Chile

Railway Rehabilitation Project

Report Date: October 2002
Field Survey: July 2001

1. Project Profile and Japan's ODA Loan

Site Map: Southern part of Chile

Site Photo: Track and Contact Lines After Renovation (Valparaiso)

1.1 Background

After the Second World War, the railway sector in Chile developed under stable management and increasing rolling stock, electrification and maintenance and rehabilitation of lines, and by adapting advanced technology that was being promoted in the railway sector in the world. After the prosperity of the 1960s and 1970s, however, under the administration of President Pinochet (1973-1990), a plan was introduced to streamline the national railway in Chile: Empresa de Los Ferrocarriles del Estado (EFE). The government's public sector investment in transport focused on the improvement of road network, suspending new investment in rail service. As a result, maintenance of the rail system was also suspended after the rail improvement projects of the 1960s, and both railroad equipment and rolling stock became increasingly obsolete. In an attempt to make operations more efficient, EFE implemented the privatization of the northern part, the closure of lines showing weak profit performance, and drastic staff reductions. The government also decided to affirmatively support EFE's reconstruction by means of a dispensation from the national treasury for the renovation of infrastructure and the repayment of accumulated debt.

1.2 Objectives

By rehabilitating of the equipment and rolling stock belonging to EFE, this project was to improve and expand the transport capacity of forestry and mineral production in Southern Chile with a comparative advantage in terms of rail transport, as well as that of passengers of metropolitan area lines and intercity line, that was to lead to the reconstruction of EFE and to the revitalization Chilean economic-social activities

1.3 Project Scope

The JBIC Loan covered the total foreign currency costs and a part of the local currency costs for the rehabilitation of 1) track, 2) electric equipment, 3) signaling equipment, 4) communication equipment,

5) passenger coaches, 6) locomotives, and for 7) consulting services.

1.4 Borrower / Executing Agency

Empresa de Los Ferrocarriles del Estado, EFE

1.5 Outline of Loan Agreement

Loan Amount Loan Disbursed Amount	6,412 million yen 6,412 million yen
Date of Exchange of Notes Date of Loan Agreement	November, 1992 November, 1992
Teams and Conditions Interest Rate Repayment Period (Grace Period) Procurement	 3.0 % 25 Years (Including 7 year grace period) General Untied
Final Disbursement Date	September, 1999

2. Results and Evaluation

2.1 Relevance

The objective of this project was to improve the level of railroad service and infrastructure of the executing agency, EFE, which was struggling to preserve profitability against gradual drops in the share of rail transport, by promoting management reforms with its contraction, as well as by investing intensively in the areas where a rise in demand and a potential for profitability were expected.

Chilean economy placed most reliance on export of primary commodities, such as copper and forestry products, and demand for rail transport was growing due to the increasing volume in export of these products, which was deemed to be suitable for rail transport. In terms of passenger transport, in order to mitigate overcapacity on road transport in the metropolitan area and improve the efficiency and environmental effect, it was requisite to improve railway sector service to enable mass passenger transit. This project was deemed to be fairly relevant to the extent that planned maintenance work and rehabilitation of passenger coaches, which had not been carried out over the past 25 years, aimed to improve transport capacity, despite it did not lead to the full restoration.

Realizing that the deterioration of the rail sector during the 1980s was caused by the superannuation of equipment and the inefficient management of EFE, in the 1990s the Chilean government implemented various reforms under the first Three Year Railroad Development Plan (1994-96), with the goal of improving the transport capacity and efficiency of rail service. This project, taking the main role in the Plan, established infrastructure and a basis of management of EFE. Even now, modernization of management and technology of the railway sector is being promoted under the principle of the Plan, which has been adopted in the second and third three-year plans. Thus, it is considered that the project has maintained its viability as that of project appraisal.

2.2 Efficiency

2.2.1 Implementation Schedule

This project including procurement of goods and services was planned to be implemented over a period of three years and five months, from the middle of 1992 to the latter half of 1995. However, the project was actually commenced in December of 1994, and was completed more than three years later than originally projected, in September of 1999.

This delay was caused mostly as a result of the progress of the privatization program of EFE. The establishment of the program itself was delayed, and this resulted in several modifications of project scope, accordingly, which delayed project implementation.

