway projects experienced many difficulties due mainly to poor project preparation. In one instance, the quality of engineering was inadequate partly because it was rushed (paras. 5, 17-18) and the consultants' performance was unsatisfactory, indicating that they should have been replaced earlier than was the case (para. 18). In another instance, engineering was only partially completed before awarding a contract, and the later completion of engineering led to delay (paras. 14 and 19-21). Finally the objectives of the maintenance project (Credit 299-RW) were too high in view of local constraints and thus were not achieved (paras. 12-13, 22 and 28).

Other points of special interest are:

- failure of traffic to divert to a project road (paras. 7-10 and 27);
- the road as catalyst to regional development (paras. 7-10 and 27); and
- realism of loan covenants (paras. 23-26).

PROJECT PERFORMANCE AUDIT MEMORANDUM

RWANDA FIRST, SECOND AND THIRD HIGHWAY PROJECTS
(CREDITS 196-RW, 196-1-RW, 299-RW AND 475-RW)

I. Background

1. The First, Second and Third Highway Projects were intended to help improve access to neighboring countries and to Rwanda's centers of production and consumption and to assist in strengthening road maintenance. The road network is the principal mode of transport for imports and exports for Rwanda, which is a landlocked country. While this road network is one of the densest in Africa, it consists largely of unengineered earth or gravel roads. IDA and its cofinanciers provided 90% of the estimated costs of these three projects; the high percentage of outside finance was required due to Rwanda's per capita GNP which is one of the world's lowest.

2. The First Highway Project, supported by Credit 196-RW for US\$9.3 million of June 17, 1970 and by supplementary Credit 196-1-RW for US\$9.5 million of December 19, 1975, was the Bank Group's first project in Rwanda. Although Rwanda had been a member of the Bank Group since 1963, it had been difficult to prepare a project suitable for IDA financing earlier; the Government's inexperience with Bank procedures and its decision that it should not borrow for studies had resulted in the earlier abandonment of two potential projects. The project comprised:

- a) construction to paved standard and supervision of the 79 km Kigali-Gatuna Road (the Government of Belgium would contribute 38% of the local cost of construction); and
- b) purchase of maintenance equipment.

The Kigali-Gatuna Road was expected to become the country's main import-export route, linking the capital Kigali with the Ugandan road network and thereby the East African Railway and Port of Mombasa, Kenya (see Map 1).

3. The Second Project for Highway Maintenance, supported by Credit 299-RW for US\$3.0 million of April 19, 1972, was the Bank Group's second project in Rwanda. The Project helped to finance the first phase of an 8-10 year highway maintenance program. The project comprised:

- a) reorganization of maintenance operations and a training program;
- b) purchase of equipment and construction of a workshop;
- c) improvement of routine and periodic maintenance of 2,200 km and betterment and deferred maintenance of 600 km (Attachment II, para. 4).

The Federal Republic of Germany helped to finance 94% of the estimated cost of workshops and the UNDP financed 90% of the cost of consulting services for the project.

4. The Third Highway Project supported by Credit 475-RW for US\$6.3 million of June 5, 1974 helped finance:

- a) completion of engineering, construction and supervision of the 60 km Ruhengeri-Gisenyi Road;
- b) feasibility and detailed engineering of the Kigali-Ruhengeri and Ruhengeri-Cyanika roads (financed by Belgium);
- c) technical assistance to the Directorate of Roads and Bridges (DRB); and
- d) training of maintenance staff.

The Ruhengeri-Gisenyi Road provides access to the densely populated north-western region which produces a major portion of Rwanda's staple crops (potatoes, yams and maize) and also coffee, tea and pyrethrum. Gisenyi is the seat of Rwanda's small industrial sector and a tourist resort.

II. Project Results

1. The First Highway Project

5. All components of the First Highway Project were completed by November 1977 representing a delay of almost four and a half years over the appraisal forecast. Maintenance equipment was delivered toward the end of 1971, almost a year later than expected at appraisal and was used to maintain the Kigali-Kakitumba Road. The delay was caused by some difficulty with the bidding documents but was mainly due to inadequate time allowed for the exercise at appraisal. The Kigali-Gatuna Road was completed four and a half years later than expected at appraisal. This delay was caused by slow mobilization by the contractor, inadequate detailed engineering (particularly inadequate soil investigation which necessitated the redesign of substantial sections of the road (Attachment I, paras. 6-7)), poor performance of the supervising consultant (who had also been responsible for the inadequate engineering) (Attachment I, para. 31), and the Borrower's late decision to alter the alignment of the 16 km Mulindi Valley section in the north to protect agricultural land. By April 1975, costs had more than doubled over the appraisal forecast because of additional works due to poor engineering estimates and price escalation; the shortage of funds brought work to a halt (Attachment I, paras. 8-13). The project was reappraised and work resumed in March 1976 when additional financing was provided by supplemental Credit 196-1-RW for US\$9.5 million. However, in spite of the many design changes made during construction, sections of pavement failed, about 20 m of embankment slipped, and a retaining wall collapsed following heavy rains during the

contractor's one-year maintenance period. These failures were mainly due to the difficult soil conditions which should have been recognized at the time of detailed engineering and to reductions in design standards to save cost. The contractor is correcting these works and the Borrower intends to accept the road shortly. It was suggested to the audit mission that another difficulty may appear in the future on the realigned section on swamp land in the Mulindi Valley where a floating embankment placed on plastic sheets was used, however, this section of the road is presently in good state (Attachment I, para. 13).

6. The total cost of the First Highway Project of US\$426.7 million (FRW 2,546.4 million) represents an overrun in terms of US dollars of 144% over the appraisal estimate including contingencies of US\$10.9 million (FRW 1,090 million) and is in line with the estimate made at reappraisal of US\$26.5 million (FRW 2,441 million).^{1/} The actual cost of construction and supervision was 145% greater than the appraisal estimate including contingencies for a variety of reasons primarily because of increased quantities, the need for additional engineering, price escalation, and because of the delays caused by the late decision to realign the Mulindi Valley section, other engineering work, shortages of fuel and cement imported and transported through the territories of two foreign countries, and insufficient funds. The actual cost of equipment was 13% greater than expected at appraisal because of price escalation.

7. The rate of return on the Kigali-Gatuna Road was estimated at appraisal at 13% while the rate of return estimated in the PCR is 16% (Attachment I, paras. 37-39). The audit considers that the PCR rate of return is somewhat optimistic in that it does not give adequate consideration to the fact that maintenance costs are likely to be far greater because of the poor condition of the road one year after completion. Therefore, taking that into consideration the audit reestimates the rate of return at 13%, the same rate as that estimated at appraisal. The higher than expected costs were offset by the higher overall volume of actual traffic.

8. However, this higher than expected traffic which in 1977 was 654% greater than the appraisal projection, is not comprised of the diverted traffic which was anticipated. Instead, this traffic appears to be largely comprised of local traffic, generated from the road's improvement, a factor which was not considered at appraisal.^{2/} Economic activities have apparently been stimulated by the improvement of the road. These include the establishment or expanded activities of the Kabuye sugar plantation, horticulture at Kajebuva, tea plantations at Mulindi and also rice cultivation and small animal farming.

^{1/} An amount of US\$300,000 will remain in the account of Credit 196-1-RW until September 1979 and may be used for slope stabilization of the Kigali-Gatuna Road.

^{2/} Because of insufficient data, the audit could not determine the proportion of total traffic which is generated; a full benefit with weight of 1.0 has been assumed for all traffic. Thus, the rate of return of 13% may represent some overestimation.

9. The original justification of the Kigali-Gatuna Road was to provide a new route for import/export traffic between Rwanda and Kampala in Uganda, to the Port of Mombasa (Map 1). At appraisal, the Kigali-Gatuna Road was expected to replace the Kigali-Kakitumba Road and thus reduce transport costs as it would be paved and 73 km shorter. In fact, no traffic has diverted from the Kigali-Kikitumba Road to the Kigali-Gatuna Road because border facilities in Uganda have not been constructed and because the road between Gatuna and Kabale (23 km) in Uganda has not been paved. The Ugandan authorities will not permit heavy traffic to use the road in its gravel condition. ^{1/} In view of the above, the audit considers, in contrast to the PCR's conclusion (Attachment I, para. 43), the project's original objective of providing a foreign trade route has not yet been met.

10. In view of these factors, the growth of traffic can be viewed as fortuitous in terms of the appraisal expectation. A careful review of traffic potential at the feasibility study stage might have identified the likely growth patterns of generated and diverted traffic.

2. The Highway Maintenance Project

11. Components of this project were substantially completed in December 1977, a year and a half behind the appraisal schedule of June 1976 (Attachment II, para. 12). The delay was caused by some difficulties in meeting the conditions of effectiveness - appointment of consultants and preparation of a plan of operation - and by the late delivery of equipment arising from slowness in completing specifications. In the end, about half the routine maintenance was undertaken for reasons discussed in paragraph 22.

12. The total actual cost of US\$7.2 million (FRW 663 million) represents an overrun in terms of US dollars of 41% over the appraisal estimate US\$5.1 million including contingencies (FRW 471 million) (Attachment II, paras. 11 and 32). ^{2/} The cost of equipment increased by 39% (Attachment II, para. 16) due to price escalation. The total cost of spares, fuel and materials was only 4% above the appraisal estimate despite price escalation because less than the planned volume of these items was purchased (about 40% less in the case of spares) as less maintenance work was undertaken than envisioned at appraisal. The cost of the workshops increased by 50% due to price escalation and the addition of another workshop at Ruhengeri to the project (Attachment II, para. 18). Finally, the cost of technical assistance was 86% greater than expected at appraisal because the consultant's contract was extended.

^{1/} The Gatuna-Kabale Road was built to gravel standard under the Uganda Second Highway Project (Credit 164-UG) of 1969. The road was to be paved using surplus funds under this Credit; this work has not been done.

^{2/} This actual cost includes amounts of US\$300,000 for maintenance equipment and US\$825,000 for technical assistance financed by an unused portion of Credit 196-1-RW.

13. The reestimated rate of return at audit is 27% compared with the appraisal estimate of 28% (Attachment II, para. 44). Although at appraisal it was expected that betterment works would be carried out on 600 km of roads and improved routine maintenance on 1,600 km, only 340 km were improved and routine maintenance was confined to 1,100 km and was to a lower standard than planned. Traffic growth, however, has been greater than expected since appraisal explaining the still very satisfactory reestimated rate of return despite the large cost overrun and the shortfall in project achievement (Attachment II, paras. 39-44).

3. The Third Highway Project

14. Most components of the Third Highway Project were completed by mid-1977 representing a delay of about one year beyond the appraisal forecast of April 1976. The construction of the Ruhengeri-Gisenyi Road was delayed by slow contractor mobilization and by the long time it took to agree on the base course material to be used since complete final engineering was not done when the contractor was retained and he later disagreed strongly with the consultant's recommendation to use scoriae as base material. The feasibility study of the Kigali-Ruhengeri Road was completed in early 1975. However, the feasibility study of the Ruhengeri-Cyanika Road and detailed engineering of both roads were dropped from the project when funds were nearly exhausted in meeting expenditures on the study of the Kigali-Ruhengeri Road and it became apparent that IDA could not participate in their construction in the near future because of heavy commitments to other projects (Attachment III, paras. 19-20). The technical assistance and training components were also deleted when the cost of constructing the Ruhengeri-Gisenyi Road proved greater than expected and exhausted available funds.

15. The total actual cost of the Third Highway Project of US\$8.9 million (FRW 820 million) represents an overrun in terms of US dollars of 16% above the appraisal estimate of US\$7.7 million (FRW 702 million). Construction and supervision of the Ruhengeri-Gisenyi Road increased by 28% ^{1/} and 70%, respectively, and supplemental design work by 300%. These higher costs resulted mainly from the disagreement over the base material to be used which caused work stoppages and extra compensation for time loss to the contractor while the consultants explored the possibility of using an alternative material, trachytic rock (paras. 20-21). Price escalation also contributed to the higher cost of the Ruhengeri-Gisenyi Road (Attachment III, para. 13). The cost of the study of the Kigali-Ruhengeri Road was US\$400,000. At appraisal the estimated cost of all studies was US\$560,000, but no breakdown was provided for individual studies and therefore a comparison of actual vs. expected cost is not possible.

^{1/} Construction contingencies at appraisal reflecting experience on the Kigali-Gatuna Road were generous, comprising 48% of cost. If contingencies are excluded, the overrun is 90%.

16. The rate of return of the Third Highway Project at appraisal and the reestimated return in the PCR are both 18% (Attachment III, paras. 28-33). In spite of higher than expected construction costs, the value of vehicle operating cost savings has also increased and traffic is in line with the appraisal expectation.

III. Main Issues

1. Inadequate Project Preparation

17. The projects under review were the first Bank Group lending operations in Rwanda which at the time was a newly-independent country with manpower constraints and a fledgling economy. There were areas of mutual unfamiliarity between IDA and the Borrower - the Rwandan Government with IDA project proceedings and the Bank Group with economic and administrative conditions in the country. It is recognized that, in some instances, a first project operation must be undertaken with calculated risk since to wait until all potential problems are studied and resolved might mean an unacceptable delay in commencing development assistance. In view of this, some of the difficulties experienced can be considered as a necessary price to pay in the interest of hastening the development of the country. Indeed, as discussed already, the traffic response to project investments was quite gratifying. Yet, despite these considerations, this audit considers that some of the major difficulties experienced under all these highway projects, i.e., the much longer than expected implementation periods, higher costs and lower achievement of project objectives, could have been prevented or at least reduced through more careful project preparation.

18. In the case of the first project, preparation seems to have been rushed. The Borrower requested that IDA finance construction of the Kigali-Gatuna Road to paved standard. Detailed engineering for a gravel-standard road prepared by consultants did not contain sufficient information and the appraisal team was asked to determine if design standards were appropriate, especially with respect to formation width and pavement, and to collect additional information to assess the economic justification of the road. The appraisal team was apparently satisfied that the engineering was adequate provided some modifications were made. It also determined that paving the road, in spite of low traffic volume of 16 vehicles per day, could be justified on the basis of the heavy traffic expected to divert to the road once it was completed and also because of its geophysical conditions -- mountainous terrain, steep grades and heavy rainfall. Finally, in 1970 both the Borrower and the appraisal team considered that these consultants should be hired to prepare bidding documents and complete engineering, including pavement and bridge design. Therefore, proposals from several firms were not invited since this firm was considered to have a comparative advantage as it had prepared the

original engineering and was already working in Rwanda. The consultants submitted three successive rounds of bidding documents, but IDA was still not satisfied because it considered that soil investigations were inadequate and that the design of the pavement proposed could be reduced to save cost. ^{1/} Neither the nature of the soil difficulties nor action taken by IDA to remedy the situation is adequately recorded in IDA's files. IDA recommended, however, that while the consultants reexamined the paving design, the construction contract could be awarded to expedite the construction process. A year later, the contractor began to experience severe geotechnical difficulties and it became apparent that the detailed engineering and soil investigations were inadequate. The consultants were asked to review the engineering, prepare new cost estimates and a work schedule and also to replace its supervision team with staff more experienced in road construction. However they were unable to do this work in a timely way. Largely as a result of this, the project suffered substantial delay and cost increase which prompted IDA to reappraise the project and provide an additional US\$9.5 million under Supplemental Credit 196-1-RW. It seems that IDA's attempt to expedite this project by proceeding with engineering and soil test about which it had some reservations and by continuing the services of the consultants who were not performing satisfactorily, did not produce the results it expected.

19. The Third Highway Project experienced cost overruns and delays which, while less severe than those under the First Highway Project, might again have been avoided by better preparation. Most of this difficulty arose because only a third of the Ruhengeri-Gisenyi Road had been engineered at appraisal. This engineering, financed by the UNDP, included detailed engineering for 20 km where major changes in horizontal and vertical alignment were necessary and pavement work for the remainder of the road's length (40 km).

20. The project was appraised and negotiations completed by November 1973. In view of the risk associated with political conditions in neighboring countries through which construction supplies, especially fuel, would have to pass, it was decided to postpone credit signature until bids were received. Bids were received in March 1974 and the lowest was 45% over the estimate due to the logistics problem and the oil crisis. The credit, while negotiated, had still not been signed; the credit amount was increased from US\$3.4 million to US\$5.3 million. Several weeks later an IDA mission visited Rwanda. According to IDA records, this mission was the first to raise concern over the fact that only a third of the road had been engineered (about 20 km against the total length of 60 km) which it felt had an adverse impact on the appraisal cost estimates. The mission noted that the contingency to cover supply risk and the amount allowed for consultants' services were inadequate, considering that the engineering on two-thirds of the road's length was yet to be completed. Consequently, the mission recommended that the amount of the credit be increased further to US\$6.3 million and that engineering be completed; the Credit Agreement for this amount was finally signed in May 1974.

