Turkmenistan

Railway Transportation Modernization Project

External Evaluator: Takako Haraguchi

Field Survey: September 2006

1. Project Profile and Japanese ODA Loan

Map of project area

Exterior of Locomotive Repair Workshop

1.1 Background

In Turkmenistan, which is characterized by the great Garagum Desert in its central region, the railway is an important means of transportation that connects major cities in the east and west. At the time of appraisal, the land transport system including the roads had been designed in accordance with the centrally administered distribution and allocation policy of the Soviet era; this land transport system was part of the vertical structure that connected Moscow with each of its republics. For this reason, the construction of transportation routes to the surrounding countries lagged behind, creating a bottleneck in Turkmenistan's economic growth.

The railway is non-electric and uses diesel locomotives. When the Soviet Union dissolved, the railcars owned by the Soviet Railway were divided among the national railways of each country, but over half of the locomotives (331) distributed to Turkmenistan Railways were manufactured prior to 1970 and so were markedly aged. As domestic facilities for inspecting and repairing locomotives, there were the repair workshop in the capital city of Ashgabat and five locomotive and railcar depots which conducted simple spot-checks, but there was no facility for conducting major repairs. Consequently, Turkmenistan Railways consigned major repairs to Ukraine, etc., which meant that service required time.

Moreover, the rail transport system was centrally managed in Tashkent (now Uzbekistan) during the Soviet era; however, following independence, each country began to manage its own system, and in Turkmenistan, the management centers were dispersed in multiple locations. Furthermore, as the system had reached an advanced age,

inefficiencies had unavoidably crept into railway management.

1.2 Objective

The project's objective is to promote improvement in the locomotive inspection and repair capabilities in Turkmenistan and to promote safe and efficient operation of the railway transport system by improving the Ashgabat Locomotive Repair Workshop and the railway management system, thereby contributing to economic development by increasing the railway transport capacity.

1.3 Borrower/Executing Agency

State Bank for Foreign Economic Affairs of Turkmenistan (guaranteed by the Government of Turkmenistan)/Turkmenistan Railways (currently Ministry of Railway Transport of Turkmenistan)

1.4 Outline of Loan Agreement

Loan Amount/Loan Disbursed Amount	4,505 million yen/ 4,477 million yen
Exchange of Notes/Loan Agreement	September 1997/December 1997
Terms and Conditions -Interest Rate -Repayment Period (Grace Period) -Procurement	2.7%(consultant portion: 2.3%) 30 years (10 years) General untied
Final Disbursement Date	March 2004
Main Contractors	ITOCHU Corporation(Japan), DAI NIPPON CONSTRUCTION(Japan)
Consultant Services	Pacific Consultants International(Japan)
Feasibility Study (F/S), etc.	1996, JBIC

2. Evaluation Results (Rating: A)

2.1 Relevance (Rating: a)

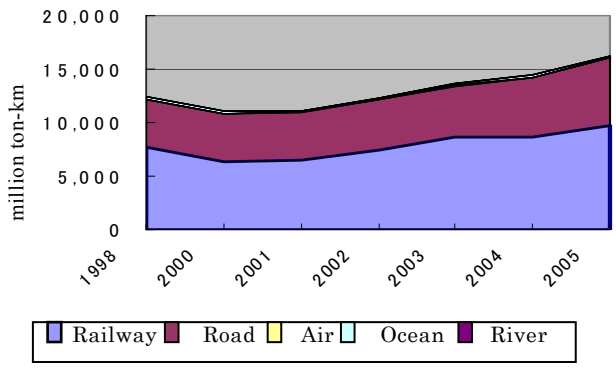
It was confirmed that the objective of the project is consistent with the policy and needs of the Turkmenistan government, and thus it was determined that the project has high relevance.

