

Pakistan

Diesel Electric Locomotives Rehabilitation Project (2)

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Field Survey: November 2006 - March 2007

1. Project Profile and Japan's ODA Loan



Map of project area



Rehabilitated Locomotive (RGE-24)

1.1 Background

In Pakistan,¹ the railway played an important role from the independence in 1947 until the mid-1980s as a major means of passenger and freight transport. However, as the emphasis was gradually placed on the road transport from the 1960's, the aging in rail infrastructure including the locomotives became serious in the later 1970's due to the insufficient budget allocation for the railway sector. As a result, the railway's share in transport has been decreasing from the latter 1980s.² Up to the present, roads have been dominant in the transport sector, with 96% of freight transport and 90% of passenger transport relying on roads. The Pakistan government is reviewing the importance of railways from the perspective of economical, efficient, and environmental view points.³ Particularly, the government is emphasizing the relative advantage of railways for

¹ Pakistan is a southwest Asian country with a population of 155.4 million persons (approximately 1.2 times that of Japan) and an area of 796,000 km² (approximately twice that of Japan). As it shares borders with India, China, and Afghanistan, it is an important country geopolitically. Pakistan's 2005 real GDP growth rate was 6.6%, and its GDP per capita was US\$847 (Government of Pakistan, *Pakistan Economic Survey 2005-2006*).

² The road transport was opened for the private companies under the deregulation policies of the Pakistan Government in 1960's. Compared to the railway transport, it enabled to import more efficient and economical vehicles, cargo-carrying cars and other road transport facilities. While the railway transport, which was out of scope of the deregulation policies and lacking funding, it could not implement the priority rehabilitation and renewal of the overall railway infrastructure, and that resulted in decrepitude. Moreover, after the Oil Shock in 1973, Rupee was devalued by 125%, and the financial status of the Pakistan Railways was worsened due to constraints in the foreign currency exchange. Hence, it has become even more difficult to address the decrepitude.

³ This project is a continuation of the Diesel Electric Locomotive Rehabilitation Project (1), for which the ex-post evaluation was conducted in 2005. For the ex-post evaluation results, see JBIC's "Ex-Post Evaluation Reports 2005."

long-distance freight transport. It also considers the decline in road safety in recent years due to inadequate operation and maintenance as well as pollution problems caused by traffic congestion.

1.2 Objective

The project's objective is to increase the capacity of rail transport, which plays a key role in long-distance transport in Pakistan, by carrying out rehabilitation of diesel electric locomotives, and thereby provide infrastructure for the country's economic growth.⁴

1.3 Borrower and Executing Agency

President of the Islamic Republic of Pakistan/Pakistan Railways, Ministry of Railways

1.4 Outline of Loan Agreement

Loan Amount/ Loan Disbursed Amount	6,774 million yen/6,643 million yen
Exchange of Notes/Loan Agreement	October 1995/March 1996
Terms and Conditions -Interest Rate -Repayment Period (Grace Period) -Procurement	2.3% 30 years (10 years) General Untied
Final Disbursement Date	July 2002
Main Contractors	Marubeni
Consultant Services	—
Feasibility Study (F/S), etc.	Pakistan Railways (1989) Diesel Electric Locomotives Rehabilitation Project (1) (L/A signed in August 1993)

2. Evaluation Results (Rating: B)

2.1 Relevance (Rating: a)

The importance of the railways in Pakistan's national policy has been maintained in the

⁴ At the time of this project's appraisal in 1995, the main objective was strengthening of freight transport, and in fact passenger transport was added later due to a change in the policy of Pakistan Railways. Because the project outline states "to increase the capacity of rail transport, which plays a key role in long-distance transport," it was interpreted as including both freight and passenger transport.

8th 5-year Plan (1993 – 1998) and the current Ten Year Perspective Plan (2001 – 2011), and the Medium Term Development Framework (MTDF) prepared in 2005.

In the 8th 5-year Plan, the government desired in particular to raise the railway/road freight transport ratio from 14:86 in 1990 to 20:80 in 1997, because the freight and passenger transport was overly biased toward road. Meanwhile, the aging of locomotives in the Pakistan Railways became a critical issue,⁵ and the Pakistani government allotted approximately 31% of public investment in the transportation sector budget to the railway sector, with the stated goal of maintaining and improving transportation capacity through repair and procurement of locomotives and improvement of other aspects of operation. The project was consistent with this policy, and its importance was high.

In the current Ten Year Perspective Plan, particular emphasis is placed on expansion of the share of long-distance railway freight transport. Among the 20 investment project plans in the railway sector, 8 projects are for rehabilitation, manufacture, or new purchase of locomotives and are allotted approximately 48% of the transportation sector budget. Thus, the project continues to maintain its relevance. In Medium Term Development Framework, development of transportation infrastructure including railways is stated as a key issue.⁶

As of April 2007, Pakistan Railways possesses 531 locomotives, and 63% of those have exceeded their durable life. The locomotives rehabilitated by this project and in Phase 1 (totaling 102) constitute 52% of the locomotives that have not exceeded their durable life, and the project is contributing to measures against overaged locomotives. Moreover, for low-income passengers who use railways as their primary means of transport, the importance of the project is high.