^{1/} As it turned out, the contractor later recommended that a triple surface treatment rather than the double surface proposed by the consultants be used. This recommendation was accepted after several test sections were built and thus IDA's insistence on reducing pavement design standards appears to have been incorrect.

21. During construction, the contractor was unable to execute the work in an orderly sequence because portions of the road engineered were in fact short sections scattered throughout the entire length of the road, often requiring the contractor to wait for the other sections to be engineered. Furthermore, the engineering and supervising consultants proposed scoriae as the base material which the contractor considered to be unstable and refused to use. The contractor hired another consultant to review the suitability of scoriae as base material, and this consultant recommended using trachytes instead. Although the trachytic material was more expensive because it had to be hauled for longer distances, the Borrower and IDA eventually agreed to use it for the base material after lengthy discussion with the contractor and consultant and this decision appears to have been an appropriate one. This change of base material, however, contributed to project implementation delays.

2. Highway Maintenance Program

22. The Highway Maintenance Project financed by the second credit to Rwanda experienced difficulties and fell short of its objectives to some extent. Fewer kilometers of roads were maintained and to a lower standard than expected at appraisal. The appraisal report envisioned maintenance of the entire 2,200 km of the national network which consists of unengineered earth and gravel roads; 250 km were scheduled for improvement, 350 km for regravelling and the remaining 1,600 km for improved routine maintenance work. Routine maintenance of 1,100 km was undertaken at a lower standard and 340 km of improvement and regravelling was done. Cost increases leading to insufficient funds contributed to this. Also, the delivery of maintenance equipment was delayed by a year because the procurement program required the services of an experienced specifications writer which were not provided for under the terms of the consultants' contract; thus the consultants' staff assigned to this task proceeded slowly. Once the equipment was delivered operators had to be trained to use it and part of the equipment was diverted to a training camp near Kigali for this use. Considerable coordination was thus required and in light of these difficulties the maintenance of the 2,200 km network during the project was probably an overoptimistic target. Under the project, the Borrower's fleet of maintenance equipment was increased some 14 times (from 16 to 226 units) and the PCR considers the staff training program to have been successful (Attachment II, paras. 29 and 39).

3. Loan Covenants

23. Covenants included in the three highway projects provided that the Borrower would ensure that vehicle dimensions and axle loads would not exceed limits consistent with design standards and that the national road network would be adequately maintained in accordance with sound engineering practices. The Borrower had difficulty in meeting these requirements for the reasons stated below and this throws doubt on the appropriateness of imposing the Bank Group's standard covenants without modifications in the light of local conditions.

24. Firstly, with respect to the covenant on vehicle dimensions and axle load limitations, the Borrower had no equipment which would make it feasible to fulfill this covenant. The Borrower has continued to rely on 1958 Belgian regulations and IDA was aware that larger vehicles and higher road standards had outdated the existing regulations. A more helpful approach may have been to help the Borrower in this effort by including in the projects a specific review of this issue and a program to implement its findings. The Borrower has established a commission which is now reviewing its legislation relating to road standards, vehicle dimension and axle load limitations.

25. The Borrower also found it difficult to comply with the covenant on road maintenance. Cost-benefit analysis to determine adequate levels of maintenance on Rwanda's road network, which consists largely of unengineered roads, had not been undertaken and the Borrower was not equipped to do such an analysis.

26. In retrospect it would have been more meaningful for the Bank to have assisted in studies on vehicle dimension and axle load limits and levels of appropriate maintenance.

IV. Conclusions

27. The First, Second and Third Highway Projects were completed with time overruns of between one year and four and a half years and with cost overruns ranging between 16% to 144%. The reestimated rates of return are between 13% and 27%. Although the Kigali-Gatuna Road has been completed under the First Highway Project, its objective of serving as an import/export route has not been attained. This road turned out to be justified by benefits not identified at appraisal, suggesting that the economic investigation preceding appraisal may not have been thorough. The road's catalytic role for regional economic development was not considered at appraisal.

28. Many of the difficulties in implementing the projects arose because these were the first IDA operations undertaken in Rwanda. However, even after allowing for such difficulties, it is evident that the projects were inadequately prepared and IDA's control of them was not as effective as it might have been. The handling of engineering preparation of the First Highway Project was haphazard, leading to increasing complications and cost rises. As a consequence, the project had to be reappraised when its cost almost tripled. The consultant responsible for the poor engineering and supervision should have been relieved of responsibility far sooner than was the case. IDA's handling of the Third Highway Project was also somewhat lax, appraising the project which had been partially engineered, making several substantive revisions of the credit amount as a consequence and finally having not reacted more decisively to the delays while a decision was taken on the base material to be used. The target set for the Highway Maintenance Project was optimistic in view of local constraints with respect to manpower and budget and coordination with the delivery of equipment.

REPUBLIC OF RWANDA

FIRST HIGHWAY PROJECT CREDIT 196-1-RW

PROJECT COMPLETION REPORT

I. INTRODUCTION

1. Rwanda has two principal routes for imports and exports: through Mombasa in Kenya and Dar es Salaam in Tanzania. The distance by road from Kigali to Mombasa is about 1,750 km, and to Dar es Salaam about 1,500 km. Although longer, the Mombasa road is better since it is paved from Mombasa up to Kabale in Uganda, 21 km from the Rwanda border, while only about 200 km of the road from Dar es Salaam are paved, and a section of about 70 km between Biharamulo in Tanzania and Rusumo in Rwanda is a low standard, fair weather track. Consequently Mombasa is the main port for Rwanda's international trade. Although transport by rail is possible from both ports to points situated some distance from Rwanda's border, only a small portion of imports and exports use the rail, mainly due to the longer time required for transport and high transshipment costs. The attached Map (IBRD 2830R4) shows the related international transport connections.

2. The Government of Rwanda decided in the early 1960s to improve road transport between Kigali, the capital, and the Uganda border. Two alternatives were considered: paving the 210 km Kigali-Kayonza-Kakitumba road which was already used by the import-export trade, or improving the existing Kigali-Gatuna track (80 km) which was usable only in good weather. In addition to being significantly shorter than the alternative road, the Kigali-Gatuna road necessitated a shorter link to a bitumen road in Uganda and was a more direct routing which would shorten the distance to Kampala and beyond by 73 km (see Map IBRD 10473). In 1964, the Government approached the Association and the European Development Fund (FED) for financing construction of a road from Kigali to the border. Initially, preference was given to the Kigali-Kakitumba road, because it was being used by international traffic. Thus, when the IDA mission visited Rwanda in August 1964, the Government pressed for improvement of the Kigali-Kakitumba road, but due to low traffic of about 20 vehicles per day the project could not be justified economically. Consequently, in 1966, the Government decided after further study to improve the Kigali-Gatuna alternative and requested the necessary financing from FED.

3. FED agreed to finance the road's technical study and the stage construction to gravel standards, starting with about 40 km of priority sections. The proposed level of financing was rather low, mainly because of constraints resulting from FED's other commitments to Rwanda's development program. The Association, believing that there was a prima facie case for reconstruction of the entire road, proposed a common approach: FED would finance the feasibility study and detailed engineering while the Association financed the subsequent construction. The studies were entrusted to the

Italian consulting firm, Electroconsult (ELC). The terms of reference required detailed engineering for a two-lane gravel road, including soil survey, earthworks, drainage and bridges of less than 10 m in length. ELC completed its assignment in July 1969.

II. PROJECT APPRAISAL

4. The appraisal of the project was carried out in December 1969. After comparing the costs and benefits of constructing a gravel and a paved road, the paved road was found preferable and economically justified, and formed the basis of the project. The ELC gravel road design could be adopted to a two-lane paved road by widening the shoulders in some sections, altering the pavement design, and including three bridges of 14 m to 30 m long. The project included consulting services for completion of the design to those standards, preparation of bidding documents and supervision of construction. Additionally, the project provided for purchase of some equipment to strengthen the mechanized unit in charge of maintenance of the Kigali-Kakitumba road. The project cost was estimated at US\$7.70 million for construction, US\$0.70 million for consulting services and US\$0.14 million for equipment. A quantity allowance of 15% was included for the work items which had been engineered and 20% for those not yet engineered (paving, bridges and extra earthwork). A price escalation allowance of about 10% was provided to cover the two-year construction period. The cost of consulting services was based on a contract negotiated between the Government and ELC. The contingencies of US\$2.31 and the cost of project items made up the total estimated project cost of US\$10.9 million. The Association agreed to finance the foreign component of US\$9.3 million, while local costs of US\$1.6 million were covered by the Belgian grant of US\$0.6 million (subsequently increased to US\$1.0 million) and the Government contribution. The IDA Credit of US\$9.3 million was approved under Credit Agreement 196-RW, signed June 17, 1970, effective September 14, 1970.

III. PROJECT EXECUTION

A. Completion of Road Design and Bidding

5. On June 18, 1970, the Government contracted ELC to complete the design of the Kigali-Gatuna road, prepare the bill of quantities and other bidding documents, and subsequently supervise the construction. The consultant completed preparation of bid documents in February 1971, and bids were called under international competitive bidding procedures for submission on June 4, 1971. Only three bids were received, of which the two lowest were by locally based foreign firms: Murri Freres (Italy) and ASAF, a joint venture of Astaldi Estero and Safricas (Italy, Belgium). The lowest bid by ASAF for FRW 458,195,620, equivalent to US\$4.58 million at the prevailing rate of exchange in 1971, was 40% below the appraisal net estimate. The low bid prices were

explained by the fact that Murri and ASAF had an adequate organization in Kigali and a major part of the equipment required for the works; they competed fiercely to get the only civil engineering job available on the local market. The contract was awarded to ASAF on September 1, 1971, the commencement of work having been fixed for December 30, 1971, and completion after 28 months, April 27, 1974.

B. Road Construction

6. The contractor submitted an acceptable work program in February 1972, proposing to start the construction from his base in Kigali (km 0), and from km 52 towards Kigali. At km 52 the road crosses the watershed between the Nyabugogo river in the south and the Mulindi in the north. Between km 30 and km 56 the terrain is hilly to mountainous, the hills have steep lower slopes, while the valleys are filled with recent sediment and water-logged turf up to 20 m deep. ASAF established a construction camp at km 52 in Mushere. This took some time and delayed normal operations until May 1972. From the start it appeared that the engineering design by ELC was insufficient, and the road alignment was changed frequently to avoid gulleys, steep hill slopes and swampy areas. Further changes were required to improve the design of drainage and pavement. The contractor complained that these changes disturbed his work schedules.

7. A more serious difficulty was encountered when the contractor started the earthworks between km 52 and km 30. Cuts disclosed unstable soils of heterogenous rocks which in some areas were highly weathered, soft pelites, clay, screes and underground water seepages. Slips occurred in cuts and in some embankments of cut-fill cross-sections. Drainage structures included in the design appeared insufficient, and no provision was made for retaining walls and slope protection ultimately required for stability of earthworks. The contractor was highly disturbed by the geotechnical problems encountered. In December 1972 he engaged a consultant, Studio-Geotecnico Italiano (SGI), to give an independent opinion and advice. In February 1973, the contractor submitted SGI's report to ELC and the Government. The report emphasized the complexity of the geological formations, the instability of soils along the road alignment, and the major need for slope protection works and drainage.

8. Alarmed by the SGI report, ELC mobilized their own expert team to conduct new site investigations in March 1973, and in July 1973 replaced the leader of the supervisory team with a more experienced engineer. On the basis of new site investigations the consultant submitted recommendations for additional works, which included about 1 km of retaining walls, 5.5 km of slope protection works, 3.5 km of gabions and 16 km of concrete drains. The estimated cost of these additional works was FRW 232 million or about 50% of the original contract amount. The proposed works were found indispensable and were approved by the Government and the Association.

9. Since final cost estimates were uncertain and it was necessary to determine the required project financing, the Association requested a detailed description and cost estimate for the additional works and the entire contract, as well as an estimate of the time required to carry out the works. ELC was

asked to complete the design and provide the estimate, but the consultant seemed unable to accomplish this task and submitted several ever growing estimates starting with the June 1973 estimate of US\$9.2 million and ending with the August 1974 estimate of US\$20.6 million. When in March 1974, the estimate rose to US\$13.4 million, the Association classified the project as a "problem project", because additional financing was needed and could not be provided by the Borrower. It was necessary to find a new source of external financing.

10. Reappraisal of the project was not possible until the cost estimate was more firmly established. It was necessary to take the risk of stopping the works because of lack of funds, and work was halted on April 30, 1975, when all available financing was exhausted and the Government owed the contractor US\$2.2 million.

11. The situation was aggravated by the Government decision in June 1974 to change the alignment of the 16 km road section near the Uganda border in order to avoid crossing from the left to the right bank of the Mulindi Valley. The valley is planted with tea on the water-logged turf, and the road crossing could have changed drainage conditions and endangered the plantation. The Government instructed ELC to prepare detailed engineering of a left bank alignment which included seven crossings of swampy, turf-filled valleys, four of which were about 400 m wide. By the end of 1974 the new design was not yet finished.

12. In December 1974 serious consideration was given to hiring another consultant in order to complete the design of the Mulindi Valley alignment and to get an independent estimate of the final cost of works. In January 1975 a French firm of consultants, BCEOM, was retained to carry out this task. BCEOM was also requested to determine the date on which the value of works carried out, at the contract basic rates, reached 120% of the contract amount, since the conditions of contract stipulated that at this stage contract rates were subject to revision. The consultant was requested to recommend the new rates. The cost of BCEOM's services (US\$140,000) was paid for under IDA Credit 475-RW, the Third Highway Project.

13. In March 1975, BCEOM mobilized a team of four experts who submitted their report in May. They selected an alignment on the left bank of the Mulindi Valley about 2 km short than the alignment proposed by ELC. BCEOM proposed crossing the swamps on a floating embankment placed on 30 m wide plastic sheets known commercially as bidim. Maintenance of embankments for five-years would be required to build up the estimated 0.8 m sinkage that would occur under traffic. BCEOM also established that the contractor had completed works for FRW 550 million, representing 120% of the original contract price at the end of August, and proposed new rates. They estimated that the cost of works excluding compensation due to work stoppages and adjustments for fluctuation of rate of exchange was FRW 1,591 million or about US\$18 million.

14. On the basis of BCEOM's findings the Association reappraised the project in June 1975. The new total project cost estimate including equipment, consulting services and contingencies, was US\$26.5 million with the foreign

exchange component of US\$22.9 million. The Saudi Development Fund agreed to finance US\$5.0 million of foreign costs and the Association US\$18.0 million. An amount of US\$0.8 million was added for additional spare parts and materials required for the road maintenance project carried out under Credit 299-RW. An amendment of the Credit Agreement raising the credit amount by US\$9.5 million to US\$18.8 million was signed on December 19, 1975 under Credit 196-1-RW, and became effective on February 18, 1976. The contractor resumed the works at the new proposed rates which were 45% higher than the original contract (para. 21) on March 15, 1976, after 320 days of inactivity.

15. The Government had been dissatisfied with ELC's services since 1971, and ELC tried to improve the quality of supervision several times by replacing field staff whose performance was questioned; for example, the resident engineer was replaced in July 1973, in June 1974, again shortly after that, and ultimately in 1976. The Government appreciated these efforts and was reluctant to replace the firm. By the end of 1975 the contract with ELC expired and was tacitly extended under the express condition that ELC would retain the site staff who had been in service since mid-1974. When in June 1976 the resident engineer and his deputy had to be repatriated for health reasons, the Government cancelled further services by ELC and appointed consultants Rhein-Ruhr Ing (RRI) of the Federal Republic of Germany for supervision of the remaining works.

16. The RRI team of three engineers supervised works for 17 months, until their successful completion in October 1977. During construction, RRI improved the pavement design by using suitable locally available materials, and improved longitudinal drainage by replacing masonry and prefabricated elements with in-situ concrete. The works were accepted provisionally by the Government on November 23, 1977.

17. To provide an adequate link with the connecting road in Uganda, the Association and the Government of Uganda arranged for the improvement of 21 km of the Gatuna-Kabale road, under financing from the IDA Credit 164-UG. The crossing of the swamp situated astride the border presented some difficulty because any difference in construction method could cause differential subsidence, thus cutting the road. To prevent this, the Governments of Rwanda and Uganda agreed in 1977, to have the work carried out by ASAF, the Uganda Government participating in the cost by a payment of US\$100,000. The work was completed in early 1978.

C. Evolution of the Construction Contract Cost

18. The original contract was for FRW 458,195,620, while the final cost FRW 2,063,496,000 equivalent. Because of the currency realignment during the project duration, the dollar cost of the works can be only approximated; the original contract price was about US\$4.58 million, and the final cost about US\$24 million.

