

CR-82

FILE COPY

RESTRICTED

Report No. TO-444a

This report was prepared for use within the Bank and its affiliated organizations. They do not accept responsibility for its accuracy or completeness. The report may not be published nor may it be quoted as representing their views.

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT
INTERNATIONAL DEVELOPMENT ASSOCIATION

APPRAISAL OF
A HIGHWAY PROJECT
BASUTOLAND

October 20, 1965

Projects Department

CURRENCY EQUIVALENTS

£ 1 million	=	US \$2.8 million
£ 1	=	US \$2.80
US \$1 million	=	£ 357,143

APPRAISAL OF A HIGHWAY PROJECT

BASUTOLAND

Table of Contents

	<u>Page No.</u>
SUMMARY	
I. <u>INTRODUCTION</u>	1
II. <u>BACKGROUND</u>	2
A. The Country	2
B. The Transportation System	2
III. <u>THE PROJECT</u>	4
A. Description	4
B. Cost Estimates	4
C. Administration and Execution	5
IV. <u>ECONOMIC JUSTIFICATION</u>	6
A. Background	6
B. Agricultural and Administrative Benefits	7
C. Reduced Transport and Maintenance Costs	7
V. <u>CONCLUSIONS</u>	9

TABLES

- 1 Road Branch Budgets
- 2 List of Works
- 3 Design Standards
- 4 Projections of Average Daily Traffic
- 5 Cost Estimate
- 6 Sales of Gasoline and Diesel Oil

MAP: Basutoland - Highway System

BASUTOLAND

APPRAISAL OF A HIGHWAY PROJECT

SUMMARY

- i. The United Kingdom High Commission Territory of Basutoland has asked the International Development Association to finance part of the cost of the design, construction and reconstruction of (i) a 76-mile section of the main north-south road, and (ii) one feeder road 17 miles long.
- ii. The total cost of the project is estimated at US\$5.4 million equivalent, of which US\$4.1 million is recommended for financing by the Association. The IDA credit would amount to 76 per cent of the cost of the project; this figure is somewhat below the estimated foreign component of 80 per cent. The cost estimate is based on preliminary engineering, and final design for a portion of the work.
- iii. The Government will finance the remaining expenditure of US\$1.3 million equivalent with funds from its own budget, from a U.K. Exchequer loan and from United Kingdom Colonial Development and Welfare funds. The United Kingdom has agreed to assist Basutoland in obtaining any additional funds needed to complete the project.
- iv. Design and supervision of construction of the main road is being carried out by consultants, while the staff of the Public Works Department will be responsible for the feeder road. The Government would engage consultants to assist in completing work on the feeder road if unexpected difficulties were encountered.
- v. Construction of the paved part of the main road will be carried out by contractors selected on the basis of international competitive bidding. The Public Works Department will execute the remaining works with its own forces.
- vi. The project is justified by the reduction in transport costs and lower maintenance costs; these benefits are estimated to bring an economic rate of return on the project of about 10 per cent, which is satisfactory. There will, in addition, be important agricultural and administrative benefits.
- vii. The project provides a suitable basis for a development credit of US\$4.1 million equivalent.

I. INTRODUCTION

1. Early in 1961, the United Kingdom High Commission Territory of Basutoland submitted a road project to the International Development Association (IDA) consisting of the construction and reconstruction of almost 1,000 miles of roads at a cost of E 3.88 million to be spent over a 10 to 15 year period. The proposal was studied by an IDA mission which visited the Territory in April 1961. The mission found that the proposal was in effect a long-term road program, rather than a specific project.
2. The Government undertook to revise its application and resubmitted it in October 1961. The proposed project was again vaguely defined although it indicated that Basutoland had made some progress in determining its needs. A second mission visited Basutoland in January 1962. It confirmed that the recently submitted proposal was not based on the execution of specific works, and that the cost estimate could not be considered sound. The mission also found that lack of technical staff was delaying the necessary studies and the Government agreed to expand its highway organization.
3. A third proposal was submitted early in 1963 and shortly thereafter an IDA mission again visited the Territory. It found that the proposed project was soundly conceived but that additional information was needed on costs, particularly in the light of the Government's decision to carry out the bulk of the work by contract rather than by departmental forces. This information, which was provided with the help of consultants, was received early in 1964.
4. From the revised information it appeared that the project was too large in relation to the economy of Basutoland, and it was decided that the project should be reduced from about US\$9.0 million to US\$5.4 million. Most of the changes involved were discussed with the Public Works Department in May 1964 and are based on revised submissions received from Basutoland in June and July 1964.
5. This report is based on the findings of the three IDA missions to Basutoland and on information prepared by various government departments. This report has been prepared by Messrs. Young and Kordik, members of the missions, assisted by Mr. Adler. Credit negotiations took place with the Basutoland mission in January 1965, but the presentation of the project for final approval was delayed several months pending the elections and the setting up of governmental institutions in Basutoland.