2.2 Efficiency (Rating: b)

2.2.1 Output

The planned outputs of the project consisted of rehabilitation of 48 US-made diesel electric locomotives (27 model ALU-20 locomotives and 21 model ALU-24 locomotives; replacement of general parts and equipment, including engines, generators, brake equipment, electric controls, and rail trucks) and technology transfer (overseas training, 12 M/M; domestic training, 24 M/M). Rehabilitation of 48 diesel electric locomotives was implemented as planned. However, 4 out of the 27 model ALU-20 locomotives which

⁵ The durable life of new locomotives is 20 years and that of rehabilitated locomotives is 15 years.

⁶ In the Japan International Cooperation Agency's (JICA) Master Plan (M/P) for the traffic sector announced in 2006, it is mentioned that measurement of traffic demand was carried out under the MTDF, and the result showed that in 2025 both passenger and freight demand would triple compared to the 2005 level. This indicates that even if all current investment is carried out in the traffic sector, supply will not keep pace with demand. As a recommendation to the railway sector, the M/P lists 46 projects (with a total project cost of 451 billion rupees) for locomotive procurement and manufacture and for building double tracks, in addition to the existing projects (9) and MTDF projects (12).

were to be rehabilitated by this project were scrapped because it was judged that their mainframes were severely dilapidated and the effect of rehabilitation would be low. They were replaced by 4 model ALU-20R locomotives which had their engines replaced in the 1980s. After rehabilitation, the ALU model was renamed RGE (i.e., rehabilitated GE), and became RGE-20 and RGE-24.⁷ Meanwhile, with regard to the technical transfer, a fund shortage occurred due to the appreciation of yen, and the overseas training was cancelled. With regard to the domestic training, although two of the three US engineers dispatched from the ALU locomotive manufacturer were forced to return to the US due to 9.11, the training was completed by the remaining engineer.

Figure 1: Locomotives Rehabilitated by this Project



RGE-20



RGE-24

2.2.2 Project Period

The planned project period was scheduled from March 1996 to October 1999 (44 months), but the actual project period was from March 1996 to September 2004 (103 months), representing a delay of 59 months. The main reason for the delay was the discontinuation of new investment in railway projects due to a policy to privatize Pakistan Railways.⁸ However, the new administration which took office in October 1999 suspended privatization, and this project was restarted. Secondary reasons that could be mentioned for the delay were the setback in domestic training and the time required for preparation, screening, and approval of the bidding documents by Pakistan Railways.⁹

⁷ Regarding specifications, RGE-20 (ALU-20) is 2,000 horsepower, and RGE-24 (ALU-24) is 2,400 horsepower. They are both manufactured in the US and are used for both passenger and freight trains.

⁸ The Pakistani government halted all new investment in railway projects from 1997 to 1999 in preparation for privatization of Pakistan Railways, and this project was one of those affected.

⁹ Because the halt of new investment due to the privatization policy began in 1997, the suspension of assistance to Pakistan due to the government nuclear test in 1998 was not a factor in the delay. Consequently, with regard to this project, the effect of the suspension of assistance was minimal.

2.2.3 Project Cost

The planned project cost totaled 9.849 billion yen, while the actual project cost was 9.168 billion yen, or 93% of the planned cost. During the period of delay, costs increased by approximately 1.5 times on local currency basis due to inflation, but on a yen basis, this increase was absorbed by fluctuation in the exchange rate.

2.3 Effectiveness (Rating: a)

2.3.1 Passenger and Freight Transport Volume¹⁰

In this ex-post evaluation, the achievement of the target for transport volume is examined from the two perspectives of ton-kilometer basis and income basis.

First, in the case of freight transport, 90% of the target was achieved in FY2004 and 2005 on a ton-kilometer basis. On the other hand, on an income basis, only 73.4% of the budgetary target level was achieved in FY 2005; however, in FY2001 and 2004, over 90% of the target was achieved, and in FY2002 and 2003, over 100% of the target was achieved.

In the case of passenger transport, over 100% of the target was achieved during FY2003-2005 on a passenger-kilometer basis. On an income basis, over 100% of the target was achieved during FY2001-2003, and over 90% was achieved in FY 2004 and 2005.

Table 1: Pakistan Railways' Passenger and Freight Transport Volume

Fiscal Year	Freight Transport					Passenger Transport				
	Based on Volume (1,000 ton-km)			Based on Profit (million PKR)		Based on Volume (million passenger-km)			Based on Profit (million PKR)	
	Target*	Actual (% of Target)	YOY (%)	Budget Target	Actual (% of Target)	Target*	Actual (% of Target)	YOY (%)	Budget Target	Actual (% of Target)
99	—	3,753	-5.5%	—	—	—	18,495	-2.6%	—	—
00	—	4,520	20.4%	—	—	—	19,590	5.9%	—	—
01	—	4,573	1.2%	4,900	4,746.7 (96.8%)	—	20,783	6.1%	5,850	6,437.6 (110%)
02	—	4,820	5.4%	4,750	4,801.6 (101%)	—	22,306	7.3%	7,100	7,162.8 (101%)
03	—	4,796	-0.5%	4,200	4,343.1 (103%)	23,040	23,045 (100%)	3.3%	7,700	7,938.7 (103%)
04	5,513	5,014 (91.0%)	4.5%	5,400	5,059.2 (93.7%)	23,250	24,238 (104%)	5.2%	9,500	9,001.9 (94.7%)
05	6,340	5,907 (93.2%)	17.8%	6,500	4,770.0 (73.4%)	23,720	25,621 (108%)	5.7%	10,000	9,938.9 (99.4%)
06	7,290	4,738 **	-19.8% **	—	—	24,310	24,173 **	-5.1% **	—	—

Note 1: The fiscal year is from July 1 to June 30.

