

## Summary of Terminal Evaluation

<b>1. Outline of the Project</b>	
<b>Country:</b> Republic of the Union of Myanmar	<b>Project Title:</b> The Project on Improvement of Service and Safety of Railway in the Republic of the Union of Myanmar
<b>Issue/Sector:</b> Transportation-Urban Transportation	<b>Cooperation Scheme:</b> Technical Cooperation
<b>Division in Charge:</b> Team 2 Transportation and ICT Group, Infrastructure and Peace Building Department	<b>Total Cost:</b> 385 million yen
<b>Period of Cooperation:</b> From May 2013 to March 2016 (Two years and 11 months, including 10 months extension)	<b>Partner Country' s Implementing Organization:</b> Myanma Railways (MR), Ministry of Rail Transportation
	<b>Supporting Organization in Japan:</b> N/A
<p><b>1-1 Background of the Project</b></p> <p>The Republic of the Union of Myanmar has a totally non-electrified meter-gauge railway network spreading as long as 5,934 km. Most of the network is single-tracked, with double-tracked sections limited to (1) the Yangon-Mandalay section (approximately 620km in length) crossing the central plain and (2) urban railway lines centering on the Yangon circular section. The annual number of passengers was 53.8 million (or approximately 147,000 per day) as of fiscal 2012. The MR (Myanma Railways) under the Ministry of Rail Transportation as fully state-owned enterprise centralizes all aspects of its management, from construction, operation, and maintenance.</p> <p>In recent years, MR and Ministry of Rail Transportation have come to recognize the importance of maintenance/repair of existing lines in reflection of past practices. In the past, MR invested more than half of the budget in the construction of new railway lines, with only a small portion appropriated for the renewal of existing facilities and equipment. As a result, MR has been facing crucial challenges on how to recover the deteriorated safety level and passenger services. Those phenomenon resulted in the occurrence of 118 accidents for 2011/2012 in Yangon-Mandalay section, whose causes are attributable to tracks (50%), rolling stock (29%) and others (21%) respectively.</p> <p>In relation to the level of service, a number of governing factors are required to be addressed, including train speed, punctuality, comfort (ride comfort, cleanliness in the passenger room) and fare and charge. The scheduled speed between Yangon and Mandalay is as low as 39km/h, with train speed limited at various points. The on-time operation rate of express passenger trains in the same section is as low as 41% for the consecutive three years. Furthermore, 59% of the services were delayed for improper track conditions and 22% by malfunction of rolling stock. This means that train delay is caused mostly by deteriorated tracks that also produce severe train vibration, which degrades vehicle comfort.</p> <p>Such background led to the planning and implementation of the Project as described in 1.2 Project Overview.</p>	

## 1.2 Project Overview

### (1) Overall Goal of the Project:

Service and safety level of Myanmar Railways is improved.

### (2) Project Purpose:

Administration and maintenance ability is improved for the enhancement of service and safety of Myanmar Railways.

### (3) Outputs

- 1) Issues are clarified for the enhancement of service and safety in the administration and maintenance process, and the improvement plan is drawn.
- 2) Technical capability is improved through emergency track maintenance to improve the level of service and safety.

### (4) Inputs (As of the Terminal Evaluation)

#### Japanese side:

- Japanese Experts: A cumulative total of 27 Experts (79 M/M, inclusive of 8.52 M/M supported by the dispatch company of the Japanese Experts)
- C/P Training in Japan: A total of 33 C/Ps
- Equipment: Japanese Yen (JPY) 62 million (Approximately USD 0.52 million)
- Operational Expenses: USD 315,739 equivalent (JPY 37,983,400)

#### Myanmar Side:

- C/Ps: 1 Project Director, 1 Project Manager, MR staff in the cumulative total of 19 personnel
- Facilities: Office space for the Experts, and temporary dormitory facility for the trainees
- Operational Expenses: Necessary operational costs of Project activities including expenses for Pilot Site work and materials, and C/P travel

## 2. Evaluation Team

<b>Members of Evaluation Team (Japanese side)</b>	[Leader]	Ms. Satoko Tanaka, Team 2, Transportation and ICT Group, Infrastructure and Peace Building Dept., JICA HQ
	[Evaluation Planning]	Mr. Yusuke Taguchi, Team 2, Transportation and ICT Group, Infrastructure and Peace Building Dept., JICA HQ
	[Evaluation Analysis]	Dr. Maki Tsumagari, IMG Inc.

