Indonesia

Rehabilitation of Bridges for Java North Line (1) (2)

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Field Survey: November 2005

1. Project Profile and Japan's ODA Loan

Project Site

A Bridge rehabilitated by the Project
(Tanjun, Central Java Province)

1.1 Background

The Java North Line Railway is, taking rank with the South Line, an arterial railway which links the capital of Jakarta to Indonesia's second largest city Surabaya (total length 726km). Both the North Line and the South Line were constructed during the Dutch colonial era. Most of the structures of the North Line were built by 1900. The South Line was designed and constructed by the colonial government, and is solidly built. The North Line, on the other hand, had its origins in private railway and its track standards were low. While almost all of the bridges on the South Line satisfied the 1921 regulations of 20-ton design load, many of the bridges along the North Line did not meet this regulation. Consequently, large locomotives couldn't run directly from Jakarta to Surabaya. Moreover, despite the fact that these bridges had undergone repeated repairs, most are deteriorating, and speed restrictions were imposed on some sections.

Demand for railway service has grown steadily. In particular, meeting the demand for economy-class travel was the Indonesian government's highest priority, and improving railway facilities to provide a safe and reliable means of transportation was a pressing need.

Amid these circumstances, the Indonesian government had begun restoration work on the North Line using its own fund. The Overseas Economic Cooperation Fund (OECF), the predecessor of the Japan Bank for International Cooperation (JBIC), started to provide support primarily for rail track rehabilitation in a number of projects in the

1970s. A survey conducted by OECF (the present JBIC) as part of these projects pointed out the need to repair and establish a maintenance system for bridges.

1.2 Objective

This project's objective was to ensure operation of the North Line and reduce transit time, together with strengthening transport capacity, by restoring railway bridges as well as bridge inspection and repair stations in the Cikampek-Semarang section (359km) and the Tobo-Babat section (64km) of the Java North Line, which links from Jakarta to Surabaya, thereby contributing to improving the safety and punctuality of this railway, and securing a means of transportation for low-income groups.

1.3 Borrower/Executing Agency

The Republic of Indonesia/Directorate General of Land Transport (the present Directorate General of Railways)

1.4 Outline of Loan Agreement

	Phase 1	Phase 2
Loan Amount/ Disbursement Amount	3,302 million yen/ 3,057 million yen	5,857 million yen/5,855 million yen
Exchange of Notes Loan Agreement	September 1992 October 1992	December 1995 December 1995
Terms and Conditions - Interest Rate - Repayment Period (Grace Period) - Procurement	 2.6%/year 30 years (10 years) General untied （Consultant component: partially untied）	 2.5%/year （2.3% for consultant component） 30 years (10 years) General untied
Final Disbursement Date	November 2001	December 2003
Main Contractors	Tekken Corporation (Japan), PT. MODERN（Indonesia）	PT. HUTAMA KARYA (Indonesia), Tokyu Construction (Japan),

		PT.DAYA TATA MATRA (Indonesia)
Consulting Services	Japan Transportation Consultants (Japan), Pacific Consultants (Japan), PT. INTI ERA CIPTA (Indonesia)	Japan Transportation Consultants (Japan), Pacific Consultants (Japan), PT. INTI ERA CIPTA (Indonesia)
Feasibility Study (F/S) etc.	1988: Overseas Economic Cooperation Fund (currently JBIC) (Survey to Promote the Aid Effectiveness of the Cikampek-Semarang Track Restoration Project)	－

2. Evaluation Results

2.1 Relevance

The objectives of this project are and were consistent with the Indonesian development policies and program both at the time of appraisal and at the time of ex-post evaluation. The plan is considered highly relevant.

2.1.1 Relevance of the plan at the time of appraisal

Repelita V: 1989-93 Indonesian fifth five-year national development plan pointed out the need to restore infrastructure and facilities to respond to the growing demand for railway services. Moreover, in Railway Law No. 13, Article 8 which became effective in 1992, the government's obligation to develop and maintain railway infrastructure was stipulated, which clearly demonstrated that the government was to maintain railway service. In particular, the Java North Line (total length 726km), which links the capital of Jakarta with Indonesia's second largest city, Surabaya, saw a sharp increase in the volume of passenger and freight transport, which rose by 55% and 294%, respectively, between the 1980s and 1990s, indicating that this line played an important role in Indonesia's railway sector.