Note 2: * The figure is the target level for July through June based on the PR Concept Clearance Paper. **

¹⁰ Because planned levels were not set at the time of appraisal, planned levels for transport volume in the budget were used, to the extent that they were available, for the ex-post evaluation.

The figure is an estimate for July through November.

Next, looking at changes in passenger and freight transport volume (passenger-kilometers and ton-kilometers), both of them hit the bottom (-2.6% and -5.5% respectively) in FY1999, but they turned positive up to FY2005 (excluding only freight volume in FY2003). The figures became particularly positive starting from FY2001 when the project was completed and the rehabilitated locomotives began operation. Furthermore, the increase in passenger volume during the same period trended between 5% and 7%, but due to the fact that the transport volume of petroleum products is unstable, freight transport volume fluctuated inconsistently from 1% to 20%.

2.3.2 Availability¹¹

The target level for availability was set at 85% for both the RGE-20 and the RGE-24

Table 2: Availability

Fiscal Year	RGE-20	RGE-24
	Actual Number of Locomotives (% of Target)	
99/00	12.6 (46.7%)	13.2 (62.6%)
01/02	7.5 (89.2%)	—
02/03	20.1 (91.7)	4.1 (96.2%)
03/04	23.9 (88.6%)	17.3 (94.5%)
04/05	25.6 (94.9%)	19.5 (92.6%)
05/06	25.2 (93.1%)	18.0 (85.9%)

which were rehabilitated by the project. The effects of rehabilitation were visible, with a significant improvement in availability of the RGE-20 from 46.7% in FY1999 to 93.1% in FY2005 and in availability of the RGE-24 from 62.6% in FY1999 to 96.2% in FY2002.

The decline in the operating ratio (85.9%) of the RGE-24 which occurred in FY2005 was due to the fact that several locomotives were out of operation because speeds over 85 km/h were causing excessive vibration and measures were being studied. The problem is now being resolved by installing shock absorbers and balancing weights, and repairs are

being made as necessary. Pakistan Railways plans to carry out necessary balancing and repairs on all RGE-24's over the next 18 months.

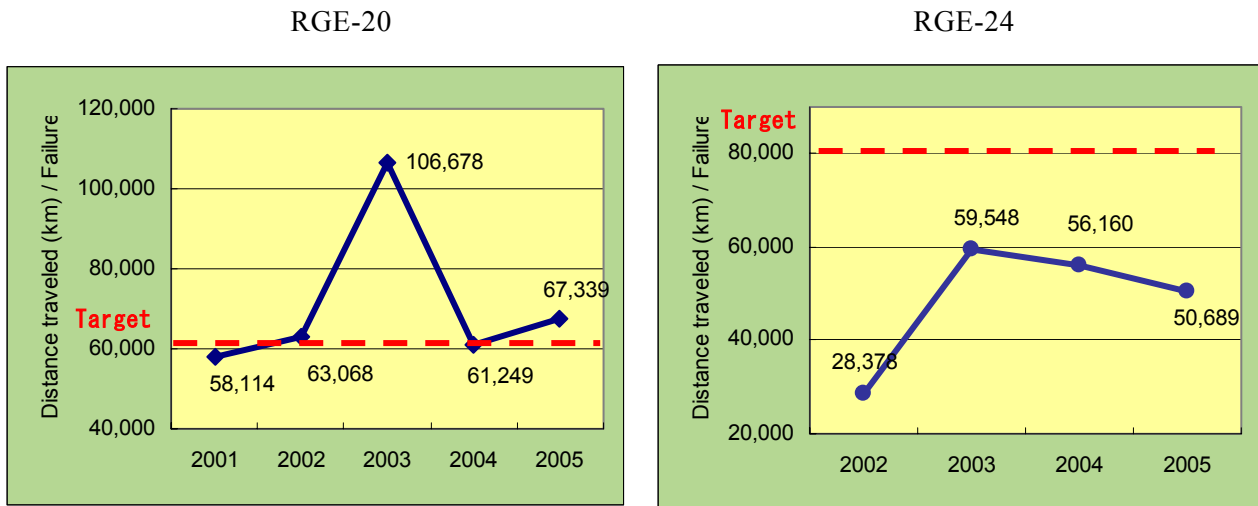
¹¹ "Availability" is an index used by Pakistan Railways, and although it is not a common index, it was utilized as a reference for examining the effectiveness of locomotives in this project. It is calculated as follows.

$$\text{Availability} = \frac{\text{Locomotive availability} \times 100}{\text{Locomotives possessed}}$$

2.3.3 Reliability¹²

In terms of reliability, the RGE-20 attained 100% of the target. On the other hand, the RGE-24's achievement of the target declined from 73% in 2003 to 63% in 2005. In the case of the RGE-24, in addition to the above-mentioned problem of excessive vibration, the frequency of operation and maintenance is lower than average because these locomotives are often utilized for freight transport, and they are frequently away from Rohri, where the locomotive yard is located, for extended periods of time. In contrast, the RGE-20 locomotives return to the locomotive yard in Quetta once every two to three days, where operation and maintenance is carried out. Furthermore, since the RGE-24 must travel longer distances than the RGE-20 and experiences a relatively large number of failures, a detailed analysis is necessary concerning the decline in its reliability.

