Botswana "Railway Rolling Stock Increase Project"

Report Date: March 1999

Field Survey: June 1998

Project Summary

Borrower:	Government of Republic of Botswana
Executing Agency:	Botswana Railways Organization
Exchange of Notes:	March 30, 1988
Date of Loan Agreement:	April 12, 1988
Final Disbursement Date:	May 17, 1993
Loan Amount:	¥2,800 million
Loan Disbursed Amount:	¥2,393 million
Loan Conditions:	
Interest:	1.5%
Repayment period: (for grace period)	30 years (10 years grace period)
Procurement Conditions:	Partially Untied

Reference

(1) Currency：Pula

(2) Exchange Rate and Consumer Price Index (CPI: 1990 = 100） [IFS average annually]

FY	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Yen/US$	144.64	128.15	137.96	144.79	134.71	126.65	111.20	102.21	94.06	108.78
Pula/US$	1.6779	1.8159	2.0125	1.8601	2.0216	2.1097	2.4231	2.6846	2.7722	3.3242
Yen/Pula	51.376	70.571	68.552	77.840	66.635	60.032	45.892	38.073	33.930	32.724
Foreign exchange fluctuation (preceding year ratio) (Yen/Pula)	—	1.37	0.97	1.14	0.86	0.90	0.76	0.83	0.89	0.96
CPI	74.3	80.5	89.8	100	111.8	129.8	148.4	164.1	181.3	199.6

(Source: IFS)

(3)Fiscal Year: April ~ March

(4) Abbreviations and Terminology

Abbreviations

① SADCC: Southern African Development Coordination Conference:
Established in April 1980. Consists of 9 member countries: Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia, and Zimbabwe.

② SADC: Southern African Development Community: The name SADCC was modified at a summit sponsored by the SADCC, changing "Coordination Conference" to "Community". Thereafter, Namibia, South Africa, and Mauritius joined the 9 original member countries, and the organization now counts 12 members.

Terminology

① Uncovered freight car: A car without a roof. Ex: general purpose uncovered freight cars, container cars on which containers are loaded.

② Box car: A car with a roof. Ex.: General-purpose box cars and refrigerator cars.

③ Tank car: A freight car provided with tanks for transporting liquid freight.

④ Car with hand brake: A caboose car. A car connected at the tail of a train, is provided with hand brakes, and serves to assist the main brake at the driving seat.

⑤ Train radio system: A system that enables a train to communicate with terminals on the ground, contributing to train safety (emergency notification in case of railway problems, etc.) and enabling one-man train operation (previously, a brake van (caboose car) would be attached at the tail of the train and the railway employee was in it.

Project Location

Note) Figures under the station names show the distance from Bulawayo, capital of Zimbabwe, and major local products are in the parentheses.

1. Project Summary and Comparison of Original Plan and Actual Result

1.1 Project Summary and JBIC Portion

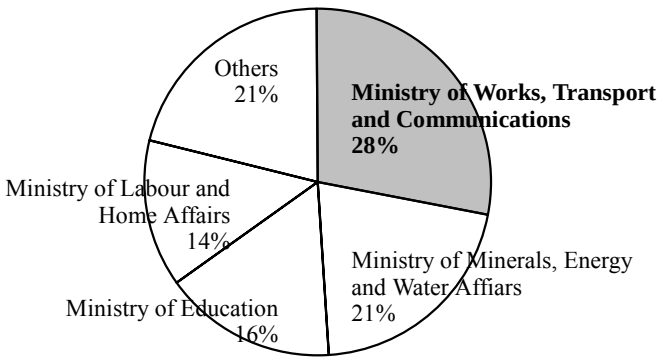
This project is designed to procure 570 needed freight cars and their spare parts as part of the railway infrastructure improvement in Botswana. The ODA loan covers the entire costs (entire amount was foreign currency) related to this project.

1.2 Background (at the time of appraisal)

1.2.1 National Development Plan and Railway Sector

According to Botswana's policy of developing national railway transport capabilities which begun under the 5th National Development Plan (from 1981 to 1985), it was decided to further promote the modernization of railway transportation as part of the 6th National Development Plan (from 1985 to 1991). A look at the budget allocations by each ministry in the 6th National Development Plan (total budget: 1.56 billion pula) shows that the Ministry of Works, Transport and Communications received the largest amount, 430 million pula (28% of the entire budget), followed by the Ministry of Minerals, Energy and Water Affairs (21%), the Ministry of Education (16%), and the Ministry of Labour and Home Affairs (14%). Approximately 32% (130 million pula) of the allocation to the Ministry of Works, Transport and Communications was allocated for the establishment of the Botswana Railways Organization (hereafter, BR) and accompanying costs. This fact shows that the railway sector is its most important sub-sector.

6th National Development Plan: Budget Allocations



(Source: 6th National Development Plan)

1.2.2 Outline of Railway Sector (at the time of appraisal)

Botswana's railway network, comprising a total of 708.8 km of lines, consisted of a main line (640.5 km) that runs South-North, from the Zimbabwe border to the South Africa border, a branch line (52.3 km) that travels up to the copper and nickel mines of Selebi-Phikwe, and another branch line (16.0

km) that runs up to Morupule, where a thermal power plant is located. The majority of Botswana's imports come in by railway, and with the exception of diamonds, which represented 76% (as of 1985) of the country's exports on a monetary base, almost all of the country's main products, i.e. copper, nickel, and beef, were transported by rail. Moreover, Botswana's railways are also very important to neighboring Zimbabwe and Zambia as a transit route to import/export ports in South Africa. Table 1.1 below lists the average annual traffic volume from fiscal 1981 to 1985.

Table 1.1 Traffic Volume (From fiscal 1981 to fiscal 1985)

	Domestic	Import/Export	Transit	Total
Freight volume (10,000 Tons km)	99	148	1,044	1,291
Ratio (%)	8	11	81	100

1.2.3 BR's History and Conditions (at the time of appraisal)

(1) BR's History

Botswana's railways used to be run by neighboring National Railways of Zimbabwe (hereinafter NRZ)[1]. History until BR was established are described below.