In addition, fragmentation of procurement lots contributed to delays by increasing related clerical work. The original plan was to divide the necessary materials and engineering works into nine lots, to be procured through international competitive bidding. However, due to an absence of tenderer capable to handle such a large-scale supply, lots were divided into over 100 so as to meet tenders by domestic firms.

2.2.2.Project Scope

Of the seven project components described above 1.1, the rehabilitation of signaling equipment and communication equipment were cancelled during project implementation. There were two reasons for the cancellations: 1) damage to tracks was greater than estimated, causing reallocation of resources to repair the tracks, and 2) according to the decision in the terms of privatization of passenger service in 1997, long distance passenger service was to be privatized and EFE's operation coverage was to be limited to commuter lines in the urban area. After 1998, EFE focused on renovation of the tracks and electrical equipment under its existing operational area. (Thereafter EFE leased some track to a telecommunication company with the provision that it upgraded communication equipment. EFE paid rent for use of such equipment. At present, no decision has been made about the signaling equipment.)

The length of renovated contact lines was nearly doubled from the projected length, by expanding the scope of work to other damaged lines that was out of the project area, in order to enhance the safety of the operation.

It could be judged that these alterations in scope were appropriate to improve the efficiency of renovations of the lines managed by the EFE.

2.2.3 Project Cost

Due to the aforementioned alterations in the scope of the project, the rail renovation component cost of ¥6.690 billion, was nearly 2.5 times the projected cost of ¥2.725 billion, and the electrification component, projected at ¥621 million, actually cost ¥928 million. However, due to the cancellation of the signal and communications component, and by lowering the number of locomotives, passenger cars, and stock cars to be renovated, the actual total project costs were nearly the same as the appraisal estimated cost of ¥8.449 billion ($77.6 million at $1 = ¥108.88).[1] As a result, ¥6.412, the full amount of the loan, was disbursed.

2.3 Effectiveness

The attainment of the improvement of rail transport capacity, the objective of this project, can be judged by such indicators as the decrease in accidents, the increase in the volume of passengers and cargo transported, and freight income.

2.3.1 The Improvement of Safety and Service

Transport capacity and safety have improved after the project. At the time of appraisal, the rail facilities and the cars of EFE were by and large superannuated. No data specific to this project's

[1] This project included components where renovation work and material procurement was directly managed by the EFE (such as the replacement of rail ties). The portion of direct management costs (costs not covered by yen loans) reported were included in the totals.

scope was available, however, it was reported that in 1993, there were 487 cases of train derailments at stations, and 416 cases on the open track. In many sections, it was necessary to lower operating speeds in order to avoid derailment. However, as this project was implemented the number of derailments showed a downward trend, as shown in the following Table 1.

Table 1: Number of Accidents (1991-2000)

Type of Accident	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
In-Station Derailments	434	444	487	473	314	56	103	80	70	80
Open Track Derailments	307	370	416	386	251	149	96	154	165	188
In-Station Collisions	10	7	7	15	8	0	0	1	6	3
Open Track Collisions	3	7	0	0	2	1	1	0	0	1

Source：Annual Estadistica 1991-2000 , EFE

Likewise, according to EFE, increase of the average speed by 20-30% was achieved due to improvements in safety. Comparing the travel time between Santiago and Chillan, which was covered by this project's scope, listed on train schedules in 1994 and 2001, it is clear that the travel time for almost all sections was shortened, improving the competitive advantage of trains over busses. (see Table 2)

Table 2: Travel Time Between Santiago and Chillan

（Units：Hours）

Destination	Bus	Train (1994)	Train (2001)
Rancargua	1.5	1.12	1.12
Curico	3.1	2.52	2.28
Talca	3.8	3.37	3.01
Linares	4.7	4.09	3.63
Chillan	5.8	5.41	5

2.3.2 Effect on Passenger Transport

As shown in Table 3, passenger transport volume dropped in 1997 due to the effects of a one-month strike in January, but in 2000 it recovered to 13,190,000 passengers that marked the highest number in the past 20 years.