II. BACKGROUND

A. The Country

6. Basutoland, a British dependency, is an enclave in the Republic of South Africa. It is bounded by the Orange Free State on the west and north, by Natal on the east and by the Cape Province on the south. The Territory, with an area of 11,716 square miles, is almost twice the size of nearby Swaziland, another British dependency. It has an estimated population of 700,000 Africans, 2,000 Europeans and 1,000 Asians and mixed races. In addition, over 200,000 Basutos live outside the Territory, most of them working in the mines of South Africa.

7. In the course of its constitutional advance Basutoland has reached the stage of responsible government with an elected legislature and a government drawn from the majority party. It is expected that Basutoland will attain complete independence in 1966. The capital and headquarters of the Government are at Maseru.

8. The lowest part of Basutoland consists of a narrow strip on the western border with an average altitude of 5,000 feet. The rest of the Territory is exceedingly mountainous and consists of the Maluti Mountains, a branch of the Drakensberg Range, which has peaks over 11,000 feet. Rivers originating in these mountains could become Basutoland's most valuable potential resource by the sale or lease of water rights to South Africa.

9. Rainfall averages 29 inches annually and is heaviest in the summer. The climate is temperate and varies considerably with the altitude. Soils are particularly susceptible to erosion.

10. The economy depends on agriculture and livestock. There are no European settlers and the majority of the Basutos farm on very small holdings. Production consists mainly of wool, mohair, hides, skins and grains. There is little mineral production although some diamonds are being mined.

B. The Transportation System

11. Basutoland does not have a railway system of its own, although a number of its border towns are close to rail points in South Africa, and Maseru is served by a branch line of the South African Railways. There is no opportunity for inland waterways transport, since the rivers cannot be made navigable. There is a small charter air service used for the transport of officials, tourists, mail and light freight.

12. Only the smallest type of aircraft are used because of the need for maneuverability and the difficulty of landing on short strips in mountainous terrain. Thus there is little likelihood that air transport will ever become important in the large-scale movement of passengers or freight. It is evident from the above that Basutoland is almost entirely dependent on its roads for internal transport and for access to the road and rail systems of South Africa.

13. The Basutoland road system consists of 240 miles of main roads, 600 miles of district roads and 400 miles of local roads and tracks. The most important road in the Territory is the main north-south artery which extends over the full length of the narrow lowland strip on the western border. Branches from this road extend westward to connect to the South African road system and eastward into the plateaus, foothills and mountains which form by far the largest part of the Territory. There are over 2,000 motor vehicles in Basutoland, of which over half are commercial. However, this figure does not include a number of vehicles from South Africa which use the territorial road system.

14. The main north-south road and its branches consist mainly of graded tracks, some sections of which have been improved through the years; other sections are narrow, winding and steep. As the terrain becomes more difficult, they gradually deteriorate to rough tracks which for motorized units are only usable by trucks and four-wheel drive vehicles. The drainage is inadequate and there are many low-level bridges which cannot be crossed when the rivers rise.

15. Construction and maintenance of the highway system are the responsibility of the Roads Branch of the Public Works Department (PWD) which has been understaffed in the recent past. Additional staff has been obtained and the technical competence of the PWD has been strengthened. Both the Chief Road Engineer and the Chief Engineer of the PWD have had many years of experience in Basutoland. Because of the remoteness of the Territory and the small size of highway works, contractors have not been attracted and the practice has been to construct roads with departmental forces.