2.1.1 Relevance in relation to Turkmenistan's development policy and development measures

The project objective has relevance as an integral part of Turkmenistan's development policy and measures. At the time of the appraisal, enhancement of the railway network was stated as one of the most important priorities in the National Development 10-year Plan prepared by the president in 1994. At the time of the ex-post evaluation, the Strategy of Social-Economic Transformations in Turkmenistan by 2010 prepared by the president in 1997 was positioned as the national development plan. Within that strategy, in the investment plan for renewal and upgrading the railway sector by 2020, the major investment areas were stated as (1) construction of new tracks and repair of existing tracks, (2) electrification of the railway, and (3) an efficient communications system, and this project is clearly identified as a project for those purposes. Moreover in the same plan, a scheme was stated for progressively renovating the locomotives manufactured in the 1970s.

2.1.2 Relevance in relation to the needs of the railway sector

Figure 1: Trends in Various Means of Freight Transport



Source: Turkmenistan Statistical Yearbook

Accompanying the enhancement of the railway network, there was also a strong need for improvement of the railcars and the transport system, both at the time of the appraisal and at the time of the ex-post evaluation, and the relevance of this project is also acknowledged in this regard. The Turkmenistan Railways (operational lines) was extended from 2,268 km in 1996 (project appraisal) to 2,523 km in 2005 (year prior to ex-post evaluation). Following this project, one line to the Iranian border and two lines to the Uzbekistani border were newly opened. Moreover, as shown in Figure 1, the volume of freight transported by rail is in an uptrend. The railway has accounted for around 60% of the freight transport in recent years on a ton-kilometer basis (excluding pipelines for natural gas, etc.),[1] and ever since the time of appraisal, the

[1] The railway freight transport volume in 2005 was approximately 9.7 billion ton-km. The total freight transport volume was approximately 16.2 billion ton-km excluding pipelines, and 44.6 billion ton-km including pipelines (2005). Furthermore, according to the statistics collected at the time of appraisal, the railway's share of freight transport was 90%, but as this is not consistent with the trends seen in information

railway has consistently been the largest means of freight transport. Given this, considering that, as stated in "1.1 Background," the railcars, related facilities, and the transportation system had been aging since Turkmenistan's independence, there was a strong need for this project, which promotes strengthening of the railway transport capacity through rehabilitation.

Furthermore, the diesel locomotives which were the assumed targets of repair at the time of appraisal were manufactured by the former Soviet Union, but at the time of the ex-post evaluation, purchases of Chinese-made locomotives were underway.[2] In interviews at the locomotive repair workshop, it was said that the test equipment, etc., provided by this project was pointed out by China as being inadequate for inspection and repair of the Chinese-made locomotives which Turkmenistan is adding to its fleet. However, the details are unclear.

2.2 Efficiency (Rating: b)

The outputs of the project were achieved at or above the level originally planned, excluding a certain portion. The time required to achieve the outputs significantly exceeded the plan, but the project cost was less than the planned amount. So, the project may be rated as moderately effective.

2.2.1 Outputs

(1) Improvement of Ashgabat Locomotive Repair Workshop

The main plan at the time of appraisal called for introduction of a total of 68 pieces of equipment and machinery for (1) renovation of existing repair equipment which was aged (lathes, workshop cranes, etc.), (2) introduction of equipment for major repairs (railcar wheel lathes, crank journal grinder,[3] etc.), (3) introduction of machinery for manufacturing locomotive parts (electric furnace, etc.), and (4) improvement of the aged workshop building and spur tracks.

Looking at the actual results, the actual amount of equipment and machinery introduced was 92 pieces in total. Nearly all of the increase was due to work equipment that was added to enable more stable domestic manufacture of locomotive parts.

The building and facilities were improved basically as planned, but improvement of the 2 km spur line from the railcar depot to the repair workshop was excluded from the

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collected for the ex-post evaluation and in other railway surveys, it is appropriate to consider the share at the time of appraisal to have been 60%.

[2] The Ministry of Railway Transport of Turkmenistan, which is the executing agency, had signed an agreement to purchase 48 locomotives from China as of the time of this field survey and had already completed purchase of 7 locomotives.