Table 3: Number of Passengers

	1993	1994	1995	1996	1997	1998	1999	2000
Total Number of Passengers (in thousands)	10,075	10,193	10,075	9,763	8,265	9,967	10,008	13,193
Passenger transport （in thousands per kilometer）	936	815	689	642	550	534	637	736

Source：Annual Estadistica 2000, EFE

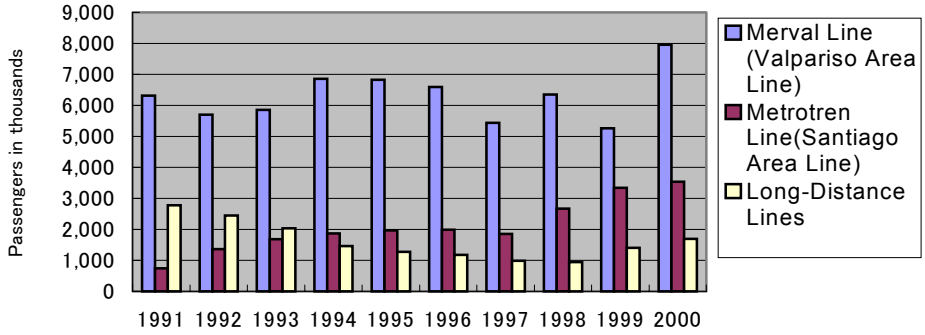
Graph 1 shows passenger transport volumes per line. This increase in number of passengers was greatly attributed to the commuter trains operating in the metropolitan area of Valparaiso, a port city on the Pacific Coast to the west of Santiago, including the Merval line: Metro Regional de Valparaiso, connecting Valparaiso and Limache (length: 43.2 km) and the Metrotren line, connecting Santiago

and Rancagua (length: 81.8 km). The Merval line had already been in great demand for passengers because it connects the Valparaiso metropolitan area and the second/third largest cities in Chile, and also because travellers used it frequently. The average number of passengers a year of this line during 1994-1996, before this project, was 6,760,000 persons. In the year 2000, one year after the completion of this project, the total number of passengers using the line increased by 17.7%. Furthermore, even in the first half of 2001 alone, the number of passengers using this line reached 4,610,000 persons. Before this project, the number of passengers on the Metrotren line stayed at 2,000,000 persons or less. It took an upturn after 1998, and averaged the high growth rate of 24% per year during 1998-2000,

It could be assessed that such a sharply increasing demand for passenger transport in the two major metropolitan areas must have been promoted by improvement of operating speeds and safety through the renovation of tracks, bridges and electrical equipment under this project, as well as by increasing the frequency of operation service through the purchase of Italian rolling stock by EFE's own funds.

On the other hand, the number of passengers using the long-distance line (the number of passengers using the Santiago-Puerto Montt Line [Length: 1,080 km], but excluding local passengers within Santiago) decreased. The number in 2000 stayed just 60% of that in 1991. Increase in frequency of service and lowering of fares may attract more passengers for such transport. However, in terms of stable management, it is deemed difficult for EFE to increase largely the number of the passenger, by expanding the lines that EFE considered profitless.

Figure 1 Passengers by Line



Source : Annual Statistica 2000, EFE

2.3.3 Cargo Transport

As demonstrated in Table 4, cargo transport volume dropped steadily since 1994. But then began recovering slowly since 1998. In 1994, the cargo transport section was privatized, and has since been operated by Ferrocarriles de Pacifico SA (FEPASA). Breakdown of the freight volume under FEPASA's operation is unknown due to lack of processing data, however, contents of its freight still are wood (such as lumber and wood chips) and minerals (such as coal and copper), which are well suited to rail transport. EFE presumed that, with no objective data in support, this project contributed to the recovery of the freight volume, by diminishing derailments and improving regularity of rail service, which led to the return of transport users. The southern region, where a potential for development of lumber related industries (lumber, wood chips, wood pulp, paper manufacturing, etc)

still remains, has the possibility of further increasing demand for cargo transport. However, it is considered difficult for rail transport to increase the number of cargo drastically under fierce price competition with road transport.