2.1.2 Relevance of the plan at the time of evaluation

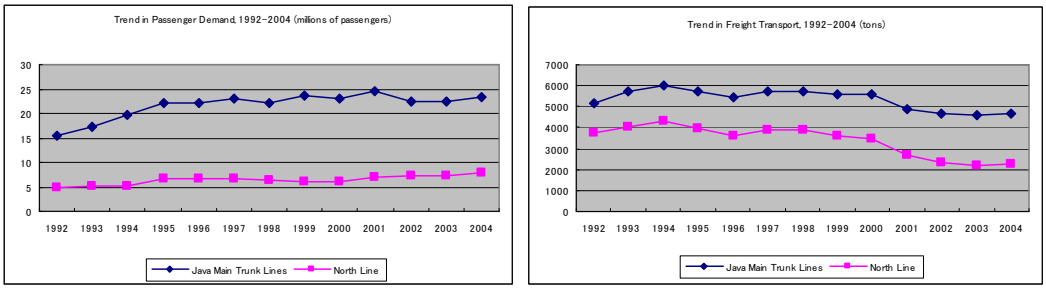
Indonesia's current national medium-term development plan (2005-2009) specifies the importance of the railway sector which transports a large volume of passengers and freight, and the need for government assistance for railway management. Railway Law No. 13, Article 8 which was still in effect at the time of the ex-post evaluation, stipulated that even though railways were completely privatized in 1999, the government, as its owner, is responsible for developing and maintaining railway infrastructure including bridges, while the 100% nationally-financed railway company PT.KAI conducts management.[1]

The economic position of Jakarta and Surabaya remains the same; thus, the importance of the Java North Line, the main trunk line linking these two cities, continues to grow. Due to stronger competition with the airline industry since 2001, passenger transport volume along all main trunk lines in Java has tended to decline, and PT.KAI, in order to obtain the effect of complete privatization, has since 2002 shifted to a management policy that emphasizes profitability over expansion of volume. Because of these developments, demand for both passenger transport and freight transport has seen sluggish growth (Figure 1). However, considering the significance of railway transport in Indonesia, the importance of travel during the Lebaran, end-of-fast festival, must be taken into account. The transportation including homecoming during this season is of extreme importance for many Indonesians. Many members of lower-income groups or economy-class train users travel long distances only during this period. Ensuring a means of transportation for lower-income groups who use economy-class trains only during Lebaran is one of critical policy objective for the Indonesian government[2]. For this reason, the importance of the Java North Line can be considered to remain unchanged.

[1] Privatization of railways in Indonesia deploys so-called two-tiered system, with national ownership of infrastructure including railway track and bridges and ownership by the railway company (PT.KAI) of rolling stock and station buildings. While the government has responsibility for development and maintenance of infrastructure, it also has the authority to set economy-class fares and provides subsidies to ensure that the lower-income groups have a means of transportation.

[2] Comprehensive passenger data classified according to high-season and off season is not available. For reference, the percentage of long-distance passenger trains at Jakarta suburban stations in 2005 relative to the average yearly number of tickets sold in November during Lebaran was 73.7% executive-class trains, 85.9% business-class trains and 132.5% economy-class trains. In light of the importance of travel during Lebaran and the fact that the subsidy program is securely maintained for the segment that uses economy-class trains, it should not be concluded that the importance of railways has declined simply by examining trends in passenger and freight transport volume.