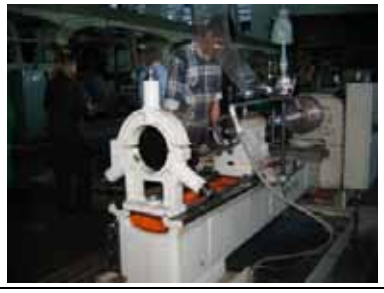
[3] The crank journal is the main shaft of the crankshaft (i.e., the part that changes the up-down motion of the pistons in the engine into revolving motion).

project because the Ministry of Railway Transport of Turkmenistan, which is the executing agency, undertook those improvements on its own.

Project output at the Ashgabat Locomotive Repair Workshop

Work area for diesel parts (crank journal grinder)

Machine work area (lathe)



Wheel assembly/disassembly work area (defect detector)

(2) Introduction of a computer system

The plan at the time of appraisal called for introduction of systems for (1) automatic ticket machines for passengers, (2) freight transport management, (3) train service management, and (4) office processing at the Computer Center to be built by the Ministry of Railway Transport of Turkmenistan, together with (5) the laying of approximately 600 km of optic fiber cable for communications. Looking at the actual results, the output was achieved basically according to plan, with the exception of (1) and (5).

Project output at the Computer Center of the Ministry of Railway Transport of Turkmenistan (Freight Transport Management System)

The automatic ticket machines for passengers in (1) above were excluded from the project because of incomplete development of the Russian system which was scheduled to be introduced. However, the Ministry of Railway Transport of Turkmenistan subsequently completed development and introduced the system on its own. Moreover, the optic fiber cable of (5) was excluded because the Ministry of Communication installed it separately.

Furthermore, at the time of the field survey, the Computer Center was located inside the main building of the Ministry of Railway Transport of Turkmenistan, but a new building funded by the ministry is under construction next door to house the Computer Center.

(3) Consulting services

Consulting services were implemented according to plan, including those related to basic design, detailed design, assistance with bid processing, construction management,

and review of accounting system and fee system. The amount of consulting services increased compared to the initial plan due to the extension of the project period (see next section).

2.2.2 Project period

The project period was initially planned from December 1997 to May 2001, a period of 3 years 6 months. The actual project period continued until February 2004, a period of 6 years 3 months (178% of plan). The main reasons were (1) the delay in consultant selection due to prolongation of negotiations on the content of consultant services and (2) the delay in equipment procurement because the inspection and repair equipment needed for the old locomotives being used in Turkmenistan was no longer being manufactured and so had to be specially ordered.

2.2.3 Project cost

Whereas the total project cost that was initially planned was 5,056 million yen (foreign currency portion: 4,505 million yen), the actual project cost was 4,939 million yen (foreign currency portion: 4,477 million yen). As stated above, the amount of procured equipment increased, but the total project cost was within the planned amount because part of the computer system was excluded from the project and because the procurement costs were restrained since equipment that was scheduled to be procured from Japan was procured from Russia and Ukraine.

2.3 Effectiveness (Rating: a)

Because it was confirmed that the project's output is being utilized and that the domestic capacity for inspection and repair of locomotives and the efficiency of railway transport system improved, the effectiveness of the project can be termed high.

2.3.1 Improvement of domestic capacity for locomotive inspection and repair

(1) State of utilization of project output

The state of operation of facilities and equipment provided by the project is good overall.[4]

[4] At the time of the field survey of the ex-post evaluation, the electric furnace used for manufacturing parts had not been operating due to the low capacity of the power supply facilities, and the Ministry of Railway Transport of Turkmenistan had just installed additional power transmission lines and a transformer. Subsequently power began to be supplied, and the electric furnace has been operating since January 2007.

(2) Results of TR-3 level inspections and repairs

The TR-3 level (see Box 1) was the highest level of inspection and repair conducted domestically in Turkmenistan prior to the project, and the Ashgabat Repair Workshop, which benefited from the project, is the only repair workshop capable of performing it, both before and after the project. The number of locomotives that have undergone regular TR-3 inspections and repairs at the Ashgabat Repair Workshop increased from 24 locomotives prior to the project to 70 locomotives in 2005 and 2006 (Table 1). According to the Ministry of Railway Transport of Turkmenistan, this figure is in accordance with the ministry's plan. Moreover, the time required for TR-3 was significantly reduced (Table 2).