1974	The Botswana government set the policy of managing railways on the national territory by itself.
August 1984	Railway Bureau was established within the Ministry of Works, Transport and Communications as part of preparations for the creation of a national railway.
December 1986	The Botswana Railway Act was passed by Parliament.
January 1987	The Botswana government bought railway facilities inside Botswana from NRZ and acquired operation rights.
October 1987	After the Botswana Railway Act took effect, the Botswana Railway (BR), under the supervision of the Ministry of Works, Transport and Communications, became independent and was formally inaugurated.

[1] The railway in Botswana was started by the private Bechuanaland Railway Company Limited in 1897. Thereafter, ownership was transferred to the national railway co-owned by the South and North Rhodesia governments. Then, following the independence of Zambia, after going through ownership by the Rhodesian government and Zambian government, it became the NRZ at the same time as the creation of the Republic of Zimbabwe in 1980.

(2) Freight car ownership

BR used to own 89 freight cars, which can be broken down into 47 uncovered freight cars, 20 hopper cars, 12 tank cars, and 10 rail carriers. Botswana also used to lease a daily average of 1,200 additional cars, about 600 each from NRZ and Spoornet (South African Railways). The Botswana government paid approximately US$7/car a day to NRZ for each car, and approximately US$8/car a day to Spoornet, expending a total of approximately US$3.3 million in leasing fees each year (1987).

1.2.4 Positioning of this Project within Master Plan

In June 1984, a master plan (hereafter, M/P) was prepared for improving freight car transport in the entire SADCC area by Kampsax-Swederil, a joint venture between Denmark and Sweden. This M/P basically aimed reducing Botswana's dependence on the South Africa economy in keeping with the aims of the establishment of SADCC, based on the premise of a shift from export-import ports in South Africa to export-import ports in the SADCC area. As part of this M/P, the procurement of 600 freight cars for Botswana alone was recommended based on the premise that Botswana would take over control of railway operations from the Zimbabwe Railway in 1987.

1.3 Project History

June 1984	Preparation of a master plan by Kampsax-Swederill (joint venture between Denmark and Sweden) to improve freight car transport in the entire SADCC (renamed SADC in 1992) area.
August 1984	Government of Republic of Botswana established Railway Bureau within the Ministry of Works, Transport and Communications.
December 1986	Botswana Railways Act was passed by Parliament.
January 1987	Government of Republic of Botswana bought railway facilities in Botswana from NRZ and acquired operation rights, with responsibility for operations going to the Ministry of Works, Transport and Communications of Botswana.
March 1987	Government of Republic of Botswana requested ODA loan for this project.
March 1987	Ministry of Works, Transport and Communication of Botswana officially announced international competitive bidding. (Procurement of a total of 450 freight cars was planned.)
September 1987	The bidding contents were changed. (An addition in the number of car types[2] and changes in some specifications, and the raising of the total number of cars to 570)

[2] Following the official announcement of bidding in March 1987, the Botswana Power Authority asserts the need for hopper wagons for coal transport, and as a result the total number of cars is revised upward to reflect the addition of 110 hopper wagons (bidding again officially announced in September 1987). However, the Botswana Power Authority then changes its position, asserting this time that hopper wagons are not needed due the fact that there are not sufficient facilities for coal, and as a result, upon award of the contract, the 110 hopper wagons are replaced with 110 uncovered freight cars.

October 1987	JBIC appraisal mission was dispatched to Botswana, and the Botswana Railways Organization was inaugurated.
November 1987	Japan/Zimbabwe joint venture successfully bidded for the contract. An additional JBIC appraisal mission was dispatched to Botswana (change in project scope = confirmation of bidding changes)
February 1988	Prior Notification from Japanese Government.
March 1988	Exchange of notes
April 1988	Signing of Loan Agreement and signing of freight car procurement contract
October 1989	Completion of freight car delivery

2. Analysis and Evaluation

2.1 Evaluation on Project Implementation

2.1.1 Project Scope

(1) Freight cars

The procurement records are listed in Table 2.1 below. As indicated, there were no differences between planned and actual figures. At the time of the first appraisal, 50 uncovered freight cars (high sides) and 110 hopper cars were to be procured, instead of 160 uncovered freight cars (high sides). However, later, the Botswana Power Authority, which was the prospective users of the hopper wagons, told BR that hopper wagons would not be needed after all because facilities requiring hopper wagons were under maintenance. As a result, BR decided to replace the hopper cars with uncovered freight cars, and in order to verify the appropriateness of this move, the JBIC sent an additional appraisal mission to Botswana.

Table 2.1 Comparison of Original Plan and Actual Regarding Procurement Plan of Freight Cars

	Plan (at time of additional appraisal)	Actual	Difference
Total of freight car	570 cars	Same as left	—
Uncovered freight car (low sides)	230 cars	Same as left	—
Uncovered freight car (high sides)	160 cars	Same as left	—
Box car	90 cars	Same as left	—
Tank car	80 cars	Same as left	—
Car with hand brake	10 cars	Same as left	—

(2) Spare parts

The procurement of spare parts for the 570 freight cars, which was part of the project scope, was not implemented. BR reported at the time of this evaluation survey that the reason for this decision was that BR had stocked enough spare parts at the time of the procurement of freight cars, and that it would be able to procure spare parts using its own funds if they became necessary. As explained later, BR actually has sufficient spare parts and is performing satisfactory maintenance, so that the decision not to procure spare parts as part of this project will not affect sustainability of operations following the completion of this project.

2.1.2 Implementation Schedule

The delivery deadline set for the freight car procurement contract was 8 months following L/C issuance, which was January 1989. Production delays then arose and BR agreed to give the contractor a 5-month extension without penalty, until June 1989 (as of June 1989, 462 freight cars were delivered). However, the delivery of the remaining 108 freight cars was finally completed in October

1989, or a total of 9 months behind the deadline fixed by the original contract. Responsibility for this delay fell on the contractor, thus BR imposed a penalty corresponding to 4 months on the contractor (see Table 2.2).