16. A substantial effort is being made to maintain and improve the road system, but because existing roads have been built to low design standards, road surfaces do not stand up, and the roads sometimes become impassable to light vehicles. Maintenance allocations have been increased substantially over the past 7 years (see Table 1) and now average roughly about £ 140 per mile annually. While this is a substantial sum for a territory like Basutoland, because of the nature of the terrain it is barely sufficient, and maintenance will continue to be a problem until the standards of the roads are upgraded. The central PWD repair shop is well equipped and managed, field forces are reasonably well trained and field facilities, while not elaborate, are adequate.

17. The existing road system provides the only means of access to the foothills and mountains where the bulk of the population lives. In 1963 South Africa established police posts on the roads leading to and from Basutoland with a view to controlling the movement of people across the border. These controls, together with the fact that the posts are closed early in the evening, place added emphasis on the need to improve internal communications as trade with the border towns in the Republic is now being diverted to local traders and merchants.

III. THE PROJECT

A. Description

18. The project consists of the design, construction and reconstruction of (i) a 76-mile section of the main north-south road and (ii) one feeder road 17 miles long (see Table 2 and map).

19. The first part of the project will improve the section with the highest traffic of the north-south artery which runs the full length of the Territory. The 76.4 miles to be reconstructed will extend from the Matsieng Turnoff, a point about 20 miles south of Maseru, to Leribe near the extreme north of the Territory. The work will include some reconstruction of the existing road, some realignment, particularly between Maseru and Teyateyaneng to avoid a badly eroded area, construction of a number of small bridges and placing pavement from Masianokeng through Maseru to Leribe.

20. The Leribe-Pitseng feeder road (17.1 miles) will improve access from the main north-south road into the foothills and mountains to the east. The work will include reconstruction, minor relocation and the construction of several small bridges.

21. Both the main road and the feeder road will be built to the design standards shown in Table 3. These standards have been selected on the basis of the traffic densities expected for each road over 20 years and the type of terrain to be traversed. While it is not possible to predict accurately traffic densities a long period ahead at the very early stage in the development of a country such as Basutoland, the figures shown in Table 4 indicate the order of magnitude of traffic expected upon completion of the project (see paragraph 42). Most of the main road will be paved while the remaining section south of Maseru will be graveled as will the feeder road.

22. The construction of roads in Basutoland presents some difficult technical problems. The soils erode easily and great care must be taken with drainage to prevent damage to lands along the right-of-way and to the roads themselves. Good quality gravels are generally not available. Surfacing materials and concrete aggregate are usually obtained from dolomite outcrops which are widely scattered and offer only a limited supply. Both of these factors obviously increase road building costs. Surfacing materials will be adequate to carry out the project, however, and the paving of the main road will help to economize on their use.

B. Cost Estimates

23. The total cost of the project is US \$ 5.4 million equivalent. A detailed estimate is given in Table 5. It includes the cost of construction, consultants' services and engineering services provided by the PWD for design and supervision.

24. The estimate includes an allowance of 10 per cent for design and supervision. An additional allowance of 10 per cent has been made for contingencies. This amount is considered adequate in view of the advanced stage of preparation of plans which permit a satisfactory estimate of quantities and costs.

25. Construction costs per mile average somewhat over \$60,000 for paved roads and about \$30,000 for gravel roads. Costs per mile are high because of the problems mentioned in paragraph 22, the need for a large number of bridges on the project roads and the substantial increases which have taken place in construction prices in southern Africa over the past two or three years.

26. The cost estimate is considered sound. It was prepared early in 1964 by the Public Works Department assisted by consultants and was based on field surveys and, for a portion of the work, on detailed plans. Unit costs were taken for similar work in the adjoining Republic of South Africa and adjusted for conditions in Basutoland.

27. The foreign component of the total cost of the project is estimated by the Public Works Department at approximately 80 per cent. It is based on the necessity of importing all equipment and supplies, the use of outside contractors, bringing in skilled labor to operate and maintain construction equipment and the employment of skilled expatriate staff to design and supervise the work.

