

PROJECT COMPLETION REPORT

TRANSPORT SECTOR I 633-0073

00004

Funding:	AID	\$ 5,900,000
	GOB	\$ 6,458,000
	TOTAL	<u>12,358,000</u>

SUMMARY:

The Transport Sector I project was developed as a continuation of earlier AID assistance for road construction in Botswana. The project began in August 1979 and was completed in March 1984. Most project financing (83%) was budgeted for equipment procurement with the balance providing modest technical assistance and training inputs. Adjustments were made during project implementation to address underestimates of technical assistance and training requirements. The GOB commitment to reorganizing the road maintenance program, strong leadership by expatriate advisors (funded by other donors) and the effectiveness of most U.S. equipment can be credited for making the project successful in improving the capacity of the Ministry of Works to adequately maintain the country's road network. While a necessary and successful interim solution to road maintenance problems, the project's achievements in longer-term institutional development and localization may be less than planned.

DESCRIPTION:

A. Background

After independence in 1966, Botswana undertook a major road construction and improvement program designed to encourage economic development of resources such as minerals, livestock and crops throughout the country, to enable the government to provide basic social services (schools, clinics, water supplies, etc.) on a more equal basis to all citizens, and to decrease Botswana's dependency on existing transport routes through South Africa. By 1978, the road network had been substantially upgraded. Approximately 580 kilometers of road were paved versus 20 kilometers in 1966, and the total gazetted road network consisted of 7,439 kilometers of paved, gravelled and sand roads. The National Development Plan (NDP IV), covering 1976-81, placed highest priority on development of the country's transport network, allocating approximately 27% of the development budget for this purpose. However, major road paving plans beyond 1983 were not anticipated given Botswana's small population and limited road traffic.

Accordingly, the GOB began to shift the emphasis in the transport sector from road construction to road maintenance. Road maintenance related assistance programs were requested from three major donors. AID, which had been a major donor for road construction in Botswana in the early

1970s, was requested to assist in the renewal of the Roads Department Maintenance Branch's (MB) largely obsolete equipment fleet and to provide related technical assistance and training. Canada and Germany agreed to provide assistance to improve the capacity of the Central Transport Organization (CTO) (which had responsibility for service and repair of road maintenance vehicles and equipment). The GOB allocated the increased recurrent budget funds necessary to support expanded road maintenance and improved CTO operations.

AID's Transport Sector I project was designed to modernize the road maintenance equipment fleet, assist the MB with planning and implementing an efficient nationwide maintenance program, and increase the number of adequately trained local personnel working in key MB and CTO positions. The project was authorized August 21, 1979 and the Grant Agreement was signed on August 24, 1979. The project provided for (1) procurement of U.S. manufactured heavy equipment, light duty vehicles, support equipment and spare parts; (2) technical assistance in the fields of road maintenance engineering, cost accounting and mechanic training; (3) training of road maintenance, equipment maintenance and cost accounting personnel; and (4) establishment of a computerized cost accounting system.

B. Equipment Procurement

\$5,000,000 of the total \$6,000,000 AID contribution to the project was budgeted for equipment purchases from U.S. sources to modernize the MB fleet. In addition, the GOE contributed over \$1,000,000 for procurement of equipment from other sources (equipment that was either more appropriate to GOB needs or unavailable from U.S. manufacturers). AID financed procurement was divided into two tranches, the first initiated in October 1979 and the second in August 1981. Attachment I provides a list of the types of equipment, planned numbers and actual numbers provided.

Procurement of the first tranche of equipment took about one year longer to accomplish than had been planned in the PP. The GOB gave inadequate attention to preparing specifications and bid documents, and to reviewing tenders. Some tenders were unresponsive and a few items had to be retendered. A Bank Letter of Commitment was used to finance many of the first tranche items. Cumbersome payment and amendment procedures, and slow service from the bank also contributed to procurement delays.

The performance and MB utilization of the first tranche equipment was evaluated before proceeding with the second tranche procurement. Except for Ford pickup trucks, the equipment was performing well. Five Ford pickup trucks planned for the AID funded second tranche were deleted and the GOB purchased five non-U.S. pickups. To support the

standardization objectives of CTO, the same brands of equipment purchased in the first tranche were specified for the second tranche. Second tranche procurement proceeded much smoother than the first tranche and generally on schedule. The procurement was much smaller in terms of total value, quantity of equipment and types of equipment. Bank Letter of Commitment procedures were dropped in favor of direct AID Letters of Commitment.