Fig. 1 Railway Demand

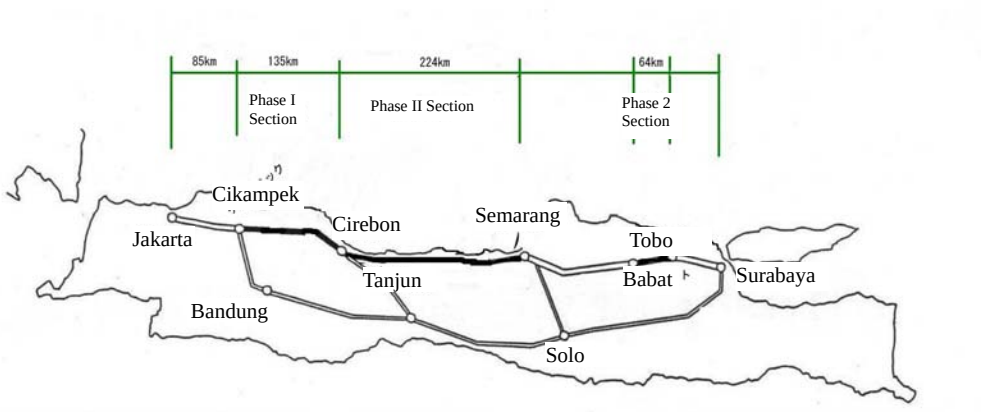


In order to tackle these challenges, improving the deteriorated railway infrastructure of the North Line through this project is, along with the several train track rehabilitation projects in the earlier phases, highly relevant. In addition, this project is implementing bridge rehabilitations in accordance with the ongoing Java North Line Double-Tracking Project (loan agreements concluded in 1994 and 1998 for double-tracking between Cikampek and Cirebon). In this regard, the project is also considered highly relevant.

2.2 Efficiency

Despite delays in implementation of this project, actual outputs and cost were satisfactory compared to the original plans, and efficiency is thus judged broadly high.

Fig.2 Section Targeted Through This Project



2.2.1 Outputs

At the time of the appraisal, it was planned to rehabilitate 35 bridges in Phase 1, 100 bridges in Phase 2 and to repair 6 bridge inspection and repair stations. In terms of the

number of bridges repaired in Phase 1, the outputs were completed as planned[3]. In Phase 2, the number of bridges planned was increased to 138, mainly due to a change in design that placed greater emphasis on flood-control measures and pedestrian convenience at the request of the railway company (PT.KAI) and local government.

The type of bridges targeted under this project varies ranging from large-scale bridges which spanned large rivers, to tiny bridges with a total length of about one meter. In addition, not only were the bridges themselves repaired but the track around the bridge was also improved at the same time. By raising the ground level around many bridges, the track surface was elevated. Underpasses were also built under train tracks and grade crossings were removed in some cases.

Bridge inspection and repair stations are storage facilities for equipment for bridge development and maintenance and serve as a base for human resources. Improvements were made at six locations (Jakarta, Cikampek, Cirebon, Semarang 1, Semarang 2 and Surabaya), and maintenance equipment such as riveting machines[4] was procured according to the plan.

Fig. 3 Output Examples of the Project

Bridge Spanning Large River

Small Bridge Built in Rice Field Area

Underpass

2.2.2 Project period

The project period planned at the time of the appraisal was 67 months from October 1992 to April 1998 (Phase 1) and 82 months from December 1995 to September 2002 (Phase 2). The actual period was 107 months from October 1992 to August 2001 (Phase 1)[5] and 100 months from December 1995 to March 2004 (Phase 2). Altogether, this period corresponds to 139% of the original plan.

The principal causes of the delay were: (1) design changes to adapt to

[3] Because the design was revised to respond to the double tracking work between Telagasari-Cikampek (funded by another ODA loan), there was a change in quantity of materials.
[4] Rivet: A type of spike used to join metal plate and steel products. See Fig. 5.
[5] The final disbursement of the loan was extended by one year.

double-tracking work which began during the implementation of this project, and (2) lack of experience of the executing agency in dealing with large-scale projects.

This project is, if separating other North Line infrastructure development projects such as track repair and double-tracking, cannot be accurately evaluated. It is worth to note that because this project spent more time in adapting to the double-tracking work than planned, the time spent on actual double-tracking was reduced. In addition, the experience gained in Phase 1 was utilized in Phase 2, and the same work was completed in a shorter period of time.

2.2.3 Project cost

The actual total project cost was 3,485 million yen for Phase 1 and 6,094 million yen for Phase 2 against a planned cost of 3,885 million yen for Phase 1 and 6,890 million for Phase 2 at the time of appraisal. These lower project costs were attributable to devaluation of the local currency which exceeded the magnitude of inflation.

2.3 Effectiveness

The objectives of this project were: (1) to expand transportation capacity through bridge restoration and (2) to ensure operation and shorten transit time by reducing the number of sections with speed restrictions due to bridge deterioration[6]. The achievement of both objectives was confirmed.

