
# JABOTABEK Railway Transportation Project

## Reasons for taking up this project

The Jabotabek railway transportation project is an infrastructure development project for the Jabotabek region, which is the area surrounding Jakarta, the capital of the Republic of Indonesia (hereafter, Indonesia). The goal is to modernize the existing railway lines (implement double tracking, electrification and automatic signal) as a way of improving the transportation means for commuting to school or work for the increasing population, and to operate trains at a higher frequency (6 to 10 minute intervals). Jabotabek is the common name for the Jakarta metropolitan area. The name is taken from the initial letters of each city's name: Jakarta, Bogor, Tangerang and Bekasi (In later years, a region called "Depok" had been deemed as a new city, and the initial letters of Depok had also been adopted within the past 10 or more years, which formed the new common name called "Jabodetabek," but this paper uses the original name "Jabotabek" nonetheless).

The following are the reasons why the Japan Society of Civil Engineers selected this Jabotabek railway transportation project, which has been supported by Japan thus far.

1) Even from a global viewpoint, it is clear that the Jabotabek railways are now being well utilized, with a rising number of users, transportation speed, etc., as a means of public transportation in the Jabotabek area, where the population is significantly increasing.
2) Keeping the systematic implementation of modernization/improvement work in mind from the beginning, the master plan has been created. In addition, the master plan was reviewed and updated constantly according to the social and economic circumstances, and executed in a flexible and systematic manner to accomplish its goal.
3) Technology transfer (Project Management Service, hereafter: PMS) was provided by the in-house engineers so that continuous maintenance, management and improvements can be carried out by Indonesian railway staff themselves. Through this activity, many engineers were trained. As a result, this project was highly recognized as a successful example of supporting capacity building over the long term.

# 1 Project Background

The Jabotabek railway system is a commuter railway that connects Jakarta, the capital of Indonesia , with surrounding cities (see Figure 1). The railways in this area are based on the railway network having started during the Dutch colonial era in the 1910s. In the 1970s, it was planned to improve transportation capacity by Japanese yen loan, and the operation of EMU (Electric Multiple Unit) started in 1976.

This project was implemented while the master plan was reviewed and updated under rapidly changing social and economic circumstances.

It was considered that there were limitations on proceeding with city development in megacity zones, like Jabotabek, relying only on the road traffic system. Hence, the continuous effort to develop and maintain a commuter rail network of this metropolitan area was regarded as a critical measure that promotes steady economic growth. It was also considered that increasing the share of burden of public transportation system like the Jabotabek railway and lightening the road traffic were also important measures from the viewpoint of urban development and environmental countermeasures. With this background, they became eager to develop the commuter rail network in Jabotabek and this project was launched.


Figure 1: Improved Railway Lines currently in use in Jabotabek Project (Double Tracking, Electrification, and Automatic Signaling)

# 2 Project Chronology

## 2.1 Investigation/Plan of the Project and Implementation status

Table 1: History of Study, Plan and Implementation of the Project

| | |
|---|---|
| 1976 | Intermediate Program |
| 1978-1979 | ① Preliminary survey on Jakarta Metropolitan Railway Improvement Project (Report on JARDEP: Jabotabek Railway Development Project) |
| 1980-1981 | ② Urban/Suburban Railway Transportation in Jabotabek Area (Master Plan by JICA) |
| 1982 | Feasibility Study on Elevation of Central Line【Japan, currently in service】 |
| 1984 | Plan for a New Line ; Chengkareng Airport Railway |
| 1985 | ③ Revise Master Plan in 1981 to Master Program |
| 1985 | Grade separation of Manggarai Station<br>Improvement of Serpong Line【France, currently in service; the re-extended portion is currently in service by Indonesia】 |
| 1986 | Improvement of Kampung Bandan Station area【Japan, currently in service】 |
| 1987 | ④ Revisions to Execution Plan |

| | |
|---|---|
| 1988 | ⑤ Revisions to Rationalized Execution Plan |
| 1988-1990 | Integrated Transportation System Improvement by Railway and Feeder Service in Jabotabek Area (ITSI) |
| 1990 | ⑥ Revisions to Practicable Execution Plan |
| 1993 | Improvement of Tangeran Line【France, currently in service】 |
| 1999 | The first term of the project ended |
| 2008 | Completion of the Yen Loan with this Master Plan via the accomplishment of the Depok EMU Depot【Japan, currently in use】 |

Note Those inside the【a,b】refer to a) a main country which worked on the project, and b) infrastructures that were specifically completed as of June 2017 and are currently in use. Other than these, the main development that is currently in use is the project of improving Tanah Abang Station into the over-track station by Japan.