Box 1: Types of Locomotive Inspections and Repairs

TO：Spot-check and cleaning without disassembly

- TO-1：Daily operation check
- TO-2：Every 48 hours, or every 24 hours of operation
- TO-3：Every 7,200 km traveled or every 17 days

TR：Spot-check and repair with partial disassembly

- TR-1：Every 29,000 km or every 2.3 months
- TR-2：Implemented at end of summer and end of winter
- TR-3：Spot-check and repair by removing the engine and rail truck from the body. Every 210,000 km or every 18 months.

KR：Major Refit. Spot-check, repair, and replacement with full disassembly.

- KR-1：Inspection by disassembling the engine and rail truck, etc. Every 680,000 km or every 4.5 years.
- KR-2：Overhaul. Every 1,360,000 km or every 9 years.

According to the repair workshop, while the renovation of the workshop was completed in 2004, as equipment procured during the project period was progressively brought into use, the number of locomotives inspected and repaired was already on the increase prior to project completion. Moreover, the reasons for the fact that the time required for inspection and repair has been reduced and the fact that the number of inspections and repairs continues to increase even after project completion is that, according to workshop personnel, (1) the workshop has become able to manufacture locomotive parts by itself, and the time required to procure parts from other countries has been reduced,[5] (2) the workshop personnel have become skilled in using the new facilities and equipment, and (3) work can be completed in a shorter time, as inspections and repairs of locomotives following the workshop renovation are easier compared to prior to the project.

[5] The results of locomotive parts manufacturing are stated in detail in Section (4). The workshop explained that, during the Soviet era, all parts could be ordered from Moscow, but following the dissolution of the Soviet Union, manufacturers became dispersed, and so even more time is required to procure parts from outside the country.

Table 1: Number of Locomotives Inspected and Repaired at the Ashgabat Repair Workshop

	1996	2003	2004	2005	2006
TR-3 Regular Inspection and Repair	24	47	60	70	70
Inspection and Repair Other than the Above (including TR-2 and below)	NA	NA	41	58	67

source: Ashgabat Locomotive Repair Workshop

Table 2: Time Required for TR-3 per Locomotive at the Ashgabat Repair Workshop

Days Planned by Ministry of Railway Transport of Turkmenistan (at appraisal)	1996	2005	2006
15 days	55 days	23.7 days	18.5 days

Source: Ashgabat Locomotive Repair Workshop

Inspection and repairs at the level of TR-2 and below is carried out in Turkmenistan basically at five railcar depots (which were not part of the project). However as shown on Table 1, some work at the TR-2 level and below is included in the repair work that is not part of the regular inspection and repair work conducted at the Ashgabat Locomotive Repair Workshop.

Furthermore, since the Ministry of Railway Transport of Turkmenistan does not release the number of operating locomotives and the number of necessary locomotives, it cannot be objectively judged whether the number of locomotives inspected and repaired following the project is adequate in terms of the demand for locomotive repair in Turkmenistan. However, the ministry explains that the necessary number of locomotives is in operation, and following the project, if necessary, idle locomotives can be repaired and put into operation.

(3) Results of KR level inspections and repairs (major refit)

At the time of the appraisal, the project planned to enable major refits (KR) of locomotives to be conducted domestically in Turkmenistan. The level of inspections and repairs currently conducted at the Ashgabat Repair Workshop is stated as up to the TR-3 level, the same as prior to the project, but according to workshop personnel, the inspections and repairs at the TR-3 level after the project cover 75% of the content of major refits (KR) (but are not called KR because 100% of the KR content is not covered). The 25% that cannot be conducted using the workshop's facilities includes repairs of electronic circuits and body frames, etc., but in cost calculations at the time of detailed

design, it was found that purchase of new parts was cheaper than introducing repair equipment, and so maintenance of such equipment was excluded from the project. Consequently following the project, major refits (KR) have in effect been carried out by making repairs at the workshop and by purchasing new parts as necessary. Moreover, no repairs have been conducted on consignment to other countries (such as Ukraine) as was done prior to the project, because due to this project, major refits (KR) can now be carried out domestically.