2.3.1 Expansion of transportation capacity

Under the 1921 regulations, bridge design load was set at 20 tons in Indonesia. Unlike the South Line built by the colonial government, the North Line had its origins in private railway management, and since there were no large cities such as Jogjakarta and Solo, passenger demand was relatively small. For this reason, the design load of many bridges built in the east of Cirebon was 15 tons or less. Thanks to this project, all bridges along the North Line satisfy the 1921 regulations. Before the project, large locomotives had to be switched to smaller ones at Cirebon Station, but direct operation without changing trains became possible through the entire Jakarta-Surabaya section after the project.

2.3.2 Ensuring operation and shortening transit time

[6] There are two possible methods of evaluating the expansion of transportation capacity: examining the increase in capacity in the design or examining the actual increase in transport volume. In this report, the increase in capacity in design is consistently examined. As can be seen in Figure 1, the actual increase in transport volume has been stable in the North Line, but this increase depends on many factors other than bridge repairs, so it is not possible to extract only the effect of bridge repairs. See also the column at the end concerning the evaluation policy adopted in this report.

At the time of the appraisal, the damage to bridge piers and abutments were severe, and there were many sections where speed was limited to 20km/h. At the time of the ex-post evaluation, however, there were no sections with speed restrictions because to bridge deterioration. As a result, travel time between Jakarta-Surabaya was shortened by a total of approximately 33 minutes, with a shortening of at least 13 minutes between Cikampek-Cirebon, the section targeted in the Phase 1, and at least 20 minutes between Cirebon–Semarang and between Tobo-Babat, the sections targeted in Phase 2[7].

2.3.3 Internal rates of return

The Economic Internal Rate of Return (EIRR) at the time of the appraisal was calculated to be 10.62%. In this calculation, the amounts saved in operating costs and the disparity in operating costs between railways and roads were considered to be the benefit while the direct cost of the project was considered to be the cost. In the ex-post evaluation, IRR was re-calculated focusing only on the reduction in transit time and securement of railway management[8]. Cost was regarded as: (1) project costs and (2) lost earnings that may have generated if repair projects had not been carried out. Benefits were considered to be the shortening of transport time through the elimination of sections with speed restrictions due to bridge deterioration. Also taken into account was the fact that railway service in Indonesia provides a means of transportation for low-income groups, especially to respond to the demand during Lebaran.

An event that merited attention when making this calculation was the bridge accident in Chomal in central Java which occurred in June 2001. This bridge was located in the Phase 2 section of this project and was seriously deteriorated[9]. Consequently, repairs had to be done without waiting for the start of this project, and were performed by the Indonesian government. These repairs were incomplete, however, and the bridge collapsed during Phase 2 of this project. Then the rehabilitation of the bridge was urgently included in this project. Work proceeded 24 hours a day, seven days a week; nevertheless, 10 days were required for recovery, and train operation was halted during the period. Since this accident occurred while this project was in progress, bridge repair

[7] These time reductions were obtained by examining only those bridges whose total length was more than 30 meters and then calculating the reduction in time due to the elimination of the speed restrictions on these bridges.

[8] Ensuring a means of transportation for low-income groups is the most important reason for national support of railway management. This is the so-called approach of securing a national minimum. The objectives of this project were to ensure the operation of railways and to shorten transit time. Even with speed restrictions, there is a major difference between trains operating with speed restrictions and trains not operating at all. EIRR was calculated estimating lost profit when operation is suspended. With respect to cost disparities factoring in road use, demand for roads has increased remarkably, but on the other hand the effect of privatization of railroads only really emerged in 2002, and so there are many unknowns concerning the shift in demand between railways and roads. For these reasons, it was disregarded in the calculation.