Table 2.2 Comparison of Original Plan and Actual Regarding Implementation Schedule

	Plan (at the time of appraisal) (period)	Actual (period)	Difference (period)
Bidding (Period)	1987.3 – 1987.11 (9 months)	1987.3 – 1987.11 (9 months)	— (—)
Signing of freight car procurement contract	1988.04	1988.04	—
Freight car fabrication and delivery (Period)	1988.04 – 1988.12 (9 months)[3]	1988.06 – 1989.10 (17 months)	+10 months (8 months)
Signing of spare parts contract	1988.08	Did not purchase	—
Spare parts fabrication and delivery	1989 - 1992	Did not purchase	—

Year	1987	1988	1989	1990	1991	1992
Bidding (Actual)	3 11					
Signing of freight cars contract (Award) (Actual)		4				
Freight cars fabrication and delivery (Plan)		4 12		(9 months)		
(On the contract)			6 1	(8 months) (17months)		
(Actual)			6 10			
Signing of pare parts contract (Award) (Plan)		8				
Spare parts fabrication and delivery (Plan)[4]			□	□	□	□

Note) The numbers over the horizontal bars in the table above express months (3=March, 11=November, etc.), and the numbers in parentheses indicate the implementation schedule.

[3] At the time of appraisal, the contract had not yet been concluded, and a delivery period of 9 months had been envisaged, but in the actual contract, the delivery period was set at 8 months following L/C issuance.

[4] Procurement of spare parts at every fiscal year was planned.

2.1.3 Project Cost

For the procurement of freight cars, there was no difference between projected and actual project costs on a US$ base. However, there was an appreciation of yen (from ¥143.6/US$ to ¥135.1/US$) from the time of the appraisal (1987) until the time of the contract (1990), and therefore on a yen base, actual costs were lower than projected. Moreover, regarding spare parts related to the project, as has been mentioned before, no spare parts were procured within the scope of this project, and thus the amount originally allocated for their purchase remained unused (see Table 2.3).

Table 2.3 Comparison of Original Plan and Actual Regarding Project Cost

(Units: ¥ million, however $1,000 in the parentheses)

	Plan (at the time of appraisal)	Actual	Difference
Total project cost	2,800	2,393	▲407
Foreign currency (JBIC portion)	2,800	2,393	▲407
	(19,484.3)	(17,713)	(▲1,771.3)
―――――	―――――	―――――	―――――
Uncovered freight cars (low sides)	933	877	▲56
	(6,498)	(6,498)	(―)
Uncovered freight cars (high sides)	631	593	▲38
	(4,396)	(4,396)	(―)
Box car	505	476	▲29
	(3,519)	(3,516)	(―)
Tank cars	408	383	▲25
	(2,841)	(2,841)	(―)
Cars with band brake	66	64	▲2
	(459)	(459)	(―)
Spare parts	257	Did not purchase	▲257
	(1,771.3)	(0)	(▲1,771.3)

Exchange rate at time of appraisal (when planned): US$1 = ¥143.6 (1987)

Exchange rate at time of actual result (when contracted): US$1 = ¥135.1 (1990)

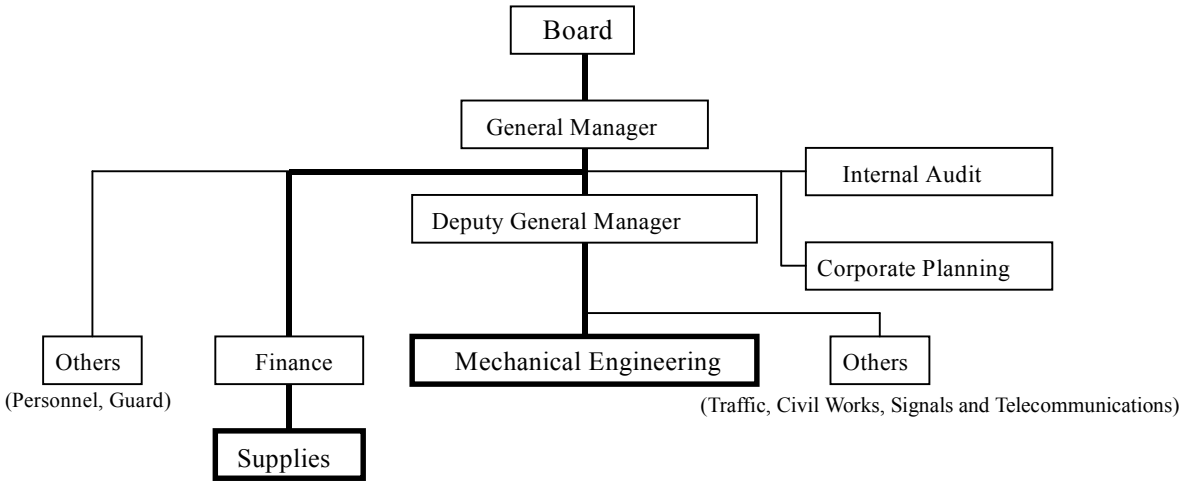
2.1.4 Implementation Scheme

(1) Executing agency

The executing agency for this project was the Botswana Railways Organization (BR). Following BR's inauguration, this project was implemented using the system described below. Regarding the purchase of BR's freight cars, the specifications and technical drawings were prepared by the Mechanical Engineering Department (out of the 215 employees of this department, 15 were assigned to prepare specifications and technical drawings), and once they were finalized, actual procurement was

performed by the Supplies Division within the Finance Department (see Figure 2.1). The 9-month delay that occurred in the procurement of the freight cars was caused by insufficient manufacturing capability of the contractor, and no major problems have been observed in BR's execution capabilities in this project.

Figure 2.1 Organization Chart of Botswana Railways Organizations
(at time of project implementation)



Note: Thick lines indicate sections related to execution (procurement control).
Source: BR

(2) Consultants

BR was judged to have sufficient procurement, execution, and management capabilities for this project, and therefore consultants were not hired. This decision did not pause problems in the implementation of this project.

(3) Contractor

The bidding procedure for this project consisted of international competitive bidding without prequalifications (hereafter, P/Q). Bidding was performed twice on account of continuous changes in specifications on the part of BR due to special circumstances. 6 companies participated in the final bidding procedure, and the choice was narrowed down to 4 companies that bid for all 6 types of freight cars (2 Japanese/Zimbabwe joint ventures and 2 Zimbabwe companies). The bidding companies were evaluated not solely on the basis of cost, but also based on delivery date of the freight cars, and the bidder whose overall conditions were deemed the most favorable, a Japanese/Zimbabwe joint venture, was selected in the end.