(4) Results of locomotive parts manufacture

As shown in Table 3, following the project, the types of parts that the Ashgabat Repair Workshop can manufacture significantly increased, to reach 46 types of parts that can be reprocessed (by grinding, repairing, etc.) and 154 types of parts that can be newly manufactured. This is equivalent to 100% of the parts required for the TR-3 level and 75% of the parts required for the KR level. The number of each part type manufactured varies from a few dozen to several hundred per year. Moreover, the parts required at the railcar depots, which conduct a lower level of inspection and repair, are manufactured and sold by the Ashgabat Repair Workshop upon order. The efficiency of inspection and repair at the railcar depots has improved due to the fact that the ordered parts are delivered quickly.[6]

Table 3: Locomotive Parts Manufactured by the Ashgabat Repair Workshop

	Before Project	After Project (2006)
Reprocessing of existing parts	22	46
Manufacture of new parts	58	154

Source: Ashgabat Locomotive Repair Workshop

There appears to be no problem in the quality of the parts because they are tested to see if they meet the quality standards using the various types of test equipment procured by the project.

2.3.2 Smooth and efficient operation of the rail transport system

It was confirmed in the field survey of the ex-post evaluation that the computer equipment provided by the project is being utilized.

The train service management system was switched from management by region prior to the project to centralized management at the Computer Center in

Locomotive departing Ashgabat Station

[6] The railcar depot in Ashgabat was visited as part of the field survey. In the work area, there were many parts ready to be sent to the Locomotive Repair Workshop for grinding and repair as well as many parts that had undergone such treatment and been returned. That day as well, certain parts were ordered in the morning and were scheduled to arrive on the evening of the same day.

Ashgabat. It became possible to switch all signals and points from the Computer Center. Due to the automation of the system, the area that can be handled by a single operator increased from one section (220 km) prior to the project to two sections (440 km) following the project.

The content of the freight transport management system basically has not been altered since prior to the project, but the staff in charge of the system at the Ministry of Railway Transport of Turkmenistan noted that, in addition to automating portions which had been manual, the system had been stabilized by renewing the mainframe and introducing a backup power source. This system is used to constantly monitor the freight train service of neighboring countries as well. Moreover, the Ministry of Railway Transport of Turkmenistan itself developed and is operating a passenger service management system (i.e., the automatic ticket machine system that was not part of this project) based on the freight system.

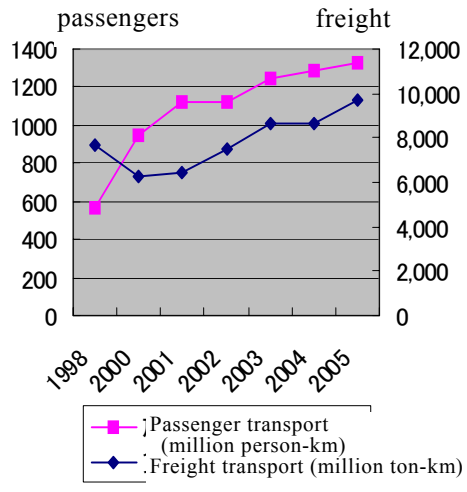
The optic fiber cable that was excluded from this project was installed separately by the Ministry of Communication, but the cable is not used for the rail transport system. The reason given was that the cable usage fee is too expensive. Currently, communications are conducted with large train stations through LAN using telephone lines and with small train station using telephones, and it was said that there are no particular problems.

However, adequate data could not be collected to determine whether or not this resulted in improvements in the timeliness and safety of train service, limits on speed and weight, accounting system, and fare system.