19. The main cost increase was for quantities of work, which, at the initial rates, increased 2.4 times from FRW 458,195,620 to FRW 1,088,000,000. The bills of quantities itemize the increases as follows:

<u>Bill of Quantities</u> <u>Items</u>	<u>Cost at Basic Rates</u>		<u>Coefficient of</u> <u>Increase</u>
	<u>Initial Quantities</u>	<u>Final Quantities</u>	
	<u>in FRW</u>		
Earthworks	145,888,220	511,724,000	3.50
Culverts and Bridges	71,090,870	148,590,000	2.09
Drainage and Protection Works	50,775,070	202,824,000	3.99
Pavement	186,792,500	218,845,000	1.17
Other Works	<u>3,648,960</u>	<u>6,017,000</u>	<u>1.64</u>
Total	458,195,620	1,088,000,000	2.40

20. The following table shows the quantity increases of the principal categories of work:

<u>Work Category</u>	<u>Quantities m³</u>		<u>Coefficient of</u> <u>Increase</u>
	<u>Initial</u>	<u>Final</u>	
Cut in hard rock	102,000	647,692	6.36
Cut in soft rock	386,000	485,051	1.26
Cut in waterlogged soil	20,600	29,427	1.43
Cut in ordinary soil	875,000	1,582,723	1.81
Concrete for drains	350	15,598	44.57
Masonry in protection works	650	13,084	20.13

21. The final cost of works was also increased significantly due to price adjustments. The contract conditions allowed an adjustment of 20% for variations of diesel oil prices and 20% for variation in the cost of labor. In addition, the General Contract Conditions provided for revision of unit rates after the value of works carried out had reached 120% of the original contract amount. The consultant BCEOM ascertained that this amount, FRW 550,000,000, was reached by the end of August 1974 and proposed new rates based on the then current prices of materials, equipment and labor (para. 13). To simplify the accounting, the Government and the contractor agreed to uniformly increase contract rates by 45% as of September 1974, which reflected the average of the BCEOM estimate, as well as the lowest bid rates for the

Ruhengeri-Gisenyi road contract awarded in September 1974. High price escalation in 1974 was a worldwide occurrence, caused mainly by the rise in fuel prices. The effect of price adjustment was FRW 589,763,000, representing 29% of the final cost of contract.

22. The cost of contract was further increased by granting the contractor a total of FRW 163,280,000 for compensation due to work stoppages which amounted to about two years in total and were caused by shortages of fuel and cement and lack of financing. An additional amount of FRW 175,822,000 was paid to cover the changes in the rate of exchange between the Belgian franc, Rwandese franc and the US dollar from the time of bidding in 1971 to the completion of works in 1977.

23. To clarify the contractual obligations at the final stage of construction and prevent claims and disputes, the Government and the contractor agreed in December 1976, to a lump sum contract price of FRW 1,975,000,000 for completion of works and subsequent one year maintenance, with an extra four years maintenance for swamp crossings. The lump sum included FRW 1,228,000,000 already paid, and the balance of FRW 747,000,000 to be paid as follows:

FRW 142,000,000 in local currency

US\$2,035,000 in local currency

US\$5,503,000 in foreign currencies.

Payment in foreign currencies allowed for realignment between the US dollar and Belgian franc to the amount of FRW 88,496,000, which accounts for the difference between the balance of FRW 747,000,000 and the value of the US\$ portion at the 1977 rate of US\$1=FRW 92. The Government agreed to pay the contractor a FRW 200 million advance on the payment balance, while the contractor renounced rights to further claims. The Association approved the related addendum to the contract.

24. The following table shows the composition of the final contract cost in FRW:

<u>Description</u>	<u>Amount</u>	<u>% of total</u>
Work carried out at basic prices	1,124,631,002 <u>1/</u>	54
Price adjustment	599,763,000	29
Compensation for work stoppage	163,280,000	8
Currency realignment	<u>175,822,000</u> <u>2/</u>	<u>9</u>
Total:	2,063,496,000 <u>3/</u>	100

D. Purchase of Road Maintenance Equipment

25. The project included the purchase of road maintenance equipment for US\$140,000 (para. 4). Bids for equipment were received in July 1971 and the following equipment was purchased: an angledozer D6C, motorgrader 12F, Magirus-Deutz 15 ton tipping truck and 8 ton water tanker, and a land-rover. The total cost of equipment and spare parts was US\$158,000 equivalent. Equipment was delivered by the end of 1971 and was subsequently allocated to the mechanized road maintenance unit on the Kigali-Kakitumba road.

E. Modification of Project Contents

26. In April 1977 the final estimate of the construction cost was firmed up, and it appeared that Credit 196-1-RW would have a saving of about US\$1.3 million. Because some additional financing was required for technical assistance under the Second Highway Project (road maintenance) and for the Ruhengeri-Gisenyi road under the Third Project, an appropriate reallocation of Credit funds was arranged with the Borrower (Annex I). An amount of US\$825,000 was allowed for continuation of services of the consultant RRI technical assistance to the Directorate of Roads and Bridges from July 1976 until December 1977, after which the RRI team continued its services with financing provided under the Fourth Highway Project Credit 769-RW. An amount of US\$70,000 was allocated for payment of services of an advisor to the Minister of Public Works, who was previously financed by the Federal Republic of Germany, but this financing was terminated in 1976. He completed his assignment at the end

-
- 1/ FRW 1,088,000,000 works at basic prices plus FRW 36,631,000 extra miscellaneous works.
 - 2/ FRW 87,326,000 compensation for currency realignment included in the amount paid prior to December 1976 plus FRW 88,496,000 compensation included in the balance due in 1977.
 - 3/ FRW 1,975,000,000 lump sum plus FRW 88,496,000 for currency realignment under the balance payment.

of 1977. An amount of US\$429,000 was allocated as a supplement for payments of construction of the Ruhengeri-Gisenyi road. The construction of this road was completed in June 1977.

F. Financing and Disbursements

27. The initially estimated project cost of US\$10.9 million was financed 85% by the IDA Credit 196-RW of US\$9.3 million and about 15% by the Government budgetary funds and the Belgian grant of US\$1.0 million (para. 4). After the 1975 reappraisal, the IDA financing was increased under the Amended Credit 196-1-RW to US\$18.8 million, of which US\$0.8 million was to supplement the allocation for spare parts and materials under the Second Highway Project. In addition, the Saudi Development Fund extended to Rwanda a loan of US\$5.0 million under a Loan Agreement dated October 28, 1976. The Association and the Saudi Fund covered 81% of the construction cost. The disbursements from the IDA Credit and the Saudi Fund Loan were divided in the proportion of 63.5% and 36.5%.

28. When the works were completed in October 1977, the distribution of the costs was as follows:

(a) Construction

IDA Credit (in round figures)	US\$15,450,000
Saudi Fund Loan (in round figures)	US\$ 4,410,000
Government (equivalent)	<u>US\$ 4,400,000</u> 1/
Total	US\$24,260,000

(b) Design and Supervision

FED grant for preliminary engineering (approx)	US\$ 120,000
IDA Credits (in round figures)	US\$ 1,500,000 2/
Government (equivalent)	<u>US\$ 220,000</u>
Total	US\$ 1,840,000

(c) Extra Works Proposed during Maintenance Period (para. 29)

IDA Credit (Category VI) about	US\$ 200,000
--------------------------------	--------------

1/ Including Belgian grant of US\$1,000,000.

2/ Including BCEOM payment under Credit 475-RW (para. 12)

The total cost of the road is thus US\$26.3 million; the cost per km is about US\$330,000. 1/ The list of project goods and related disbursements are shown in Annex II and the summary disbursements in Annex III.

29. Although the project is virtually complete, the Credit is not yet fully disbursed. On May 31, 1978, the undisbursed amount was US\$482,459.22.

	<u>US\$</u>
Category I, Kigali-Gatuna road	43,842.64
Category II, Maintenance equipment	nil
Category III, Spare parts and materials	194,048.73
Category IV, (a) supervision of works	1,357.55
(b) technical assistance	21,859.66
(c) advisor to MPW	nil
Category V, Ruhengeri-Gisenyi road	17,350.64
Category VI, unallocated	<u>204,000.00</u>
	482,459.22

The Category III funds are being used for the current road maintenance program, pending effectiveness of Credit 769-RW, the Fourth Highway Project. Category VI could be used for some additional works such as road signalization and guard rails, which were not part of the construction contract, and for some additional protection of slopes in cuts and embankments, where slips occurred during the March-April 1978 rainy season. The reallocation of Credit funds for these purposes is under consideration. The Credit closing date has been extended to December 31, 1978.

G. Performance of Contractor, Consultants and Borrower

30. The contractor ASAF was slow to mobilize manpower and equipment, but on the whole carried out the job satisfactorily. He was seriously hampered by design changes, shortages of fuel and cement, and delayed payments; in mid-construction, work had to be interrupted for 320 days due to the lack of financing. Considering the stoppages and the doubling of work quantities, the 71 months construction period is not excessive when related to the initial contractual completion time of 28 months. The quality of construction work was good.

1/ The cost is comparable with the cost of similar standard roads built at this period in a hilly to mountainous terrain on the Bank financed projects in Fiji (US\$367,000), Algeria (US\$338,000), Honduras (US\$337,000), Ivory Coast (US\$300,000).

31. The consulting firm ELC did not provide satisfactory services. It failed to identify the geotechnical and hydrological problems at the final engineering stage, and was slow in determining the necessary modification in design. Although ELC is a well known consulting firm, its expertise was mainly in electricity generating and supply, and it seemed to have difficulties in recruiting staff qualified and experienced in road design and construction for this project. The Government had to call in another consultant, BCEOM, to revise and complete the detailed engineering of the final section of the road and prepare final estimates of costs. The supervision of works was poor; ELC had to change the resident engineer four times. Finally, when about 30% of the work were still outstanding, the Government entrusted supervision to the consultant RRI, who led the works to a satisfactory completion.

32. The Government had shown great understanding of the difficulties encountered during project implementation. It made continuous efforts to incite the consultants to improve the quality of services. Financial constraints did not permit an increase in Government participation. In fact, even at completion of the work, the budgetary funds were not sufficient to fully pay the contractor for the local portion of bills, and an outstanding amount of about FRW 40 million was deferred to the 1979 budget. The periodic shortages of fuel and cement were the result of Rwanda's land locked position and beyond Government's control. The December 1976 agreement with the contractor to complete the works on a lump sum basis defined clearly the duties and obligations of both parties in the contract's final stage, and aided materially the satisfactory conclusion of the works within the availability of funds.

IV. ECONOMIC REEVALUATION

A. Appraisal Expectations

33. When the First Highway Project was appraised in 1969, the provision of a good route for import and export traffic was considered essential since Rwanda depends heavily on external trade, for which transport represents a sizeable share of costs. The alignment for the Kigali-Gatuna road was selected over the existing road via Kakitumba because it provided a shorter link with the paved network in Uganda and reduced the distance from Kigali to the port of Mombasa by some 73 km; most of Rwanda's import and export traffic is channelled via Mombasa. Because transport costs were considered critical in the expansion of trade in Rwanda, the Kigali-Gatuna road was selected as top priority by the Government. Prior to the construction of the Kigali-Gatuna road, most of Rwanda's external trade was channelled to Mombasa via Kakitumba and Kampala over an earth and gravel road, 210 km in length. The project road was expected not only to shorten the distance to Kampala but also to offer improved riding conditions.

34. At the time of appraisal, traffic on the route via Kakitumba averaged 50 vpd, of which two-thirds were heavy vehicles with an expected

traffic growth of 8% p.a. Foreign trade was growing at about 16% while the vehicle fleet had increased 24% annually over the preceding four years. The appraisal report indicated that while it was unusual to find paving justifiable at the then prevailing traffic levels, it was felt that the high proportion of heavy vehicles, and heavy rainfall in the area of the project road, favored a paved surface. In addition, while paved road construction and maintenance costs are higher than those for a gravel or laterite surface, the appraisal did not estimate them to be sufficiently high in this case to offset the savings in vehicle operating costs (voc) for a bitumen surfaced road. The appraisal estimated the rate of return on the road to be 13%.

B. Developments since Appraisal

35. As noted earlier, construction of this road was completed in late 1977, about four years later than expected at appraisal. Final cost, including supervision, was US\$26.3 million (para. 28), 145% above the appraisal estimate including contingencies. During the intervening years, traffic in Rwanda and particularly international traffic increased by almost three times the rate anticipated at appraisal. This is substantiated by an average annual increase in the vehicle fleet of 15% during the 1968-76 period and increases in fuel consumption of more than 15% p.a.

36. While the new Kigali-Gatuna road has been open to traffic since December 1977, it is used mainly by cars and light trucks. Since customs facilities for commercial traffic are not yet complete and because road markings and signalization for heavy vehicles have not been installed, it is assumed that the absence of heavy traffic is only temporary. Traffic since the opening of the road, however, has attained levels much greater than anticipated at appraisal.

C. Recalculation of Rate of Return

37. The appraisal rate of return was based on vehicle operating cost savings and net maintenance expenditures and assumed an increase in traffic of 5% annually to 1978 and 3% thereafter. Furthermore, the analysis assumed that once the new road was opened, all transit traffic on the old road via Kakitumba would divert to the Kigali-Gatuna road. For the reevaluation it has been assumed that the heavy traffic on the old road would be diverted to the new road on the basis of one half in 1979 and the remainder in 1980. Benefits for this traffic have been taken as the difference in transport costs between the two routes, expressed in 1973-74 prices.

38. Maintenance costs on the new road are estimated, at 1978 prices, at about US\$2,000 per km including resealing every seven years, or an annual expenditure of US\$160,000. The maintenance costs on the Kigali-Kayonza-Kakitumba road are estimated at US\$230,000 per year for light traffic only, and US\$450,000 for heavy traffic. Under the assumption that the heavy traffic will be diverted to the new route the combined maintenance costs of the Kigali-Gatuna and Kigali-Kayonza-Kakitumba routes yield a net maintenance benefit of US\$60,000 per year. For the reevaluation a growth rate of 5% per annum for

traffic has been used because exact traffic growth data on the new road are not available. 1/ We believe, however, that this figure is conservative and that actual growth will be higher. Results of the traffic counts in 1970, 1972 and 1977 on the Kigali-Gatuna road are shown in Annex IV and vehicle operating costs in Annex V.

39. On the basis of the foregoing, the recalculated rate of return is 16% compared to the appraisal estimate of 13% (Annex VI). 2/ The substantial cost increases and the delays in project execution have been more than offset by greater traffic growth than expected.

V. OBSERVANCE OF CREDIT COVENANTS

40. Government complied with the Particular Covenants (Article IV) of the Credit Agreement, cooperating fully with the Association to ensure the accomplishment of the Agreement purposes. However, no measures were undertaken to control the dimensions and axle-loads of vehicles using the national highway network, mainly because the use of heavy vehicles and overloading are limited by the poor road conditions and steep gradients. Arrangements for control were deferred to the current Fourth Highway Project. The highway maintenance study financed by UNDP was completed by ELC in February 1971, and has formed the basis for a road maintenance program under the Second Highway Project. Up to mid-1976 road maintenance was carried out manually, except of the Kigali-Kakitumba road, where a mechanized unit was in charge of maintenance since the late 1960's. The quality of the maintenance was generally low, but is improving under the impact of the Second and subsequently Fourth Highway Project.

VI. ROLE OF ASSOCIATION

41. When the FED could not undertake financing of the construction of Kigali-Gatuna road, the Association stepped in and appraised the project. The major weakness in the project preparation was using the ELC's detailed engineering which the Association did not review during the progress of the studies. After abortive efforts since 1964 to set up a transportation project in Rwanda, which clearly needed assistance to improve its highway network, the Association decided to undertake the risk of appraising the project on the basis of ELC's design and cost estimate of a gravel road on the

1/ Actual growth between 1972 and 1977 on the Kigali-Byumba section was 25% p.a., so an assumed growth rate of 5% throughout the 20-year life of the road is on the conservative side.

2/ Without transit traffic the rate would be 12%.

assumption that the soil survey and design were adequately supervised by the Rwandese Department of Roads and Bridges and the Technical Assistance staff of the department.

42. The IDA staff in charge of the supervision of project implementation dedicated considerable time and effort to help the Government towards the successful completion of the project. Together with the Government they persistently prodded the consultant ELC to improve its services, and the contractor to provide the manpower and equipment sufficient for an adequate progress of works. The project staff reviewed the technical reports, design modifications and the new estimates of cost, and continually supervised the progress. The Association arranged for the expert services of BCEOM and helped in selection of the alternatives recommended by the consultants. The project staff was instrumental in setting up the final agreements on a lump sum basis for completion of the works. The Association provided the supplementary credit needed to complete the project.

VII. CONCLUSIONS

43. The First Highway Project in Rwanda was one of the Association's problem projects, and its successful completion was possible largely due to the cooperation between the Government of Rwanda and the Association. The objective of the project - joining Kigali to the paved road network leading to Mombasa - was achieved. The distance between Kigali and Mombasa by road is now shorter by 73 km, 4% of the total distance by road.