However, as mentioned before, this project experienced a delay of 9 months in the delivery of the ordered freight cars, and BR has reported the cause as being insufficient manufacturing and processing

capabilities of the contractor. Actually, the contractor had taken responsibility and has paid the penalty (corresponding to delay of 4 months). The fact that although BR lifted the penalty it had the right to impose for the first 5 months of delay, the additional delay of 4 months, suggests that the construction period indicated by the contractor was unrealistic.

(4) Overall implementation scheme

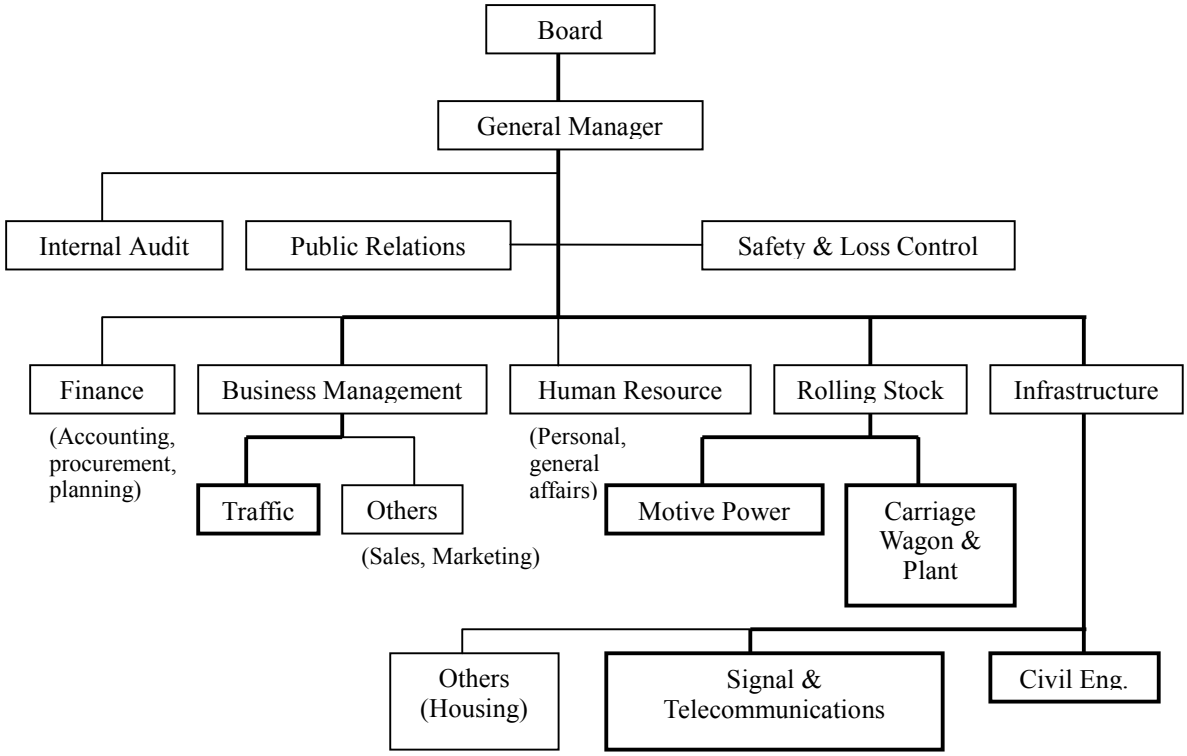
Aside from the delay in the implementation schedule, no major problems are believed to have existed in the overall implementation scheme. However, JBIC's current procurement guidelines specify that a P/Q is required as a rule for procurements of the same scale as this project, and a P/Q should have been done in order to ascertain the suitability of the contractors manufacturing capabilities.

2.2 Evaluation on Operations and Maintenance

2.2.1 Operations and Maintenance Scheme

As of March 1998, BR had 1,196 employees, and its current organization board is shown in Figure 2.2 below. Compared to BR's staffing level of 1,756 employees at the time of the JBIC appraisal (1987), this represents a 40% reduction, and this personnel reduction has been conducted as part of BR's program to make its operations reasonable. The trend in BR's staffing level is shown in Table 2.4 below.

Figure 2.2 Organization Chart of Botswana Railways Organization



Note: Thick lines indicate sections related to operations and maintenance of cars and trains.

Source: BR

Table 2.4 Changes for Numbers of BR Employees

FY	87/88	88/89	89/90	90/91	91/92	92/93	93/94	94/95	95/96	96/97
Number of employees	1,756	1,854	2,024	2,028	2,025	2,024	2,039	1,940	1,795	1,196

Source: BR Annual Report

BR's maintenance plants are under the Rolling Stock Department. The main maintenance plant is located in Mahalapye, where headquarters are also located, and additional inspection plants where maintenance of freight cars are performed are located in Francistown in the North, and Lobatse in the South. Simple inspections of freight cars are done once a year. Inspections focussing mainly on wheels and related parts (replacement of brake pad, wheels, etc.) are conducted every 3 years, and overhauls are done at 12 year intervals. The execution capability and staff configuration of each plant is shown in Table 2.5.

Table 2.5 Execution Capability of BR Maintenance Plants

		Mahalapye Plant	Francistown Plant	Lobatse Plant
Personnel	Engineer	5	0	0
	Worker	30	14	20
Types of cars repaired		Locomotives, freight cars, passenger cars	Freight cars, passenger cars	Freight cars, passenger cars
Execution capability		① Processing capability (per time) ・Locomotives (except inspection) 4 units ・Freight cars and passenger cars: 10 to 12 units ②Maintenance lines ・Locomotive inspection: 1 line ・Locomotive repair and tuning: 2 lines ・Freight cars and passenger cars inspections: 2 lines	① Processing capability (per time) ・Freight cars and passenger cars: 3 to 4 units ②Maintenance lines ・For freight cars and passenger cars: 1 line	① Processing capability (per time) ・Freight cars and passenger cars: 3 to 4 units ②Maintenance lines ・For freight cars and passenger cars: 1 line
Repair contents		Running apparatus inspection, consumables replacement, locomotive engine tuning, car cleaning	Consumables replacement, car cleaning	Consumables replacement, car cleaning

Source: BR

2.2.2 Operations and Maintenance

Although it was feared that reduction of numbers of staff at BR would diminish its maintenance capabilities, it actually has not had a negative effect on BR's capabilities, as will be described in greater detail later.