2.3.3 Recalculation of economic internal rate of return (EIRR)

The EIRR was recalculated, assuming the expense of the renovation and the operation and maintenance of the Ashgabat Repair Workshop and assuming the benefit (i.e., the reduction of the expense since consignment of repairs to other countries stopped).[7] In calculating the benefit, it was impossible to specify, from the data collected, the demand for locomotives and the number of locomotives in operation at the time of the

Figure 2: Trends in Rail Transport Volume



Source: Turkmenistan statistical yearbook

[7] The financial internal rate of return (FIRR) was not calculated at the time of appraisal. At the time of the ex-post evaluation, an attempt was made to collect the data necessary for calculation, but calculation was abandoned because adequate financial data could not be obtained.

ex-post evaluation. Consequently, the benefit was calculated by assuming that the purchases of new locomotive estimated at the time of the appraisal[8] had occurred. Whereas the EIRR at the time of appraisal was 13%, the figure when recalculated was 17.9%. It appears that the recalculated figure is higher than the figure at the time of appraisal due to an increase in the real value of the benefit, as a result of steady economic growth due to strong exports of natural gas in recent years.

2.4 Impact

It can be surmised that the repair of locomotives and the improvement in the rail transport system realized by the project contributed to the reinforcement of rail transport (particularly freight transport). However, the impact on economic development could not be quantitatively verified.

2.4.1 Economic development through reinforcement of the rail transport capacity (degree of achievement of this goal)

(1) Increase in rail transport volume

As shown in Figures 1 and 2, Turkmenistan's rail transport volume is in an uptrend. Moreover, according to sources in the Ministry of Railway Transport of Turkmenistan, the Ashgabat Repair Workshop, and railcar depots, train delays due to slowness of locomotive repairs particularly affected freight transport prior to the project (i.e., to minimize delays of passenger trains, freight locomotives were diverted to passenger trains, and freight trains were delayed instead), but the problem was alleviated following the project, and freight transport became efficient.

Due to lack of data, it was difficult to quantitatively specify the correlation between the above-mentioned trends and this project. However, it may be said that by enabling locomotives to be repaired as planned, the project provided essential support for the reinforcement of rail transport.

(2) Economic development

Because the facilities and equipment installed by the project are used in Turkmenistan's nationwide rail network, the beneficiary area is considered to be the entire country. Looking at the economic growth trends before and after the project, the annual average of the real GDP growth rate from 1999 to 2005 was strong, at 12.2%.[9] Moreover, the real GDP growth rate in 2005 was estimated at 21.4% by the Turkmenistan government and at

[8] The number of locomotives in operation according to this estimate was 186 locomotives in 2005 and 320 locomotives in 2020.

[9] World Bank data

9.6% by the World Bank.

Regarding trends in exports, during 2003 to 2005 exports displayed growth of 20% to 30% on average each year,[10] but this is thought to be due mainly to the rise in the international price of natural gas (Turkmenistan's leading export product). Because natural gas is exported via a pipeline, the impact on the increase in exports via rail transport cannot be verified.

2.4.2 Environmental impact

As environmental measures scheduled at the time of the appraisal, it was planned to take water pollution countermeasures by using the existing waste oil treatment facility and to take air pollution countermeasures by installing a soot removal device, at the Ashgabat Repair Workshop. At the time of the field survey, it was confirmed that the waste oil treatment facility was being used as planned. With regard to the soot removal device, according to the repair workshop, information was obtained that the device scheduled for purchase was not functioning properly in other countries, and so the purchase was cancelled. However, water quality and soot monitoring is conducted annually by the repair workshop and the Ministry of Environment based on an Environmental Management Plan (EMP), and given that the monitoring results satisfy Turkmenistan's domestic standards, no particular problem exists. According to the repair workshop, the environmental impact has actually been lightened due to the modernization of the facilities.

2.5 Sustainability (Rating: a)

No significant problems are visible in the technical capacity, operation and maintenance system, or financial status of the executing agency. Since it was confirmed that improvement are being made in the project's facilities and equipment following the project, the sustainability of the project is judged to be high.

