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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT  
INTERNATIONAL DEVELOPMENT ASSOCIATION

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APPRAISAL OF  
A HIGHWAY PROJECT  
RWANDA

May 26, 1970

Transportation Projects Department

Currency Equivalents:

Currency Units	=	Rwandese Francs (RF)
FRW 1	=	US\$0.01
FRW 100	=	US\$1.00
FRW 1,000,000	=	US\$10,000

Fiscal Year                      January 1 to December 31

Weights and Measures:      Metric

Metric: British/US Equivalent:

1 kilometer (km)	=	0.62 miles (mi)
1 meter (m)	=	3.28 feet (ft)
1 square kilometer (km <sup>2</sup> )	=	0.386 square miles (sq mi)
1 hectare (ha)	=	2.47 acres (ac)
1 liter (l)	=	0.22 gallons (Imperial) 0.26 gallons (US)
1 metric ton (m ton)	=	2,204 pounds (lbs)

Abbreviations and Acronyms :

DRB	-	Department of Roads and Bridges
FED	-	European Development Fund
GDP	-	Gross Domestic Product
PMEA	-	Permanent Mission in Eastern Africa
UNDP	-	United Nations Development Programme

RWANDA

APPRAISAL OF A HIGHWAY PROJECT

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This report was prepared by Messrs. H. Brandreth (economist) and G. Chaix (engineer), and was edited by Miss J. Murphy.

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## RWANDA

### APPRAISAL OF A HIGHWAY PROJECT

#### SUMMARY AND CONCLUSIONS

- i. As is true of most land-locked countries, effective access to world markets is of primary importance to Rwanda. Located about 1,750 km from the nearest port, Rwanda spends as much as 35% of its meagre export earnings on transport costs for trade items.
- ii. Since independence, the main traffic routes for imports and exports have been through Uganda-Kenya and Burundi-Tanzania to the Indian Ocean ports of Mombasa, Kenya, and Dar es Salaam, Tanzania, respectively. Of these routes, that to Mombasa is the more important; first, because it involves only one transshipment of traffic (between road and rail) and second, because almost 50% of Rwanda's imports originate at points in Uganda and Kenya lying on this route. Kampala, the capital of Uganda and the main transshipment point on the route to Mombasa, has become a major marketing center for Rwanda.
- iii. The proposed project provides for the construction of a paved road from Kigali to Gatuna on the Uganda border, which, by connecting more directly with the Uganda highway system than the existing trade route via Kakitumba, will shorten the distance to Kampala and beyond by 73 km. It will also provide much better riding characteristics for local and international road traffic. As a result, transport costs will be lowered substantially for import and export traffic; this factor, combined with the increased speed, convenience and safety of the new route will undoubtedly generate additional traffic. The road construction project is estimated to have an internal rate of return of 13%, on the basis of traffic diverted from the existing link and normal growth.
- iv. The contract for construction of the road also provides for its maintenance for a full year after construction is complete. This is to ensure that the road is properly maintained, pending improvement of the Government's maintenance service through implementation of maintenance study recommendations (see para. vi).
- v. The project also includes the provision of a small amount of road maintenance equipment to improve the effectiveness of mechanized maintenance operations. Pending the reorganization of maintenance services, the equipment will be allocated to a mechanized maintenance unit now deployed on the existing road link from Kigali to Uganda via Kakitumba. This unit, partially equipped through German aid, is efficiently managed and operated by a four-man German technical assistance team. It comprises the only mechanized maintenance unit in Rwanda at present.
- vi. Large-scale assistance to Rwanda's road construction and maintenance organization cannot be justified at present because of the poor state of the organization and facilities available. A maintenance study is needed to formulate a comprehensive program of rehabilitation and development, including the provision of adequate local funds to meet the

needs of an efficient maintenance service. The improvement of maintenance facilities in Rwanda is vital to the proper upkeep of a major new paved road link of international significance as provided under this project. The UNDP is financing such a highway maintenance study, with the Bank as Executing Agency. The Government has agreed to implement a highway maintenance program, upon completion of the study and agreement with the Association on its recommendations.

vii. The total cost of the project is estimated at US\$10.9 million equivalent. The proposed credit of US\$9.3 million equivalent represents 85% of the total cost of the project and covers the estimated foreign exchange costs. The Government has confirmed that it will meet the local costs, estimated at US\$1.6 million equivalent. Belgium is making available US\$600,000 equivalent to Rwanda as a contribution towards this local cost financing.

viii. The project provides a suitable basis for an IDA credit of US\$9.3 million equivalent.

## RWANDA

### APPRAISAL OF A HIGHWAY PROJECT

#### 1. INTRODUCTION

1.01 The Government of Rwanda has asked the Association to help finance a project consisting of:

(i) construction of a 79 km paved road between the capital, Kigali, and Gatuna on the Uganda border, including (a) preparation of bidding documents and supervision of construction by consultants, and (b) provision for one year's full maintenance of the project road by the construction contractor; and

(ii) purchase of road maintenance equipment.

The total cost of the project is estimated at US\$10.9 million equivalent. The Credit of US\$9.3 million equivalent (85%) will cover the estimated foreign exchange costs.

1.02 The road construction was first identified as a potential Bank Group project in April 1966 when a PMEA mission visited Rwanda. At that time the European Development Fund (FED) was proposing a feasibility and detailed engineering study of the Kigali-Gatuna road to be followed by limited improvements. The Bank Group, believing there was a prima facie case for total reconstruction of the road, proposed a common approach. As a result the necessary studies were financed by FED, utilizing the services of the Italian consultants, Electroconsult, on the understanding that the Association would proceed with an appraisal thereafter. Electroconsult completed its assignment in July 1969.