**Evaluation Period:** January 18th to 29th, 2016

**Type of Evaluation:** Terminal Evaluation

## 3. Results of Evaluation

### 3.1 Confirmation of Results

#### (1) Achievements of Outputs

All the indicators set for Output 1 (“Issues are clarified for the enhancement of service and safety in the administration and maintenance process, and the improvement plan is drawn”) have been met by the time of the Terminal Evaluation and thus Output 1 is achieved.

Regarding “OVI 1-1. System for collecting information of track, rolling stock, signal and communication, and operation is established”, in order to collect relevant information, Project established Counterpart Team consisting of key managerial as well as technical members drawn

from both Japanese and Myanmar side, structured in matching pairs. In addition, two experts visited MR Headquarters and three rolling stock workshops for facts finding in August and September, 2013. Based on these results, “Present Situation of Safety and Service Level of MR” was compiled to guide further process for this Output.

On “OVI 1-2. Safety issues are listed based on the investigation and analysis of cause of accident”, Project organized a workshop during the cause and analysis training conducted from February 10 to 28, 2014, where 25 topics relating to accidents and low service levels were selected.

With respect to “OVI 1-3. Service issues are listed”, following the cause and analysis training of February 10 to 28, 2014, Project conducted questionnaire survey on customer satisfaction in order to clarify areas and levels of dissatisfaction which should be improved.

Likewise, on “OVI 1-4. Service and safety improvement plan is drawn so as to tackle the issues”, after the discussions among the Project concerned people, “Revised Report of Proposal of Recommendation on Technical Standards of MR and Short-, Medium-, and Long-Term Railway Facilities Improvement Plan” was prepared.

All the activities that have been planned under Output 2 (“Technical capability is improved through emergency track maintenance to improve the level of service and safety”) have already been conducted by the time of Terminal Evaluation in a way to significantly exceed the indicators set forth, and thus Output 2 is also achieved.

On “OVI 2-1. Technical transfers are made effectively at each measure (targeted numbers of technical staff 30 persons)”, approximately 20km Pilot Section in the 46.5 mile section (74.8km long) between Yangon and Bago on Yangon-Mandalay line was selected for technical transfer, and the Project conducted comprehensive training program for a batch of 30 trainees from the end of October, 2013 to mid-May, 2014. The Project then enlarged the scope of Pilot Section to provide training to more staff, by re-programming the contents and timing to fit into one month program. Finally, the number of the training graduates increased to 574.

In connection with “OVI 2-2. Working manual of emergency track maintenance is prepared”, Japanese experts summarized the points of reflection through the whole maintenance work and compiled into a set of three maintenance manuals, (1) Safe Work Manual, (2) Track Work Manual, and (3) Measurement for Track Manual (English and Burmese).

Likewise, “OVI 2-3. Proper equipment and materials are procured both qualitatively and quantitatively”, equipment and materials were selected based on careful analysis of the prevailing situations/conditions in Myanmar.

Finally, on “OVI 2-4. Counterpart personnel acquired necessary proficiency through seminars (3 times), training (3 times) for technical improvement on the rail maintenance and others”, three combined cycles of (1) seminars and (2) training have been conducted. Japanese experts confirmed through actual work on Pilot Section that the trainees had obtained necessary techniques.