Figure 2: Reliability: Degree of Achievement of Target Level



Note: The reason why the target level of RGE-20 is lower than that of RGE-24 is that RGE-20 operates in Quetta where the gradient is steep and trains run short distances at low speeds. Furthermore, the target levels were set based on experience points.

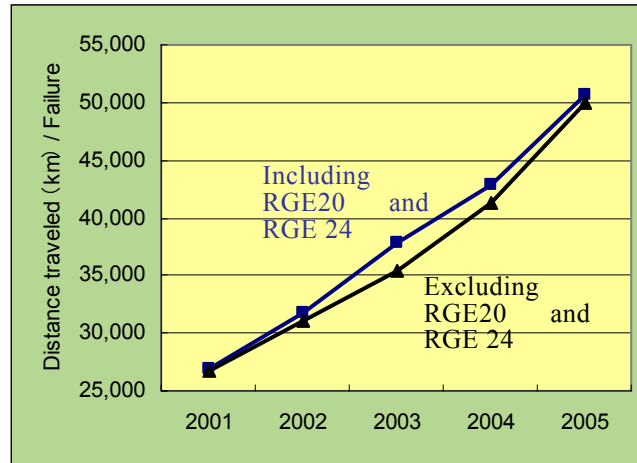
When comparing the reliability of all Pakistan Railways locomotives with that of the locomotives excluding the RGE-20 and RGE-24, the difference is evident particularly in FY2003 and FY2004. This indicates that overall reliability of Pakistan Railways locomotives has been improving by including RGE-20 and RGE-24.

¹² "Reliability" is also an index used by Pakistan Railways and is calculated as shown below.

$$\text{Reliability} = \frac{\text{Distance traveled (km)}}{\text{Failure}}$$

A "failure" refers to a state that requires locomotive repair and indicates cases where the locomotive is forced to stop for 60 minutes or more or cases where the locomotive must be replaced.

Figure 3: Reliability of Locomotives of Pakistan Railways



2.3.4 Number of running train and operational state

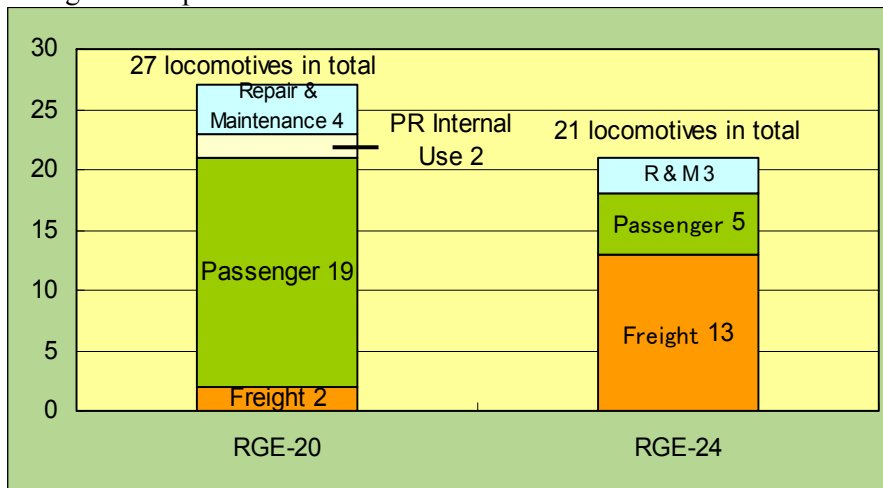
Table 3 shows the routes and the number of runs per day by RGE-20 and RGE-24 locomotives. The RGE-20's are equipped with dynamic brakes, and rehabilitation of these brakes enabled them to operate on the branch line that connects the Main Line (Karachi-Peshawar) with the city of Quetta located in the western state of Balochistan. Dynamic brakes are an absolute necessity for safe operation in the Sibbi-Quetta section, which has a steep gradient. Since RGE-20's are the only locomotives equipped with dynamic brakes in the entire Pakistan Railways' fleet, they fill an important role.

Table 3: Number of Running Train (RGE-20 and RGE-24)

Passenger		Freight	
RGE-20	RGE-24	RGE-20	RGE-24
16 locomotives; 22 trips	5 locomotives; 6 trips	11 locomotives; 17 trips	13 locomotives; 13 trips
Routes		Routes	
<ul style="list-style-type: none"> • Quetta↔Sibbi (×5) • Quetta↔Chaman • Sibbi↔Rohri (×2) • Sibbi↔Karachi • Sibbi↔Faisalabad • Quetta↔Zahidan (Iran) 	<ul style="list-style-type: none"> • Rhori↔Khanewal • Karachi City ↔Khanewal • Karachi↔Rohri 	<ul style="list-style-type: none"> • Sibbi↔Khanpur (×5) • Khanpur↔Quetta (×2) • Rhori↔Sibbi (×2) • Quetta↔Zahidan (Iran) (×0.5) 	<ul style="list-style-type: none"> • Rhori↔Khanewal • Samasatta↔Kundian (×3) • Rhori↔Samasatta (×15) • Samasatta↔Khanewal

Regarding the operational state of RGE-20 and RGE-24 locomotives as of April 12, 2007, as is clear from Figure 4, all locomotives are either in operation or undergoing maintenance, and there are no locomotives which are left idle.