1.03 The project will provide a paved road, which will link Rwanda and the Uganda highway system, replacing an existing earth track and reducing by 73 km the road distance to Kampala, the market center and transshipment point in Uganda for Rwanda imports and exports. It will therefore have a very favorable impact on transport costs related to Rwanda's foreign trade. The project will also provide some road maintenance equipment which will improve the effectiveness of mechanized road maintenance operations.

1.04 Although, before independence, Rwanda was the partial recipient of a 1957 Bank loan (165-BE) for a transport project in the Belgian Trust Territory of Ruanda-Urundi, the proceeds were devoted entirely to expanding the port of Bujumbura and to improvement of the Bujumbura-Muramvya road, all in what is now Burundi. The proposed project will therefore be the first Bank Group transport sector lending operation in Rwanda. However, two earlier appraisal reports have been prepared for transport projects.

1.05 The first, initially prepared in the PMEA office in December 1967, consisted of a highway maintenance study, advisory services to the Department of Roads and Bridges (DRB), the purchase of an emergency supply of maintenance equipment and spare parts, and a series of road feasibility and detailed engineering studies. At the request of the Government this report was drastically revised in October 1968 to delete the advisory services and all but one of the road studies. A credit for this latter proposed project was negotiated in November 1968 but the Government withdrew its credit request in favor of a UNDP-financed study covering highway maintenance and engineering of the Gisenyi-Ruhengeri road. The Plan of Operation for this study was approved by the Government in April 1970. The study is being carried out by the Italian consultants, Electroconsult, with the Bank as Executing Agency.

1.06 This report is based on the economic and engineering studies of Electroconsult and on the findings of an appraisal mission consisting of Messrs. Chaix (engineer) and Brandreth (economist) who visited Rwanda in December 1969. It was edited by Miss J. Murphy.

## 2. BACKGROUND

### A. Economic Setting

2.01 Rwanda, a land-locked country in east-central Africa about two-thirds the size of Switzerland (23,640 km<sup>2</sup>), shares many of that country's topographical features. With an average altitude of over 2,000 m, Rwanda enjoys a tropical highland climate. Most of the arable land lies in the mountainous western half of the country where rainfall is sufficient to permit several crops per year to be grown. Further east, where the terrain subsides into a rolling plateau, rainfall diminishes, the land is less fertile, and the prevalence of the tsetse fly inhibits animal husbandry. As a result, the western mountain slopes are the most densely populated and there is little arable land which remains untilled.

2.02 The country suffered great social and political turmoil between 1959 and 1965, marked by internal tribal conflict and incursions by political refugees sheltered in neighboring lands. This unrest intensified after 1962 when Belgium relinquished its trusteeship and Rwanda separated from Burundi to become independent. This instability combined with a lack of experience in government affairs led to a severe economic slump from which the country did not start to recover until 1964. Rwanda is currently a one-party republic with a relatively stable government and economic progress has been moderately good in the last few years.

2.03 The population of Rwanda, growing at over 3% annually, currently approximates 3.5 million, making it, with 148 inhabitants per km<sup>2</sup>, among the most densely populated countries in Africa. The economy is primitive, with subsistence agriculture the rule, and there are few population centers of consequence. The GDP per capita in 1968 was estimated at US\$50,

of which over half consisted of food crops grown for subsistence consumption. Commerce and industry are very limited and most manufactured goods, from cloth to machinery, as well as some food items, must be imported. Exports consist almost exclusively of tin ore and coffee, supplemented by pyrethrum and, more recently, by a growing volume of tea.

2.04 In 1968, imports, amounting to 75,000 tons, were 35% higher than in 1966, representing an annual growth of over 16%. Exports totalled about 17,000 tons in 1968 - up 29% from 1966 or 13.7% annually (Table 1). Prior to independence, 25%-50% of overseas trade moved via Atlantic ports in Congo (K) or Angola. In recent years all this trade has been diverted to the Indian Ocean ports of Mombasa in Kenya and, less importantly, Dar es Salaam in Tanzania. In 1967 and 1968, 92% of Rwanda's exports and 85% of imports moved over the route to Mombasa.

## B. The Transport System

### (1) General

2.05 Road movements dominate transport in Rwanda for both internal and external traffic. There are no railways, and while there is some water transport on Lake Kivu, it is not of national significance. Scheduled air transport is limited to international connections to all neighboring countries and Europe through Kigali airport which is equipped to handle modern long-range jet aircraft.

2.06 The primary concern of the Government is with access to neighboring and overseas markets. The more productive northern area of the country finds its natural outlet through Uganda, by road as far as Kampala, the logical transshipment and local market point, and by rail from there to Mombasa (see Map 1). Southern areas, with production centered in Butare and Cyangugu, are closer to the Tanzanian outlet via Bujumbura in Burundi, the Lake Tanganyika waterway to Kigoma, and by rail from there to Dar es Salaam. While this southern route is slightly shorter (1,750 km versus 1,800 km for the Mombasa route), there are two expensive and time-consuming transshipments en route (road to water at Bujumbura and water to rail at Kigoma) versus one transshipment (road to rail at Kampala) on the northern route. Additionally, in the three years 1966 to 1968 inclusive, about 50% of Rwanda's imports originated in Kampala or other intermediate stations in Uganda and Kenya, chiefly refined oil products, cement and salt. A third route is under development, with German assistance, which will eventually link southeastern Rwanda by road with Tabora, Tanzania, and thence, by rail, with Dar es Salaam. Thus, Rwanda is endeavoring to maintain and expand its options for port access, in an attempt to avoid situations encountered in the past in which, at one time or another, one or all of the routes through Congo (K), Burundi and Uganda have been cut for political reasons.