C. Technical Assistance

The project provided technical assistance to address GOB needs that were existing at the time of the PP development and to assist with implementation of the computer component of the project. A road engineer was provided to head the West division of the MB, two mechanic trainees were provided to improve CTO mechanic capabilities and a cost accounting specialist helped establish a new computerized cost accounting system for the MB.

Road maintenance engineers in over-all charge of the RDMB and the three regional MB divisions were responsible for planning and implementing the nationwide road maintenance program. Other donors were providing engineers for the Gaborone Headquarters and as heads of the North and South maintenance divisions, but were unable to recruit qualified engineers willing to live in the remote West division. Communication from Gaborone to the West division was difficult and without a qualified supervisor, road maintenance in the region was the poorest in the country. The project funded engineer served for three years (from May 1980 to May 1983) as Senior Roads Engineer (West).

Maintenance of project funded and other GOB equipment was the responsibility of CTO. To expedite routine service and repairs, CTO seconded mechanics to nine MB depots throughout the country. Most of the seconded mechanics were expatriates, recruited and paid for by the GOB. At the same time, CTO recruited four Batswana mechanic trainees and identified four in-service mechanics for advanced training, with the objective of eventually localizing some CTO mechanic positions. The project funded two U.S. mechanic trainers to assist the in-country training programs for the trainees. While planned for two years each, the two trainers were extended and served three and three and a half years respectively.

Finally, an accounting specialist with computer experience was recruited for two years to establish, test and supervise use of a new cost-accounting system for the RDMB. The specialist was responsible for writing all the programs used by the system and for providing on-the-job-training to two counterparts. The specialist was extended twice and eventually served three and three-quarter years with project funding and another one-quarter year with funding provided by a general AID training project.

D. Participant Training

To increase the numbers of adequately trained local personnel working in key MB and CTO positions, the project planned to provide nine months of U.S. training to four MB Technical Officers (36 person months total) and six CTO mechanic trainees (54 person months total) and six months of U.S. training to one Cost Accounting Counterpart. In addition, it was planned to use funds from a regional AID training project to continue two MB TOs in engineering degree programs (96 person months total). During the course of project implementation, it became apparent that training needs were much greater than had been originally anticipated. Contingency funds were used to provide much more training than had been planned.

Eight TOs from the MB received 12 to 24 months of training at the Texas State Technical Institute in Waco, Texas (121 person months total). One received an Associate Degree in Civil Engineering Technology (CET), three received diplomas for completing a Building Construction Technology Program (after performing too poorly to continue in the CET program) and two received certificates after poor performance in the CET program. The last two TOs received additional training at other institutions, funded from the regional AID training project (71 person months total). One failed to complete the pre-engineering degree program, but the other received a Bachelor's Degree in CET.

Eight mechanic trainees received training in diesel equipment service in the U.S., four at the Denver Automotive and Diesel College and four at West Shore Community College and Ferris State College (both located in Michigan). The Denver program was of nine months duration with double the normal course workload. Three of the trainees did very well in the program and received Associate Degrees. The fourth trainee received a certificate for completing the program. The West Shore/Ferris State program was twenty-four months in duration. All four trainees did well and received Associate Degrees.

An initial cost accounting counterpart received a diploma for successfully completing a seven month course at the Computer Learning Center in Springfield, Virginia. It was the opinion of the project's Cost Accounting Specialist that this first counterpart would be unable to manage the computer system alone, and a second counterpart was recruited and trained. The second counterpart received an Associate Degree for completing a twenty-seven month program at Hocking Technical College in Nelsonville, Ohio. Funding for his training was provided by the AID regional training project.

E. Computer System

The project planned to finance a computerized cost accounting system that would provide the MB with: (1) improved budgeting procedures; (2) a sound basis for evaluating the efficiency of work accomplished; (3) a basis for evaluating performance of personnel; (4) cost and reliability standards of vehicles and equipment; and (5) the basis for evaluating overall project and departmental performance. A WANG mini-computer was purchased from a WANG agent in Botswana who was also contracted to provide regular service and repair assistance. Technical assistance and training (described in Sections C and D) were provided to support the system. The project focused on two key programs; standards for vehicles and equipment and standards for actual maintenance of roads.