2.5.1 Executing agency

2.5.1.1 Technical capacity

(1) Ashgabat Locomotive Repair Workshop

The number of staff at the repair workshop increased from 260 persons at the time of appraisal to 440 persons at the time of the ex-post evaluation.[11] Of these, 118 persons are engaged in operation and maintenance of the project's facilities and equipment. The

[10] Turkmenistan Statistical Yearbook

[11] The number of repair workshop staff is said to be adjusted annually depending on the number of locomotives scheduled for inspection and repair.

majority of the staff has been employed at the repair workshop continuously since before the project, and no problem has been detected in the technical capacity for operating the equipment.

Ten persons are in charge of overhauls of machine tools (6 mechanical engineers and 4 electrical engineers), and all machinery-related repairs are conducted by the repair workshop staff (except for some electric system repairs which are outsourced).

Staff training is essentially conducted through on-the-job training provided by the senior engineers. The design and the usage of the training system and the training manual are satisfactory.

(2) Computer system (Ministry of Railway Transport of Turkmenistan)

During the project, the consultant provided training for the system engineers and the operators, and the staff that received training continues to carry out the operation of the system. According to interviews with Computer Center staff, because the system basically has not changed compared to prior to the project, they have no problem operating it.

The above-mentioned staff is conducting the system's daily maintenance, and no particular problems have been indicated. However, the Ministry of Railway Transport of Turkmenistan maintains that new training is necessary for the staff of the ministry to conduct system maintenance following the expiration of the warranty.

2.5.1.2 Operation and maintenance system

In 2003, the Turkmenistan Railways (under the jurisdiction of the Ministry of Transportation and Communication), which was the project's executing agency, was reorganized as the Ministry of Railway Transport of Turkmenistan, but there was no change in the railway's operating system. The Ashgabat Repair Workshop is operating in accordance with the annual plan for locomotive inspections and repairs prepared by the Ministry of Railway Transport of Turkmenistan; however, its budget is independent and it receives no subsidies from the ministry.[12] The Computer Center is positioned as a post in the Ministry of Railway Transport of Turkmenistan.

At the current point in time, there is no plan to privatize railway operations.

2.5.1.3 Financial status

The financial statements of the Ministry of Railway Transport of Turkmenistan are not publicly disclosed, but it appears that the ministry has the necessary budget to operate and maintain the benefits of the project, given that Turkmenistan's government revenue and

[12] The Ministry of Railway Transport of Turkmenistan makes the payments in foreign currency to purchase locomotive parts, but the repair workshop pays the ministry an equivalent amount in local currency.

expenditure have been consistently in the black,[13] that the Ministry of Railway Transport of Turkmenistan is constructing new tracks and renovating some railcars in accordance with the investment plan for renewal and upgrading the railway sector by 2020 mentioned in "2.1 Relevance," and that the ministry's facilities and the Computer Center's equipment have also been renovated since the project completion.

Electric Furnace which began operating in 2007

Although limited data was obtained for the Ashgabat Repair Workshop, which is self-supporting, there appear to be no significant problems. As shown in Table 4, profit from railcar inspection and repair declined in 2005, but in addition to maintaining a surplus, the repair workshop is also earning a profit from manufacture and sale of parts by using the equipment procured by the project.[14] Moreover, part of the budget for railcar inspection and repair is deposited in an equipment repair fund. The repair workshop's cost management is in good condition, as it is recording details even for small parts.

Table 4: Income and Expenditure of the Ashgabat Locomotive Inspection and Repair Workshop

unit: 1,000 manats (1,000 dollars in parenthesis)

	2004	2005
Income from railcar inspection and repair	26,345,929（5,067）	34,991,070（6,729）
Expenditure for railcar inspection and repair	25,174,151（4,841）	34,931,971（6,712）
Deposit in Equipment Repair Fund	583,294 （112）	101,782 （20）
Balance of railcar inspection and repair	1,171,778 （225）	59,099 （11）
Balance of manufacture and sales of locomotive parts	N.A.	202,991 （39）

Note: Figures were converted to dollars at the rate of $1 = 5,200 manats.

source: Ashgabat Locomotive Repair Workshop

2.5.2 Operation and maintenance status

The operation and maintenance status is satisfactory at the Ashgabat Repair Workshop,

[13] According to the Turkmenistan Statistical Yearbook, annual revenue was approximately 14.26 trillion manat in 2004 and 18.28 trillion manat in 2005. Annual expenditure was approximately 14.25 trillion manat in 2004 and 18 trillion manat in 2005 (the official exchange rate was 5,200 manat to the dollar). In 2005, tax revenue accounted for approximately 68% of the annual revenue.