(ii) Highways

2.07 In spite of generally rugged terrain, Rwanda has a road system which in relation to the area of the country, is more than three times as extensive as that of its neighbors - Uganda or Kenya. Its 6,000 km of roads consist of about 2,000 km of national routes and 4,000 km of tertiary local roads. Almost the entire system consists of unengineered earth or gravel roads on which standards of alignment and roadway width vary unpredictably, and the classification relates chiefly to the allocation of responsibility for maintenance and repair. The Ministry of Public Works and Energy is responsible for the national routes, while maintenance of the remaining roads is undertaken by the local districts or communes. In practice, maintenance standards vary only slightly from one class of road to another. Shortages of funds, competent staff, and equipment have reduced maintenance operations, with few exceptions, to hand labor standards. The Association has been viewing the serious condition of maintenance services with concern for two years and recommended a maintenance study leading to an improvement program. The UNDP is financing this study.

(iii) Transport Policy

2.08 Transport on the existing link between Kigali and Kampala is controlled by the Agence Maritime Internationale, a subsidiary company of a Belgian shipping line, which has been appointed by the Government to act as forwarding and receiving agent and to contract for the road services required. Most of the transport is effected by Uganda road haulage firms with only a few small local operators participating. Transport rates are approved by the Government.

2.09 Several years ago, the Government created a public bus company (Societe des Transports Publics) to operate inter-city passenger services. In the past year, this organization has expanded considerably with Japanese technical assistance, not only to extend its service to more communities but also to introduce a bus service in Kigali proper. There are no other organized passenger services in Rwanda - in fact, there are very few taxis in Kigali and only one or two "bush" taxis in the countryside - in spite of the fact that there are no restrictions applied to such services.

2.10 There are no regulations applicable to trucking services and no restrictions to the importation of vehicles. A trade license is all that is required to enter the transport business and, although provisions exist for safety and economic regulations, none has been placed in force. Except for the fact that capital is extremely scarce, it may be said that within the local transport industry, conditions of virtually free competition exist.

2.11 Road user taxes of all types are very low, particularly since April 1968 when the Government cut many taxes in all fields. Import duties on transport vehicles and parts range from 5% to 10%. Duties on gasoline amount to RF 2 per liter (US \$ 2) which will be increased to RF 4 per liter in the current year. The diesel fuel duty is RF 2.5

per liter. There are no excise taxes on fuel and the price of diesel is slightly lower than in neighboring Uganda. As a result, the Uganda trucking firms handling Rwanda traffic arrange to purchase fuel in Rwanda rather than at their home bases.

2.12 On the single paved route in the country, a 10 km stretch between Kigali and the airport, a toll system has been introduced. The RF 50 (US\$0.50) one way toll (for trucks) is calculated to be sufficient to meet maintenance and amortization costs. There is, in effect, a road toll on all international transport movements, since each time a truck or trailer enters Rwanda, a tax of RF 1,000 (US\$10) is payable (Table 2). Since most of the important import-export traffic is handled by foreign vehicles, this tax ensures a revenue contribution by carriers which might otherwise escape taxation. It is likely, however, that most of this tax is ultimately paid by Kigali consumers in the form of a higher transport element in the price of imported commodities. None of the foregoing revenues extracted from road users is earmarked in any way for road construction, improvements or maintenance. In 1967 and 1968, these revenues fell slightly short of expenditures on road maintenance. In 1969, the shortfall was quite considerable, as shown below:

<u>Year</u>	<u>Estimated Highway User Charges</u> (US\$'000)	<u>DRB Expenditures</u> <sup>1/</sup> (US\$'000)
1966	n.a.	519.8
1967	514.2	572.1
1968	566.2	599.8
1969	593.4	736.4

1/ Road maintenance only, no construction undertaken.

Details of revenues and expenses are outlined in Tables 2 and 3 respectively.

2.13 Since to be effective, any taxation policy of Rwanda must be correlated with that of neighboring countries, any increase in road user charges should be carefully evaluated. As part of the UNDP-financed maintenance study, the consultants will look into the entire question of highway financing and will make specific recommendations as to the most effective way of charging road users (para. 3.11).

### 3. THE HIGHWAY SECTOR

#### A. Road Traffic Characteristics

3.01 The vehicle fleet is small but has been growing extremely rapidly in recent years (see Table 4). Between 1965 and 1968, the number of private cars increased 25% annually to reach a total of nearly 3,000 in 1968. Small trucks and vans increased at an even faster annual rate (28%) exceeding 900 in 1968, while the number of large trucks increased from 400 to over 600 in the period (over 13% per year). Figures for 1969 are not yet available but, assuming these growth rates have continued, the total number of vehicles currently exceeds 5,000. The vast majority of trucks carrying imports and export traffic, however, are registered in Uganda. Typically, each of these transport units consists of a 12-ton truck with a trailer capable of hauling 12-18 tons.

3.02 Traffic volumes are light throughout the country. Less than 100 km of road handle 100 vpd. The most heavily travelled routes include Kigali-Gitarama-Butare (136 km), Ruhengeri-Gisenyi (68 km), Kigali-Ruhengeri (116 km), the Cyangugu-Burundi frontier road (47 km), and the Kigali-Kakitumba road (208 km), currently carrying the Uganda traffic which will be diverted to the proposed project road.