28. The present credit of US\$4.1 million equivalent will amount to 76 per cent of the total cost of the project, or somewhat less than the foreign exchange component. The additional funds of US\$1.3 million would be provided as follows: US\$0.8 million equivalent from the Territory budget, US\$0.1 million equivalent from U.K. Exchequer loans, and US\$0.4 million from Colonial Development and Welfare grants. In addition, the United Kingdom has agreed to assist Basutoland in obtaining any additional funds which might be required in the future to complete the project, in case of unforeseeable price inflation or other problems.

C. Administration and Execution

29. Construction of the paved part of the main road Masianokeng-Leribe will be carried out under unit price contracts let on the basis of international competitive bidding. Final plans have already been completed for the Masianokeng-Teyateyaneng section so that a contract for this work could be let as soon as the funds become available. Preliminary surveys have been completed on the remaining sections.

30. The remaining parts of the project will be built by departmental forces. This procedure is considered acceptable because the relatively small size of the works involved would be unlikely to attract outside contractors.

The opportunity will be taken on the departmental work to train local personnel in order to develop a small permanent construction unit capable of building low-standard roads in remote areas. Execution of the project is expected to take about three years.

31. Design and supervision of construction of the main road will be carried out by consultants, while the staff of the PWD will be responsible for the feeder road. The staff has been strengthened over the past two years and is considered capable of carrying out its part of the work. The Government will assign more of the design and supervision to consultants if found necessary.

32. The Government has undertaken that the PWD will continue to be adequately staffed in order to insure that (i) the project will be successfully executed and (ii) the project roads will be adequately maintained after their completion.

IV. ECONOMIC JUSTIFICATION

A. Background

33. The importance given to roads in the Basutoland development is based to a considerable extent on the findings and recommendations of an economic survey mission appointed in 1959 by the United Kingdom in consultation with the Bank. The mission, headed by Professor Chandler Morse, found that the most economic form of road transport is the heavy truck "and it is important that such vehicles be enabled to penetrate much further than is now possible in the productive areas; but for this the existing roads must be greatly improved." The mission gave the highest priority to raising the most heavily traveled 235 miles of main roads to a fully graveled all-weather standard and believed that reduced transport costs and savings in maintenance expenditures would fully justify the proposed investment.

34. The survey mission also recommended that the feeder roads be improved. "These feeder roads are exceedingly important to the economic development of the country, especially for the part they would play in helping to convert agriculture from a subsistence to a cash basis, and in increasing the proportion of the export value of mountain crops that accrues to the producer."

35. Similar conclusions were reached by a senior representative of the Road Research Laboratory, an agency of the United Kingdom, who visited Basutoland in 1962. He pointed out that road transport in Basutoland can operate effectively only in dry weather and "there can be no doubt that the state of the roads is impeding the development of the country." He also concluded that while better roads might not by themselves assure agricultural development such development could not take place without them.

B. Agricultural and Administrative Benefits

36. The area affected by the project is estimated at about 450,000 acres, or somewhat less than one-half of Basutoland's total arable acreage. Present yields per acre are relatively low, varying between 2-8 bags of maize (200 lbs per bag), and could be increased. However, achievement of such an increase would require a variety of measures, such as intensifying extension services, the provision of agricultural credit and introduction of fertilizers, better seeds, etc; reduced transport costs would be merely one of many requirements. The new Development Plan visualizes some improvements in these various areas, and while it is not possible to allocate any particular share of the expected improvements to the better roads, it is clear that they will provide farmers and livestock owners with easier and less expensive access to the market, as well as facilitate transport of fertilizers, for example to the farms. In view of the uncertain outlook for Basutoland's economic development and the difficulties of expressing these benefits in monetary terms, no allowance is here made for these potential benefits.

37. The type of agricultural benefit which could well materialize is illustrated by the centralized marketing of wool, mohair, hides and skins at Maseru, which the better roads would facilitate. The economy would benefit from higher prices obtainable through bulk sales of graded and standardized products. Prices of wool in 1961 were only US 27¢ per pound in Basutoland compared to 43¢ in South Africa; the Department of Agriculture's estimate that bulk sales would permit an increase in price of nearly 3¢ seems therefore reasonable. Similarly, it appears that the price of good quality mohair could well increase from US 70 to 75¢ per pound. More efficient marketing of wool and mohair could therefore bring annual benefits of about US \$ 100,000 equivalent. Not all of these could be attributed to the road project though they would not be obtainable without it.