## (2) Prospect for Achieving the Project Purpose

The Project Purpose (“Administration and maintenance ability is improved for the enhancement of service and safety of Myanma Railways”), as determined by the indicators, has been met as

stated below:

On “OVI 1. Accident cause analysis and countermeasures to prevent the similar accidents, and means to improve service levels are established and executed, and inherited by MR,” training program to guide MR staff to familiarize with techniques on cause of accident and low service level analysis and establishment of countermeasures was conducted from February 10 to 28 in 2014 at MR Headquarters (“HQ”), participated by 19 senior staff drawn from track maintenance, civil works, signaling, rolling stock and train operation divisions as well as from MR HQ. The training consisted of three parts: (1) classroom lecture with textbooks prepared by the Experts; (2) workshop, (3) training of vibration measurement of rolling stock. Following the training, in order to find areas for improvement on service level, interview survey to investigate customer satisfaction level of MR passengers was also conducted. Although the result showed its satisfaction level was low in general, areas with low satisfaction level was specifically figured out, and the improvement plan was drawn. On-site interviews of the Terminal Evaluation confirmed that the manuals prepared by the Project are now referenced for day-to-day practices mainly by inspectors. In addition, these manual sets serve as review materials for them to prepare for refresher exams they sit every two years. Judging from this, the manuals are expected to be continuously referenced and inherited in MR.

On “OVI 2. Administrative and managerial capacity of track maintenance is improved, and improved level is kept by MR,” the interviews conducted for Terminal Evaluation at the Pilot Section with the Project trainees endorsed that the Project introduced track maintenance techniques (using Project provided equipment) and safety culture (such as conducting visual check for safety, and wearing of safety gears like helmet, safety boots, safety vest) have been rooted into the track maintenance routines of the staff trained. From now on, the graduates of the training will return to their duty stations and disseminate track maintenance techniques and safety culture to all the areas of MR, so that administrative and managerial capacity enhanced by the Project is most likely be maintained by MR.

As mentioned above, the manuals for improving service level are referenced in their daily work, and track maintenance techniques and safety culture have roots in the day-to-day practices. Moreover, they are expected to continuously maintained, so that it can be concluded that administration and maintenance ability was strengthened for the enhancement of service and safety of Myanmar Railways.

### (3) Prospect for Achieving the Overall Goal

The word “present” in the indicators is assumed to refer to 2013, the year of PDM revision to PDM2. Thus, prospect of achieving the Overall Goal within three to five years after the completion of the Project must be determined based on the comparison of the corresponding figures of two time horizons at the minimum, the data of 2013 and the latest available at the time of Terminal Evaluation. Although the Terminal Evaluation Team requested the latest available data for these three indicators, such data has not been provided during the Terminal Evaluation interview. Without the availability of such dataset, the prospect of achieving the Overall Goal cannot be determined at

this stage. Nevertheless, given importance of these three indicators to measure safety/ service level of the operation, it is strongly recommended that MR keeps these records available.

### **3.2 Summary of Evaluation Results**

#### **(1) Relevance: High**

The relevance of the Project is evaluated as high based on its close alignment with (1) the Government policy of the Republic of the Union of Myanmar, (2) strategic plan/direction of Myanmar's rail transport sector, (3) the Japan's ODA Policy, and (4) comparative empirical and technological advantage of Japan's cooperation.

#### **(2) Effectiveness: High**

The effectiveness of the Project is assessed as high, for having already met the Project Purpose as per the determined indicators based on solid results that were materialized through Output 1 and Output 2.

The achievement of the Project was derived by a balanced combination of Japanese equipment and machinery selected for applicability for the technology transfer to Myanmar and the high technical expertise of the Japanese Experts who also possess compassionate characters. As Project Director noted in the Terminal Evaluation interview, this Project has been one of the kind MR had never experienced, and thus the results are directly attributable to the Project.

While the Project framework was well structured to develop associated technical skills through both theoretical (in seminars) and practical (both at non-operating track and actual OJT work) along with compilation of knowledge products (such as manuals), additionally, the Project benefited from support of other parties. One such example is a donation of rails by a Japanese steel manufacturer to MR installed on Yangon - Mandalay Line. It provided the Project an opportunity to check their strengthened, more technology oriented skills built through the Project.

#### **(3) Efficiency: High**

The Efficiency of the Project is evaluated as high in view of the four dimensions of Input-Output relationships that the Project managed for results.