(1) Number of owned freight cars

Table 2.6 shows BR's ownership of freight cars as of March 1997. Out of a total of 1,026 freight cars, 570 were procured through this project and 20 were provided through DANIDA (Danish International

Development Agency). The other freight cars were procured by BR using its own funds. Incidentally, BR owns a total of 40 locomotives.

Table 2.6 BR Number of Owned Freight Cars

Type of car	Number of cars	Type of car	Number of cars
Uncovered freight car	230	Car for livestock	134
Uncovered freight car	160	Hopper car	284
Box car	90	Car with hand brake	10
Tank car	80	Others	38
		Total	1,026

(Source: BR Annual Report 1997)

All 570 freight cars procured through this project still exist. However, as of June 1998, 8 of the 10 cars with hand brake procured through this project were not in use. (The remaining 2 cars with hand brake are being used as box cars for carrying parcels on branch lines). The reason given by BR for not using all the cars with hand brake is that it has introduced a train radio system as part of the modernization of facilities, and as a result, cars with hand brake have become unnecessary[5].

As previously mentioned, BR was established to accompany the effectuation of the Botswana Railway Act in October 1987, and at the stage when bidding for this project was officially announced (March 1987) and the appraisal was performed (October 1987), BR's facilities modernization program had not yet been considered and cars with hand brake were considered necessary. Nevertheless, considering that the actual introduction period for cars with hand brake and the introduction period for the train radio system were not greatly separated (both occurred in 1989), BR should have carefully reconsidered the procurement of cars with hand brake in view of the facilities modernization plan that was already under implementation at the time.

(2) Repair capability of maintenance plants

Based on materials supplied by BR, the daily repair capacity of BR's maintenance plants is as listed in Table 2.7 below.

[5] Traditionally, the conductor on board of the car with hand brake at the tail of the train is responsible for monitoring and notification in case of accidents such as disconnection of freight cars. However, thanks to the introduction of a train radio system, it is now possible to monitor the connected status of all cars from the locomotive, and cars with hand brake are no longer necessary as a result.

Table 2.7 Repair Capability of Plant per Day

	Mahalapye Plant	Francistown Plant	Lobatse Plant
Annual locomotive inspections	2 cars / 2 days = 1 car	Not carried out	Not carried out
3-year locomotive inspections	4 cars / 10 days = 0.4 car	Not carried out	Not carried out
Annual passenger & freight car inspections	4 cars / 1 day = 4 cars	2 cars / 1 day = 2 cars	2 cars / 1 day = 2 cars
3-year passenger & freight car inspections	6 cars / 7 days = 0.85 car	2 cars / 7 days = 0.3 car	2 cars / 7 days = 0.3 car

Assuming that each plant has 250 working days a year, the total annual repair capability of the 3 plants is calculated as follows.

① Annual locomotive inspections:

250 days × 1 car/day = 250 cars/year

② 3-year locomotive inspections:

250 days × 0.4 car/day = 100 cars/year

③ Annual passenger & freight car inspections:

250 days × (4+2+2) cars/day = 2,000 cars/year

④ 3-year passenger & freight car inspections:

250 days × (0.85+0.3+0.3) cars/day = 362 cars/year

Based on these numbers, BR can be said to have sufficient repair plant facilities in relation to the number of cars (40 locomotives, 47 passenger cars, 1,026 freight trains, as of June 1998).

(3) Spare parts

The maintenance plants have at most the equivalent of one year's stock of spare parts normally used for repairs. The Mahalapye Plant stores a constant number of spare parts, while each plant also has stocks of small parts. Moreover, spare parts that are used usually for repairs are controlled by a system like automatically ordering them once their number falls below a certain level. All inventory control is done centrally using a database, and all inventory in/out movement statuses can be checked using a personal computer. Moreover, spare parts specifications are standardized within SADC, and inter-lending among the railways of neighboring countries is possible. Moreover, since the makers of spare parts are also these neighboring countries, these spare parts are easy to procure.

(4) Car maintenance budget

Maintenance expenses, which are determined based on a budget system, are allocated every year. Statistics are listed in Table 2.8 below. The ballooning in maintenance expenses for freight cars during fiscal 1996 is due to the fact that 48 freight cars were overhauled (overhauls are done every 12 years). Based on the satisfactory status of maintenance at present, it is thought that budget allocations and disbursements are adequate.

Table 2.8 Maintenance Cost (Unit: 1,000 pula)

FY	1995	1996	1997
Cars (locomotives, passenger cars, freight cars)	11,415	8,210	11,665
For freight cars only	543	1,387	683

(Source: BR)

2.2.3 Operational status

An examination of the freight car operation status was made on the following four aspects: (1) transportation demand, (2) required number of freight cars, (3) car maintenance capability and car operation rate, and (4) track capacity[6].

(1) Transportation demand

BR's freight transport statistics before and after this project are listed in Table 2.9 below.

Table 2.9 Freight Transport Statistics (Unit: 1,000 ton)

Item \ FY	1988	1989	1990	1991	1992	1993	1994	1995	1996
Domestic	424	372	409	468	483	391	450	447	390
Import	758	829	907	825	825	654	653	573	652
Export	97	114	120	185	222	282	375	389	273
Subtotal of import /export	855	943	1,027	1,010	1,047	936	1,028	962	925
Transit [7]	754	949	787	887	1322	386	281	336	652
Total	2,033	2,264	2,223	2,365	2,852	1,713	1,759	1,745	1,967

(Source: BR Annual Report)

The above-listed transport tons figures were analyzed for three categories of freight, ① domestic freight, ② import/export freight, and ③transit freight in Botswana, and the average figures for the period from fiscal 1990 to fiscal 1996 are listed in Table 2.10 below.

[6] Track capacity: A measure of the number of cars that can be set on a given line section, consisting of the number of trains that can be run on a given line in a day.

[7] Transit: Freight that simply passes through Botswana without being consumed is called transit freight. During transit, the railway of the country that owns the freight pays a railway and locomotive usage charge to BR.