Figure 4: Operational state of RGE-20 and RGE-24 Locomotives



2.3.5 Aging

Among 531 locomotives possessed by Pakistan Railways, 63% (334 locomotives) had exceeded their durable life (of 20 years) (not including those scrapped). The locomotives in this project represent approximately 24% of the 197 locomotives that had not exceeded their durable life, and their further aging was slowed by the project. This was necessary to secure the sustainability of the very operation of Pakistan Railways, and the positive effect of the project can be acknowledged.

Table 4: Age Composition of Pakistan Railway's Locomotives
(as of April 12, 2007)

	Model	Manufacturer	Age (years)	Number of Units
Exceeded Durable Life	ALU-12/95	US	42 or above	49
	GEU-15/20	US	32 - 41	123
	GMU-15/30	US		
	ARU-20	US		
	BCU-30	UK		
	GMCU-15	German	22 - 31	73
	ARPW-20	—		
	HAU-10/20	Japan/US		
HGMU-30	German/US	21	87	
HBU-20	Japanese/US			
Within Durable Life	PHA-20	Japanese/US	12	23
	AGE-30	German/US	9	30
	GRU-20	US	10	48
	RGE-20	US	6	27
	RGE-24	US	5	21
	DPU-30	Chinese	4	24
	DPU-20	Chinese	4	7
Diesel Electric Locomotives				512
Electric Locomotives				19
Total				531

Furthermore, Pakistan Railways takes the problem of aging seriously. It is studying multiple countermeasures, including introduction of a total of 69 new locomotives using supplier's credit from China, procurement of 75 new locomotives, and rehabilitation of the GMU-30 (36 locomotives) and the HGMU-30 (27 locomotives).

2.3.6 Economic analysis

(1) Financial internal rate of return (FIRR)

In the ex-post evaluation, FIRR was recalculated based on the same calculation method that was used as at the time of appraisal. As a result, FIRR declined to 9% compared to 17% at the time of appraisal due to the increase of total project cost on a local currency basis because of depreciation of Rupee.

(2) Economic internal rate of return (EIRR)

Although EIRR was not calculated at the time of appraisal, an attempt was made to calculate EIRR for this ex-post evaluation. EIRR was calculated by conducting a with/without comparison of the current state on the premise that locomotive rehabilitation was not carried out and subsequently a switch was made to road transportation. Consequently, the cost and benefit are the difference between the case in which rehabilitation was conducted and the case in which it was not conducted. The resulting EIRR was 18%.

	Appraisal	Ex-Post Evaluation	
IRR	FIRR : 16.8%	FIRR : 9%	EIRR : 18%
Cost	Initial investment, operation and maintenance cost	Initial investment, operation and maintenance cost	Initial investment, operation and maintenance cost
Benefit	Fare income	Fare income	Fare income and savings on fuel expense compared to road transport
Project Life	15 years	15 years	15 years

2.4 Impact

2.4.1 Expansion of the railway's market share in passenger and freight transport

The railway's share of freight transport volume hit the bottom as 3.6% in 1999. After that, it trended in the 4% range, displaying a gradual, although slight, climb, but it failed to regain 4.7%, the level of FY1997. On the other hand, as mentioned above, the freight transport volume is now in an uptrend, as in FY2005, it increased 17.8% from the previous year and is predicted to reach approximately 6,000 million ton-kilometers (an increase of just below 2% compared to the previous year) in FY2006. With regard to passenger transport volume, the share is expanding, exceeding the FY1997 figure and

reaching 9.9% (estimated) in FY2005.

Table 5: Share of Railways and Roads in Freight and Passenger Transport Volume

Fiscal Year	Freight (Million ton-KM) (% share)		Passenger (million passenger-KM) (% share)	
	Rail	Road	Rail	Road
1997	4,447 (4.7%)	89,527 (96.3%)	18,774 (9.7%)	173,857 (90.3%)
1998	3,967 (4.0%)	95,246 (96%)	18,980 (9.3%)	185,236 (90.7%)
1999	3,753 (3.6%)	101,261 (96.4%)	18,495 (8.6%)	196,692 (91.4%)
2000	4,520 (4%)	107,085 (96%)	19,590 (8.6%)	208,370 (91.4%)
2001	4,573 (4%)	108,818 (96%)	20,783 (9%)	209,381 (91%)
2002	4,820 (4.2%)	110,172 (95.8%)	22,306 (9.4%)	215,872 (90.6%)
2003	4,796 (4.0%)	114,244 (96.0%)	23,045 (9.4%)	222,779 (90.6%)
2004	5,014 (4.1%)	116,327 (95.9%)	24,238 (9.5%)	232,191 (90.5%)
2005	5,916 (4.8%)	117,035 (95.2%)	25,621 (9.7%)	238,077 (90.3%)

Source: Government of Pakistan, Pakistan Economic Survey, 2006-2007

2.4.2 Promotion of local industry

In 1995, it was thought that the impact on the power sector would be large because the railway sector was the main means of transport (approximately 40%) for oil from Karachi to the inland thermal power plants. However, due to a change in the policy of the Government of Pakistan to convert major thermal power units from oil to gas, as well as weak sales and marketing efforts by Pakistan Railways to fetch alternative freight, the rehabilitated locomotives are currently used mainly for passenger transport. Consequently, it is assumed that “impact on specific local industries” is limited.