Table 4: Cargo Transport

	1993	1994	1995	1996	1997	1998	1999	2000
Total Volume of Cargo Transport (in thousands of tons)	5,620	5,408	4,529	4,303	4,153	4,401	5,097	5,293
Cargo Transport (in thousand tons per kilometer)	1,321	1,178	967	931	867	972	1,097	1,241

Source：Annual Statistica 2000, EFE

2.3.4 Improvement of the Financial Status

One of the objectives of this project was to stabilize EFE's management, which was encouraged by the Chilean Government from the planning stage, by abolishing service for unprofitable lines, reducing personnel, and intensively allocating resources to profitable sections. The plan has not been fully accomplished, however, the operational efficiency of EFE has been greatly improved by accommodating demand for more profitable local lines of passenger transport in the metropolitan area of Santiago and Valparaiso and by its aggressive efforts such as personnel reduction or outsourcing services.

2.3.5 Financial Internal Rate of Return

At the time of appraisal, the financial internal rate of return (FIRR) was projected at 10.7%, but because cash flow (excluding interest on payments) from operating activities making up the accounting basis was negative until the year 2000, the FIRR was not recalculated.

2.4 Impact

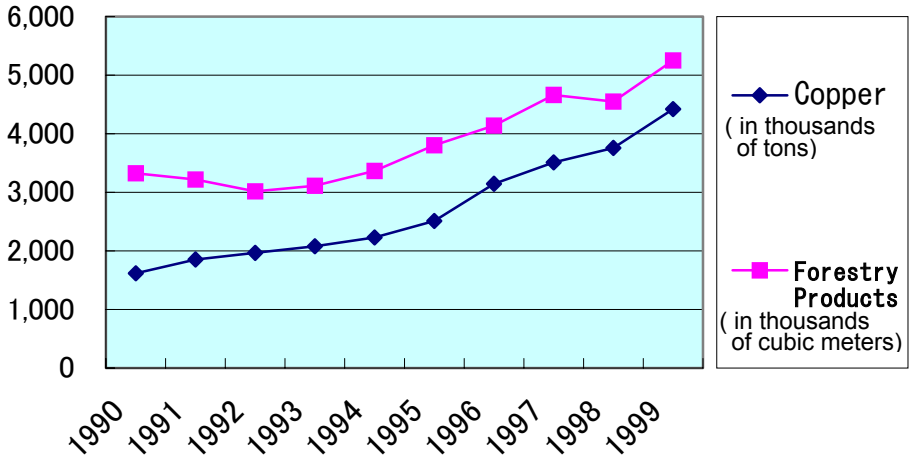
It is difficult to quantitatively measure or forecast what impact this project has had because only two years has passed since project completion in 1999.[2] Therefore, only a qualitative evaluation is made.

2.4.1 Impact on the Economy

This project was expected to revitalize the Chilean economy by improving rail transport capacity, thus promoting the transport of wood products and minerals in Southern Chile. As only two years have passed since the completion of the project in September of 1999, at present it is impossible to measure the effect derived from this project to the Chilean economy. Until 1997 the Chilean economy had enjoyed a growth rate of 6% due to the increase in exports of natural resources such as lumber, copper, and seafood. Rail transport is considered more competitive than trucks in this area, and therefore it could contribute to an increase in production and exports if it is possible to meet the growing demand for transport of lumber and mineral. However, it will be necessary to step up efforts to maintain an advantage over competing truck transport.

[2] Although this project is expected to effect the regional economy, at resent, regional economic statistics are only available up to 1999.

Figure 2 Production of Copper and Forestry Products in Chile
(1991-99)



Source:Panorama Economico y Social las Regiones de Chile 1990-1999,
Instituto Nacional de Estadisticas

Table 5: The volume of Cargo Handled in Chilean Ports 1995－1999
(Unit: thousands of tons)

	1995	1996	1997	1998	1999
Leaving Port	34,889	37,873	38,203	36,696	40,709
Arriving in Port	22,347	26,504	26,565	27,711	28,878

Source: Anuario de Transporte y Comunicaciones 1999,
Instituto Nacional de Estadisticas

2.4.2 Development in Metropolitan Areas

With traffic congestion being a prominent problem in the areas around Santiago and Valparaiso, EFE has attempted to expand passenger share by increasing the frequency of the commuter service. The project has also contributed to metropolitan development by extending Santiago's commuter area, which includes regions previously deemed difficult to reach. At present, development of the neighboring areas of Melipilla station (roughly 60 km from Santiago) and Batuco station (roughly 30 km from Santiago) are also being planned.