Table 2.10

	Domestic	Import & Export	Transit	Total
Freight volume (1,000 ton)	434	991	664	2,089
Ratio (%)	21	47	32	100

(2) Required number of freight cars

① Required number of locomotives

The number of BR trains that run in one day consists of two round-trip passenger trains (2 trains, main line only), 5 round-trip, main line freight car trains (10 trains), and 5 round-trip, branch line trains (the Sua Pan and Selebi Phikwe branch lines running 2 round-trips, 4 trains, and the Morpule branch line running 1 round trip, 1 train). The number of locomotives this requires is as follows.

2 round-trip passenger trains: 2 cars

10 round-trip freight car trains: All freight carried on branch lines consists of heavy ore material, and therefore, two-car trains are operated for branch lines, and 80% for main lines (data based on interviews at BR). The number of locomotives that is required for this freight car traffic is equal to:
(2 trains x 1 car + 8 trains x 2 cars) + (2 trains x 2 cars + 2 trains x 2 cars + 1 train x 2 cars)
= 28 cars.

Beside this, Francistown, Mahalapye, Gaborone, and Lobatse, which all have train shunting stations, each have one shunting locomotive (total of 4 shunting locomotives). Thus, BR's required number of locomotives for the above-listed freight traffic is 34, which breaks down into 2 passenger train locomotives, 28 freight train locomotives, and 4 shunting locomotives.

② Required number of freight cars

Freight cars used for each type of transport (BR freight cars, foreign railway freight cars)

The freight cars that run in Botswana consists of:
1. For domestic traffic as a rule, BR-owned freight cars
2. For import/export traffic, approximately 50% of BR-owned freight cars
3. For transit freight traffic, approximately 30% of BR-owned freight cars.

Trains, in addition to BR-owned freight cars, also include a mix of Spoornet freight cars (South Africa) and NRZ freight cars.

BR-owned freight cars headed for foreign countries, in the case of import/export freight transport, stay on average 4 days at the freight handling station in the foreign country, and in the case of transit freight transport, an average of 2-day stay. Therefore, the domestic operation rate of foreign-bound freight cars is:

Export/import freight car

Domestic = 1 day, Foreign = 4 days: Domestic operation rate = 1/5 = 0.2

Transit freight car

Domestic = 1 day, Foreign = 2 days: Domestic operation rate = 1/3 = 0.33

Assuming that the daily number of freight train travels is 20, and each train has on average 28 freight cars (maximum of 45 cars can be connected), the number of freight cars that runs inside Botswana is 20 x 28 = 560. A calculation of the number of freight cars required for domestic, import/export, and transit based on the above total of 560 cars gives the following results:

Domestic freight cars: 560 x 0.21 x 1 = 118
Import/export freight cars: 560 x0.47 x 0.5 = 132
Transit freight cars: 560 x 0.32 x 0.3 = 54

Since, in order to ensure this number of freight cars, it is necessary to take in consideration the domestic operation rate mentioned above, one obtains the following:

Import/export freight cars: 132/0.2 = 660, transit freight cars = 54/0.33 = 164

Based on the above, in order to operate 560 cars every day in Botswana, 118 + 660 + 164 = 942 freight cars are required.

(3) Car maintenance capability and car operation rate

① Locomotives

The inspection and repair of locomotive parts is done every 3 years and requires approximately 10 days. Moreover, simple locomotive parts checks are done annually and required approximately 2 days. Therefore, the operation rate of 1 locomotive (outside plant), k, is as follows.

k = (3 years x 365 days - 10 days - 2 days x two times) / (3 years x 365 days) = 0.987

Since the total number of locomotives is 40, the result is 40 x 0.987 = 39.48. In other words, based on these calculations, there is always 1 locomotive out of 40 that is undergoing inspection and repair, while the remaining 39 are operational. Actually, in the survey for this evaluation, a visit to the Mahalapye plant revealed 3 locomotives to be undergoing inspection, and thus it is safer to judge that there are always 2 locomotives under repair and 38 that are operational.

② Freight cars

In the case of freight cars, inspections and repairs are performed over a period of 7 days every three years, and lighter ones over 1 day every year. Thus, the operation rate of freight cars is, K, = (3 x 365 - 7 - 1 x 2) / (3 x 365) = 0.99. Since the total number of freight cars was 1,026 (as of June 1998), the result is 1,026 x 0.99 = 1,015.7 freight cars. Therefore, there should always be 11 cars undergoing inspection and repair versus 1,015 freight cars in operation.

(4) Traffic capacity

A line section located between two railway signals is called a block section, and only trains can run in this interval. Therefore, the number of trains that can run on a given section is fixed, and this number is called the traffic capacity. Traffic capacities are classified by single track or double track, train speed, and block section length. In BR's case, all lines are single track, and in BR's 640.5 km of railway, there are 47 stations where trains can shunt. Block sections are located between these stations having side tracks, so that the length of block sections L = 640.5 / 46 = 13.9, in other words approximately 14 km. Assuming that the average travel speed of freight trains between station (V) is approximately 60 km/h, we calculated traffic capacity C (= f x V / L) per hour.

Here, L/V is the time required for a train to cross the block section, which is the section between two stations. Moreover, f is a coefficient called the track utilization efficiency, which serves to absorb uncertain factors such as the train speed variation and the waiting time between stations. f is usually set between 0.5 to 0.75. In Japan, 0.6 is usually used. Therefore, using f = 0.6, L = 14, and V = 60, one obtains:

C = 0.6 x 60 / 14 = 2.6. Assuming that trains run for 16 hours a day, from 06 to 22 hours, the daily line capacity is 2.6 x 16 = 41.6 trains.

(5) Summary of freight car operation status

Locomotives: Of the 40 locomotives that BR owns, 38 were operational. The required number of locomotives is 34, including 6 replacement locomotives, and thus the current locomotive ownership level is amply sufficient, and can support a future increase in trains.

Freight cars: Of the 1,026 freight cars that BR owns, 1,015 are operational. The required number of freight cars is 942, and from a arithmetic viewpoint, the current number of freight cars suffices. However, depending on the nature of the freight, BR may have shortages. Moreover, import/export and transit freight are subject to large seasonal variations, and thus BR actually leases freight cars from South Africa and Zimbabwe on occasion. Traffic capacity is sufficient compared to the current number of trains running (14 trains, main line only), and should be able to support future increases in trains. Thus, BR's 1,026 freight trains are well balanced, compared to the number of pulling locomotives, given current annual transport demand of 2 million tons, and BR's rolling stock maintenance status is satisfactory. Therefore, BR's rolling stock can be said to be utilized fully.