Furthermore, in this ex-post evaluation, an interview study of companies was implemented for the purpose of identifying other methods that could be used to improve the railway’s freight transport sector. As a result, the following three areas were found to be the ones which Pakistan Railways should strengthen, from the viewpoint of the companies: (1) Timeliness (operation according to timetable, shortening of delays), (2) Quality and variety of services (increase in number of wagons, tracking of shipments, simplification of procedures), and (3) Pakistan Railways staff (prompt response to orders placed, requests, and complaints, etc., training of field staff to handle shipments carefully,

measures for customer-oriented management). Overall, it was confirmed that companies regard the most important issue as being “making Pakistan Railways more customer-orientated.”

Moreover, although the “impact on specific, local industries” was limited, 16 out of the 27 RGE-20 locomotives are utilized for passenger transport on the only branch line (Sibbi-Quetta branch line) that runs through into Quetta, Baluchistan, as previously mentioned. In Baluchistan, conflicts have continued between armed ethnic groups and security forces, and it is also unstable in the area between the Afghanistan border and Quetta. In addition, social infrastructure in the region is not complete, although road improvements are progressing. Therefore, it can be said that RGE-20 locomotives play important roles as a means of transportation for low-income persons in Baluchistan province which is the least developed of Pakistan.

2.4.3 Job creation in Pakistan Railways

To secure the human resources required for carrying out the project, employees with the appropriate skills and knowledge were recruited from among the excess personnel of Pakistan Railways at the time. Consequently, there were only 40 new jobs created by the project.

Column 1: Survey on Passenger Satisfaction with Pakistan Railways

As part of this ex-post evaluation, a passenger satisfaction survey was conducted, in addition to the interviews conducted for companies. This was the first time for such a social survey to be conducted concerning Pakistan Railways, and an adequate data sample could not be collected; however, it may be considered a significant survey for understanding the opinions of passengers concerning the service of Pakistan Railways.

-Study Objective

- (1) To identify points that can be improved in Pakistan Railways’ customer service.
- (2) To demonstrate the importance of such surveys to Pakistan Railways itself and to set a precedent for implementation of such surveys.

-Study Methodology

- Implementation period: November 19 – December 5, 2006
- Valid responses: 123 persons selected at random, including 38 women (31%) and 85 men (69%).
- Train station where implemented: Karachi, Lahore, Rawalpindi

Figure 5: Rawalpindi Station



-Study Result

- According to the survey, second-class and economy passengers (approximately 65%) are likely to be low-income earners (4,000 to 8,000 rupees/month) and those in second-class with air conditioning are likely to be middle-income earners (8,000 to 15,000 rupees/month). It was confirmed that, generally, Pakistan Railways’ passengers are middle- and low-income earners.

Table 6: Matters Identified as Needing Improvement at Pakistan Railways

Very Important	① Improve punctuality (81.3%)
	② Reduce travel time (62.6%)
	③ Reduce fares (36.6%)
Somewhat Important	① Improve frequency of trains (69.1%)
	② Improve railways staff’s behavior (69.1%)
	③ Provide better information (57.7%)
	④ Improve on-board service and facilities (55.3%)
Not Very Important	① Improve connections with other means of transport (43.9%)
	② Improve frequency of trains (21.1%)
	③ Reduce fares (12.2%)

- 73% of respondents replied that they are “satisfied with using the railway as a means of transport,” and mentioned as reasons “low fares” (48.8%) and “safety” (45.5%).
- 55.3% of the total have experienced time changes and forced schedule cancellation due to the occurrence of problems with locomotives. Of those, 37.4% say that they “frequently experienced” such problems. In such cases, about half (49.6%) say that the problem was due to “inefficient operation” and only 26.8% say that it was due to “locomotive malfunction.”

2.5 Sustainability (Rating: b)

2.5.1 Executing agency

2.5.1.1 Technical capacity

Currently, operation and maintenance of the locomotives in this project is ordinarily conducted at the Rohri yard and Quetta yard where the locomotives are stationed. There are no serious problems in the technical level of the operation and maintenance at the train yards. However, there is room for improvement in the operation and maintenance of

the RGE-24 during periods when it is away from its assigned train yard.

With regard to the training system, the training center is fully equipped with infrastructure. Training (on management and accounting, etc.) is newly set up to provide knowledge and know-how that will be necessary when Pakistan Railways becomes a public corporation in the future, and Pakistan Railways fully understands the necessity of this. Furthermore, there are three schools that function as training institutes of Pakistan Railways. The main training institute is the Pakistan Railway Academy Walton Lahore which was established in 1929. It primarily handles training of engineers involved in the driving of locomotives, train examining and operating staff at the stations. It also accepts trainees from other countries. The Moghalpura Training Center was established in 1965. It is an important training institute for this project because it conducts training for engineers in their third year after joining the railway and also conducts training concerning diesel electric locomotives. Furthermore, training for drivers and operation and maintenance staff of diesel engines is conducted at the Diesel Training Center Karachi.