[9] The underwater bridge piers and abutments were deteriorated because this bridge spans the fastest-running river in the North Line area and the people of the area had been dredging sediment from the river bed. Beginning on June 19, 2001, the bridge began to collapse, and on the 20th train operation was halted. Operation resumed on June 30.

specialists and materials and equipment could be procured quickly, and for this reason, the monetary cost for the recovery was only about 100 million yen. It should be assumed that without this project, repair of the bridge would have required many more days and considerably more direct expenses. Nevertheless it is quite difficult to estimate the cost of recovery work for the bridge accidents in the case where this project had not been implemented. By a conservative estimate here, 1.5 times the amount of time would have been required. Moreover, it is supposed that if this project had not been implemented, and if the bridge had remained in a state of deterioration, the same type of accident would have occurred once every five years. Taking into account the above suppositions and even with a conservative estimate of lost earnings due to the halting of train operation, the EIRR of this project can be calculated as 12.1%[10].

[10] The executing agency did not consider the possibility of a cessation of operation due to deterioration of the bridge and calculated EIRR to be 10.4%

Fig. 4 Bridge Restored by Emergency Repair Work in 2001

Condition at Time of Evaluation

Lower Structure Built in Rapid Flow

2.4 Impact

The higher objectives of this project were to improve the safety and the punctuality of the Java North Line and to ensure a means of transportation for low-income groups. Through bridge rehabilitation carried out under this project, these higher objectives were achieved.

2.4.1 Improvement of safety and punctuality

In restoring bridges under this project, safety and punctuality were taken into account in bridge designs. Because the North Line area is near the coast, attention must be given to the frequent flooding that occurs when rain is heavy. Bridges were built on higher spot than before by raising the ground level and elevating the track surface around bridges. The bridges were thus made resistant to flooding. Before the project, if the water level of rivers rose due to flooding, railway tracks would become submerged, and railway operation would inevitably be suspended, something which had happened about once a year. Following the project, stoppages of train operation due to flooded bridges are now unthinkable.

Another improvement that may be mentioned is the construction of underpasses. Bridges do not span only rivers. At six locations where railways and roads intersected, underpasses for vehicles and pedestrians were built under the track, which was elevated by raising the ground level. Constructing these underpasses eliminated grade crossings, which put an end to crossing accidents and waiting time at crossings.

2.4.2 Ensuring a means of transportation for low-income groups

In Indonesia’s railway sector, a system has been adopted whereby a subsidy is paid for economy-class fares to ensure transportation for low-income groups. The most

important objective is securing railroad transportation capacity for economy-class passengers particularly during Lebaran[11]. To that end, it is essential to improve infrastructure. Improving the condition of bridges through this project is clearly a contribution to the national policy of securing a means of transportation for low-income groups.

2.4.3 Other impacts

This project is, in principle, the rehabilitation of existing bridges. Other than a certain amount of noise generated during this work, no other negative impacts on the environment have been observed. In addition, no special problems surrounding the acquisition of sites or relocation of residents were confirmed. Some of the positive impacts of this project to be pointed out are the reduction in flood damage in the vicinity of underpasses thanks to installation of drainage pumps as a part of bridge development and maintenance, and also the direct employment of 720 people generated in this project. It is particularly worth noting that by changing designs to adapt to double-tracking, the project contributed to the smooth implementation of the double-tracking project. It is estimated that 7.89 million people have benefited from the project (the total yearly number of users of the North Line in 2004, corresponding to approximately 7% of the population of Java).

Fig. 5 Bridge Rehabilitated to Accommodate Double-Tracking

Condition Before Project


Condition at Time of Evaluation

2.5 Sustainability

No particular problems were found concerning the technical capacity, systems and financial status of the executing agency and the system/conditions of facilities' operation and maintenance at the time of the evaluation.

2.5.1 Executing agencies

[11] In 2.1.2 above, it was stated that ensuring a means of transportation for low-income people is an Indonesian national policy. At an interview held with the executing agency, it was confirmed that the government's stance emphasizes being able to respond to demand during the Lebaran season.

2.5.1.1 Technical capacity

At the time of the appraisal, each six bridge inspection and repair stations which performed bridge maintenance had a staff of 15 to 40 people. However, the condition of bridge operation and maintenance was poor due to the aging of equipment for maintenance work, deficiency in quantity and lack of technical capacity, and there were problems in the technical capacity for maintenance and painting.

This situation was improved by providing on-the-job training (OJT) and renovating bridge inspection and repair stations during the project. According to comments by PT.KAI and the construction management consultant, the technical skills of engineers were markedly improved through OJT; this included 12 technicians in the Cikampek-Cirebon section, 38 in the Cirebon-Semarang section and 37 in the Semarang-Surabaya section. In addition, the railway company PT.KAI prepared a bridge inspection manual SOP (standard operating procedure) and the instruction manual prepared by the equipment manufacturer were translated into Indonesian and used.