2.4.3 Environmental Impact

According to EFE, no negative environmental impact has been reported as a result of the implementation of this project. It is deemed that, in terms of the nature of this project, rehabilitation of the existing facilities will not have adverse effects on the environment.

2.5 Sustainability

2.5.1 Operation and Maintenance

The Maintenance Section of the Infrastructure Division is responsible for the planning, inspection and supervision of the maintenance of facilities and equipment owned by EFE, with some

activities outsourced to private companies. The Business Department is in charge of operations. In the year 2000, the Engineering Division was established to implement the research and creation of new capital investment and repair plans. Despite a general contraction in staff size, operations and maintenance have been reinforced by securing personnel from other sections. At present, no major technical problems have been reported relating to the operation and management of facilities.

2.5.2 The Outlook for Passenger Transport

As described in Section 2.3, the demand for passenger transport in metropolitan areas has grown in recent years. Further increases in service frequency and improvements in service regularity may enable EFE to achieve continued expansion of passenger transport. If convenience for users is improved by networking with other mass transit services such as buses and subway, further increase in demand can be expected.

2.5.3 The Outlook for Cargo Transport

As mentioned in Section 2.3.3, cargo transport, which is easily affected by economic conditions, is expected to achieve a certain degree of volume growth. Even the third Railroad Development Plan of EFE shows prospects that cargo transport volume will be 1,300,000 tons per kilometer in 2001 and attain 1,380,000 tons per kilometer in 2002. It will be important to determine which goods are most suited to rail transport.

2.5.4 Improvement of the Financial Condition of EFE

Despite reinforced operations and maintenance and the recent positive outlook on and future demand, the financial condition of EFE, whose accumulated debt has surpassed 700 billion pesos (roughly $1.2 billion), remains poor. To sustain the project, this situation must improve. Recent recovery trends in operating profit, seemingly the result of the increase in passengers through improvements in service and efforts to cut costs by improving efficiency, may lead to gradual improvements in EFE's financial condition. With its large debt accumulated over many years, financial stability will not only require further EFE efforts, but government support as well.

Comparison of Original Plan and Actual Scope

Item	Plan	Actual
1. Project Scope		
(1) Renovation of Track	Differed Maintenance：2,426km Welded Rail：129km Bridges：232 bridges	Differed Maintenance：1,856km Welded Rail：190km Bridges：116 bridges
(2) Renovation of Electrical Equipment	Contact Line：300km	Contact Line：655km
(3) Renovation of Signaling Equipment	Electric Interlocking：10 stations	Cancelled
(4) Renovation of Communication Equipment	Underground Laying：360km	Cancelled
(5) Renovation of Passenger Coaches	Heavy Repair：EMU 3sets and 16 cars Light Repair： EMU10sets, 88 cars	Heavy Repair：EMU 3sets Cancelled
(6) Renovation of Locomotives	Heavy Repair：6 cars Light Repair： 6 cars	Heavy Repair：10 cars Light Repair ：4 cars
(7) Consulting Services	Drafting Bid Documents and Supervision and Control of Progress of the work etc	Drafting Bid Documents and Supervision and Control of Progress of the work etc
2. Implementation Schedule		
(1) Track Renovation	July, 1992-December, 1995	December, 1994-September, 1999
(2) Electric Equipment Renovation	July, 1992－January, 1995	May, 1996－September, 1999
(3) Signals and Communication Renovations	October, 1992－September, 1995	Cancelled
(4) Car Renovations	May, 1992－December, 1995	October, 1997－June, 1998
(5) Consulting Service	May, 1992－December 1995	October, 1993－July, 1999
3. Project Cost		
Foreign Currency	1,822 million yen	821 million yen
Local Currency	6,727 million yen	7,628 million yen
Total	8,549 million yen	8,449 million yen
ODA Loan Portion	6,412 million yen	6,412 million yen
Exchange Rate	1 peso ＝ 0.405 yen	1 peso＝ 0.207 yen