44. The cost of the project and time of implementation was considerably higher than estimated at appraisal, but economic return reevaluated at 16% is higher than the appraisal rate of 13%. So, the project was justified, even at the final high cost.

45. The difficulties encountered were due mainly to the insufficient project preparation. Such situation was frequent in 1960s, particularly in countries where the Bank Group was just beginning its lending operations. Since then the highway projects have usually been based on detailed studies carried out under preceding Bank projects. In retrospect, the problems encountered could have been alleviated, if more time had been devoted by the project staff to review the ELC detailed engineering. However, it should also be noted that if project preparation had been more exhaustive it is doubtful whether the project would have been implemented at all. If the high cost of construction had been known at the time of appraisal and if the original traffic growth estimates were used in judging the project's economic viability, the investment would probably not have seemed justified.

46. The experience gained in the course of implementing this project also indicates that the selection of a consultant should be based on the consultant's experience and achievements in the type of service required. If the consultant engaged does not have the specific experience desired, then great attention should be taken to insure that the staff he recruits for the project have the requisite qualifications and experience.

REPUBLIC OF RWANDA

FIRST HIGHWAY PROJECT CREDIT 196-1-RW

Annex I

Page 1 of 2

PROJECT COMPLETION REPORT

Amendments of Project Contents

A. Credit 196-RW, dated 6/17/1970

(i) Description of the Project

Part A: The construction and one year maintenance of a bituminous paved road between Kigali and the Uganda border at Gatuna;

Part B: the purchase of road maintenance equipment;

Part C: the preparation of bidding documents for Parts A and B and supervision of construction.

(ii) Allocation of Proceeds of Credit

<u>Category</u>	<u>Allocation in dollar equivalent</u>	<u>Disbursement percentage</u>
I. Construction and one year maintenance of the Kigali-Gatuna road	6,620,000	85%
II. Road maintenance equipment	130,000	100% c.i.f.+ Kigali
III. Consulting services for preparation of bidding documents and supervision of works	590,000	100% of foreign expenditure
IV. Unallocated	<u>1,960,000</u>	
Total	9,300,000	

B. Credit 196-1-RW, Amendment dated 12/19/1975

(i) Description of the Project

Part A: as under Credit Agreement of June 17, 1970;

Part B: the purchase of road maintenance equipment, spare parts and materials;

Part C: as under Credit Agreement of June 17, 1970.

(ii) Allocation of Proceeds of Credit

<u>Category</u>	<u>Allocation in dollar equivalent</u>	<u>Disbursement percentage</u>
I. Construction and one year maintenance of the Kigali-Gatuna road	13,360,000	85% up to a total of US\$8,263,000 thereafter 81%
II. Road maintenance equipment, spare parts and materials	950,000	100% c.i.f.- Kigali

III. Consulting services for preparation of bidding documents and supervision of works	1,035,000	100% of foreign expenditure 80% of local expenditure
IV. Unallocated	<u>3,455,000</u>	
Total	18,800,000	

C. Credit 196-1-RW, Amendment dated 4/27/1977

(i) Description of the Project

- Part A: As under Credit Agreement of June 17, 1970;
 Part B: purchase of road maintenance equipment for Part A of the Project;
 Part C: purchase of road maintenance equipment, spare parts, fuel and materials for road maintenance;
 Part D: 1. preparation of bidding documents for Parts A and B, and supervision of construction under Part A;
 2. technical assistance to the Directorate of Roads and Bridges (DRB) for highway maintenance;
 3. employment of an advisor to the Ministry of Public Works and Equipment (Minitrape).
 Part E: improvement of the Ruhengeri-Gisenyi road to two-lane paved standard (about 60 km).

(ii) Allocation of Proceeds of Credit

<u>Category</u>	<u>Allocation in dollar equivalent</u>	<u>Disbursement percentage</u>
I. Construction and one year maintenance of the Kigali-Gatuna road	15,491,000	85% up to a total of US\$8,263,000 thereafter 81%
II. Road maintenance equipment for part B of the Project	158,000	100% c.i.f. Kigali
III. Road maintenance equipment, spare parts, fuel and materials for part C of the project	300,000	100% of foreign expenditure
IV. (a) Consulting services for Part D.1 of the Project	1,323,000	100% of foreign expenditure and 80% of local expenditure
(b) Technical assistance to DRB under Part D.2 of the Project	825,000	100%
(c) Advisor to Minitrape under Part D.3 of the Project	70,000	100%
V. Civil works for Part E of the Project	429,000	83%
VI. Unallocated	<u>204,000</u>	
Total	18,800,000	

RWANDA

FIRST HIGHWAY PROJECT, CREDIT 196-1-RW

PROJECT COMPLETION REPORT

List of Project Goods and Disbursements
in US\$

<u>Category</u>	<u>Initial Allocation 6/17/70</u>		<u>Amended 12/19/75</u>		<u>Amended 4/27/77</u>		<u>Disbursed as of 3/31/78</u>
	<u>Amount</u>	<u>Disbursement %</u>	<u>Amount</u>	<u>Disbursement %</u>	<u>Amount</u>	<u>Disbursement %</u>	
I Construction and one year maintenance of the Kigali-Gatuna road	6,620,000	85%	13,360,000	85% and 81%	15,491,000	85% and 63.5% of 8%	15,447,000 ^{1/}
II Road maintenance equipment (initial amount)	130,000	100%) cif) Kigali)	950,000	100%) cif) Kigali)	158,000	100% cif Kigali	158,000
III Road maintenance equipment, spare parts, fuel and materials))	300,000	100% of F/E	
IVa Consulting services for Category I	590,000	100%	1,035,000	100% of F/E, 80% of L/E	1,323,000	100% of F/E, 80% of L/E	1,322,000
IVb Technical assistance for road maintenance program					825,000	100%	803,000
IVc Advisor to the Ministry of Public Works and Equipment					70,000	100%	70,000
V Improvement of the Ruhengeri-Gisenyi road					429,000	83%	412,000
VI Unallocated	<u>1,960,000</u>		<u>3,455,000</u>		<u>204,000</u>		-
Total	<u>9,300,000</u>		<u>18,800,000</u>		<u>18,800,000</u>		<u>18,212,000</u>

^{1/} Additional disbursements were made from the Saudi Development Fund loan of US\$5,000,000 at the rate of 36.5% of 81%, amounting on 3/31/78 to US\$4,409,000

June 1978

REPUBLIC OF RWANDA

FIRST HIGHWAY PROJECT CREDIT 196-1-RW

Annex III

PROJECT COMPLETION REPORT

US\$'000

Disbursements Summary as of 3/31/1978

<u>IDA Fiscal Year, Semester and/or Quarter</u>	<u>Appraisal Estimates</u>	<u>Actual Disbursements</u>	<u>Actual Disbursement as % of Appraisal Estimate</u>
<u>1971</u> ^{1/}			
1st		63	
2nd	1,600 ^{1/}	172	11%
<u>1972</u>			
1st		220	
2nd	5,600	381	7%
<u>1973</u>			
1st		1,166	
2nd	8,900	2,243	25%
<u>1974</u>			
1st	9,300	3,530	38%
2nd	9,300	5,731	62%
<u>1975</u>			
1st	9,300	7,660	82%
2nd	9,300	9,294	100%
<u>1976</u>			
1st	9,300	9,294	100%
2nd ^{2/}	13,700	12,200	89%
<u>1977</u>			
1st	15,500	14,030	91%
2nd	17,300	17,756	103%
<u>1978</u> ^{3/}			
1st Semester	18,800	18,050	96%
3rd Quarter	18,800	18,212	97%
Closing dates	December 31, 1977	December 31, 1978	

^{1/} Figures from 1971 to 1976 refer to the initial Credit 196-RW of US\$9.3 million

^{2/} Figures for the second semester 1976 and thereafter refer to the amended Credit 196-1-RW of US\$18.8 million

^{3/} From July 1977 the Saudi Development Fund intervened in financing the foreign expenditures of the project to a total of US\$4,409,000.

June 1978

REPUBLIC OF RWANDA

FIRST HIGHWAY PROJECT CREDIT 196-1-RW

PROJECT COMPLETION REPORT

Kigali-Gatuna Average Daily Traffic

	<u>1970</u>			<u>1972</u>			<u>1977</u>		
	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total
<u>Gatuna-Byumba</u>									
Gatuna	9	8	17	na	na	na	276	108	384
Byumba	22	8	30	30	12	42	347	60	407
<u>Byumba-Kigali</u>									
Byumba	38	24	62	67	28	95	228	82	310
Ngiri	57	67	124	94	84	178	254	303	557
Kigali	310	171	481	412	164	576	1269	742	2011

Source: Ministry of Public Works, November 1977.

June 1978

REPUBLIC OF RWANDA

FIRST HIGHWAY PROJECT CREDIT 196-1-RW

Annex V

PROJECT COMPLETION REPORT

Economic Vehicle Operating Costs^{1/}: Kigali-Gatuna
(US¢ per km)

	<u>Truck/Trailer</u>	<u>Truck</u>	<u>Car</u>
Paved Road	0.51	0.35	0.13
Gravel Road	0.89	0.54	0.19
Earth Track	1.26	0.77	0.32

1/ After adjustment for inflation

Source: Fourth Highway Project
Appraisal mission data.

June 1978

REPUBLIC OF RWANDA

FIRST HIGHWAY PROJECT CREDIT 196-1-RW

Annex VI

PROJECT COMPLETION REPORT

Recalculation of Economic Return: Kigali-Gatuna

(US\$ 000)

<u>Year</u>	<u>Construction Costs</u>	<u>Total Benefit</u>	<u>Net Benefit</u>
1970	142.00	0.00	-142.00
1971	142.00	0.00	-142.00
1972	376.00	0.00	-376.00
1973	1130.00	0.00	-1130.00
1974	3760.00	0.00	-3760.00
1975	3950.00	582.00	-3368.00
1976	3730.00	1234.00	-2496.00
1977	8320.00	1298.00	-7022.00
1978	340.00	2260.00	1920.00
1979		3081.00	3081.00
1980		3168.89	3168.89
1981		3977.84	3977.84
1982		4097.17	4097.17
1983		4220.09	4220.09
1984		4346.69	4346.69
1985		4477.09	4477.09
1986		4611.40	4611.40
1987		4749.74	4749.74
1988		4892.24	4892.24
1989		5039.00	5039.00
1990		5190.17	5190.17
1991		5345.88	5345.88
1992		5506.25	5506.25
1993		5671.44	5671.44
1994		5841.58	5841.58
1995		6016.83	6016.83
1996		6197.34	6197.34

Internal Rate of Return: 16%

June, 1978

REPUBLIC OF RWANDA

HIGHWAY MAINTENANCE PROJECT CREDIT 299-RW

PROJECT COMPLETION REPORT

I. BACKGROUND

1. In 1967 the Bank's Permanent Mission in Eastern Africa identified improvement of Rwanda's highway organization and maintenance operations as a priority need in the country's transportation sector. Subsequently, in late 1968, the Government and IDA negotiated a credit of US\$380,000 for an emergency supply of road maintenance equipment and highway studies, which included engineering of the Ruhengeri-Gisenyi road and updating a report on Rwanda's highway organization prepared in 1964 by the French consultant BCEOM. However, the Government then decided to forego the Credit. Purchase of equipment was deferred to a proposed highway maintenance project, and Government requested the United Nations Development Programme (UNDP) to finance the studies. In April 1970 UNDP approved a grant of US\$186,000 for the studies, and the Bank agreed to act as the executing agency.

II. PROJECT PREPARATION AND APPRAISAL

2. The highway studies were entrusted to the consulting firm Electroconsult (ELC, Italy), which was already working in Rwanda on engineering and supervision of the Kigali-Gatuna road under the First Highway Project (Credit 196-RW, 1970), and which could consequently mobilize a field team at short notice. The consultants' terms of reference required them to review the organization of the Directorate of Roads and Bridges (DRB), propose measures for DRB's improvement, prepare an 8 to 10-year road maintenance program including requirements for road equipment, and carry out an engineering study of the Ruhengeri-Gisenyi road. 1/

3. ELC started field work in June 1970 and submitted its report on highway organization and maintenance in February 1971. The report formed a basis for the Highway Maintenance Project (Second Highway Project), which undertook the initial 4-year phase of an 8-year highway maintenance program. The project was appraised by the Association in July 1971, and the credit was negotiated in January 1972. Credit Agreement 299-RW for US\$3.0 million was signed on April 19, 1972.

1/ This study led to the Third Highway Project (Credit 475-RW, 1974, US\$6.3 million), under which the Ruhengeri-Gisenyi road was improved to bitumen paved standards.

III. THE PROJECT

4. The Project consisted of:

- (i) the reorganization and strengthening of maintenance operations, including training of maintenance personnel at all levels;
- (ii) the purchase of maintenance equipment, spare parts, fuel and materials;
- (iii) the construction and equipping of maintenance workshop facilities;
- (iv) the improvement of routine and periodic maintenance operations over the 2,200 km national road network; and
- (v) the betterment of selected roads and elimination of a backlog of deferred maintenance on about 600 km of the above roads.

5. The DRB was severely understaffed, with only 12 engineers and technicians, 3 of whom were Rwandese nationals while the rest were foreign experts provided by the Federal Republic of Germany (FRG) and Belgium under technical assistance schemes. Government was unwilling to delegate any administrative authority to foreign experts, and decision making even on minor matters was centralized at the ministerial level, to the detriment of efficient administrative procedures. To help correct these problems, a new DRB organization was agreed at negotiations, and each of the new divisions for planning, road maintenance, equipment and administration was given adequately defined responsibilities and authority. The technical assistance of five additional engineers and technicians would be needed for project implementation, and the contracting of such assistance from a consulting engineering firm was made a condition of Credit effectiveness.

6. DRB's road maintenance equipment at the time of appraisal consisted of 16 serviceable items: a bulldozer, front loader, tractor, fuel tanker, pick-up, compressor, 2 graders, 2 pneumatic tire rollers, 2 vibrating compactors and 4 trucks. The project included purchase of equipment for 4 mechanized units required for reshaping, regravelling and improvement of roads. Provision was also made for the foreign expenditures related to the purchase of spare parts, fuel and materials.

7. Since existing workshop facilities were rudimentary and would not be sufficient to service new equipment, the project provided for construction and equipping of a central workshop in Kigali and a district workshop in Ruhengeri. Cost of the Kigali workshop was covered by an FRG grant while that of the Ruhengeri workshop was included in the IDA credit. Technical assistance to organize and operate the workshops, maintain equipment and train the related local personnel was arranged under bilateral agreements for six master mechanics, one provided by Belgium and the rest by FRG.

8. The road network at the time of project appraisal consisted of about 6,000 km of low-standard earth and gravel roads and 48 km of bitumen-surfaced roads. DRB was directly responsible to maintain about 2,200 km of the network, but maintenance was rather poor, due to insufficient budgetary allocations, lack of equipment, and a shortage of qualified staff for adequate organization and supervision of work. The 1971 DRB budget provided US\$633,000 equivalent, of which 58% was for salaries and wages, 31% materials and fuel, and 11% for local authorities responsible for about 3,800 km of communal and urban roads. The budgetary problem was addressed under a 1972 supplemental letter to the Credit Agreement by which Government agreed to provide DRB with the following budgetary allocations: 1973 - US\$780,000 equivalent, 1974 - US\$785,000 equivalent, 1975 - US\$810,000 equivalent, and 1976 - US\$925,000 equivalent

The amounts were estimated in expectation of relative price stability, since from 1966 to 1972 the general price index in Rwanda increased by only 10% or less than 2% p.a. However, from 1973 onward prices increased at a much faster rate, rendering the agreed amounts insufficient.

9. Improvement of road maintenance under the project was closely tied to efficient operation of the mechanized units which were expected to start early in 1973. The work program of these units included reshaping of the earth and gravel roads and regravelling and improving of about 600 km of selected roads.

10. Project implementation was scheduled to begin in mid-1972 and be completed in June 1976. The Credit Agreement provided that Government and the Association would consult in 1975 on the definition of the second phase of the road maintenance program and its financing.

IV. COST ESTIMATES AND FINANCE

11. The capital costs of the Project were estimated at US\$5.1 million, of which local costs were US\$0.7 million. The cost estimate at appraisal is summarized below:

	<u>Local</u>	<u>Foreign</u> (US\$ million)	<u>Total</u>
<u>IDA participation (US\$3.0 million)</u>			
Equipment, spare parts, fuel and materials	0.33	2.96	3.29
Ruhengeri district workshop	<u>0.01</u>	<u>0.04</u>	<u>0.05</u>
Sub-total	<u>0.34</u>	<u>3.00</u>	<u>3.34</u>
<u>UNDP participation (US\$1.1 million)</u>			
Technical assistance	0.30 <u>1/</u>	0.93	1.23
<u>FRG participation (US\$0.5 million)</u>			
Kigali workshop	<u>0.07</u> <u>2/</u>	<u>0.48</u>	<u>0.55</u>
Total	<u>0.71</u>	<u>4.41</u>	<u>5.12</u>

1/ UNDP would cover US\$0.17 of local costs.