#### B. Highway Administration

3.03 The DRB, a department of the Ministry of Public Works and Energy, is responsible for the construction and maintenance of the national highway system. The organizational structure of the DRB is not clearly defined but, in general, construction work is undertaken by one central office, while maintenance functions are divided between the main Kigali office, which retains control of mechanical equipment, allocating it according to need, and 10 prefectural offices which employ hand labor on daily maintenance work. This structure is patterned on pre-independence procedures which, at that time, provided Rwanda with a well maintained road network on a modest budget. In recent years the growth in traffic, the lack of budgetary resources, and the shortage of trained staff have resulted in serious deterioration in technical and operational standards with an inevitably adverse effect on the road system. At the present time, both the construction and maintenance functions of the DRB are in the charge of foreign experts, although the DRB itself is headed by a national.

#### C. Engineering and Construction

3.04 No road construction of importance has been undertaken in recent years except for 10 km of paving near Kigali. Construction work by the DRB has been confined, of late, to a few minor structures. The DRB has also supervised the detailed engineering for the Kigali-Gatuna road financed by FED and for a bridge on the road to Tanzania, at Rusumo, financed by German aid. The major role in this work was performed by foreign staff provided under German technical assistance.

D. Maintenance Services

3.05 The maintenance service is run by two Belgians, an engineer and a mechanic. The staff at their disposal has little or no technical training, and, at the prefectural level, the educational potential, even of senior staff, is frequently hampered by the lack of any language knowledge beyond the local dialect. This is one reason why mechanical equipment is not allotted to the prefectures but is maintained under the supervision of headquarters. Another reason is because modern equipment in good working order is in extremely short supply and, consequently, is not available for regular assignment. The exception to this situation is one maintenance unit recently equipped through aid provided by the Federal Republic of Germany. The unit, supervised and maintained by four foreign technicians, operates efficiently, concentrating its efforts on the main roads, especially the Kigali-Kakitumba-Uganda road, which, although only an unengineered dirt road, is presently the best link with Uganda.

3.06 The road maintenance equipment owned by the DRB was inventoried before the mission arrived in Rwanda. Of a total fleet of 114 units, only about 10% (7 agricultural tractors, 1 loader and 3 trucks), financed by German aid less than two years ago, is operational. About 70% of the fleet is more than 5 years old and currently inoperable. These units are beyond economic repair and should be written off. The remaining 20% consists of units 3 to 5 years old and most of it is out of service.

3.07 Efficient maintenance and repair of equipment is practically impossible under present circumstances. Aside from the lack of funds for staff and spare parts, the DRB has no maintenance workshops or servicing facilities and very few tools. It has no qualified local mechanics on its staff.

3.08 The Government has requested IDA financing for equipment and spare parts. But under present conditions, merely supplying new equipment and spare parts would not provide a solution to the problem of equipment shortages because of the inability of the DRB to make effective use of such material. Pending completion of the maintenance study and subsequent reorganization of road maintenance services, the project will provide a limited amount of equipment which could be efficiently and effectively utilized by the mechanized maintenance unit described in para. 3.05 (see para. 4.07).

3.09 The development of an adequate national road maintenance organization would require not only capital investments but the provision of a substantial amount of technical assistance at the working level and a program for large-scale training of local staff. Since the DRB's road maintenance resources cannot adequately cope with the existing national road system and certainly would not be able to maintain the projected Kigali-Gatuna road, it is imperative that steps be taken to improve the maintenance facilities and to develop an effective maintenance program. The UNDP-financed highway maintenance study, expected to be completed early in 1971, will prepare such a program. Specifically, this study will provide recommendations to reorganize maintenance services and to determine technical assistance

and maintenance equipment needs. During negotiations, the Government confirmed that it will, upon receipt of the study, and after consultations on its recommendation and agreement with the Association, implement a program to improve highway maintenance. Assuming adequate financing is available, such a program could probably start by mid-1972.

#### E. Highway Financing

3.10 Over the past 4 years (1966-1969) total highway maintenance expenditures have averaged about RF 55 million per year (approximately US\$550,000 equivalent) (see Table 3). Of this, about RF 25 million was devoted to DRB salaries and RF 26 million to materials, spare parts and vehicle fuel. The remainder (about RF 4 million per year) was allocated to the maintenance of tertiary roads to be done by the local communities. There has been no expenditure for road construction; only the improvement and paving of the 10 km airport road has been undertaken, financed in its entirety by German aid.

3.11 Maintenance funds are drawn from general budgetary allocations and are related to overall fiscal policy rather than road maintenance needs. Funds have been generally inadequate to meet basic requirements. The UNDP-financed maintenance study will investigate the financial requirements of the DRB, present and potential road user taxes, the changes that are needed to meet expenditure requirements and the desirability of and necessity for earmarking a portion of these revenues for road maintenance services.

### 4. THE PROJECT

#### A. Description

4.01 The project consists of:

- (i) construction of a 79 km paved road between Kigali and Gatuna on the Uganda border, including (a) preparation of bidding documents and supervision of construction by consultants, and (b) provision for one year's full maintenance of the project road by the construction contractor; and
- (ii) purchase of road maintenance equipment.