However, BR does not own container cars. BR has built two container yards besides the one in Gaborone, the capital, and has come to understand the convenience of container transportation. Yet it leases the all-important container cars from other countries, and it is thought that expansion will be needed in the future. (No detailed data on leasing conditions could be obtained.)

(6) Signaling and communications equipment

Block sections between stations use a automatic block system. Train detectors are installed within station precincts before and after each station. In this system, when the position of a train is notified to the signal operation center of Mahalapye station, this information is staffed by radio based on this

information. Unless the train receives this staffing information, it cannot run on this block section.

A signal operation center is provided in the station precinct of all the major stations, such as Gaborone and Mahalapye, and button operation in the signal operation center activates the railway turnouts. At these stations, turnouts are manually operated, and the conductor assistant in the locomotive operates the turnouts. Although this system does not represent a problem at the current level of about 24 trains per day, a large increase in the number of trains in the future may make support using this system difficult. Also, from the viewpoint of the efficiency and safety of freight cars, the modernization of these facilities should be considered by BR.

(7) Track maintenance status

Regarding the main tracks and sidetracks at the major stations, there are no major errors, and track maintenance is satisfactory.

2.3 Financial Status of BR

We analyzed BR's financial status based on its profit and loss statements and its balance sheets.

2.3.1 Revenues and Expenditures

A look at revenues and expenditures in the most recent 5 years shows that, as has been mentioned before, BR, which had long been in the red figures, has been able to achieve operating profits by reducing payroll expenses through personnel cuts.

Fares are determined by BR's management conference. Since government approval is not required, BR is free to fix fares on its own accord. However, since its operations are constantly exposed to competition from road transport, a drastic increase in fare levels is considered difficult, and BR will therefore have to secure profits by continuing to secure high traffic volumes and cut costs (Table 2.11) (Reference: BR Freight Rate Table).

Table 2.11 BR Statements of Income (Unit: 1,000 pula)

Item \ FY	88/89	92/93	93/94	94/95	95/96	96/97
Operating revenue						
Domestic freight	6,971	13,623	12,352	14,406	15,710	15,364
Transit freight	17,989	42,889	13,828	10,941	10,958	23,492
Import freight	14,918	23,370	19,845	19,255	16,132	20,922
Export freight	2,495	10,218	14,178	22,034	25,579	13,580
Passenger and others	10,521	21,181	22,090	20,212	16,821	17,092
Total	52,894	111,281	82,293	86,848	85,200	90,450
Operating expenditure						
Business expenses	24,147	41,460	27,306	16,091	19,008	23,178
Car maintenance	8,039	14,866	14,324	11,415	8,210	11,665
Public relations cost	4,275	6,008	6,463	6,551	7,352	6,463
Railway track maintenance cost	9,743	11,945	8,577	10,800	7,239	5,997
Signal, communications equipment maintenance cost	1,350	3,664	2,603	2,382	2,703	2,002
Personal expenses	9,853	22,207	28,348	27,802	25,071	19,832
Depreciations	-	-	13,130	14,836	15,797	16,144
Total	57,407	100,150	100,751	89,877	85,380	85,281
Note) Depreciations from ’89 to ’93 are included in the business expenses.						
Operating profit	-4,513	11,131	-18,458	-3,029	-180	5,169
Other profit	1,640	13,100	12,277	10,740	15,038	11,683
Repayment to the government (interest)	-4,965	-21,123	-17,012	-16,656	-17,910	-16,351
Extra ordinary profit and loss	-326	-379	0	-23,951 [8]	-25,009	27,390
Net profit	-8,164	2,729	-23,193	-32,896	-28,061	27,891

Source: BR Annual Report

Next, we compare revenues generated per car for freight cars and passenger cars (Table 2.12). According to the data in Table 2.12, passenger cars bring close to three times as much revenue as freight cars. However, it is clear that BR's revenues are mainly generated by large-volume freight

[8] This extra ordinary item arose from freight fare payment default vis-a-vis BR on the part of a soda ash plant in Sua Pan due to declining production volume. BR treated the corresponding accounts receivable as special losses for fiscal 1994/1995 and 1995/1996. In fiscal 1996/1997, the Botswana government paid part of the sum corresponding to this accounts receivable to BR on behalf of the soda ash plant, and this payment is accounted as profit for that fiscal year.

transport, and that this will continue. As a result, it is hoped that BR will continue to work in the direction of maintaining current demand while competing with road and other types of transportation (by improving service, etc.).

Table 2.12 Comparison of Revenue by Type of Car (Unit: 1,000 pula)

Item \ FY		92/93	93/94	94/95	95/96	96/97
Operating revenue	Freight car	90,100	60,203	66,636	68,379	73,358
	Passenger car	7,538	6,456	7,263	9,223	10,006
	Other	13,643	15,634	12,949	7,598	7,086
	Total	111,281	82,293	86,848	85,200	90,450
Number of cars (Unit: car)	Freight car	1,055	1,055	1,027	1,026	1,026
	Passenger car	43	47	47	47	47
	Total	1,098	1,102	1,074	1,073	1,073
Operating revenue per car for freight cars (Operating revenue of freight cars/Number of cars for freight cars)		85	57	65	67	71
Operating revenue per car for passenger cars (Operating revenue of passenger cars/Number of cars for passenger cars)		175	137	154	196	212

Source: Prepared based on data from BR Annual Report

2.3.2 Financial status

As shown below in Table 2.13, a look at the indices indicating BR's financial status shows that BR's current ratio, which indicates its short-term liability payment ability which had been in a declining trend, exceeded 300% in fiscal 1996, while coverage ratio of fixed assets by long-term liabilities and capital[9], which indicates the long-term liability payment ability which had been in an increasing trend, declined. BR's capital-asset ratio has also been rising. What these trends show is that BR made efforts to strengthen its financial condition in fiscal 1996.

[9] Coverage ratio of fixed assets by long-term liabilities and capital = fixed assets / (capital + long-term liabilities). Indicates the extent to which fixed assets covered by long-term procurement capital (= capital + long-term liabilities), and one of the indicates of long-term financial strength. If this number exceeds 100(%), this indicates that fixed assets are not covered by long-term procurement funds and that short-term procurement funds are being used to maintain fixed assets, with the likelihood of tighter short-term cash flow.