2/ FRG would cover US\$0.02 of local costs.

Taxes and duties estimated at US\$0.25 million were included in the Government contribution of US\$0.52 million. The cost of expert-mechanics was excluded from the project costs since this assistance was arranged under bilateral agreements (para. 7).

V. PROJECT IMPLEMENTATION

A. Implementation Progress

12. The original implementation schedule was over-optimistic. Credit effectiveness was delayed by six months due to the time required for a formal agreement (Plan of Operation) between Government, UNDP and IDA, and the appointment of a consulting firm for technical assistance (para. 5). These formalities were completed in January 1973. Delivery of equipment, anticipated at appraisal in early 1973, was completed at the end of 1975. Consequently, the project was completed in December 1977 rather than in June 1976.

B. Technical Assistance

13. Technical assistance for the project was provided by the consulting firm Rhein-Ruhr Ing. (RRI, FRG). RRI was slow in mobilizing its field team, and the team leader and maintenance engineer arrived in Rwanda in

February 1973, while the two field engineers (technicians) and administrative expert arrived in July 1973. The team leader and maintenance engineer were replaced for personal reasons after about one year, but thereafter the team remained relatively stable. The new team leader remained in his post until mid-1976, when his position was taken over by the maintenance engineer, who is still in service. The maintenance engineer's position was thereafter filled by a field engineer who was assisted in reorganizing and training the mechanized units.

14. The RRI team assisted in the reorganization of DRB; training of personnel; improvement of manual maintenance; organization of mechanized units; administration; purchase of equipment, spare parts and materials; introduction of cost accounting, etc. The Government was satisfied with the consultants' services and extended their contract for technical assistance under the current Fourth Highway Project, which covers the second phase of the maintenance program.

15. The original RRI contract for US\$1.1 million, amended in 1976 to US\$1.172 million, covered consultants' services until June 1976. The additional US\$72,000 was provided by UNDP. To ensure continuation of technical assistance from July 1976 to project completion in December 1977, the Association provided the necessary financing under Credit 196-1-RW for a total of US\$825,000 (para. 32), including US\$60,000 for purchase of the team's vehicles. The consultant provided in total about 270 man-months of field services.

C. Procurement of Equipment

16. Procurement of equipment was delayed because RRI was not familiar with the Association's procurement procedures. Bidding documents for equipment were drafted by June 1973, but were not adequately amended and finalized until April 1974. Bids were called in May 1974, orders for equipment were placed in November of that year, and delivery took place between June and December 1975. The list of equipment, cost and date of delivery are shown in Annex I. The equipment purchased was substantially as proposed at appraisal, but the total cost of US\$2,285,129 was about 60% higher than the appraisal estimate of US\$1,645,000. The increase in cost was mainly due to equipment price escalation, which by the end of 1974 was much higher than the appraisal estimate of 10%. After the training of operators and drivers was finished, the project equipment was deployed in 4 mechanized units, about 2 years later than anticipated at appraisal.

D. Workshops

17. Construction of the Kigali workshop commenced in 1973 and was carried out under the guidance of the master mechanics who would supervise the workshop's operations. By the end of 1975 the workshop was adequately staffed and equipped, and fully operational. The completion coincided suitably with the delivery of project equipment. Responsibility for workshop operations was in the hands of six master mechanics provided by FRG and Belgium for the positions of workshop manager, and chiefs of the warehouse, machine shop, heavy equipment, and vehicles sections and the field repairs unit. The expatriate staff

were also responsible for training of Rwandese workshop personnel which numbered about 80 skilled and 80 semi-skilled and unskilled workers. The counterpart local staff, including a mechanical engineer and two technicians, was appointed in 1976/1977.

18. The workshop's cost was initially estimated at US\$0.55 million, of which US\$0.50 million was covered by an FRG grant. Due to an escalation in prices, the grant was later increased to US\$0.80 million. When the main workshop was completed in 1975, a small balance of the grant remained which Government and FRG agreed to apply toward construction of the Ruhengeri district workshop. Since the Association was to have provided US\$40,000 for the latter project component, that amount is still undisbursed from Credit 299-RW and will be used for spare parts and materials for the Ruhengeri workshop, which was completed in mid-1978.

19. The Kigali workshop is sufficient for maintenance and repairs of the project equipment, but is not large enough to handle an expanded equipment fleet. Because the Fourth Highway Project (Credit 769-RW, 1978, US\$15 million) includes additional equipment estimated at US\$2.4 million, the Kigali workshop will be expanded and two district workshops, in Butare and Cyangugu, will be constructed under that project.

E. Reorganization of DRB

20. The DRB was reorganized by a presidential decree of May 29, 1974. However, the new organization differed to a certain extent from that agreed at credit negotiations in that the spare parts warehouse was made independent of the workshop division, and the terms of reference for various DRB units were not defined with sufficient clarity. Conflicting responsibilities and weak management capability resulted. The new organization was determined on the basis of availability of qualified local staff, which was insufficient to satisfy all DRB requirements. Because the Government was unwilling to delegate executive powers to foreign experts and the number of local technical staff was so low, the new DRB divisions were severely understaffed, and the available local engineers and technicians simultaneously held different assignments and were subject to frequent re-assignments.

21. In the initial period of project implementation the foreign experts considerably outnumbered the local professional staff (para. 5). However, their effectiveness was hampered not only by their limited executive/administrative powers, but also by lack of cooperation between various groups of experts. Each group was working under terms of reference agreed separately between the Government and the agency concerned; this included FRG experts in the head office, UNDP and IDA-financed project consultants, Belgian experts, and FRG master mechanics. The duties and responsibilities of experts were often not clearly defined and sometimes were duplicated. At the Association's suggestions, this situation was improved to some extent through discussions with the parties concerned.

22. A severe shortage of Rwandese professional staff persisted through 1974, until the University of Rwanda in Butare graduated a group of 10 civil engineers, 7 of whom were appointed to DRB. With additional recruitment of Rwandese engineers and technicians graduated abroad, by mid-1976 the DRB had 7 local engineers and 7 technicians, and by the end of 1977, 12 engineers and 14 technicians. Continued improvement of this situation is expected. The University at Butare is now in a position to annually graduate about ten engineers, starting in 1979. And, according to the Ministry of Planning, 24 Rwandese engineers and technicians (in all branches of engineering) should graduate in 1978 from foreign universities, 25 in 1979 and 9 in 1980. It would thus seem that in the near future the staffing of DRB higher technical posts will depend only on the related budgetary allocations.

23. Further reorganization of DRB was agreed under the Fourth Highway Project, which also helps finance the continuation of technical assistance to provide practical training of the newly appointed Rwandese engineers and technicians and to expand training of the staff in intermediate and lower grades.

F. Training

24. RRI's terms of reference included training of DRB personnel at all levels, including administrative staff, the field work force (supervisors and foremen), equipment operators and mechanics, the latter in cooperation with the master mechanics provided by FRG and Belgium. Although training was hampered by the shortage of DRB staff, prevailing illiteracy of lower grade personnel, and difficulty in securing classrooms and teaching aids, the program reached a wide variety of staff members. In 1974 RRI organized 2-week courses for 22 district works supervisors and their assistants in groups of 4 or 5 trainees, and repeater courses were held in 1975. RRI has trained about 10 surveyors and soil laboratory technicians and provided on-the-job training in manual maintenance to about 120 foremen. When in mid-1976 mechanized road units were organized, the 3 field engineers in the RRI team were seconded to supervise the units on a full time basis, and to provide on-the-job training to 4 supervisors, 25 foremen, and the equipment operators.

25. Training of drivers, operators and mechanics was initiated in 1974. The master mechanics organized courses in basic principles of equipment functioning, maintenance and operations. Practical training was given on-the-job in the workshop and on the sites where equipment was used. In 1975 about 250 candidates for equipment operators and drivers were tested, and about 100 were selected for further training. Project equipment began to arrive in June 1975 and was used during about 9 months on the site of an urban road construction in Kigali where the new operators and drivers were thoroughly trained.

26. In the new Kigali workshop, a classroom was provided for theoretical training of mechanics, fitters and electricians. The master mechanics periodically organized courses for groups of about 10 workshop personnel, but turnover of workshop staff was high because many trained mechanics left the workshop for private employment, where pay was higher than in government service.

27. RRI also enlisted the specialized assistance of the Organization for Rehabilitation and Training (ORT, Switzerland) in order to prepare a comprehensive training program to be implemented under a subsequent project. After a month-long survey in Rwanda, ORT submitted in November 1973 a draft program for the training of 440 DRB staff. Estimated to cost about US\$800,000, the program included the services of 2 training experts, construction of classrooms, procurement of teaching aids and some training abroad. The program was approved by Government and included in the Third Highway Project, negotiated in November 1973. ^{1/} However, it was not implemented under that project and was subsequently incorporated in the current Fourth Highway Project.

G. Road Maintenance and Improvement

28. Until mid-1976 road maintenance was carried out manually, with the exception of the Kigali-Kayonza-Kakitumba road, used by export/import transport, and some roads near Kigali where existing equipment was used for reshaping and regravelling. Manual maintenance was limited to routine operations: filling of potholes, clearing vegetation, maintenance of drainage. The RRI team reviewed existing maintenance practices and output, and in January 1974 prepared a program for improvement of manual maintenance on about 1,100 km of roads. The program was later extended to the whole network under DRB responsibility. To improve mobility of work supervisors and foremen, 10 motorcycles and 60 bicycles were purchased early in 1975 with project financing. An amount of about US\$200,000 was spent to purchase urgently needed spare parts and hand tools. Manual maintenance was carried out by a work force of about 2,200 men organized in gangs of 12 laborers and a foreman, each gang responsible to routinely maintain a section of road 12 to 15 km long about once a month. Hand tools and supervision of the gangs were improved under the project, resulting in a higher output and better quality of work.

29. Three regravelling/improvement units and one reshaping unit were formed in 1976; the composition of the units is shown in Annex II. From July 1976 to December 1977 the mechanized units carried out improvement and gravel-ling of 340 km of roads and reshaping of about 1,100 km. The output and quality of work were good. Roads for betterment and improvement were selected at appraisal. There was little change in the list of selected roads, but due to the late arrival of equipment for the units, only about 50% of the original program was implemented by the end of the project period (see Annex III). The work is being continued under the current Fourth Highway Project.

30. In spite of budgetary provisions made under the project (para. 8), maintenance operations continued to be limited by insufficiency of allocations. Although the DRB budget for recurrent costs related to the highway network was gradually increased, the escalation of prices since 1973 caused the real value of allocations to remain stationary. As shown below, the general price index in Rwanda between 1972 and 1977 indicates drastic price increases:

^{1/} See Rwanda - Third Highway Project Completion Report.

<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u> 1/
110	127	182	213	234	257

As a result, the real value of DRB allocations was significantly affected:

<u>Fiscal Year</u>	<u>Amount agreed at negotiations</u>	<u>Budget allocation</u>	<u>Budget allocation in 1972 values</u>
	------(in US\$ equivalent)-----		
1972	475,000	550,000	550,000
1973	780,000	750,000	650,000
1974	785,000	810,000	490,000
1975	810,000	1,150,000	590,000
1976	925,000	1,300,000	610,000
1977	-	1,400,000	620,000

31. When in 1974 wages and salaries increased to compensate for the dramatic rise in the cost of living, the DRB budget was exhausted by mid-year, with the resulting lay-off of nearly half the maintenance labor force. But the improvement of maintenance operations as a result of the project and the establishment of mechanized units in 1976 helped to compensate for the reduction in labor. By the end of the project period, driving conditions on roads maintained by DRB improved significantly.

H. Cost of the Project

32. The project's capital cost surpassed appraisal estimates (para. 11) due to delays in project implementation and price increases. In 1975 the Association reappraised the three highway projects in Rwanda and under the amended Credit 196-1-RW (First Highway Project) provided additional financing of the Highway Maintenance Project. This financing included US\$300,000 for equipment, spare parts, fuel and materials, and US\$895,000 for technical assistance. 2/ The UNDP grant was increased by US\$72,000, and the FRG grant by US\$300,000 equivalent (paras. 15 and 18). The Government contribution was increased mainly due to the 1974 rise in taxes and duties, and is estimated at US\$1,000,000 equivalent. The final capital cost of the project was the following:

1/ Index for years 1972-1975 as given by Direction de la Statistique, while for 1976 and 1977 estimated at 10% p.a.

2/ This amount included a sum of US\$70,000 for the services of an advisor to the Minister of Public Works during 1977.

	<u>Local</u> -----	<u>Foreign</u> (US\$ million)	<u>Total</u> -----
<u>IDA participation (US\$4.2 million)</u>			
Spare parts, fuel and materials	0.70	3.30	4.00
Technical assistance	<u>0.22</u> 1/	<u>0.68</u>	<u>0.90</u>
Sub-total	<u>0.92</u>	<u>3.98</u>	<u>4.90</u>
<u>UNDP participation (US\$1.2 million)</u>			
Technical assistance	0.40 2/	1.00	1.40
<u>FRG participation (US\$0.8 million)</u>			
Kigali and Ruhengeri workshops	<u>0.10</u>	<u>0.80</u>	<u>0.90</u>
Total	<u>1.42</u>	<u>5.78</u>	<u>7.20</u>

The recurrent budget allocations related to the highway network from mid-1973 to December 1977 totalled about US\$5.0 million equivalent (para. 30).

I. Disbursements

33. Credit disbursements were delayed by the slow procurement of equipment. About two-thirds of the Credit amount was withdrawn in one fiscal year (1976) against the credit lifetime of 6 and 1/2 years. The original closing date of December 31, 1976 was extended first to June 30, 1977, then to June 30, 1978, and finally to December 31, 1978. Most of the US\$47,000 still undisbursed as of December 31, 1977 was originally retained for construction of the Ruhengeri district workshop, but since this project component was financed under the FRG grant, the credit balance will be used for spare parts and materials for the district workshop. Details of Credit disbursements are shown in Annex IV.

J. Observance of Credit Covenants

34. Government complied with the Credit Agreement covenants within the limits of budgetary and staffing constraints. Budgetary allocations for recurrent costs were higher than the amounts agreed in the Credit supplementary letter but were substantially lower in real terms, due to the intervening inflation (para. 30). The DRB was reorganized in 1974, but due to the shortage of qualified local staff, the new organization was not exactly as agreed and required further changes. Maintenance of roads improved gradually under the project's impact. The consultants initiated a cost accounting system, but

1/ Local costs were covered by IDA financing.

2/ US\$0.20 million of local costs were covered by the UNDP grant.

its application was deferred to the Fourth Highway Project. The legislation and control of vehicle weights and dimensions was also deferred, since this was not considered urgent as vehicle overloading in Rwanda is largely prevented by steep gradients and sharp horizontal curves. The covenant requiring timely preparation of the maintenance program's second phase was observed, resulting in the Fourth Highway Project.

K. Performance of Consultant and Borrower

35. The project consultant, RRI, had some initial difficulties in mobilizing its field team and was slow in preparing satisfactory bid documents for purchase of equipment, chiefly because this was its first experience in procurement under an IDA credit. In the main, however, the services rendered were satisfactory, and cooperation with the Government and Association was good. The consultant was therefore retained under the Fourth Highway Project to ensure the continuity of technical assistance. Moreover, RRI was entrusted with feasibility studies, detailed engineering and supervision of construction on several road projects in Rwanda.

36. Government officials dealing with the project participated efficiently in its implementation, and collaborated closely with the financing agencies and the project consultants and experts. The Government is greatly interested in road maintenance, and preparation of the maintenance program's second phase under the Fourth Highway Project was well timed. The country's development plans allocate high priority to the highway network, and several main roads have been upgraded to bitumen paved standards, or are in the process of being upgraded.

VI. ECONOMIC RE-EVALUATION

37. The significance of road transport for the economy of Rwanda was recognized at the time of appraisal of the Second Highway Project which was the first phase of an 8-year road maintenance program. At that time, the bulk of the network consisted of low standard earth and gravel roads in very poor condition. The effect of such poor road conditions was to raise transport costs as well as the prices of imported goods and to narrow the domestic market for the few locally manufactured products. Export development also suffered from the very high transport costs which aggravated Rwanda's land-locked position.