#### B. Construction of the Kigali-Gatuna Road

4.02 The Kigali-Gatuna road will link Kigali, the capital and main commercial center, with the road/rail network in Uganda by which most of Rwandese imports and exports are shipped. At present, only a 107 km, seasonal dirt track exists between Kigali and Gatuna. Imports and exports between Kigali and Uganda utilize another, low-standard, earth road that goes around the Muhazi lake to avoid mountainous areas north of Kigali, and reaches the Uganda border at Kakitumba in the northeast of Rwanda, 208 km

from Kigali. This road has not been engineered and has design standards which vary from section to section, but are consistently low. The roadway width ranges from 4 to 6 m and earthworks are very limited. In some sections in flat terrain, there is no laterite surfacing whatsoever. With insufficient drainage and scarcity of laterite surfacing, the road is barely passable for heavy trucks during the rainy season and does not permit satisfactory vehicle operation under the best of conditions. The present maintenance effort (para. 3.05) is helping the situation slightly, but any real improvement would require total reconstruction.

4.03 The proposed road will go straight north 79 km from Kigali to join the Uganda road system at Gatuna on the border. It will connect with a gravel road to Kabale, the improvement of which is scheduled for completion in 1971 with financing from Credit 164-UG. From Kabale to Kampala the highway is paved. Compared to the existing link via Kakitumba, the proposed road will reduce the distance for transport between Kigali and Kampala, the capital of Uganda and the transshipment point for most of Rwanda's imports and exports, by 73 km. On the first 12 km, the new road will closely follow the alignment of the Kigali-Ruhengeri road, and reconstruction of this section will also benefit the traffic on that route. Beyond this point the new road will replace a seasonal track which is not currently passable by heavy trucks because of weak bridges and steep grades. It will connect two valleys separated by a high ridge which will be crossed by a 26 km long section on which substantial earthworks and numerous retaining walls are required. Locally, the road will serve the town of Byumba, located on a short spur, and its populated countryside as well as an important tea plantation near Gatuna.

4.04 Electroconsult prepared detailed engineering for a two-lane gravel road including soil survey, earthwork, drainage, and bridges of less than 10 m length. For the most part, the design selected by the consultants can be adopted for a two-lane paved road (6 m carriageway and one meter shoulder width). In cut sections, however, the adoption of the consultants' design would have reduced the shoulder width to only 0.5 m. The Association and the Government agreed to widen the roadway in cut sections to keep a 1 m width shoulder, with the exception of a very mountainous 26 km stretch near Byumba, where widening of the proposed roadway would lead to prohibitively expensive additional earthwork. (See Table 5 for design standards.) These modifications increase the earthwork construction costs by about 5% over the consultants' estimate. They are justified since they will simplify pavement construction and provide better operating conditions. Engineering required by these modifications in design will be undertaken under the project.

4.05 Detailed engineering of three small bridges on the project road ranging in length from 14 to 30 m has not been undertaken. Similarly, pavement design has yet to be done. This work, combined with the changes in roadway width mentioned in para 4.04, will take approximately four months

and will have to be completed before bidding documents can be prepared. While it would have been desirable to have this work finished for consideration during negotiations of the proposed credit, it was not essential. The appraisal estimate for road construction includes the cost of changing the design standards and adding the bridges and paving work.

4.06 Because of the inadequacy of the current maintenance service in Rwanda, it is advisable to provide for separate maintenance of the project road for one full year after its completion. This will ensure that the road is properly maintained until, as a result of the maintenance improvement program implemented on the basis of the maintenance study recommendations (see para. 3.09), the DRB is in a position to provide its own adequate service. The construction contract for the project road provides for full maintenance of the road for one year after its completion, in addition to the normal contractor's obligation to repair faulty construction; financial provision has been made for this in the credit.

#### C. Purchase of Road Maintenance Equipment

4.07 The project also includes the purchase of some equipment and a vehicle to increase the efficiency of mechanized maintenance operations. Pending reorganization of maintenance services, the equipment would be allocated to the mechanized maintenance unit working on the most heavily used roads, mainly the Kigali-Kakitumba road. The equipment (1 bulldozer, 1 grader and 1 dump truck) will speed up maintenance activities while the light transport vehicle will improve liaison with Kigali, the major source of supply. (Table 6 gives additional details on this unit.) The maintenance study will make recommendations for absorbing this equipment within the framework of an overall maintenance facility at a later date.

D. Cost Estimates and Financing

4.08 The estimated cost of the project is summarized as follows:

	<u>RF (million)</u>			<u>US\$ (million)</u>			<u>% Foreign Exchange</u>
	<u>Local</u>	<u>Foreign</u>	<u>Total</u>	<u>Local</u>	<u>Foreign</u>	<u>Total</u>	
(a) Construction and one year's maintenance of Kigali-Gatuna Road	115	655	770	1.15	6.55	7.70	85
(b) Preparation of bidding documents and supervision	11	59	70	0.11	0.59	0.70	84
(c) Maintenance equipment	1	13	14	0.01	0.13	0.14	93
(d) Contingencies	<u>35</u>	<u>196</u>	<u>231</u>	<u>0.35</u>	<u>1.96</u>	<u>2.31</u>	<u>85</u>
TOTAL PROJECT COST	162	923	1,085	1.62	9.23	10.85	
Say,	<u>160</u>	<u>930</u>	<u>1,090</u>	<u>1.60</u>	<u>9.30</u>	<u>10.90</u>	85

4.09 The construction cost estimates are based on quantities derived from the detailed engineering estimates for a gravel road and on unit prices prepared by the consultants and reviewed by IDA. They include assessments of costs related to the roadway width changes mentioned in para. 4.04, as well as estimates, based on the consultants' preliminary studies, of the cost of the three small bridges not yet designed. They also provide for road paving costs based on recent Government studies, reviewed by IDA. An allowance of 15% has been included for work which has been engineered, and of 20% for work which has not yet been engineered (paving, bridges and design revision) to cover possible increases in physical quantities. A price escalation allowance of about 10% has been provided to cover the two-year construction period.