Fig. 6 Bolt and Rivet

One area of concern was the confusion caused by constructing bridges using bolts instead of rivits to join steel products in this project. In general, in order to realize homogeneous performance (high quality), it is the internationally recognized standard to construct bridges using bolts, and at present, rivets are hardly used in bridge construction (with riveting, differences in individual level of skill of workers may cause erratic quality during construction). Among the bridges repaired in this project, only bridges that had to be rebuilt used bolts entirely.

Most of the existing bridges along the Java North Line have been constructed using rivets, and staff that perform bridge inspections and maintenance are more familiar with rivets than bolts. Some complains were heard at PT.KAI's bridge maintenance and management division about the executing agency's top-down decision-making on technology without working with PT.KAI's bridge maintenance and management division: "All of sudden we were forced to switch over from familiar procedures to unfamiliar ones," "It takes an enormous amount of time for training," "Nearly all of several hundred bridges on the North Line use rivets. But still we have to use bolts for those bridges to be rebuilt. It is just a mess and time-consuming to acquire skills and prepare materials for both bolts and rivets." The division also emphasized the merits of

the rivets: 1) manufactured domestically, 2) can be procured reliably, 3) allowing prompt response to maintenance. Also, bolts can easily be stolen when they are loose. When introducing an unfamiliar technology into the workplace, it is important for the executing agency to provide sufficient explanations in advance, to coordinate with related agencies, to provide training for inspection and maintenance personnel in the handling of bolts, and to secure material supply routes for maintenance purpose.

2.5.1.2 Operation and maintenance system

This project has initiated under the organization of the Directorate General of Land Transport (DGLT) as the executing agency, and actual operation and maintenance is performed by the railway public corporation established in 1991 (PERUMKA, a government-owned company). At the time of the appraisal, DGLT, the executing agency was reorganized as the Directorate General of Railways (DGR), and this meant that the department specializing in railways would be in charge of implementation of this project. In addition, PERUMKA was completely privatized in 1999, and became the railway company (PT.KAI).

However, the Railway Law No. 13, Article 8 (taken effect in 1992) stipulates that the government shall be responsible for maintenance as the owner of railway infrastructure including bridges. Accordingly, a system is in place whereby the government takes full responsibility for bridge maintenance.

2.5.1.3 Financial status

With the exception of station buildings, principal railway infrastructure facilities are government assets, while other facilities are PT.KAI's assets. PT.KAI pays lease fees to the government for government assets, but the government provides a subsidy for operation and maintenance expenditures. Since the time of the appraisal, however, the actual amount disbursed for operation and maintenance have been consistently just about one-third of the amount required, and there are concerns about a shortage of operation and maintenance expenditures. However, if bridges are in an extreme state of deterioration, railway services cannot be provided at all, and budgetary measures have been taken for notably deteriorated bridges even under the severe budget constraint. Therefore, although it cannot be assumed that the bridges will become greatly deteriorated due to their financial status, it is imperative to have the Indonesian government and PT.KAI reacknowledge the importance of securing a budget for ongoing maintenance and daily checkups, because the purpose of maintenance is

essential to prevent deterioration[12].

2.5.2 Operation and maintenance status

Only a short time has passed since the repair of the railway bridges, so the condition of the bridges at the time of the ex-post evaluation was extremely good. As previously described, there were no speed restrictions or weight limits due to bridge deterioration. It was also confirmed that the bridge inspection and repair stations were sufficiently provided with equipment and spare parts. Although some bridges had not reached the final process of painting due to lack of budget, the final coating of paint is applied more for aesthetic effect than for protection of the bridge and is a low priority in terms of maintenance of the bridges.

Although not crucial matters, there are some problems associated with the North Line: (1) because the line runs along the coast, bridges are susceptible to salt damage, (2) bridges and their surroundings are used by many nearby residents as toilets[13], and (3) bolts are sometimes stolen[14]. Bridges may be vulnerable to those factors, and it should be noted that there are possibilities that maintenance costs would be bloated.