Figure 6: Main training institute of the Pakistan Railways, Pakistan Railway Academy Walton Lahore



Classroom for practical training



Classroom for newly established management course

2.5.1.2 Operation and maintenance system

As a point deserving special mention regarding the system of Pakistan Railways overall, Pakistan Railways itself lost a substantial amount of independence due to the transfer and merger of the former Railway Board established at the Pakistan Railways headquarters in Lahore to the Ministry of Railways in Islamabad in 1999. Currently, policy decisions on Pakistan Railways' management, personnel, planning, and finances are made primarily in Islamabad.

Furthermore, concerning the corporatization of Pakistan Railways, the plan has been promoted since 1999, led by the World Bank, and as of October 2006, the target date for

corporatization is August 2007. In October 2006, the Pakistan Railway Corporation Act was drafted, and meanwhile, the Pakistan Railways' public corporation plan was completed in December 2006. Currently, it is awaiting consideration by the Council of Common Interests (CCI) in accordance with Article 154 of the Constitution. After that, following deliberation and approval by the Parliament, it is scheduled to be put into effect. In any case, it is highly possible that there will be a long delay beyond the target date of August 2007¹³.

Furthermore, with regard to the operation and maintenance system, as stated above, there is a strong possibility that the operation and maintenance system is inadequate for the RGE-24 locomotives during periods when they are away from their assigned train yard. Currently this is not causing any significant problem, but it is necessary to organize the operation and maintenance system at train stations in addition to at the train yard.

2.5.1.3 Financial status

Looking at the trends in the financial status during the past several years, sales have certainly grown due to growth in passenger volume and fare hikes. However, it has not reached the point of recovering operating expenses, and operating losses have become chronic. To improve the financial situation, it is necessary to further raise fares in keeping with the increase in operating costs, together with improving management efficiency. On the other hand, a further fare hike would make it difficult to compete with road transport. In response, the government is granting subsidies (determined by the Ministry of Finance) to compensate for the losses in each accounting period and is providing fund assistance for investments. According to financial statements for June 2006, whereas the annual sales were 18,182 million rupees, the current loss was 9,187 million rupees. Subsidies were 8,515 million rupees, and fund assistance for investments was 5,339 million rupees.

Table 7: Financial Statements of Pakistan Railways

	2001/2	2002/3	2003/4	2004/5	2005/6
(unit: million rupees)					
Profit and Loss Statement					
Revenues	13,046	14,810	14,635	17,828	18,182
Normal operating	11,315	12,682	13,377	14,182	17,724

¹³ World Bank's effort towards the reorganization of railway sector, including Corporatization, was gradually established during the former Chairman of Pakistan Railways. Currently, there are several on-going mid-term and long-term reforms (e.g. change in accounting standards, Corporatization) and collaboration with Pakistan Railways for preparation and implementation of management plan. The public opinion, including national railway experts, generally support the Corporatization, and expectation is growing. However, there exists a strong resistance within Pakistan Railways. Considering the fact that the attempt of Privatization from 1995 to 1999 failed, many people still doubt the realization of the Corporatization.

expenses					
Pension expenses and others	3,093	3,190	3,324	3,512	3,801
Transfer of reserves for depreciation	993	1,200	1,200	1,200	2,115
Total operating expenses	15,401	17,072	17,901	18,894	23,640
Operating profits	-2,355	-2,262	-3,266	-1,066	-5,459
Interest cost	2,398	3,392	2,094	2,169	3,729
Current loss	-4,753	-5,654	-5,360	-3,235	-9,187
Income from subsidies	6,000	8,100	8,001	3,950	8,515
Current unappropriated profits	1,247	2,446	2,641	715	-672
Balance Sheet					
Assets	64,091	70,859	77,559	85,115	92,918
Capital	31,371	34,403	37,902	40,843	46,182
Accumulated losses	-27,630	-25,184	-22,743	-22,027	-22,699
Liabilities	60,350	61,640	62,401	66,299	69,435
Total capital and liabilities	64,091	70,859	77,560	85,115	92,918
Sales Breakdown					
Passengers	6,569	7,430	8,218	9,267	10,267
Freight	4,790	5,071	4,566	5,287	4,934
Mail and parcel	807	905	928	887	1,001
Other	881	1,404	923	2,387	1,980
Total sales	13,047	14,810	14,635	17,828	18,182

source: Figures for February 2001 to April 2003 are from the Ministry of Railways' *Appropriation Accounts of Pakistan Railways*. Figures for May 2004 to June 2005 are from Pakistan Railways' *Commercial Accounts of Pakistan Railways*.

Furthermore, the government is obligated to provide assistance for unprofitable operations of the railway, as part of its Public Service Obligation. Consequently, it appears highly unlikely that government assistance will be cut off given the current conditions, although it cannot be said, financially speaking, that there are absolutely no problems with sustainability when viewed from the perspective of corporate accounting.¹⁴

2.5.2 Operation and maintenance status

Currently, the problem of excessive vibration is occurring only with the RGE-24.