4.10 The estimates for consulting services include the preparation of bidding documents, including the completion of detailed engineering for bridges, paving and revisions in design standards, and the supervision of construction. They were confirmed during credit negotiations, when a contract between the consultants and the Government was also negotiated. A 10% contingency allowance is included to cover possible price variations.

4.11 The cost of the limited quantity of highway maintenance equipment to be included in the project is based on estimated C.I.F. costs Kigali.

E. Execution

(1) Construction of the Kigali-Gatuna Road

4.12 The DRB will be responsible for the execution of the project and is capable of doing so with the assistance of consultants. The consultants will prepare bidding documents, advise on the prequalification of contracting firms, and aid in the assessment of bids, as well as complete the engineering work described in paras. 4.04 and 4.05 and supervise construction. The Government has retained Electroconsult to carry out this work because of their intimate knowledge of the project. Signature of the consultants' contract is a condition for effectiveness of the credit.

4.13 Bidding documents will be submitted to IDA for review prior to issuance. During negotiations, the Government confirmed that construction work will be awarded on the basis of international competitive bidding in accordance with Bank/IDA guidelines. The Government also confirmed that adequate right-of-way will be available to permit construction to begin on schedule. The construction contract is expected to be awarded early in 1971; works will require about two years.

(ii) Purchase of Road Maintenance Equipment

4.14 The maintenance equipment will be procured on the basis of competitive bidding in accordance with Bank/IDA guidelines. This was confirmed by the Government during negotiations. The consultants will assist the DRB in the preparation of bidding documents within four months of the consultants' contract effectiveness date. They will be submitted to IDA for review to ensure that they conform with its procedures. The equipment procurement contracts will be awarded on the basis of the lowest evaluated bids. The equipment will be delivered during late 1970 or early 1971.

4.15 The maintenance equipment will be specifically allocated to the mechanized maintenance unit described in para. 3.05 pending its redeployment under a suitable maintenance program (para. 4.07). During negotiations, the Government confirmed this disposition of equipment and its intention to ensure the efficient use of this equipment by supplying adequate fuel, staff, servicing and maintenance.

F. Financing and Disbursement

4.16 The Association will finance the foreign costs of the project. During negotiations, the Government confirmed that it will meet the local costs, estimated at US\$1.6 million equivalent. Belgium is making available US\$600,000 equivalent to Rwanda as a contribution towards this local cost financing.

4.17 Credit disbursements will be made on the following basis:

- (i) 85% of expenditures on road construction which represents the estimated foreign exchange component thereof;
- (ii) actual foreign exchange expenditures on the consultants' contract; and
- (iii) 100% of the C.I.F. price (Kigali) of maintenance equipment.

4.18 Any surplus remaining in the credit account upon completion of the project would be cancelled. Assuming credit effectiveness in late 1970, IDA disbursements will be as follows:

	<u>IDA Fiscal Year</u>				
	<u>1970/71</u>	<u>1971/72</u>	<u>1972/73</u>	<u>1973/74</u>	<u>Total</u>
Forecast IDA disbursements (US\$ million)	1.6	4.0	3.3	0.4	9.3

## 5. ECONOMIC EVALUATION

5.01 The development of the economy of Rwanda beyond the present subsistence level depends on the expansion of trade: essential imports ultimately paid for by increased exports. Transport costs are a critical element in this expansion because the distance of Rwanda from the Indian Ocean places it at a basic disadvantage with regard to the price of imports and the competitive position of its basic exports, coffee and tin, in the world market. In 1967, for example, transport costs of imports and exports equalled 23% of export earnings. In 1968, this figure rose to 26% and, in the first nine months of 1969, to 35%. Any reduction in transport costs offers immediate and tangible benefits to the economy.

5.02 Construction of the project road clearly offers such benefits. The present route to Kampala, via Kakitumba, is made up of 235 km of un-engineered earth and gravel road and 349 km of paved road for a total distance of 584 km. The new route via Gatuna will only be 511 km, of which 488 km will be paved. Not only will the proposed Kigali-Gatuna road offer vastly improved riding conditions, but it will shorten the distance to the railhead at Kampala by 73 km.

5.03 In 1968, about 8,700 trucks (with and without trailers) passed over the existing Uganda route via Kakitumba, together with 2,900 cars and light vans. International traffic over this route is expected to grow at the rate of 8% annually until 1973, the year when the proposed road will be opened to traffic. Foreign trade growth has averaged 16.5% per year in the past and is forecast by the Ministry of Commerce for an 8% - 10% growth

over the next five years. The vehicle fleet in Rwanda has increased 24% annually for the past four years and is likely to continue to increase rapidly. The 8% growth estimate is therefore considered to be conservative.

5.04 This growth rate would yield about 12,780 trucks and 4,260 cars and light vehicles by 1973 or about 47 vpd, all of which will be diverted to the proposed road. When combined with local traffic now using the existing track, total traffic over the new Kigali-Gatuna route will amount to about 60-65 vpd. On the first 12 km north of Kigali, the road will also service the Kigali-Ruhengeri traffic, which, by 1973, will average about 115-120 vpd, yielding an overall total for this section of 175-185 vpd.

5.05 Vehicle operating cost savings in 1973 will total about US\$980,000. The basis for these savings may be found in Table 7, in which vehicle operating expense levels for different road surfaces are outlined.