Table 2.13 Various Indicators

Fiscal Year	89/90	92/93	93/94	94/95	95/96	96/97
Current ratio	165.0	215.5	198.7	195.6	129.6	324.6
Ratio of fixed assets to long-tern capital	93.7	92.5	93.7	94.6	96.5	89.0
Equity ratio	60.2	68.5	68.6	69.4	55.2	74.9

Source: Prepared based on data from BR Annual Report

Table 2.14 BR Balance Sheet (Unit: 1,000 pula)

Item \ FY	88/89	92/93	93/94	94/95	95/96	96/97
Asset						
Current asset						
Inventories	11,182	17,350	16,409	15,579	13,128	11,247
Account receivable	10,739	25,332	35,742	20,080	17,164	22,543
Cash and bank balances	17,005	81,770	59,430	59,655	51,712	64,556
Other	—	1,021	—	—	—	—
Total	38,926	125,473	111,581	95,314	82,004	98,346
Fixed assets						
Initial investment	217,522	889,008	768,334	756,850	461,465	457,701
New investment	—	—	57,952	66,083	60,968	94,339
Cumulative total of depreciation	10,233	117,889	—	—	—	—
Construction in progress	20,886	11,467	—	—	—	—
Other investment	—	43,061	—	—	—	—
Total	228,175	825,647	826,286	822,933	522,433	552,040
Total	267,101	951,120	937,867	918,247	604,437	650,386
Liabilities and capital						
Current liabilities						
Accounts payable	9,571	5,891	7,344	6,113	13,139	6,984
Short-term liabilities	—	4,111	4,920	5,461	5,689	4,341
Interest	14,027	48,214	43,886	37,153	44,460	18,972
Total	23,598	58,216	56,150	48,727	63,288	30,297
Fixed liabilities						
Government loan	82,742	241,430	237,991	232,530	207,712	133,250
Capital						
Government equity	166,508	262,448	294,577	331,863	377,252	492,201
Capital reserve	—	—	—	—	595	595
Asset replacement fund	—	8,272	10,338	23,528	30,701	39,419
Accumulated deficit	-11,152	45,793	23,618	-9,548	-75,111	-45,376
Other	5,405	334,961	315,193	291,147	—	—
Total	160,761	651,474	643,726	636,990	333,437	486,839
Total	267,101	951,120	937,867	918,247	604,437	650,386

Source: BR Annual Report

2.4 Project Effects and Impacts

2.4.1 Qualitative effects

(1) Reduction of freight car leasing fees (foreign currency savings)

Freight car leasing fees from other countries were decreasing at the time of the appraisal (US$3.3 million, or 5.537 million pula in fiscal 1987). Leasing fee statistics until fiscal 1997 are as shown in Table 2.15 below. Although it is difficult to make generalizations since leasing fees vary every year due to fluctuations in demand, they can be described as decreasing following the completion of this project. Since, through this project, BR now has enough freight cars, lopsided leasing of freight trains which existed prior to the implementation of this project has stopped. BR's current leasing fees are defined as (expenditure) - (revenue). These terms are defined below.

(Revenue) Revenues obtained from transit duties on foreign freight cars traveling on BR lines, and revenues obtained from the lease of empty BR freight cars after they have unloaded their cargo in a foreign country (South Africa, Zimbabwe, etc.).

(Expenditure) Transit fees paid on BR freight cars traveling on foreign lines, and leasing charges incurred by BR when it uses empty freight cars of other countries after their cargo has been unloaded in Botswana.

Table 2.15 Leasing Charges of Freight Cars (Unit: 1,000 pula)

Fiscal Year	1990	1991	1992	1993	1994	1995	1996	1997
Leasing charges	4,554	5,694	5,775	4,315	340	1,712	662	2,208

Source: BR

(2) Alleviation of freight car shortages

In the case of BR, rolling stock must be shared not just inside Botswana, but throughout the SADC area (particularly South Africa and Zimbabwe). For this reason, the procurement of 600 freight cars has been recommended in the master plan mentioned on “1.3.4 Positioning of this project within Master Plan” of this report. From this viewpoint, this project, in addition to having the effect of reducing freight car leasing fees, has given BR greater flexibility in sharing freight cars throughout the SADC area, and thus strengthening its transport capability.

2.4.2 Financial internal rate of return

BR does not systematically collect transportation statistics for the 570 freight cars that were procured through this project. Further, the usage purpose of each car is not fixed (this is particularly true for uncovered freight cars and box cars), and transportation statistics by freight category are not compiled systematically. Thus the cost and benefit of these freight cars could not be calculated, and FIRR was not computed in this evaluation. (At the time of appraisal, a FIRR of 17.2% was calculated assuming a fixed transport volume for each freight car category.)

Reference

<Contractor/Consultant>

1. Contractor
   ZECO (Zimbabwe) / Mitsubishi Crop. / Marubeni Corp. Joint Ventures
2. Consultant
   Not employed.

3. Lessons Learned

1. It is necessary to perform a Pre-qualification (P/Q) in order to measure the capability of the contractor when a large number of items is placed, even in the case of simple materials or equipment.

As this project consisted in the procurement of freight cars relatively simple in terms of specifications, bidding procedures were conducted without P/Q. Yet, the result a delay of 9 months in their delivery. According to JBIC's existing Guidelines for Procurement, P/Q is required as a rule for procurements of a large number of items, even if they are simple like this projects, in order to ascertain the suitability of the contractors' manufacturing capabilities.

2. It is essential to consider the appropriateness of changes to a project scope even immediately after appraisal, and to flexibly deal with to such changes.

Following the JBIC's appraisal of this project, the project scope (type of freight car) was changed on the request of the executing agency, JBIC checked the appropriateness of these changes by conducting an additional appraisal. If procurement had been conducted per the original project scope at the time of appraisal, it may have brought about a large number of unnecessary freight cars. Since JBIC flexibly handled to the changes to the project scope, the efficient utilization of freight cars was achieved. Thus, even if there are changes to the project scope immediately after the appraisal, it is essential to verify the appropriateness of these changes and handle flexibly.

① Gaborone station

② Freight cars running in Botswana

③ Headquarter of Botswana railways