Vehicle and equipment standards were used to evaluate utilization rates. Operating costs were difficult to determine because of lack of reliable fuel consumption/costs and service/repair costs from CTO. However, the system was programmed to record plant availability, usage and down time. Comparisons could be made for an individual piece of equipment against others of the same type or same manufacturer. These comparisons were used as a basis for decisions to cancel plans for second tranche procurement of additional Ford pick-up trucks, to increase spare parts procurement for the first tranche Fords, and to improve spare parts procurement procedures for International Harvester trucks. Comparisons over time were also used to demonstrate the impact seconded mechanics had on equipment availability.

A system to evaluate the efficiency of maintenance work accomplished was more difficult to implement. To establish standards for productivity required periodic inputs of costs and work accomplished for comparison with previously developed milestones of performance and efficiency. Comparisons would have to consider variations in sections of roads based on construction type, usage and geography. Implementing the planned system was complicated by a lack of reliable cost data for equipment usage and the difficulty in specifying quantifiable standards for road maintenance. The system that has evolved measures equipment, labor and contract costs of maintenance work on defined road sections for subjective comparison with other road sections in the country.

In addition to the two major computer programs, a system to estimate industrial class payroll budgets was established in July 1981 and systems to register boreholes and soil samples were initiated late in the project. The payroll system is used by MB as a basis for annual budget requests and the registers will be used to assist planning of road maintenance and upgrading activities.

COVENANTS:

The GOB agreed to and satisfied six special covenants in the Project Agreement as follows:

A. Project Evaluation

"The Parties agree to establish the evaluation program..."

The PP envisioned Project Evaluation Summaries (PES) in September 1980 and 1982, a Special Evaluation in July 1981, (prior to the second tranche procurement), and a Project Completion Report at the end of the project. The first PES and the Special Evaluation were combined and performed in September 1981. This combined evaluation focused primarily on first tranche procurement procedures and MB utilization of the first tranche vehicles and equipment. The second PES was performed in January 1983, after the project had been audited in late 1982. The second PES reviewed the design of the project, measured progress against the log frame and recommended measures to improve project implementation. It also addressed key issues raised by the audit.

B. Provision of Mechanics

"The Grantee...will second or otherwise provide...at least six additional mechanics from...(CTO) to the Maintenance Branch (bringing the total of CTO mechanics...to nine)"

At the time of the audit and second PES, only seven CTO mechanics had been provided to MB. The final two were assigned in January 1983.

C. Storage Facilities

"The Grantee...will provide...adequate additional spare parts storage facilities at the locations where CTO provided mechanics will be stationed..."

Workshops and storerooms at the nine MB depots throughout the country were completed in 1981. Only the depots at Gaborone and Francistown were used to store major quantities of spare parts. Fast moving items such as filters, belts and tires were stocked at all depots.

D. Spare Parts

"The Grantee...will provide all spare parts necessary to ensure the proper maintenance of AID financed equipment for the useful life of that equipment."

This covenant was originally intended to mean that the GOB would not only provide but also stock all spare parts necessary to support the vehicles and equipment.

During project implementation it became apparent that difficulties in managing large spares inventories would result in considerable cost to the GOB. A system was eventually agreed upon whereby local agents in Botswana or South Africa were relied upon to stock the parts and the GOB made budget provisions for prompt purchase of parts as needed. The one exception was the provision of spares for the Ford trucks. There were no agents in Southern Africa who dealt with the U.S. manufactured Fords. The project provided extra funds for procurement of large quantities of Ford spares direct from the U.S. and these spares were stocked in the MB depots.

E. Use of Equipment

"The Grantee covenants that equipment financed by AID will be used only for road maintenance activities, except that under extraordinary circumstances...for general economic development purposes and only with the prior written authorization of the Permanent Secretary, Ministry of Works and Communications..."

The audit of the project suggested that there were some instances when the equipment was being used for non-road maintenance activities that did not meet the "extraordinary circumstances" criteria. The Ministry was also failing to authorize these circumstances in writing. The GOB was reminded of the terms of this covenant and thereafter made it a practice to use only non-AID financed equipment for these other purposes.