38. The border controls newly established by the Government of South Africa will in time shift trade and traffic in grains from the South African border towns to towns within Basutoland, most of which are near the main highway. The controls will make the trading of exports at South African border towns more difficult and the Government will have to take measures to channel the food surpluses from the north to food deficient areas in the south. The project roads represent the only possible traffic link and the volume of staple food transported on the roads would be about 18,000 tons annually. This movement would be encouraged by the road improvement itself, even without the new border controls.

39. The inadequate road system also seriously interferes with the administration of Basutoland, making it difficult for health, agricultural, engineering and other officials to work in many parts of the country.

C. Reduced Transport and Maintenance Costs

40. Reduced transport and maintenance costs, on which the survey mission put its main emphasis, are important because they will free resources

which can then be used for other purposes. These benefits are estimated to bring rates of return on the investments in the Matsieng Turnoff-Leribe road of 10 per cent and in the Leribe-Pitseng road of 12 per cent. Reductions in transport costs account for more than 90 per cent of these benefits while lower maintenance costs make up the remainder. While these estimates can only indicate orders of magnitude, the returns are satisfactory in a country like Basutoland, especially since they are based on conservative assumptions and, as explained above, make no allowance for potential agricultural and administrative benefits.

41. Traffic counts for the individual roads were made by the Government in 1962 and are presented in Table 4. Additional traffic counts were made early in 1964 and they indicate an annual traffic growth in the order of 10 per cent. Gasoline and diesel consumption also increased about 10 per cent annually between 1959 and 1962. The number of Government vehicles increased by about 12 per cent annually between 1959 and 1963, and while the data for private vehicles registered are not very reliable, they indicate a growth exceeding 10 per cent annually since 1957. This traffic growth took place in spite of the fact that during this period the economy of Basutoland made no significant progress.

42. On the basis of the above considerations, it has been assumed that the traffic would grow by 9 per cent for the first 5 years, 7 per cent for the following 10 years and 5 per cent thereafter (see Table 4). This is somewhat more conservative than the 12 per cent growth assumed in the report of the survey mission or the Government's own estimates. The life of the investment has been estimated at 20 years. While the above traffic forecast is believed to be reasonable, in view of the country's uncertain economic outlook, alternative calculations have been made for a traffic increase at half of the above rates. The rates of return in this case would be about 6 to 7 per cent rather than 10 to 11 per cent. With the additional agricultural and administrative benefits, these returns could still be regarded as adequate.

43. The reductions in transport costs from the road improvements are based on investigations carried out by the United Kingdom Road Research Laboratory into operating costs on all types of surfaces in similar territories, particularly Central Africa and including Basutoland. The results of these investigations were checked by the appraisal mission against the operating costs of the only trucking enterprise in Basutoland, and the two were found to be reasonably consistent. These studies show, for example, that the operating costs of a truck are generally about 25 per cent higher on a gravel road than on a bituminous surface road and 50 per cent higher on an earth surface.

44. The reductions in routine maintenance costs from the road improvements are based on studies of the Road Research Laboratory of the actual experience in Basutoland. They indicate on the better maintained roads annual maintenance costs per mile of about £ 170 for a gravel road and £ 125 for a bituminous road. As pointed out above, the benefits from reduced maintenance

are small compared to those from lower vehicle operating costs.

V. CONCLUSIONS AND RECOMMENDATIONS

45. The project is technically feasible and economically justified primarily on the basis of road user savings and lower maintenance costs. The cost estimate is soundly based and includes a reasonable allowance for contingencies.

46. The project provides a suitable basis for a development credit of US \$ 4.1 million equivalent.

October 20, 1965

Table 1

BASUTOLAND
HIGHWAY PROJECT
ROAD BRANCH BUDGETS

<u>Year</u>	<u>Administration</u>	<u>Maintenance</u>	<u>Construction</u>	<u>Total</u>
1957/58	9,500	46,750	55,000	111,250
1958/59	10,000	77,375	55,000	142,375
1959/60	10,500	100,500	55,000	166,000
1960/61	11,000	135,950	52,500	199,450
1961/62	12,500	151,616	52,500	216,616
1962/63	13,000	166,496	70,000	249,496
1963/64	15,000	170,000	70,000	255,000
1964/65 *	16,500	180,000	70,000	266,500