According to the executing agency, there have been cases where local governments have implemented development plans that might have had adverse effects on maintenance of the bridges without coordinating with the executing agency. (For example, by changing the flow of a river, the water level rose in a river on the outskirts of Pekalongan, and when the river became swollen, an excessive load could have been exerted on the bridge. Also, the local government of Bekasi[15] located in the suburb of Jakarta expanded the width of a river as a anti-flood measure while the bridge remained as it was.) The executing agency also shared their recognition that local government should better regulate actions of the local public that would be obstacle to bridge maintenance (e.g. removing bolts, disposing of wastes and dredging sediment from the river)[16].

[12] Since the time of being state-run, the financial status of PT.KAI has been consistently in deficit, but in FY1994, it turned a profit. In 2002, moreover, the company raised fares for executive and business classes and shifted to a management that emphasized profitability over quantitative expansion.

[13] Temporary toilets were installed around bridges on a trial basis but they were not used at all. Although it could be problematic in terms of health and hygiene, the cost of repairing bridges is lower than that of educating residents in terms of maintenance of the bridges.

[14] Some residents remove bolts for a joke, or with the intention of selling them.

[15] This section is not covered by this project.

[16] In addition to regulations, it is also necessary to teach residents that such behavior is dangerous and could lead to major accidents. However, poverty is a background factor lying behind such behavior by residents. If attention is given only to ignorance or low morale without addressing the poverty which is the real cause of these behavior, measures including regulations and education will have no effect.

3. Feedback

3.1 Lessons learned

When unfamiliar technology is introduced at the operational level, it is important for the executing agency to provide adequate explanations in advance, to coordinate with related agencies, to provide training to inspection and maintenance personnel, and to secure routes for procuring the equipment and materials needed for maintenance, and others.

3.2 Recommendations

Executing Agency: Development and training of inspection and maintenance personnel who handle bolts is necessary.

Executing Agency/Local Government: When the regional development plans of local government, such as river improvement projects, may have an impact on bridge maintenance, the executing agency and local government should better coordinate in advance.

Comparison of Original Plans and Actual Outputs

Item	Planned	Actual
(1) Outputs 1) Bridge restoration	Phase 1: 35 bridges Phase 2: 100 bridges Repaired Phase 1: 112.00 tons Phase 2: 403.00 tons Replaced Phase 1: 340 tons Phase 2: 1,210 tons Painted Phase 1: 29,215m^2 Phase 2: 111,734 m^2	As planned 138 bridges 280.73 tons 808.10 tons 785.42 tons 867.70 tons 11,617 m^2 N.A.
2) Restoration of inspection and repair stations	6 locations	Virtually as planned
3) Consulting Service a) Foreign b) Local	Phase 1: 65MM Phase 2: N.A. Phase 1: 82MM Phase 2: N.A.	128.5MM 221.0MM 325.0MM 666.0MM
(2) Project Period	Phase 1: October 1992-April 1998 Phase 2: December 1995- September 2002	October 1992-August 2001 December 1995-March 2004
(3) Project Cost Phase 1 Foreign currency Local currency Total ODA Loan Portion Exchange rate Phase 2 Foreign Currency Local Currency Total ODA Loan Portion Exchange rate	 2,275 million yen 1,61 million yen (25,16 million Rp) 3,885 million yen 3,302 million yen 1Rp＝0.064 yen (as of April 1992) 3,515 million yen 3,375 million yen (74.997 million Rp) 6,809 million yen 5,857 million yen 1Rp＝0.045 yen (as of April 1995)	 2,395 million yen 1,09 million yen (65,54 million Rp) 3,485 million yen 3,057 million yen 1Rp＝　0.017 yen (1993 average-2001 average) 4,889 million yen 1,205 million yen (89,467 million Rp) 6,094 million yen 5,851 million yen 1Rp＝0.013 yen (1997 average-2003 average)

Analysis of “effectiveness” and “impacts” in this report

(1) Ensuring train operation

Railway bridges do not function without railway track; one could say that bridges are a part of the railway track. The railway tracks and bridges complement each other and together can contribute to railway operation. This project and the track repair project in the earlier phases also complemented each other and together generated major effects. Greater effects were realized by implementing both projects than would be produced by simply adding the effects that would be obtained by repairing the bridge or the track seperately. These additional effects cannot be clearly separated into effect produced by repairing the bridge or effect produced by repairing the track.