5.06 Construction of the project road will result in a shift in road maintenance costs arising not only for the new mileage to be created but also by the diversion of traffic flows. Maintenance costs on the 208-km Kigali-Kakitumba road, for example, will fall drastically since traffic will be reduced to local requirements. The new Kigali-Gatuna road, however, will have maintenance expenses considerably higher than the existing earth track.

5.07 Taking into consideration both vehicle operating costs and net maintenance expenditures, the internal rate of return for a paved road over 20 years is slightly over 13%, which is sufficient to justify its construction. These calculations are based on a modest increase in traffic of 5% annually to 1978 and 3% thereafter. No allowance has been made for generated traffic (see Table 8).

5.08 While it is unusual to find paving justifiable at relative low traffic levels, the high proportion of heavy vehicles (up to 30-ton loads), combined with the mountainous terrain, steep grades and heavy rainfall in the area of the project road, tend to favor a paved surface. While paved road construction and maintenance costs are higher than those for a gravel or laterite surface, they are not sufficiently so in this case to offset vehicle operating costs savings accruing to the pavement. As a result, the paved road rate of return is virtually identical with that of a gravel road. While paving the road will add US\$1.6 million equivalent to construction cost, this addition will yield an internal rate of return of almost 12%, which is sufficient to justify its expenditure. There is little doubt that the calculations leading to this conclusion include only minimum benefits since no provision has been made for generated traffic which would be very much higher on a paved road than on a gravel surface.

5.09 Not all sections of the road offer the same rate of return from paving. The sections into which the road can logically be divided yield economic returns ranging from 8%-23%, as follows:

<u>Road Sections (Km)</u>	<u>% Economic Return</u>
(Kigali) PK 0 - 12	23%
PK 12 - 34	9%
PK 34 - 60	10.5%
PK 60 - 79 (Gatuna)	8%
Total	12%

The first and third sections, representing nearly half the total length of the road, offer acceptable rates of return, while the second and fourth sections are marginal in this respect. However, it would be impractical to pave only part of the road now, since paving would be essential by 1976 and another paving project, requiring the mobilization of contracting forces a second time, would involve higher costs. Also, gravel roads deteriorate rapidly unless adequately maintained. The establishment of a maintenance unit designed to maintain the gravel portions of this road for only about four years would be a costly undertaking. Accordingly, in view of the satisfactory return on the project, a paved road is proposed.

5.10 Improvement of maintenance services on the main national road links would offer very substantial benefits and a maintenance improvement program should, from an economic standpoint, be given the highest priority among future highway projects. The UNDP-financed maintenance study will define such a program. While complete renewal of the highway maintenance fleet must await the outcome of this study, the maintenance equipment provided under the present project will be efficiently and effectively utilized by the mechanized maintenance unit, and will favorably affect the maintenance standard on the most important roads pending implementation of a highway maintenance program.

## 6. RECOMMENDATIONS

6.01 During credit negotiations, the Government agreed to the following major matters:

- (a) upon receipt of the highway maintenance study, and after consultations on its recommendations and agreement with the Association, a program to improve highway maintenance will be implemented (para 3.09);
- (b) the design standards for the project road will be changed as proposed by the Association (para 4.04); and
- (c) the equipment to be purchased under the project will be specifically allocated to a mechanized maintenance unit under the supervision of qualified

experts and will be adequately staffed, supplied and serviced (para 4.15).

6.02 Signature of the consultants' contract is a condition for effectiveness of the credit.

6.03 The project is a suitable basis for an IDA credit of US\$9.3 million.

May 26, 1970

TABLE 1

RWANDA  
APPRAISAL OF A HIGHWAY PROJECT

<u>Imports</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>Annual Rate of Growth</u>
Petroleum Products	10,213	12,175	14,264	
Cement	9,867	13,193	13,565	
Salt	5,505	6,241	9,022	
Sugar	1,864	3,097	4,340	
Flour	2,916	2,030	1,378	
Sheet Metal	986	1,181	2,241	
Other	24,249	23,583	30,190	
	<hr/>	<hr/>	<hr/>	
TOTAL:	55,600	61,500	75,000	16.1%
<u>Exports<sup>1/</sup></u>				
Coffee	8,700	10,100	12,000	
Mineral	2,133	2,988	2,580	
Pyrethrum	417	458	291	
Tea	324	321	635	
Cotton	313	350	257	
Other	1,117	1,350	1,037	
	<hr/>	<hr/>	<hr/>	
TOTAL:	13,004	15,567	16,800	13.7%

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1/ Excluding live animals

Source: Rwanda, Ministry of Commerce

March 20, 1970

TABLE 2

RWANDA

APPRAISAL OF A HIGHWAY PROJECT

Highway User Charges  
(in US\$)

	<u>Toll</u>	<u>Vehicle Registration Charges</u>	<u>Import duties on fuel 1/</u>	<u>Total</u>
1966	n.a.	59,879	294,000	n.a.
1967	154,780	69,461	290,000	514,241
1968	155,355	70,859	340,000	566,214
1969	161,830 <sup>2/</sup>	72,543	359,000 <sup>2/</sup>	593,373

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1/ estimated on the basis of fuel consumption

2/ estimated on the basis of 6 months

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Source: Customs' Service

February 17, 1970

TABLE 3

RWANDA

APPRAISAL OF A HIGHWAY PROJECT

Department of Roads and Bridges Expenditures  
(in US\$)

<u>Year</u>	<u>Salaries</u>	<u>Maintenance</u>	<u>Urban and Communal Roads</u>	<u>Total</u>
1966	232,387	249,300	38,071	519,758
1967	250,519	282,166	39,396	572,081
1968	289,175	272,973	37,658	599,806
1969	325,520	315,850	95,000	736,370