F. Personnel

"The Grantee...will provide...all necessary counterpart personnel and individuals to undertake participant training."

As discussed earlier, more counterparts and individuals were trained than had originally been planned; 8 MB TOs vs. 4 planned, 8 CTO mechanic trainers vs. 6 planned, and 2 Cost Accounting counterparts vs. 1 planned.

COMPLETION STATUS:

A. Equipment Fleet

The MB fleet in 1978 was characterized by a large proportion of obsolete equipment, i.e. vehicles and plant that were too old to be operated and maintained economically. The age of the equipment, combined with poor service from CTO, resulted in low availability of equipment for productive use, a major factor affecting the inadequate maintenance of roads in the country. Procurement of new equipment and improvements to spare parts and mechanic support were provided in the project to correct the equipment deficiencies. The following table gives progress

during project implementation towards achieving PP targets for fleet obsolescence and equipment availability rates.

	Targets	ACHIEVEMENTS			
		9/78	9/81	9/82	12/83
Obsolescence (%)	0	75	33	10	7
Availability (%)					
Graders	78	69	69	78	64
Dozers	80	70	76	77	77
Loaders	80	69	85	93	88
Rollers	70	60	88	80	76
Tippers	70	36	27	68	58
Flat Beds	80	82	78	77	50
Pick-ups	80	70	66	83	79
Tractors	85	75	86	71	62

The GOB defines the useable lifetime of equipment as 8 years for graders, dozers, loaders, rollers and tractors, and 5 years for tippers, flat beds and pick-ups. The figures given for obsolescence in the table are the percentages of the total MB fleet older than the defined useable lifetime. AID engineers had proposed a more rigorous definition in the PP, i.e. 5 years for heavy equipment and 3 years for trucks. Much of the shortfall in attaining availability targets for graders, tippers and tractors can be attributed to the GOB using equipment that is too old. For example, the project financed graders have an availability record of 86% versus 64% for all graders in the fleet.

The appropriateness of equipment to Botswana conditions is another factor affecting availability rates. Four wheel drive Ford pick-ups and International Harvester dump trucks have experienced considerable mechanical problems that have affected the average fleet availability for their classes of equipment. A heavy infusion of spare parts has kept the availability of Ford 4x4s at a reasonable 67% versus 79% for all pick-ups, but poor local dealer support for IH has hurt overall availability of tippers (IH availability is 43% versus 58% average) and forced the GOB to purchase thirteen additional dump trucks that were not planned for in the PP.

B. Road Maintenance Program

The frequency and extent of road maintenance in the 1970s was largely dependent on the availability of equipment. For example, if a grader was in working order, it would be used on the most important road in the area in need of grading. If a grader was not working, all roads in the area remained in usually poor condition. With the modernization of the equipment fleet under the project, the

MB began a more systematic approach to road maintenance. All gazetted roads in the country are now divided into control sections for purposes of planning and monitoring maintenance activities. MB equipment and labor are divided into work units along functional lines such as grading, graveling, regravelling, bush clearing, bridging/culverting, etc. Each regional MB division prepares annual work plans for road sections according to work unit activities. The work plans are based on maintenance requirements determined by experience and traffic projections, and are not limited by equipment availability. The cost accounting computer system monitors work actually performed for comparison with the annual plans. Inefficiencies such as underutilization of work units are noted and discussed at monthly meetings of key MB headquarters and division personnel. Adjustments are made to work plans or the composition of work units or the location of work units as required. The result is an effective and efficient road maintenance program that is no longer criticized as it was before the project.

C. Localization

The MB and CTO, like other GOB departments, rely heavily on the services of expatriate advisors for management assistance. The project accepted that localizing the expatriate positions was a long-term goal, not possible to be accomplished during the project, but hoped to have a small initial impact through a training program for technical staff who seemed to have potential for advancement into management positions. The effect of project training has been less than hoped for in the MB, but far greater than anticipated in CTO.