* Estimate

Source: Public Works Department

Table 2

BASUTOLAND
HIGHWAY PROJECT

LIST OF WORKS

<u>Ref. on</u> <u>Map</u>	<u>Main Road</u>	<u>Surface</u>	<u>Type</u> *	<u>Length</u> <u>(miles)</u>
1	Matsieng Turnoff - Leribe			
	a) Matsieng Turnoff - Masianokeng	gravel	1	10.0
	b) Masianokeng - Leribe**	pavement	1	<u>66.4</u>
				76.4
	<u>Feeder Road</u>			
2	Leribe - Pitseng	gravel	2	17.1

* See Table 3

** Masianokeng - Maseru section (8.5 miles) to be built to 22 feet pavement width and bridges to 24 feet width, curb to curb.

Table 3BASUTOLANDHIGHWAY PROJECTDesign Standards

	Type 1	Type 2	
	<u>Rolling Terrain</u>	<u>Rolling Terrain</u>	<u>Hilly Terrain</u>
Design speed (mph)	40	40	25
Minimum radius (feet)	500	500	250
Maximum gradient (percent)	8	8	10
Non-passing sight distance (feet)	275	275	150
Surface width (feet)	20 <u>1/</u>	18	18
Shoulder width (feet)	5 <u>2/</u>	6	4
Maximum super-elevation (percent)	10	10	10
Slope of cut banks	1 $\frac{1}{2}$: 1		
" " fills	1 $\frac{1}{3}$: 1		
Design load for pavement (wheel load)	9,000 lbs.		
Bridge width (curb to curb, feet)	24		

1/ Pavement through Maseru to be widened to 24 feet.

2/ Shoulder widths reduced to 3 feet on the sections where road climbs an escarpment.

BASUTOLAND
HIGHWAY PROJECT

Projections of Average Daily Traffic*

	<u>1962</u>	<u>1967</u>	<u>1977</u>	<u>1987</u>
<u>Main Road</u>				
1. Matsieng Turnoff - Leribe	130	195	420	750
<u>Feeder Road</u>				
2. Leribe - Pitseng	40	60	130	230

* For explanation of basic assumptions
see paragraphs 41-42.

Table 5

BASUTOLAND
HIGHWAY PROJECT

COST ESTIMATE

<u>Main Road</u>		<u>Total</u> <u>(in £)</u>	<u>Total</u> <u>(in US\$</u> <u>equivalent)</u>
1. Matsieng Turnoff - Leribe			
a) Matsieng Turnoff - Masianokeng	100,000		
b) Masianokeng - Leribe	<u>1,300,000</u>	1,400,000	3,900,000
	<u>Feeder Road</u>		
2. Leribe - Pitseng		<u>200,000</u>	<u>560,000</u>
	Sub-total	1,600,000	4,460,000
	Engineering (10%)	160,000	450,000
	Contingencies (10%)	<u>175,000</u>	<u>490,000</u>
	TOTAL	<u>1,935,000</u>	<u>5,400,000*</u>

* \$100,000 of this amount was spent on studies and engineering prior to April 1, 1964.

BASUTOLAND

HIGHWAY PROJECT

Sales of Gasoline and Diesel Oil

(in Imperial Gallons)

<u>Year</u>	<u>Gasoline</u>	<u>Diesel Oil</u>	<u>Total</u>
1958	496,549	271,990	768,539
1959	675,411	449,400	1,124,811
1960	712,976	485,832	1,198,808
1961	718,346	605,074	1,323,420
1962	825,848	630,742	1,456,590
1963	919,439	630,558	1,549,997
1964	938,669	571,976	1,510,645

BASUTOLAND HIGHWAY SYSTEM

- | | |
|-----------------------|--------------------------|
| EXISTING ROADS | |
| — | MAIN |
| — | DISTRICT & FEEDER |
| - - - | ACCESS TRACKS |
| — | ROADS OUTSIDE BASUTOLAND |
| + | RAILWAYS |

ALTITUDE IN FEET	
	5,000 - 7,000
	7,000 - 9,000
	9,000 - 10,000
	Over 10,000

PROJECT ROADS