##### **1) Causality of Inputs and Outputs**

The scope and the type of technical transfer (i.e. on mechanized track maintenance) was new to the C/P, and without the Project it would not have been introduced to MR. For that matter, there was direct cause and effect relationship between Project inputs and outputs.

##### **2) Achievements of Prerequisites**

The important assumption set for the Project at the launch that is "The Government support to the MR, especially financial support is secured," held to support the Outputs to be produced.

##### **3) Appropriateness of Inputs by Japan**

The planned input was procured to support effective implementation of the Project. Regarding Japanese Experts, in order to address very specific expertise sought, particularly in the area of track maintenance, five Experts were assigned to respectively cover their speciality areas. For

the whole duration of the Project period including follow-up period, a total of 79 M/M Experts' time was allocated to this Project (from May 2013 to January 2016). Eleven percent of this M/M was shouldered by the dispatching company of the Expert Team as the company's own proposal/initiative in order to enhance the project effectiveness and sustainability.

On May 2015, before finishing the Project, MR requested continuation of the training on track maintenance, lecture series on outsourcing track maintenance, and seminar and training course series on bridge maintenance, the Project was extended to March 2016. This extension led the Project to provide the training to 574 staffs who were gathered from all over Myanmar, contributed to forming the base of disseminating track maintenance techniques to all over Myanmar.

With regard to some of the equipment and machinery selected for the suitability for MR were no longer readily available in the Japanese market, procurement of those items required additional time to import into the country. Those items reached Myanmar about half a year after the beginning of the Project. The necessity for those items and evaluation of the Project introduced Japanese equipment were extremely high, with appreciation among C/P expressed at the time of Terminal Evaluation interviews. These comments included practicality of hand tie tampers (so much easier to handle than the huge machines traditionally used in Myanmar) and precision of vibration measuring equipment. All in all, exposure to new type of equipment through the Project put the work of C/P a level higher toward more mechanized maintenance operation.

Training in Japan was also highly valued by C/P as an eye-opening experience to see some of the Japanese system, such as signaling and safety door at stations. While not all the system can be readily introduced to Myanmar, some track technologies are applicable and thus it was enlightening, was the word of one training participant interviewed for Terminal Evaluation.

As mentioned above, the extension of the Project yielded the prospects for disseminating track maintenance techniques to all over Myanmar, and the equipment and machinery and training in Japan improved techniques of C/P. Judging from them, inputs by the Japanese side were considered as appropriate.

#### 4) Appropriateness of Inputs by the Myanmar side

Myanmar side also made the effort in securing resources to support the Project activities. It included expenses for Pilot Site work, materials and C/P travel. Also, Myanmar side provided temporary housing facility for the trainees. It can be concluded that these inputs have been appropriate just enough for the Project activities.

#### (4) Impact: **Fair**

Unavailability of comparator data set over a minimum of two time points by the time of Terminal Evaluation makes assessment on whether the Project is on a course to achieve the Overall Goal impossible at this stage.

However, information collected through and the improvement plan designed by the Project have and are expected to continue to aid the other activities MR has been and will be conducting with JICA, such as "The Project for Installation of Operation Control Center System (2013-2014)" and "Detailed Design Study for Yangon - Mandalay Railway Improvement Project." Such synergy is

expected to positively affect the results of Project achievement toward meeting the Overall Goal.

If MR continues to move on a similar trajectory with regard to their staffing composition, the important assumptions set for the Overall Goal, that are “Administration staff members are not relocated drastically,” and “Technical staff members are not relocated drastically” are anticipated to hold through the time till the impact is measured at Ex-Post Evaluation, i.e. three to five years after the Project completion.

Given the prospect for achieving the Overall Goal entails mixed potential, impact is assessed as **fair**.