Of the nine MB participants (three Senior Technical Assistants, two Technical Officers, three Senior Technical Officers and one cost accounting counterpart), four returned from training to their previous position, four received one-step promotions and one was promoted into a Senior Roads Engineer position. Only the Senior Roads Engineer replaced an expatriate advisor. The four one-step promotions would probably have occurred on the basis of work experience and good performance without the benefit of the project's training programs.

In contrast, four of the eight CTO participants (the four in-service trainees) replaced expatriate advisors after their training program. One is Chief Training Officer, and three are heads of CTO workshops in Sebele, Francistown and Maun (the three largest and most important CTO workshops in the country). The four new mechanic recruits are now in senior mechanic positions (two in Sebele and two in Maun).

D. Financial Summary

A summary of the project's PP budget and final expenditures is attached. With allowances for contingency and inflation, expenditures on project components were generally within budgetted amounts even though much more technical assistance and participant training (in terms of person-years) was actually provided. \$100,000 of project funds were deobligated in 1983 after a review of actual and planned expenditures.

CONCLUSION:

Road maintenance projects are unglamorous activities, not often undertaken by AID or other donors. They seldom produce outputs like new buildings, smooth new roads or long lists of active participants that can demonstrate how successful the projects have been. People only notice road maintenance when it is inadequate or non-existent. Poor road maintenance in Botswana used to be a favorite topic of parliamentary debate and press criticism. A measure of the success of the Transport Sector I project is that road maintenance no longer receives any attention by these critics. The project achieved its purpose of improving the capacity of the Ministry of Works to adequately maintain its large and expanding roads network during a period when GOB and other donor investments in road construction exceeded 100 million dollars and while the gazetted road network grew from about 7400 kilometers to over 8100 kilometers. The overall upgrading of Botswana's transport sector has already had a noticeable effect on achievement of the project's sector goals of (a) promoting development and the provision of basic social and economic services in rural areas (as evidenced by Botswana's expanding water, education and health delivery systems in the West and North), (b) encouraging exploitation of the development potential of isolated regions of Botswana (the establishment of a wood industry in the Kasane area and the Communal First Development Area program in western Ngamiland), and (c) decreasing the dependency on existing transport networks through South Africa (road linkages to Zimbabwe and Zambia have been recently upgraded and major improvements to routes west to Namibia are to begin soon). The GOB commitment and relatively modest AID/GOB investment in road maintenance has gone a long way towards insuring effective utilization of the much larger investment in road construction.

Recent trends in GOB management of the MB equipment fleet and the cost accounting systems, if continued, could jeopardize some of the accomplishments made to date:

- Many items in the equipment fleet are at or beyond their useful lifetime, even according to relaxed GOB guidelines. While the RDDB is understandably reluctant to give up equipment that has even marginal usefulness, the MWC should realize that old equipment is too costly to operate and should eliminate these items from the active fleet. The GOB has shown a willingness to add or replace necessary equipment in the past, but is faced with major replacement requirements in the near future that may stretch or exceed budgetary limitations.
- Proper utilization of the cost accounting system during the project was largely due to the skills of the cost accounting specialist and the interest of the two expatriates that served as overall head of the MB. Recognition of the usefulness of the system has not been universal in MB, even among the various expatriate advisors and especially among the Batswana responsible for supplying the system's data inputs. With the operation of the computer system now localized and a replacement for the head of the MB due to be named in early 1985, it remains to be seen if the system will continue to be effectively utilized.

LESSONS LEARNED:

Lessons learned during implementation of the Transport Sector I project are already reflected in changes to AID and USAID/B policies. For example:

- U.S. manufactured pick-up trucks performed poorly without adequate dealer support in the region. Subsequent purchases by the GOB were for vehicles with strong local dealers. AID now grants blanket vehicle waivers for Southern Africa, based, in part, on lack of dealer support for U.S. vehicles.
- Bank Letter of Commitment procedures were unsatisfactory due to poor bank service and AID Direct Letters of Commitment were substituted. AID now has a general policy to prefer use of Direct Letters of Commitment under similar circumstances.
- The project attempted an ambitious computerization component that underestimated technical assistance support and localization difficulties. The technical advisor was extended and counterpart training increased. AID now subjects computer procurement proposals to more rigorous review before approval.

--- The project underestimated the needs for training and the difficulties in identifying Botswana personnel with the academic background necessary to successfully complete training programs. Human resources development has become the major component of USAID's strategy in Botswana and programs include projects to improve general basic education.