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Source: DRB

February 17, 1970

TABLE 4

RWANDA

APPRAISAL OF A HIGHWAY PROJECT

Vehicle Fleet

	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>Annual Rate of Growth</u>
Cars	1,467	1,942	2,353	2,880	25%
Vans	434	567	712	908	28%
Trucks	416	492	537	606	13%
Tractors	38	48	43	48	8%
Total	<u>2,355</u>	<u>3,049</u>	<u>3,645</u>	<u>4,442</u>	24%

Fuel Consumption  
(1,000 liters)

	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>Annual Rate of Growth</u>
Gas	6,417	6,563	6,628	7,886	7%
Diesel	6,413	6,043	5,863	6,918	3%
Total	<u>12,830</u>	<u>12,606</u>	<u>12,491</u>	<u>14,804</u>	5%

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Source: DRB

March 20, 1970

TABLE 5

RWANDA

APPRAISAL OF A HIGHWAY PROJECT

Design Standards

(two-lane paved highway)

	<u>In rolling terrain for 53 km</u>	<u>In mountainous terrain for 26 km</u>
Design speed	60 km/h	45 km/h
Maximum grade		
Normal	6%	7%
Exceptional	7.5%	8%
Minimum curve Radius		
Normal	150 m	75 m
Exceptional	75 m	70 m
Width of Carriageway	6 m	6 m
Width of Shoulder	1 m	0.50 m <sup>1/</sup>

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1/ Concrete lateral ditches should be constructed  
- on each side

Source: Consultants' report

February 17, 1970

TABLE 6

RWANDA

APPRAISAL OF A HIGHWAY PROJECT

Mechanized Maintenance Unit

(i) List of Equipment and Vehicles

<u>Items</u>	<u>Existing Equipment</u>	<u>New Equipment to be ordered</u>	<u>Total</u>
Bulldozer	-	1	1
Grader	-	1	1
Dump Trucks	2	1	3
Tractors and Trailers	7	-	7
Loader	1	-	1
Compactors	2	-	2
Tanker	1	-	1
Mobile Workshop	1	-	1
Cars	2	1	3

(ii) List of Personnel

Supplied by Foreign Aid :	Foreman	1
	Assistant Foreman	1
	Mechanics	2
Supplied by DRB :	Assistant Foreman	2
	Operators	) as
	Unskilled Labor	) necessary

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Source: DRB

February 17, 1970

TABLE 7

RWANDA

APPRAISAL OF A HIGHWAY PROJECT

Basic Data on Vehicle Cost Savings and Growth of Traffic

1. Estimated Vehicle Operating Costs (net of taxes)  
(US cents per veh./km)

	<u>Kigali-Kakitumba Road Costs</u>	<u>Proposed Kigali-Gatuna Road Costs</u>	
		<u>Gravel Standard</u>	<u>Paved Standard</u>
Car or light vehicle	7.0	5.6	4.4
12-ton Truck	32.2	25.3	16.5
12-ton Truck + Trailer	58.5	44.6	29.0

2. Estimated 1968 Annual Traffic (number of vehicles)

	<u>Kigali-Kakitumba</u>	<u>Kigali-Byumba</u>	<u>Kigali-Ruhengeri cut-off (11 km) north of Kigali</u>
Cars or light vehicles	2,900	1,825	11,000
6-8 ton Trucks	-	1,700	18,250
12-ton Trucks	4,300	-	-
12-ton Trucks + Trailers	4,400	-	-

3. Traffic Growth Factors

1968-1973	8%
1973-1978	5%
1978-1992	3%

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Source: Mission estimates

February 17, 1970

TABLE 8

RWANDA

APPRAISAL OF A HIGHWAY PROJECT

Flow of Net-of-Tax Costs and Benefits from Construction  
of the Kigali-Gatuna Road

1971-1992

(US\$'000)

<u>Year</u>	<u>Capital Cost</u>		<u>Net Benefits Accruing from Maintenance Costs</u>		<u>Savings in Vehicle Operating Costs</u>	
	<u>Gravel Surface</u>	<u>Paved Surface</u>	<u>Gravel Surface</u>	<u>Paved Surface</u>	<u>Gravel Surface</u>	<u>Paved Surface</u>
1971	3,380	4,200				
1972	3,390	4,200				
1973			- 1	11	811	979
1974			- 1	11	852	1,028
1975			- 1	11	895	1,134
1976			- 1	11	940	1,191
1977			+ 5	118	987	1,250
1978			- 1	11	1,036	1,312
1979			- 1	- 373	1,067	1,352
1980			- 1	11	1,098	1,393
1981			- 1	11	1,132	1,435
1982			+ 5	118	1,167	1,478
1983			- 1	11	1,201	1,521
1984			- 1	11	1,237	1,567
1985			- 1	11	1,274	1,614
1986			- 1	- 373	1,313	1,663
1987			+ 5	11	1,352	1,713
1988			- 1	11	1,392	1,764
1989			- 1	11	1,434	1,816
1990			- 1	11	1,477	1,872
1991			- 1	11	1,522	1,928
1992			+ 5	11	1,568	1,986

Internal Rate of Return: Gravel Road 13.3%  
Paved Road 13.2%

Source: Mission estimates

March 20, 1970





# RWANDA HIGHWAY PROJECT MAIN ROAD NETWORK

-  Paved roads
-  Gravel roads
-  Road to be constructed under the project
-  Projected road
-  International airport
-  Mining
-  Coffee production
-  Tea production