(5) Sustainability: **Fair**

For the achievement of the Project to be maintained and/or further expanded by the Myanmar side after the Project period, there is room for efforts, such as mainstreaming safety agenda within MR by setting up a cross-cutting unit, timely completion of additional equipment distribution to duty stations of the Project participated trainees, and attention to financial soundness to enable investment in succeeding Project produced results. Thus, sustainability of the Project achievements is assessed as fair.

1) Institutional Aspect: **High**

“The Survey Program for the National Transport Development Plan in the Republic of the Union of Myanmar: Final Report (September 2014),” whose contents were officially adopted in January 2016 by the Government of Myanmar as the country’s Master Plan for Transport Sector, acknowledges MR as playing a vital role for inter-city passenger and freight transport services. For the connectivity MR provides both for citizens (passenger service) and business (freight service) for the country’s national development, priority entrusted on to MR is expected to continue. It can be concluded that sustainability from the viewpoint of institutional aspect is high.

2) Organizational Aspect: **Fair**

Sustainability judged from the present organizational structure is fair.

One positive push factor for the organization is the recent enactment of New Railway Act (January 2016). It will require MR to review and furnish new rules and regulations, and the Project prepared manuals and documents can provide good starting references, according to the comment of MR Manager. This is one area where MR can be motivated to bring forward experiences they accumulated with the Project.

To ensure the results of the Project to be institutionalized more broadly on its sustainability, review of organizational structure of MR to see if housing a unit that will oversee safety issues across divisions might merit consideration. This time the Project worked with Civil Division mainly, but going forward, mainstreaming safety as an organizational agenda with a cross-cutting unit will make MR a more effective organization on safety concerns.

3) Technical Aspect: **Fair**

The graduates of the training have since returned to their duty stations throughout the country to apply obtained techniques. The enlarged scope of track maintenance training led the Project to provide the training to over 500 (by the time of the Terminal Evaluation in January 2016). Given

the total number of civil staff at MR is around 4,000, the Project essentially affected 13% of its workforce engaged with track maintenance.

Project arranged additional equipment for the increased scope and coverage of the trainees. On these additional equipment, at the 8th Joint Coordinating Committee (“JCC”) meeting, it was agreed that allocation of one set to each division is important. At the time of Terminal Evaluation, however, the allocation has not been completed. Thus, it will be important for the Project to complete the equipment allocation before its closure in a way so that the Project trained staff can continue with the technology they have acquired from the Project. Considering that equipment allocation hasn’t been completed yet at this stage, sustainability by technical aspect is evaluated as fair.

4) Financial Aspect: **Fair**

As a monopolized state-owned transport enterprise, MR has maintained its operation under deficit as the sole critical mass transit mode for the country. This operation mode is considered to continue in the coming years, and it will be an institutional judgement and decision as to how much/less to resource the organization for carrying forward the results produced by the Project. However, as discussed multiple times in this report, national importance is attached to MR, and thus, its status as on-going concern is not doubted. Because MR is a loss-making enterprise but can receive financial support from the government as an important state-owned enterprise, sustainability with respect to current financial aspect is fair.

### **3.3 Factors enabling the realization of positive effects**

(1) Factors concerning planning

The Project crafted a working plan taking into consideration on-site conditions, such as a sudden rain during rainy season and temperature rise during dry season. Moreover, as there are few roads connecting with working sites except inside stations, it takes more time to carry equipment and move to working sites in many places than usual. The working plan was carefully made in consideration for these conditions as well.

(2) Factors concerning implementation process

During implementation, equipment from Japan and duties by Myanmar side (provision of ballast and sleepers) were delayed. In addition, due to the trains which are not operated on time and the changes of locomotives which are not displayed on the timetable, things didn’ t always go as designed. In these cases, the Project dealt with them flexibly depending on the situations, such as checking up train delays by contacting the neighboring stations.

### **3.4 Factors obstructing the realization of positive effects**

(1) Factors concerning planning

Judging the prospects of meeting Overall Goal, figures for indicators have not been compiled by MR side by the time of Terminal Evaluation. Evaluation Team didn’t receive parts of indicator data and had difficulties in determining the prospects of achieving.



- (2) Factors concerning implementation process

None.