A. Prior Justification

38. The economic evaluation at appraisal defined costs as the difference between the total capital and recurrent costs required and the recurrent expenditures normally allocated to highway maintenance. Costs included the contributions of the UNDP and FRG for consultants' services and the provision of a central workshop but excluded technical assistance provided under bilateral agreements with FRG and Belgium. Quantified benefits were those arising

from savings in vehicle operating costs on approximately 600 km of road betterment and 1,600 km of improved routine maintenance. Based on a ten-year planning horizon, a 7% annual traffic growth, a life of six to seven years for road betterment and a period of four years during which routine maintenance was carried out, the appraisal estimated the rate of return to be 28%.

B. Developments since Appraisal

39. Due to slow mobilization of consultants and delayed arrival of equipment, the project did not fulfill the amount of work estimated at appraisal. Manual maintenance was carried out over 2,200 km from mid-1973 to the end of 1977. From mid-1976 to the end of 1977, reshaping was carried out over 1,100 km of roads and regravelling and improvement work over 340 km. The project was extended one and a half years beyond the initial project completion date. The final cost was US\$7.2 million or 41% above the appraisal estimate, and the quantity of work performed was 42% less than estimated at appraisal. Nevertheless, this first phase of the maintenance program established a foundation for the development of a maintenance capability which is now continuing under the Fourth Highway Project (Credit 769-RW).

40. While work accomplished under the project was not as great as anticipated, traffic on road sections maintained and improved under the project has grown by an average of 10% p.a., rather than the 7% projected at appraisal. Annex V gives traffic levels in 1972 and 1977.

C. Recalculation of Rate of Return

41. The economic re-evaluation quantifies only savings in vehicle operating costs; additional benefits such as generated traffic and reductions in the rate of accidents may be realized but have not been quantified. Costs have been taken as the capital and recurrent costs of the regravelling and improvement and reshaping works. Capital costs include the costs of equipment, spare parts, fuel, materials and technical assistance provided by FRG and UNDP. Recurrent costs are the local costs borne by Government. Manual maintenance costs include labor costs, local supervision and materials.

42. Although traffic growth has been averaging 10% per year during the past six years, this rate of growth is not expected to continue. The appraisal rate of 7% has therefore been maintained for the re-evaluation from 1978 onwards.

43. Because the nature of the works actually done were of a lower standard than planned at appraisal, the life span of expected benefits is consequently shortened. The economic life for the regravelling and improvement work has been assumed at five years, while benefits from routine maintenance were assumed to occur only during the four years of project execution. Estimated vehicle operating costs for the various project components are shown in Annex VI.

44. Based on the foregoing assumptions, the recalculated rate of return is 27% compared to the appraisal estimate of 28% (Annex VII). Thus although there has been less work carried out than originally anticipated and at a cost 41% above the appraisal estimate, these drawbacks have been offset by greater traffic growth than anticipated.

VII. CONCLUSIONS

45. Although originally planned to cover a four-year maintenance period up to June 1976, the project was actually brought to an end one and a half years later in December 1977, mainly due to delayed procurement of road equipment as well as a delay in Credit effectiveness in order to finalize the UNDP plan of operation related to the financing of technical assistance. The longer project duration and unforeseen price escalation resulted in higher than anticipated project costs.

46. The project progress was hampered by budgetary constraints with respect to recurrent expenditures, a shortage of local professional staff and the low educational level of the lower grade DRB staff. In view of the severe lack of local technical personnel which only began to improve towards the end of the project period, the project's timing might seem premature. However, considering the rapid increase in the country's vehicle fleet (18% p.a. between 1967 and 1971 and 13% thereafter) and the poor state of the road network, the decision to start the project was timely, as was the decision to follow it up with a second maintenance project. The slow initial progress made on the project was inevitable in view of the goal to improve administrative efficiency and to train staff at all levels.

47. Improvement of road maintenance in the last year of the project augurs well for the success of the second maintenance project which was begun in January 1978 under the Fourth Highway Project. The continuity of work is preserved by collaboration of the same financing agencies and the Government's decision to retain the same consultant for technical assistance.

48. The project objectives have been achieved. The DRB organization was improved, technical personnel increased, training of personnel initiated, workshops and offices constructed and equipped, road equipment purchased and deployed. Maintenance operations were improved and better road conditions achieved.

REPUBLIC OF RWANDA

HIGHWAY MAINTENANCE PROJECT CREDIT 299-RW

PROJECT COMPLETION REPORT

Equipment Procured under the Project

<u>Item</u>	<u>Nos. Agreed at Appraisal</u>	<u>Nos. Purchased</u>	<u>Make</u>	<u>Cost (US\$)</u>	<u>Delivery</u>
Angledozer	3	2	CATD6C	250,950	Dec 1975
Front loader	4	2	CAT930	148,974	Oct 1975
Grader	6	6	CAT12G	543,854	Dec 1975
Tipping Truck	25	20	FIAT 110N	579,415	Dec 1975
Water tanker	5	4	FIAT 110N	190,105	Dec 1975
Fuel tanker	1	1	FIAT 350	38,190	Aug 1975
Low Loader	1	1	T 38	34,240	Aug 1975
Compactor on tires	4	3	Albaret	96,415	July 1975
Roller, vibrating	2	1	Zettlemeyer	23,430	June 1975
Tractor, agri. type	7	4	Ferguson	43,300	Aug 1975
Maintenance truck	2	2	FIAT	45,160	July 1975
Fuel tank trailer	5	5	Burns	76,107	June 1975
Pick-up	3	3	Peugeot	15,470	April 1975
Caravan	4	2	Burns	20,990	June 1975
Bitumen sprayer	-	2	Wallis	1,676	April 1975
Air compressor with accessor	2	1	Holman	15,930	Oct 1975
Concrete mixer	3	2	200L	4,300	June 1975
Concrete vibrators	-	5	Rilco	7,270	June 1975
Road marking machine	-	1	Hoffman	3,996	July 1975
Motorcycle	30	10	Honda	6,350	Feb 1975
Bicycle	100	60	Lumala	5,400	April 1975
Spare parts				<u>133,607</u>	
		TOTAL		US\$ <u>2,285,129</u>	

Note: The Government purchased under financing from other sources: angledozer CATD6C (Jan 76) front loader CAT930 (Oct 75), grader CAT12G (March 76) and mobile stone crusher (Feb 78).

September 1978

HIGHWAY MAINTENANCE PROJECT CREDIT 299-RW

PROJECT COMPLETION REPORT

Mechanized Road Improvement and Maintenance Units

Regravelling and betterment units

Unit I

Supervision: RRI Field engineer

Equipment: 1 angledozer
1 front loader
2 graders
1 compactor on tires
1 water tanker
1 maintenance truck
5 tippers
1 tractor (agr. type)
1 fuel trailer
1 water trailer
1 towed roller
1 caravan
1 pick-up

Labor: 1 technician
3 clerks, time keepers
2 mechanics
6 foremen
18 operators and drivers
58 laborers

Present location: Kayonze-Kakitumba road.

Unit II

Supervision: RRI Field engineer

Equipment: 1 angledozer
1 front loader
2 graders
1 compactor on tires
1 water tanker
6 tipper
1 tractor
1 fuel trailer
1 water trailer
1 pick-up

Labor: 1 technician
2 clerks
3 foremen
18 operators and drivers
38 laborers

Present location: Kigali-Ruhengeri road

Unit III

Supervision: RRI Field engineer

Equipment: 1 angledozer
1 grader
1 compactor on tires
1 air compressor
2 tippers
1 fuel trailer
1 pick-up

Labor: 1 technician
1 clerk
12 foremen
10 operators and drivers
10 miners
156 laborers

Present location: Gitarama-Ruhengeri road (road improvement in rocky terrain).

Reshaping Unit

Equipment: 3 graders
1 pick-up

Labor: 1 technician
7 operators and drivers

Source: Directorate of Roads and Bridges
September 1978

HIGHWAY MAINTENANCE PROJECT CREDIT 299-RW

PROJECT COMPLETION REPORT

Regravelling and Improvement Program and Progress

(Km)

<u>Road</u>	<u>Appraisal Program</u>	<u>Progress</u>
Kigali-Ruhengeri	100	75
Ruhengeri-Cyanika	27	-
Butare-Gikorongo	29	15
Gitarama-Gatumba	30	-
Base-Byumba	47	11
Kigali-Murehe	10	8
Ruhengeri-Gisenyi	62	-
Kigali-Gitarama	49	30
Gitarama-Butare	81	20
Butare-Burundi Border	33	-
Gitarama-Kibuye	85	40
Ruhengeri-Gatumba	34	22
Kigali-Kayonza-Kakitumba	-	105
Bugarama-Mashyusa	<u>-</u>	<u>14</u>
Tbtal	587	340

Source: Directorate of Roads and Bridges

September 1978

HIGHWAY MAINTENANCE PROJECT CREDIT 299-RW

PROJECT COMPLETION REPORT

Disbursement Summary as of July 31, 1978

(US\$ '000)

<u>IDA Fiscal Year and Quarter</u>	<u>Appraisal Estimates</u>	<u>Actual Disbursements</u>	<u>Actual Disbursements as % of Appraisal Estimates</u>
<u>FY 1973</u>			
September 30, 1972	30	-	0
December 31, 1972	150	-	0
March 31, 1973	450	-	0
June 30, 1973	750	-	0
<u>FY 1974</u>			
September 30, 1973	1,000	-	0
December 31, 1973	1,300	10	1
March 31, 1974	1,500	10	1
June 30, 1974	1,700	10	1
<u>FY 1975</u>			
September 30, 1974	1,900	15	1
December 31, 1974	2,100	90	4
March 31, 1975	2,300	320	14
June 30, 1975	2,500	430	17
<u>FY 1976</u>			
September 30, 1975	2,700	1,020	38
December 31, 1975	2,750	1,260	46
March 31, 1976	2,800	2,200	78
June 30, 1976	2,850	2,500	88
<u>FY 1977</u>			
September 30, 1976	2,900	2,600	90
December 31, 1976	3,000	2,600	87
March 31, 1977	-	2,750	92
June 30, 1977	-	2,800	93
<u>FY 1978</u>			
September 30, 1977	-	2,900	96
December 31, 1977	-	2,950	98
March 31, 1978	-	2,950	98
June 30, 1978	-	2,950	98
<u>FY 1979</u>			
September 30, 1978	-	-	-
December 31, 1978	-	3,000	100
Closing date:	12/31/1976	12/31/1978	

HIGHWAY MAINTENANCE PROJECT CREDIT 299-RW

PROJECT COMPLETION REPORT

Average Daily Traffic

<u>Road</u>	<u>Light Vehicles</u>		<u>Heavy Vehicles</u>	
	<u>1972</u>	<u>1977</u>	<u>1972</u>	<u>1977</u>
Kigali-Ruhengeri	80	104	50	135
Butare-Gikongoro	90	141	50	27
Base-Byumba	40	120	20	23
Kigali-Murehe	35	114	15	45
Kigali-Gitarama	200	321	50	109
Gitarama-Butare	100	156	40	69
Gitarama-Kibuye	20	77	15	25
Ruhengeri-Gatumba	20	76	15	35
Kayonza-Kakitumba	-	55	-	108
Kigali-Kayonza	-	111	-	144

Source: Road Branch, November 1977.

September 1978

REPUBLIC OF RWANDA

HIGHWAY MAINTENANCE PROJECT CREDIT 299-RW

PROJECT COMPLETION REPORT

Economic Vehicle Operating Costs ^{1/}

(US /km)

	<u>Light Vehicles</u>		<u>Heavy Vehicles</u>	
	with	without	with	without
	<u>project</u>	<u>project</u>	<u>project</u>	<u>project</u>
Regravelling & improvement	.221	.26	.565	.69
Reshaping	.234	.26	.586	.69
Manual maintenance	.249	.26	.648	.69

1/ After adjustment for inflation

Source: Appraisal Mission data
Fourth Highway Project.

September 1978

HIGHWAY MAINTENANCE PROJECT CREDIT 299-RW

PROJECT COMPLETION REPORT

Recalculation of Economic Return
(US\$ '000)

<u>Year</u>	<u>Total Cost</u>	<u>Total Benefit</u>	<u>Net Benefit</u>
1973	435.00	243.00	-192.00
1974	871.00	260.00	-611.00
1975	871.00	278.00	-593.00
1976	1518.00	1169.00	-349.00
1977	2219.00	1742.00	-477.00
1978	86.00	1863.94	1777.94
1979	86.00	1994.42	1908.42
1980	86.00	2134.02	2048.02

Rate of Return: 27%

September 1978

REPUBLIC OF RWANDA

THIRD HIGHWAY PROJECT (CREDIT 475-RW)

PROJECT COMPLETION REPORT

I. INTRODUCTION

1. The Third Highway Project was a continuation of the IDA assistance to the Government of Rwanda in providing an improved road network in the areas of potential economic development. The first project, for construction of the Kigali-Gatuna road, was partially financed by two credits; the original IDA Credit 196-RW was for US\$9.3 million and the supplementary credit, to cover increased construction costs, was for US\$9.5 million. The second project, Credit 299-RW, US\$3 million, expanded Government's road maintenance capability. During identification of the second project in 1967 the need to upgrade the Ruhengeri-Gisenyi road (60 km) to bitumen paved standards became apparent, and this formed the main component of the Third Highway Project.

II. PROJECT PREPARATION

2. The Government and IDA agreed initially to prepare both the Second and Third Highway Projects under a separate credit for engineering and road maintenance. This project was appraised in 1968 and a credit of US\$380,000 was negotiated in November 1968; it included US\$160,000 for studies and US\$220,000 for an emergency supply of maintenance equipment. However, the Government subsequently decided against the special IDA credit for studies and applied for UNDP financing of the project preparation. UNDP approved the application and granted US\$186,000 for the studies and at Government's request, the preliminary reconnaissance of the Kigali-Ruhengeri-Gisenyi road. The plan of operation was signed on April 17, 1970, the Bank agreeing to act as the executing agency.

3. With the Government's concurrence, the Bank had appointed the Italian consulting firm, Electroconsult (ELC), to carry out the studies. ELC were already working in Rwanda on the Kigali-Gatuna road engineering and supervision of works and could mobilize a study team at short notice. The terms of reference required ELC to (i) review the organization of the highway department and make proposals for improvement; (ii) prepare an 8-year road maintenance program; (iii) carry out a feasibility study of the Ruhengeri-Gisenyi road, specifying design standards and scope of detailed engineering necessary, and (iv) prepare a preliminary survey of the Kigali-Ruhengeri-Cyanika road. The schedule required starting the studies in June 1970 and completing them in August 1971. The contract amount was US\$165,000.

4. ELC proposed in the feasibility report to rectify the alignment of certain sections, totalling about 20 km, of the Ruhengeri-Gisenyi road and to follow the existing alignment on the remaining sections. The detailed engineering would cover the 20 km of new alignment, with pavement design only for the remainder which would follow the existing alignment. The design

standards are shown in Annex 1. The Bank and the Government approved ELC's proposals. The draft report containing detailed engineering and cost estimates of works was submitted in May 1971, and the final report and the bidding documents were completed and approved in May 1972.

III. PROJECT APPRAISAL

5. On the basis of the ELC studies the Association appraised the Ruhengeri-Gisenyi road improvement in March 1973. The proposed project also included technical assistance to the Department of Roads and Bridges (DRB) and training of personnel, and a feasibility study and detailed engineering of the Kigali-Ruhengeri (116 km) and Ruhengeri-Cyanika (27 km) roads. The technical assistance of a transport economist and the training of personnel were added to supplement technical assistance provided by the Federal Republic of Germany (FRG). The Kigali-Ruhengeri-Cyanika road studies were a follow-up of the reconnaissance carried out under the UNDP project (para. 2). The Belgian Government agreed to finance engineering studies of the Kigali-Ruhengeri-Cyanika road provided the Association would participate in the review of reports. The appraisal mission broadly estimated the cost of construction of the Ruhengeri-Gisenyi road, including about 20% contingencies, at US\$3.7 million.

6. Due to the uncertainty of construction prices, the Government and IDA decided to call for bids for construction of the road prior to determining the credit amount. The Government arranged with ELC for updating the 1972 bid documents and cost estimates and their assistance in the bidding procedure. Bids were called in November 1973. Only two bids were received, both from the locally based foreign contractors: Murri Freres (Italy) and ASAF, a joint venture of Astaldi Estero and Safricas (Italy, Belgium). The Murri bid of FRW 346,066,200 (US\$3,761,589) was the lower bid. It was accepted and a contract with Murri was signed on June 18, 1974.

7. Because the contract amount was higher than the initial net estimate, Government approached the UNDP with a request to finance the project's technical assistance and training component, estimated at US\$0.7 million. To gain time, this amount was included conditionally in the Credit pending the UNDP decision. The project cost estimate was as follows:

(i) civil works for road improvement	US\$3.8 million
(ii) contingencies: physical 28% /1 and price 20.5%	1.9 million
(iii) consulting services for civil works	0.6 million
(iv) technical assistance and training	0.8 million
(v) engineering studies	<u>0.6 million</u>
Total	US\$7.7 million

/1 High physical contingency estimates were used because two-thirds of the road was not engineered (para. 4).