[14] In addition to inspection and repair of railcars and manufacturing and sales of parts, the repair workshop personnel said that workshop also earns income from materials tests and strength tests of parts carried out using equipment procured by the project, but the amount of the income could not be obtained.

excluding the crankshaft test equipment.[15] As stated in "2.3 Effectiveness," the electric furnace that was stopped due to lack of electric power capacity began operation in January 2007. However, as mentioned in "2.1 Relevance," in order to inspect and repair the Chinese-made locomotives purchased following the project, further enhancement of the repair workshop facilities is likely to be required.

With regard to the computer system, some monitors procured by the project already malfunctioned and have been replaced by liquid crystal monitors funded by the Ministry of Railway Transport of Turkmenistan. However, there appear to be no particular problems in the condition of the system.

3. Feedback

3.1 Lessons Learned

To increase the sustainability of the effects of the improvement in the railcar repair workshop, it is desirable when doing the design to keep in mind the potential for renovation of railcars over the long term. That is to say, when there is to be a change in the model of locomotives in the future as was the case in this project, it would be advisable to make an adequate study beforehand regarding the facilities in the inspection garage, or to provide a design and arrange a budget so that the facilities can be expanded in the future.

3.2 Recommendations

Recommendation for the Ministry of Railway Transport of Turkmenistan and Ashgabat Locomotive Repair Workshop:

It is desirable to conduct a study and, based on the study results, to invest in facilities and equipment in order to handle inspections and repairs of the Chinese-made locomotives which are being newly purchased.

[15] The crankshaft test equipment that was delivered could not be used because it was defective from the beginning. Following the project completion, it was repaired by the manufacturer in Ukraine but as of March 2007 still was not operating satisfactorily. The repair workshop explained that, due to this, precision tests of crankshafts must be done manually, which slightly lowers the precision.

Comparison of Original and Actual Scope

Item	Plan	Actual
1.Output		
1) Renovation of Locomotive Repair Workshop	Introduction of 68 pieces of equipment and machinery (Renovation of existing repair equipment, introduction of machinery for major refitting, introduction of equipment for manufacturing locomotive parts), improvement of workshop building, spur lines, etc.	Basically according to plan, except for the following: -Introduction of 92 pieces of equipment and machinery -Cancellation of spur line improvement
2) Introduction of computer system	Automatic passenger ticket machine system	Cancelled
	Freight transport management system	As planned
	Train service management system	As planned
	Office processing system	As planned
	Optic fiber cable- 600km	Cancelled
3) Consultant services	Foreign: 119MM Turkmenistani: 258MM	Foreign: 120MM Turkmenistani: 324MM
2. Project Period		
1) L/A signing	July 1997	December 1997
2) Consultant selection	August 1997-December 1998	January 1998-Nov 1998
3) Detailed design	January 1998-June 1998	December 1998-August 1999
4) Bidding, Contracting	July 1998-June 1999	September 1999-Oct 2000
5) Main construction	July 1999-May 2001	January 2001-Feb 2004
3. Project Cost Foreign currency	4,505 million yen	4,477 million yen

Local currency	551 million yen (4.80 million dollars)	462 million yen (9.96 million manats)
Total	5,056 million yen	4,939 million yen
Japanese ODA Loan Portion	4,505 million yen	4,477 million yen
Exchange rate	1 dollar ＝114.87 yen (as of September 1997)	1 manat＝46.39 yen (average of 2000 to 2004)