### **3.5 Conclusions**

The relevance of the Project is evaluated as high based on its close alignment with (1) the Government policy of the Republic of the Union of Myanmar, (2) the strategic direction of the country's rail transport sector, (3) the Japan's ODA Policy, and (4) comparative empirical and technological advantage of Japan's cooperation. The effectiveness of the Project is assessed as high, for the achievement of Project Purpose before the completion of the Project. The efficiency of the Project is evaluated as high in view of the four dimensions of input-output relationships that the Project managed for results: (1) causality of inputs and outputs; (2) achievements of outputs; (3) appropriateness of inputs by Japan; and (4) appropriateness of inputs by Myanmar. On the other hand, the prospect for achieving the Overall Goal against the preset indicators cannot be determined, and the factors relevant to the prospects are variable, which in turn warrant a rating of fair for the Project impact. Project sustainability is also considered fair, based on a comprehensive assessment of the implementing agency's current institutional, organizational, technical, and financial aspects.

Terminal Evaluation Team thus confirmed successful implementation of the Project with full achievement of the Project Purpose and reached a conclusion that the Project be completed in March 2016 as per signed M/M of April 6, 2015.

### **3.6 Recommendations**

- (1) To be Responded by the Completion of the Project

- 1) Allocation of at least one set of equipment to each division

Project arranged additional equipment for the increased scope and coverage of the trainees. On these additional equipment, at the 8th JCC meeting, it was agreed that allocation of one set to each division is important. At the time of Terminal Evaluation, however, the allocation has not been completed. Thus, it will be important for the Project to complete the equipment allocation before its closure in a way so that the Project trained staff can continue with the technology they have acquired from the Project.

- (2) To be Considered for Successful Achievement of the Overall Goal in Three to Five Years After the Project Completion

- 1) Periodic training for track maintenance

By the enlarged scope of track maintenance technology transfer, the Project could manage basic track maintenance using technology to about 13% of the total civil staffs (574 staffs out of approx. 4,000) at MR. Now MR has a sufficient foundation to mainstream new practices nationwide. It is hoped that training for such techniques will be incorporated into existing training conducted by MR.

- 2) Establishment of a cross-cutting safety unit

In this Project, the focus was placed on safety and service improvement through track

maintenance. Achievement of the Overall Goal will be supported by comprehensive measures beyond track maintenance. In order for MR to tackle safety improvement issues organization wide, establishment of a cross-cutting safety unit to more broadly oversee safety matters merits consideration.

3) Keeping records regarding safety/service level of the operation

For Overall Goal, the Project used indicators that require at least two comparative figures from different time points for judgement (e.g. operating speed in 2013 and 2015). However, since baseline and present figures have not been compiled by the time of Terminal Evaluation, Evaluation Team had to conclude that the prospect of meeting Overall Goal cannot be determined or low. Nevertheless, given importance of these three indicators to measure safety/ service level of the operation, it is strongly recommended that MR keeps these records available.

### 3.7 Lessons Learned

(1) Equipment and technical transfer arrangement which are the most suitable for C/P

Experts with highly advanced knowledge and technology in the given field carefully examined the working environment of MR, and selected appropriate equipment and technology transfer arrangement. Carefully crafted plans and implementation procedure by the joint effort of the implementing agency and the Experts secured solid technology transfer achievement.

(2) Implementation of C/P training in Japan to introduce state-of-the-art technologies

Because the Project was managed by a team of Experts with full access to technically advanced train service operation in Japan, C/P training in Japan could be organized to entail aspects/cases that are concrete as well as motivational for them. This experience has positively affected the staff of the implementing agency, and made the subsequent Project activities more vibrant.

(3) Establishment of a system for keeping figures for indicators from the early stage of the Project

For Overall Goal, the Project used indicators that require at least two comparative figures from different time points for judgement (e.g. operating speed in 2013 and 2015). However, since baseline and present figures have not been compiled by the time of Terminal Evaluation, Evaluation Team had to conclude that the prospect of meeting Overall Goal cannot be determined or low.