The IDA credit financed US\$6.3 million, Belgium US\$0.6 million, and the Government US\$0.8 million including US\$0.5 million to cover an estimated 6% of the total project cost for taxes and duties. The project's Credit Agreement 475-RW was signed on June 5, 1974. A condition of credit effectiveness was the appointment of consultants for supervision of works.

8. The improvement works on unengineered sections of the road required detailed survey before construction, and the setting out of realigned scattered sections needed incorporation into a single road alignment. For these reasons the terms of reference for consulting services included the completion of detailed engineering of the 40 km concerned, besides the supervision of works. The Government received two priced offers: from ELC and the German consulting firm, Rhein-Ruhr Ing (RRI). The ELC offer seemed lower and was selected for the contract award. Because it was urgent to start additional engineering before the commencement of works, the Government allowed ELC to start mobilization pending the submission of a draft contract. However, the ELC draft contract contained an unacceptable condition of price adjustment based on January 1973 rates. The negotiations with ELC failed, and the contract was finally awarded to RRI, and was signed on September 20, 1974, for an amount of US\$440,000, covering services estimated at 68 man-months. Credit 475-RW was declared effective on October 14, 1974. The ELC expenditures of US\$8,000 for mobilization and related services were reimbursed under the Credit.

IV. PROJECT IMPLEMENTATION

A. Completion of Detailed Engineering

9. To complete the detailed engineering in the shortest time possible, RRI added extra engineering staff to their field team. The field work and drawings were completed in February 1975. RRI found some discrepancies in the ELC initial design and in the setting out of the road center line which they corrected; the consultant also proposed an alternative pavement construction using locally found volcanic scoriae for the base course. It appeared that the quantities of work were underestimated, particularly on the unengineered sections of the road; the new quantities were about 22% higher than the contract quantities. Additionally, the high price escalation after the 1973 oil crisis and the 1974 increase in local taxes and duties forecast the possibility of a higher price increase than was initially estimated. A longer time would also be required to carry out the works, because of the extent of supplementary detailed engineering, extra quantities and periodic fuel shortages in Rwanda.

B. Civil Works

10. The contractual start of works was on October 15, 1974, with completion scheduled for April 15, 1976. The contractor was slow in mobilizing equipment and manpower. However, he could not proceed with full deployment on the site while the supplementary detailed engineering and setting out of road alignment was in progress. When in May 1975 the contractor improved his site organization, a problem arose concerning use of volcanic scoriae for the road base, which resulted in another slowdown.

11. Volcanic scoriae are not a homogenous material and differed considerably in hardness in any single location. The contractor was unwilling to accept responsibility for the quality of a base course made of scoriae, and arranged for an independent opinion by the consulting firm Centre d'Etudes du Batiment et des Travaux Publics (CEBTP, France). In February 1976 he submitted to RRI the CEBTP report, in which the consultant warned against the use of scoriae and recommended for the base course trachytic rock which was also available along the road. During the next five months RRI carried out laboratory tests and the road test sections of base course with scoriae and trachyts. Although their findings confirmed suitability of selected scoriae for use in the base course, the contractor refused to accept responsibility for the quality of pavement with a scoria base course. Finally, in September 1975, the Government decided to use scoriae for sub-base, and trachyts for base course.

12. Following the decision on pavement design, the contractor brought to the site additional equipment, labor and supervisory staff and subsequently increased output considerably. During 9 months from September 1976 to June 1977, 65% of total civil works was carried out, whereas only 35% was done in the previous 22 months (see Annex II). The works were completed by June 1977, and were provisionally accepted in July 1977.

C. Cost of Works

	<u>Appraisal</u>			<u>Final Cost</u>
	<u>Net Estimate</u>	<u>Contingencies</u>	<u>Total</u>	
US\$	3,800,000	1,900,000	5,700,000	7,168,360

13. The initial contract price was FRW 346,066,200 (US\$3,761,589), while the final cost was US\$7,168,360 equivalent or 90% higher than expected. About one third of this increase was due for an increase in quantities which raised the cost of works at bid price to an estimated FRW 457,550,000 while the greater part of the cost increase resulted from price escalation and compensation for delays and stoppages caused by design changes and fuel shortages. The contractual price adjustment allowed for an increase in the cost of labor and diesel oil at 20% of the interim certificates for each of these items. Additionally, an adjustment was allowed for cement and steel prices because of Government price controls.

14. To clarify and simplify the contractual obligations of both parties at the final stage of construction, the Government and the contractor agreed in December 1976 to a lump sum contract price of US\$5,950,000 plus FRW 112,200,000, a total of US\$7,168,360 equivalent; the amended time of completion was mutually agreed to be July 1977. The contractor was allowed a FRW 100 million advance on the outstanding contract amount, and he renounced the right to further claims.

15. The initial RRI contract for supervision was for US\$440,000, covering the services of 68 man-months of consultants' staff. Due to extra work required for completing the design and the contract time extension, RRI provided about 100 man-months of expert services. Price adjustment and currency realignments between US\$ and DM further increased the cost of supervision. In December 1976 the Government arranged with RRI for the completion of their services on a lump sum basis of US\$637,000 plus FRW 17,000,000, a total equivalent to US\$822,000.

16. The total cost of improvement of the Ruhengeri-Gisenyi road, including US\$220,000 for feasibility and detailed engineering, was US\$8.2 million or US\$135,000 per km. The relatively low cost was due to the limited scope of works because much of the existing alignment was retained. Sub-base was required only on about two-thirds of the road length; steep gradients up to 12.6% and curves of 35 m radius were allowed. Annex I gives a description of the road after improvement. The quality of work was good. Horizontal and vertical signalization was not included in the contract; the Government will carry out this work by force account within the current road maintenance program.

D. Technical Assistance to DRB and Training

17. The Project provided for the services of a transport economist for 2-1/2 years and the training of about 440 road maintenance personnel: equipment operators, drivers, mechanics, work superintendents and administrative staff. A provision was also made for the services of 2 training experts for about 3 years' duration. The training program was prepared in 1974 by the specialized consultant, the Organization for Rehabilitation and Training (ORT, Switzerland). Initially the Government approached UNDP with a request for the technical assistance and training (para. 7). UNDP agreed in principle, but this allocation would have required cancelling some other items of their program in Rwanda which the Government did not accept.

18. Before implementation of this project component commenced, it was ascertained that the civil works would cost more than initially anticipated and that Government could not undertake the extra financing. Government therefore proposed deferring technical assistance and training to the Fourth Highway Project and using the related credit funds for road construction; the Association agreed to this proposal.

E. Engineering of Kigali-Ruhengeri-Cyanika Road

19. The feasibility study and detailed engineering of the Kigali-Ruhengeri-Cyanika road (143 km) was financed by a Belgian Government grant of US\$0.6 million equivalent. The Association reviewed the terms of reference for the study in August 1973, and subsequently the Belgian consulting firm SODECOTRA was entrusted with the work. The SODECOTRA draft report on feasibility of the Kigali-Ruhengeri section (116 km) was reviewed by the Association in March 1975. The southern alignment recommended for improvement had shown a rate of economic return of 16% and qualified for detailed engineering. At this time the Association decided to provide additional financing for the ongoing Kigali-Gatuna road construction, and a follow-up of the ongoing road maintenance project. Consequently, the IDA financing of the Kigali-Ruhengeri road construction was not possible in the foreseeable future, and the Governments of Rwanda and Belgium were advised accordingly.

20. The engineering study of the Kigali-Ruhengeri road was also carried out by SODECOTRA. The Government approached FRG for the financing of construction and obtained an allocation of DM 61 million. In order to select the best road alignment, FRG arranged for supplementary detailed engineering by RRI. The RRI study is scheduled for completion in August 1978, and the Government would be then in a position to select the alignment for construction.

F. Review of Design of the Kigali-Gatuna Road

21. In January 1975 the Government and Association decided to retain a consultant to supplement the ELC services in reviewing and completing the design and cost estimates of the Kigali-Gatuna road constructed under the First Highway Project. ^{1/} As the related Credit 196-RW was exhausted, the cost estimated at US\$140,000 was financed under this project. The French consultant BCEOM was retained and satisfactorily completed the required services.

G. Changes in Project Contents

22. The original project contents included:

Part A - improvement of the Ruhengeri-Gisenyi road and supervision of works;

^{1/} See First Highway Project Completion Report for details.

Part B - engineering studies of the Kigali-Ruhengeri-Cyanika road;

Part C - technical assistance to DRB and training of personnel.

During project implementation the technical assistance and training component was deleted and the review of design and cost estimate of the Kigali-Gatuna road was added to the project contents. When the Government had arranged with the contractor and the supervising consultant RRI for lump sum contracts (paras. 14-15), the final cost estimates were more clearly determined, and on April 27, 1977, the project description was amended and Credit proceeds reallocated. The original part C of the project description containing technical assistance and training was formally deleted and replaced by a component for consulting services for supervision of works, and a new part D added to cover consulting services to review the design and cost estimate of the Kigali-Gatuna road. The credit allocation was modified by allocating US\$5,500,000 to civil works, US\$600,000 to supervision of works and US\$140,000 to consulting services in relation to the Kigali-Gatuna road, leaving US\$60,000 unallocated. Additionally, in the amended Credit 196-1-RW a sum of US\$429,000 was allocated for civil works related to the improvement of the Ruhengeri-Gisenyi road. Details of the changes in project description and credit allocations are shown in Annex III.

H. Financing and Disbursements

23. At the time of project appraisal, the estimated total cost of construction of US\$5.7 million was financed 92% by the IDA credit and 8% by the Government, the latter participation including 6% taxes and duties. However, in 1974 the Government increased taxes and duties so that their incidence in the cost of civil works rose to 15%. Accordingly the Association decreased its participation in the cost of civil works to 83%. Because of the initial disbursements at the 92% level, the disbursements from April 9, 1976 were reduced to 79%, to make a total IDA participation of 83% in civil works.

24. The original Credit closing date was extended by six months to December 31, 1977. The disbursements were completed in due time, as follows:

Category I, civil works	US\$5,540,000
Category II, supervision of works	620,000
Category III, consulting services BCEOM	132,000
reimbursement ELC (para. 8)	<u>8,000</u>
Total	US\$6,300,000

Additionally, a sum of US\$412,000 was disbursed for improvement of the Ruhengeri-Gisenyi road under Credit 196-1-RW. A summary of the Credit disbursements is shown in Annex IV.

V. PERFORMANCE OF CONTRACTOR, CONSULTANT AND BORROWER

25. The contractor Murri Freres was slow in site mobilization. However, at the beginning of the work he was hampered by the delayed detailed engineering and setting out of road alignment and later by changes in pavement design and periodic shortages of fuel. When in September 1976 pavement design was finalized, he considerably accelerated the progress of works, and in nine months -- half of the contractual time -- completed 65% of the works. The quality of the work was good. The contractor cooperated satisfactorily with the supervising consultant and the Government.

26. Following Government and Association approval of the scope of detailed engineering, ELC had designed and set out road sections with new alignments, totalling about one-third of the road length. When the contract for works was awarded, it was recognized that the detailed engineering should be completed for the whole road (para. 8). The Government intended to retain ELC as the consultant for civil works but did not agree to the conditions of employment, and finally awarded the contract to RRI. RRI completed the design and provided satisfactory services for the supervision of works.

27. The Government showed good understanding of the difficulties encountered during construction, and assisted the contractor and consultant in bringing the project to a successful completion. During the protracted review of pavement design (para. 11), the Government agreed to the extensive testing of proposed materials, and finally made the best selection of pavement alternatives. By arranging in December 1976 for a lump sum payment for completion of the works, Government ensured the satisfactory conclusion of the contract. Financial constraints did not permit an increase in Government participation when the cost of civil works had exceeded the agreed financing. In fact, even at completion of the work the budgetary funds were not sufficient to fully pay the contractor for the local costs portion of bills, and an outstanding amount of about FRW 20 million (US\$220,000) was deferred to the 1979 budget.

VI. ECONOMIC RE-EVALUATION

Appraisal Expectations

28. The Government's Second Plan for 1972-76 listed the Ruhengeri-Gisenyi road section as having the highest priority among projects for which external financing was being sought. It was at the time of appraisal, and still is, one of the most heavily trafficked roads in the country since it joins two major production centers in an area having about one-quarter of the country's total population.

29. The area served by the road is agriculturally rich, producing a large part of the country's staple crops such as potatoes, yams, and maize. Coffee, tea and pyrethrum are also grown, and the area's production accounts for about one-quarter of the country's exports.

30. At appraisal, average daily traffic using the whole length of the road was about 220 vehicles, about one-third of which were trucks averaging 8 tons capacity. While traffic growth had been increasing very rapidly during the period 1964-71, it was expected to continue growing at these high rates for only a few more years and taper off after 1976. Benefits foreseen at appraisal were derived from the reduction of vehicle operating costs and resulted in an economic return for the project of 18%.

Developments Since Appraisal

31. As noted earlier, construction of this road was completed in June 1977, about 16 months later than expected at appraisal. Final cost of construction was US\$7.2 million, 90% above the appraisal net estimate. Heavy vehicle traffic during the intervening years grew slightly faster than expected, a reflection of the importance of the region's economic activity. The following table compares appraisal traffic projections with actual counts in 1976-1977.

Average Daily Traffic, Ruhengeri-Gisenyi Road

	<u>1971</u> <u>actual</u>	<u>1976</u> <u>expected</u>	<u>1976</u> <u>actual</u>	<u>1977</u> <u>actual</u>
Light vehicles	138	305	243	347
Heavy vehicles	<u>83</u>	<u>120</u>	<u>190</u>	<u>205</u>
Total	<u>221</u>	<u>425</u>	<u>433</u>	<u>552</u>

Recalculation of the Rate of Return

32. The appraisal rate of return was based on vehicle operating cost savings with traffic growth rates ranging from 6% to 15% depending on the type of vehicle. For the re-evaluation, the traffic has been assumed to grow at a constant 6% over the 20-year life of the road since traffic growth rates are not available by type of traffic. Benefits for this traffic have been taken as the difference in transport costs between the paved and the previously existing earth road, expressed in 1975-76 prices. The recalculation includes a net maintenance cost averaging US\$34,000 per year for the paved road. Vehicle operating costs used for this analysis are shown in Annex V.

33. On the basis of the foregoing, the recalculated rate of return is 18%, or the same as at appraisal (Annex VI). Thus, although there has been an increase in costs and a longer construction period than expected, this has been offset by higher traffic levels and slightly greater savings in VOC's than estimated at appraisal.

VII. OBSERVANCE OF CREDIT COVENANTS

34. Government complied satisfactorily with the covenants of the Credit Agreement as set out in Articles III and IV, except for Section 4.02 which requires the control of the dimensions and axle-loads of vehicles. The overloading of vehicles in Rwanda is effectively limited by generally poor conditions and steep gradients, and is not so great a problem as in some other East African countries. Arrangements for vehicle dimension and axle-load control were deferred to the current Fourth Highway Project. With respect to Section 4.04 of the Credit Agreement which relate to road maintenance, the Government provided the financing of recurrent expenditures within its budgetary possibilities and has arranged two road maintenance projects since 1972: the Second and Fourth Highway Projects. The quality of maintenance is improving under the impact of these projects.

VIII. ROLE OF THE ASSOCIATION

35. The participation of the Association in the development of the highway sector in Rwanda, through the four highway projects approved between 1970 and 1978, not only helped Rwanda directly with a US\$43 million total in credits, but also generated technical cooperation and financial assistance from other agencies: UNDP, FED, Saudi Development Fund, Belgium, FRG, etc. It may be of interest to mention that by the end of 1977 three paved highways were completed: Kigali-Gatuna (80.5 km), Ruhengeri-Gisenyi (60.5 km), and Kigali-Rusumo (165 km), the last under a project of the People's Republic of China. Bids were recently received for construction of the Kigali-Butare-Burundi border road (153 km) financed by FED. Financing of the Kigali-Ruhengeri road (116 km) is ensured by the FRG. The Association was also instrumental in catalyzing assistance in the field of institution building and road maintenance.

36. The Association staff in charge of the project supervision assisted the Government at all stages of project implementation, particularly when a decision on important matters like selection of consultants, design standards, quality of work or financing was required. The project staff was instrumental in arranging the agreement between Government and the contractor for a lump sum payment for completion of the works, which avoided possible litigation.

IX. CONCLUSION

37. Delaying the credit approval until bids were received and evaluated was a good measure to prevent a project cost overrun. Unfortunately, the contract was based on incomplete detailed engineering, which resulted in a 32% increase in quantities of work, a delay in construction and a higher adjustment for price escalation. Consequently, this project may be considered as another example of how the insufficient preparation results in difficulties in implementation. In this particular case, the financing problem was solved through cancellation of a project item and a small supplement from another credit (196-1-RW).