¹⁴ In order to deal with the current situation, the Pakistan Government is planning the corporatization of Pakistan Railways. Also, in order to grasp PR's real financial situation and eventually improve the situation, it is currently planning to introduce a project under the technical assistance from the World Bank. This project consists of six components (to identify the gaps between the PR's accounting system and the Financial Accounting System as per IAS, and to introduce the Cost Accounting System, etc.). It is scheduled to complete within 18 months, but it already experienced some delays at the time of April 2007.

Because the frame would be damaged if this problem were ignored, modifications are being made by installing additional shock absorbers and balancing weights, as stated above, in cooperation with the contractor. Also, a technical evaluation revealed some problems in the expressors¹⁵, but currently no measures are being taken to solve this. In order to improve both availability as well as reliability of REG-24, it is necessary to consider the investigation of the cause of frequent expressor failures to avoid major breakdowns in the future.

With regard to spare parts, which are vital to operation and maintenance, the minimum standard for spare parts in stock is 80%, but currently the percentage of spare parts in stock is 60%. Parts that increase the reliability of locomotives are low-cost and frequently-replaced expendable items (such as pistons rings, filters, and bearings), and so it is necessary to at least stock 100% of these kinds of low value spare parts. Although the locomotives rehabilitated by this project are all currently in operation, and no significant problems are occurring in their operation and maintenance, yet these remain as some areas for improvement.

3. Feedback

3.1 Lessons Learned

In the ex-post evaluation of Diesel Electric Locomotives Rehabilitation Project (1) implemented in 2004, “lack of technical assessment at the time of appraisal” was mentioned as one reason for the deterioration in the efficiency of that project. Because the executing agency adequately considered the lessons learned in that project when implementing this project, the technical assessment prior to the project was improved, and this led to greater efficiency in this project. Henceforth, when studying new projects, it is desirable to give adequate consideration to similar projects implemented in the past and to conduct technical assessments.

3.2 Recommendations

-For Pakistan Railways

- FINANCIAL ASPECT: It is necessary for Pakistan Railways to depart from its operating loss situation as soon as possible. Moreover, it is necessary to study a management strategy that will make Pakistan Railways profitable, so that it need not rely on government subsidies. The first step for that is to complete the introduction of

¹⁵ It is a machine which controls air pressure for breaks, commonly used in the American locomotives. It combines both air compressor and exhaustor (or vacuum pump).

an accounting system, which is currently underway, as soon as possible and to accurately grasp the financial situation. It further needs to assess the users' needs, explore new customers, and deliver the value-added services.

- FREIGHT SECTOR: PR currently is focusing more on passenger sector. This is clear by looking into the fact that highly reliable locomotives such as RGE-20 are preferentially allocated to passenger transportation. Due to this, efficiency and reliability of freight transportation have declined losing both actual clients as well as potential clients. Contrary to passenger services, freight is a business that can be profitable. Thus, in order to strengthen it and make freight a profitable unit, Pakistan Railways should allocate highly reliable locomotives to haul the freight services to a timetable.
- OPERATION AND MAINTENANCE: In order to ensure the sufficient operation of both existing and new locomotives in the future, Pakistan Railways needs to re-acknowledge the importance of rehabilitation and avoid the problems that will occur in the medium to long term. Moreover, Pakistan Railways should, at minimum, allocate funds appropriately, so that it has a complete stock of spare parts that increase the reliability of locomotives. Furthermore, it is desirable that maintenance procedures for the RGE-24 are reorganized for the periods when it is away from the train yard. Moreover, regarding the problem with the expressor, it is necessary to verify the nature of the problem, analyze it, and study solutions, such as by setting up a task force within Pakistan Railways.
- TRAINING: In order to promote PR's corporatization as well as to increase efficiency of the daily operation, the following points should be considered: (1) Assess the training requirements of all PR personnel. (2) In order for all the staff to be able to respond to the new technology that is being introduced, it is necessary to periodically revise the content of the training courses (especially the ones on electrical/electronic systems, computer skills and accounting). (3) Management marketing and administration courses should be taken up at least by all middle and management personnel (including engineers). These courses should enable PR personnel to learn on the importance of emphasizing on the need for customer orientation; proactive assessment of the needs of railway users; increase the number of customers, and provide high value added services.

Comparison of Original and Actual Scope

Item	Plan	Actual
1. Output	Rehabilitation of 48 locomotives total ALU-20: 27 locomotives ALU-24: 21 locomotives Technical transfer Overseas training: 12M/M Domestic training: 24M/M	Rehabilitation of 48 locomotives total ALU-20: 23 locomotives ALU-20R:4 locomotives ALU-24: 21 locomotives Technical transfer Overseas training: cancelled Domestic training: 25M/M
2. Project Period	March 1996 – October 1999 (44 months)	March 1996 – September 2004 (103 months)
3. Project Cost		
Foreign Currency	6,476 million yen	6,643 million yen
Local Currency	3,373 million yen (1,057.4 million rupees)	2,525 million yen (1,252 million rupees)
Total	9,849 million yen	9,168 million yen
ODA Loan Portion	6,774 million yen	6,643 million yen
Exchange Rate	1 rupee = 3.19 yen (as of February 1995)	1 rupee = 2.017 yen (average of 2000 to 2004)