There was considerable overlap among the track repair project in the earlier phases, this project and the double-tracking project (a type of track improvement project) that started along the way, and it is difficult to evaluate these separately as individual projects. The track repair project also included bridge repairs, and bridge repair also included double-tracking work. Track and bridges can not be detached from each other, and there was also overlap among these projects.

In this ex-post evaluation report, what was directly produced by the bridge restoration project is considered to be only “removing obstacles to railway operation caused by deterioration of bridges.” Only after railway operation is secured through bridge restoration can the discussion begin about safety or punctuality. If there is no railway operation, it is pointless to argue about safety or punctuality. The objective of this project was removing the operational disruptions caused by bridge deterioration.

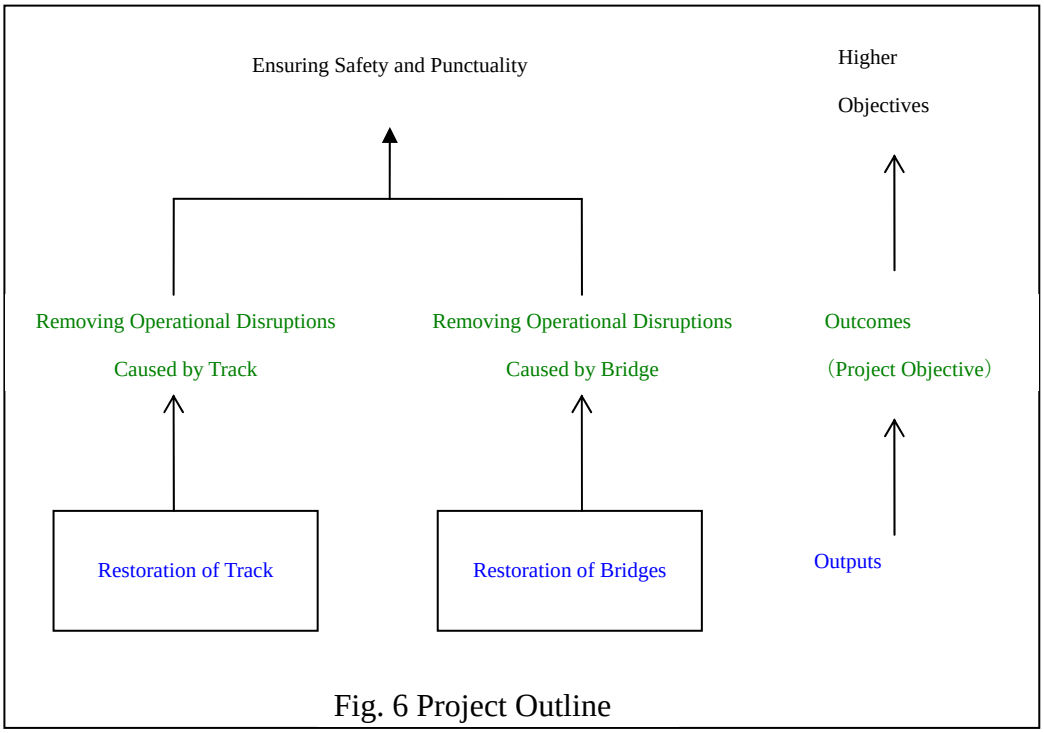


Fig. 6 Project Outline

Under this evaluation policy, the fact that speed-restricted sections caused by bridge deterioration were entirely removed is an indicator for evaluating the effectiveness of this project. In the calculation of EIRR, magnitude of eliminating time loss due to speed restrictions was considered a major benefit.

(2) Expanding transportation capacity

Bridge restoration includes both reinforcement and repair.

(a) Repair: To restore strength at time of design

(b) Reinforcement: To boost strength to a degree above that planned at the time of design

In (1) above, the explanation was made with it being anticipated that only repair work would be done; however, in this project, reinforcement work was performed in order to satisfy the 1921 regulation that all bridges should be built with a design load of 20 tons. Therefore, a more accurate definition of the objective of this project would be “to ensure the operation of the North Line together with expanding transportation capacity.”