August 9, 1978

REPUBLIC OF RWANDA
THIRD HIGHWAY PROJECT CREDIT 475-RW
PROJECT COMPLETION REPORT

Ruhengeri-Gisenyi Road: Design Standards and Road Description

A. Design Standards

Design speed	60 km/h
Maximum grade	6% normal, 12% exceptional
Minimum curve radius	50m horizontal; 1500m vertical
Width of carriage way	6m
Width of shoulders	1.0m normal, 0.5m exceptional
Surface	Bituminous surface treatment

B. Road Description (After improvement)

Length - 60,465m

Horizontal alignment:

straight sections total	34,967m
389 curves total	25,498m
9 curves $R = 35m$ total length	406m
13 curves $35 < R < 50m$ total length	521m
95 curves $50 < R < 100m$ total length	5,195m
173 curves $100 < R < 500m$ total length	11,550m
99 curves $R > 500m$ total length	7,826m

Vertical alignment:

Vertical radius	1,500m
Grade less than 3% total length	33,802m
Grade between 3% and 5% total length	13,445m
Grade between 5% and 9% total length	11,118m
Grade between 9% and 12.6% total length	2,100m

Altitudes: Ruhengeri 1,820m; km 29.5 - 2.477m; Gisenyi 1,467m

Pavement: generally 20 cm scoriae subbase and 15 trachytic base, double surface treatment Ruhengeri to km 8, triple surface treatment km 8 to Gisenyi.

Width of carriageway 6m; width of shoulders 0.5 to 1.5m.

Source: Rhein-Ruhr Ing. Final Report, August 1977

August 1978

REPUBLIC OF RWANDA

THIRD HIGHWAY PROJECT CREDIT 475-RW

PROJECT COMPLETION REPORT

Modifications of Project Contents

A. Credit Agreement 475-RW, June 5, 1974

(i) Project Description

Part A: Improvement of the Ruhengeri-Gisenyi road to two-lane paved standards (60.5 km)

Part B: Feasibility studies and detailed engineering of the Kigali-Ruhengeri road (116 km) and the Ruhengeri-Cyanika road (27 km)

Part C: Technical assistance to the Department of Road and Bridges and training of personnel

Expected completion of the Project - December 31, 1976.

(ii) Allocation of Credit Proceeds

<u>Category</u>	<u>Allocation in dollar equivalent</u>	<u>Disbursement percentage</u>
I. Civil works for road improvement	3,500,000	92%
II. Consultant's services for civil works	400,000	100% of foreign expenditure
III. Technical assistance and training	700,000	100% of foreign expenditure
IV. Unallocated	<u>1,700,000</u>	
Total	6,300,000	

B. Amendment dated April 27, 1977

(i) Project Description

Parts A and B: unchanged

Part C: Consulting services for supervision of construction under Part A.

Part D: Consulting services to review the design and cost estimate of the Kigali-Gatuna road.

(ii) Allocation of Credit Proceeds

<u>Category</u>	<u>Allocation in dollar equivalent</u>	<u>Disbursement percentage</u>
I. Civil works for road improvement	5,500,000	83%
II. Consultant's services for Part C of the Project	600,000	100% of foreign expenditure
III. Consultant's services for Part D of the Project	140,000	100% of foreign expenditure
IV. Unallocated	<u>60,000</u>	
Total	6,300,000	

C. Final Disbursements

<u>Category</u>	<u>Allocation in dollar equivalent</u>	<u>Disbursement percentage</u>
I. Civil works for road improvement	5,540,000 <u>1/</u>	83%
II. Consultant's services for Part C of the Project	620,000	100% of foreign expenditure
III. Consultant's services for Part D of the Project	<u>140,000</u>	100% of foreign expenditure
Total	6,300,000	

1/ An amount of US\$411,000 representing 83% of final contractor bills was additionally disbursed under Credit 196-1-RW.

August 1978

REPUBLIC OF RWANDA

THIRD HIGHWAY PROJECT CREDIT 475-RW

PROJECT COMPLETION REPORT

Disbursement Summary (as of 12/31/1977)
(US\$.000)

<u>IDA Fiscal Year and Quarter</u>	<u>Appraisal Estimate</u>	<u>Actual Disbursement</u>	<u>Actual Disbursement as % of Appraisal Estimate</u>
<u>FY 1975</u>			
September 30, 1974	800	-	-
December 31, 1974	1200	436	36%
March 31, 1975	1800	558	31%
June 30, 1975	2700	948	35%
<u>FY 1976</u>			
September 30, 1975	3700	1258	34%
December 31, 1975	4600	1775	39%
March 31, 1976	5400	2176	40%
June 30, 1976	5800	2346	41%
<u>FY 1977</u>			
September 30, 1976	5950	2546	43%
December 31, 1976	6100	3146	52%
March 31, 1977	6200	4963	80%
June 30, 1977	6300	6156	98%
<u>FY 1978</u>			
September 30, 1977	-	6228	99%
December 31, 1977	-	6300	100%
 Closing date	 June 30, 1977	 December 31, 1977	

August 1978

REPUBLIC OF RWANDA

ANNEX V

THIRD HIGHWAY PROJECT CREDIT 475-RW

PROJECT COMPLETION REPORT

Economic Vehicle Operating Costs^{1/}
(US\$ per km)

	<u>Truck/Trailer</u>	<u>Truck</u>	<u>Car</u>
Paved Road	0.51	0.35	0.13
Gravel Road	0.82	0.47	0.17
Earth track	1.16	0.67	0.22

1/ After adjustment for inflation, as of 1976

August 1978

REPUBLIC OF RWANDA

ANNEX VI

THIRD HIGHWAY PROJECT CREDIT 475-RW

PROJECT COMPLETION REPORT

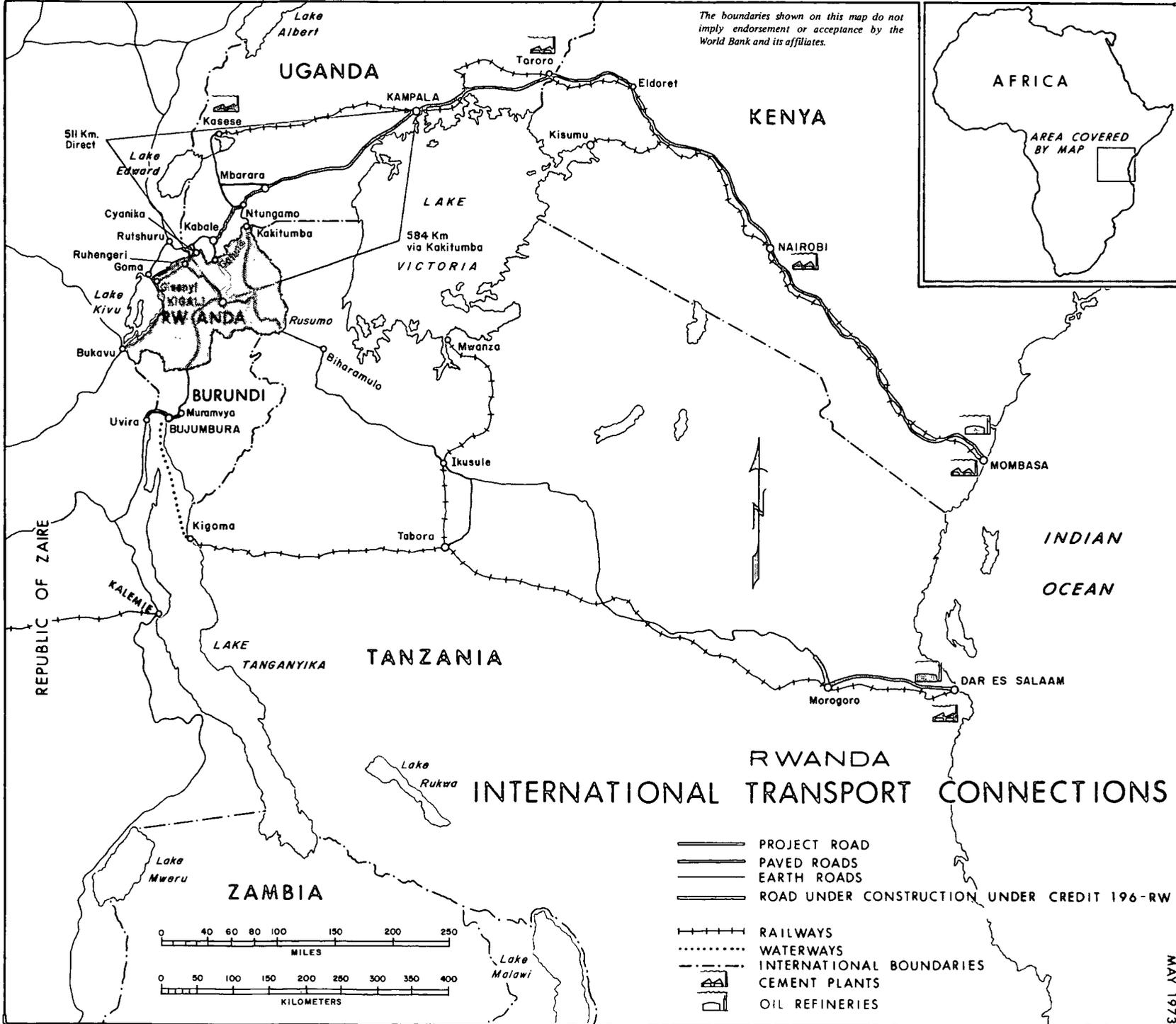
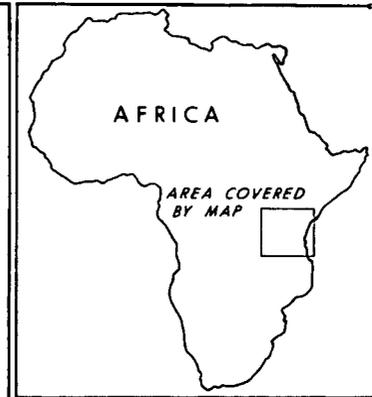
Recalculation of Economic Return: Ruhengeri-Gisenyi Road
(US\$ 000)

<u>Year</u>	<u>Construction and Maintenance costs</u>	<u>VOC Savings Benefit</u>	<u>Net Benefit</u>
1973	64	0	-64
1974	140	0	-140
1975	1488	0	-1488
1976	2253	0	-2253
1977	2941	0	-2941
1978	128	1100	972
1979	34	1166	1132
1980	34	1235	1201
1981	34	1310	1276
1982	34	1388	1354
1983	34	1472	1438
1984	34	1560	1526
1985	34	1653	1619
1986	34	1753	1719
1987	34	1858	1824
1988	34	1969	1935
1989	34	2088	2054
1990	34	2213	2179
1991	34	2346	2312
1992	34	2486	2452
1993	34	2636	2602
1994	34	2794	2760
1995	34	2962	2928
1996	34	3328	3294

Economic Rate of Return: 18%

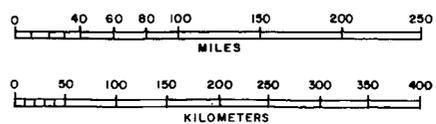
August 1978

The boundaries shown on this map do not imply endorsement or acceptance by the World Bank and its affiliates.



RWANDA INTERNATIONAL TRANSPORT CONNECTIONS

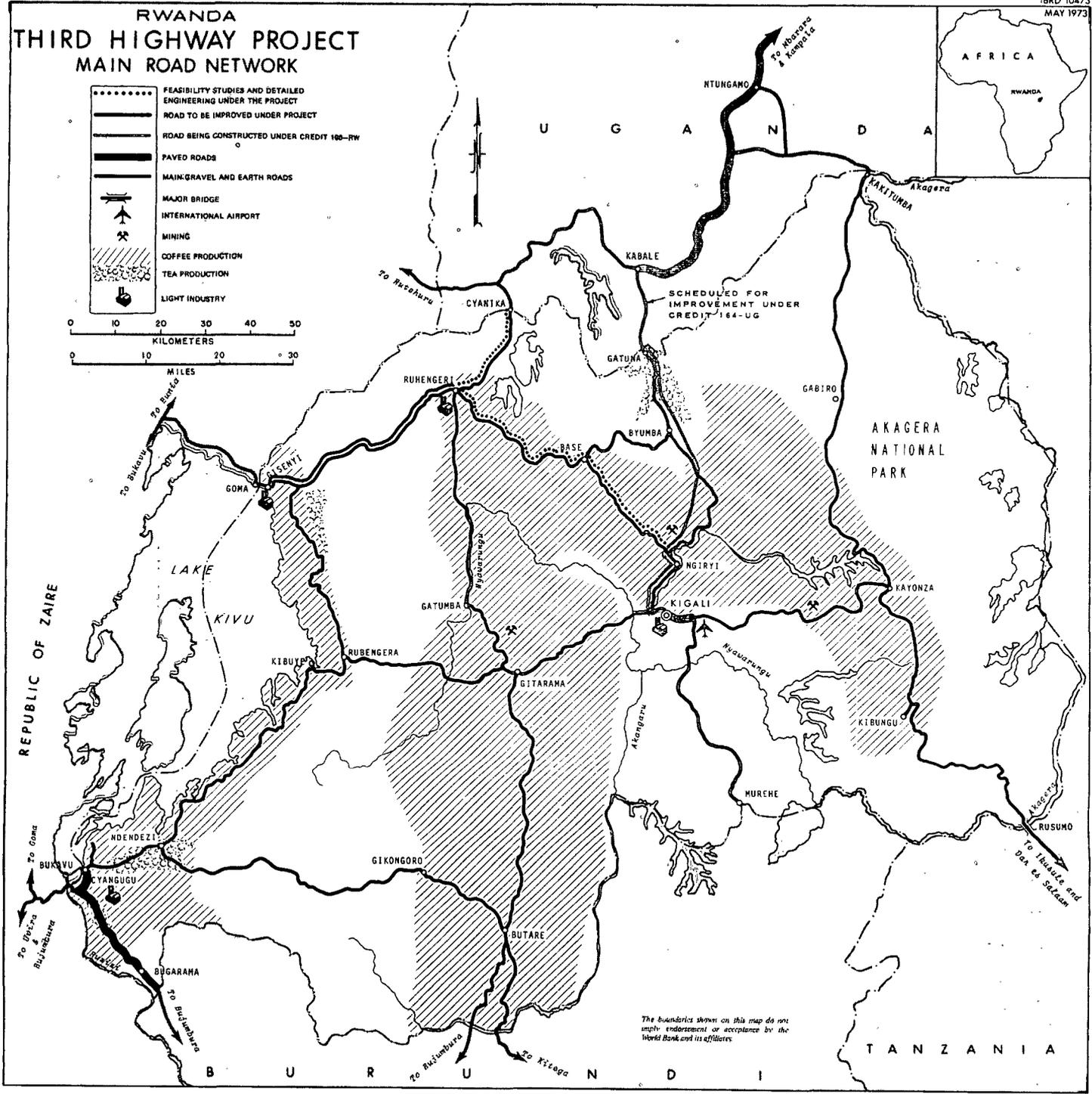
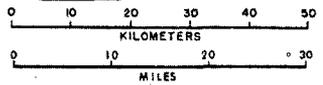
- PROJECT ROAD
- PAVED ROADS
- EARTH ROADS
- ROAD UNDER CONSTRUCTION UNDER CREDIT 196-RW
- RAILWAYS
- WATERWAYS
- INTERNATIONAL BOUNDARIES
- CEMENT PLANTS
- OIL REFINERIES



IBRD 2830 R4
MAY 1973

RWANDA THIRD HIGHWAY PROJECT MAIN ROAD NETWORK

- FEASIBILITY STUDIES AND DETAILED ENGINEERING UNDER THE PROJECT
- ROAD TO BE IMPROVED UNDER PROJECT
- ROAD BEING CONSTRUCTED UNDER CREDIT 180-RW
- PAVED ROADS
- MAIN GRAVEL AND EARTH ROADS
- MAJOR BRIDGE
- INTERNATIONAL AIRPORT
- MINING
- COFFEE PRODUCTION
- TEA PRODUCTION
- LIGHT INDUSTRY



The boundaries shown on this map do not imply endorsement or acceptance by the World Bank and its affiliates.

TANZANIA

RWANDA HIGHWAY MAINTENANCE PROJECT MAIN ROAD NETWORK

-  PAVED ROADS
-  MAIN GRAVEL AND EARTH ROADS
-  ROAD BEING CONSTRUCTED UNDER CREDIT 196-RW
-  PROJECTED BRIDGE
-  INTERNATIONAL AIRPORT
-  MINING
-  COFFEE PRODUCTION
-  TEA PRODUCTION