ATTACHMENT I

AID FINANCED

	Item	Quantity	
		Planned	Provided
1.	150 HP Motor Grader (Caterpillar 140)	8	8
2.	125 HP Motor Grader (Caterpillar 120)	11	11
3.	Bulldozer (Caterpillar D6D)	4	4
4.	Front End Loader (Caterpillar 920)	5	5
5.	Towed Vibrating Roller (Hyster C200B)	3	3
6.	Towed Grid Roller (Hyster)	2	2
7.	2,000 lb. Vibrating Roller (Over-Lowe)	5	5
8.	4,500 lb. Vibrating Roller (Dynapac CC10A)	2	2
9.	4 x 2 Pickup (Ford F250)	21	18
10.	4 x 4 Pickup (Ford F250)	13	11
11.	4 x4 Mechanic Truck (Ford F250)	9	9
12.	Dump Truck (International Harvester)	19	19
13.	Water Truck (International Harvester)	8	8
14.	Mower Attachments	4	0
15.	Mechanical Brooms	4	0
16.	Bitumen Sprayers	3	3
17.	Radios (Marconi)	54	54
18.	Lubrication Units (Rassow)	9	9
19.	Tool Sets (Snap-on)	9	9

GOB FINANCED

1.	Flat Bed Truck (Bedford, Nissan)	9	13
2.	Flat Bed Truck w/crane (Bedford)	3	3
3.	Tractor	21	22
4.	4 x 4 Tractor (SAME)	9	9
5.	Caravans	16	13
6.	Dumping Trailer	9	0
7.	10,000 ltr. Towed Water Bowser	3	3
8.	5,000 ltr. Towed Water Bowser	10	10
9.	Mower Attachments	0	4
10.	Mechanical Brooms	0	4
11.	4 x 4 Pickup (Toyota Landcruiser)	0	2
12.	4 x 2 Pickup (Toyota Hilux or Stout)	0	11
13.	Dump Truck (Toyota, Nissan)	0	13
14.	Towed Grader	0	3

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GOB FINANCED

1.	Flat Bed Truck (Bedford, Nissan)	9	13
2.	Flat Bed Truck w/crane (Bedford)	3	3
3.	Tractor	21	22
4.	4 x 4 Tractor (SAME)	9	9
5.	Caravans	16	13
6.	Dumping Trailer	9	0
7.	10,000 ltr. Towed Water Bowser	3	3
8.	5,000 ltr. Towed Water Bowser	10	10
9.	Mower Attachments	0	4
10.	Mechanical Brooms	0	4
11.	4 x 4 Pickup (Toyota Landcruiser)	0	2
12.	4 x 2 Pickup (Toyota Hilux or Stout)	0	11
13.	Dump Truck (Toyota, Nissan)	0	13
14.	Towed Grader	0	3

ATTACHMENT II

TRANSPORT SECTOR I (633-0073) FINANCIAL SUMMARY

	BUDGET	EXPENDITURE
TECHNICAL ASSISTANCE		
Roads Engineer (Argo)	118,000	146,373.85
Cost Accountant (Niles)	85,000	124,533.72
Mechanic Trainer (Rokos)	84,000	115,562.60
Mechanic Trainer (Cox)	84,000	106,822.24
Sub-total	371,000	493,292.41
PARTICIPANT TRAINING		
MWC	102,000	174,089.80
CTO	154,000	126,493.82
Cost-Accounting	18,000	12,038.42
Sub-total	274,000	312,622.04
EQUIPMENT		
1st Tranche	3,446,000	3,530,145.31
2nd Tranche	1,554,000	1,374,752.33
Sub-total	5,000,000	4,904,897.64
COMMODITIES		
Mini-computer	60,000	53,583.98
Training Materials	10,000	1,591.28
LDV Refitting		7,876.33
Radio Aerials/Batteries		5,967.29
Sub-total	70,000	69,018.88
OTHER COSTS		
TA House	35,000	24,552.97
Local Support	120,000	9,357.36
Inflation & Contingency	130,000	
Sub-total	285,000	33,910.33
TOTALS	6,000,000	5,813,741.30

NOTE: \$ 186,258.70 has been deobligated.