Through the launch of the bullet train line, the momentum to make the railway business an export industry heightened, and JARTS was established in 1965.

Along with the cooperation by the Japanese National Railways and provision of relevant information from Jakarta, interest in improving the urban railway in Jakarta has increased, and the short-term Intermediate Program was established and implemented by the Export-Import Bank of Japan (Exim Bank) and the Overseas Economic Cooperation Fund (OECF) in 1976, and furthermore, a preliminary study (JARDEP: JAbotabek Railway DEvelopment Project) was implemented with the subsidy from Japan Shipbuilding Industry Foundation in 1978. Then after 1980, a full-scale study was carried out by JICA. The Urban/Suburban Railway Transportation in Jabotabek Area (Jakarta Metropolitan Area Railway Transportation Plan) formulated in 1981 became the master plan that has become the basis of the subsequent systematic railway improvement efforts. The Jabotabek railway transport project was implemented as a national project under a presidential decree in 1982 and 1983, and started with the aim of creating a railway system that would become the keystone for commuters in the Jakarta metropolitan area.

## 2.2 Implementation of PMS

Table 2: PMS Implementation Stages

| | |
|---|---|
| 1987-1989 | PMS-1:<br>Formulation of basic plan before project implementation (in other words, the basic thought process for creating an image for modern railway, devising the foundational implementation plan, and establishing operation and maintenance system) |
| 1990-1992 | PMS-2:<br>Support for various tasks involved in project implementation (in other words, requesting the construction budget, ordering the construction work, solving various problems during construction, and preparing for the launch) |
| 1992-1995 | PMS-3:<br>Technical support for implementing the project subsequent to PMS-2 (in other words the train operation plan for the 12/20 min operation interval, standards of the maintenance and business operation systems, and trainings for transitioning to the new system) |
| 1995-1998 | Extension of PMS-3:<br>Final verification, supplementation and improvement of the transportation service in terms of volume and quality to gear up for the launch of the 12/20 min train operation interval, evaluation of economic and financial benefit of the project. |

PMS for the project was conducted in four stages, starting in 1987. PMS-1 and PMS-2 were conducted by yen loans and funds from the Indonesian government, and PMS-3 and the Extension of PMS-3 were conducted by yen loan. In addition to JARTS, OPMAC (Overseas Project Management Consultants Ltd), local consultants in Indonesia and local staff members constitute the other partners of PMS in-house consultants. The ratio of Japanese engineers, who were expatriates, to local staff members was 50% at PMS-1. However, as technical transfer progressed, the ratio decreased to 30% at PMS-2, 23% at PMS-3, and eventually to 19%.

# 3 Project Features

## 3.1 Creating and readjusting project implementation plan (Master plan)

As shown in Table 1, the master plan was remade/readjusted 6 times. ① Jabotabek Railway Development Project (JARDEP) (1978 to 1979) is a preliminary planning survey that was conducted before the project started in earnest. This preliminary investigation of the comprehensive long-term railway improvement plan considered the metropolitan plan that was newly developed, and based itself on the relationship with road traffic.

② Master Plan (1980 to 1981) is the realistic master plan that was formulated by JICA for Jakarta Metropolitan railway improvement integrated with an overall urban plan based on ① above. The plan included double tracking, station remodeling, railway elevation, electrification, EMU depot improvements, workshop equipment improvement, signal improvement, increasing the number of EMU and new line construction. Then, it was revised to ③ Master Program (since 1985). In the Master Program, the improvement and modernization items in the Master Plan were readjusted, while focusing on the items that strengthen the transportation capacity, to achieve the maximum result with the minimum investment, because the traffic congestion in Jakarta became worse; at the same time, securing funds became difficult due to global economic fluctuations. For example, the target to have trains operating at 6 to 10 minute intervals during morning rush-hours by 1992 was concretely set. Nonetheless, the target set for 1992 became difficult to achieve due to project delays, problems with securing funding, etc. The Master Program was revised into ④ Execution Plan (since 1987) and to ⑤ Rationalized Execution Plan (since 1988) to be more practical, by taking measures such as limiting the improvement items to focus on. Eventually, due to further project delays and issues regarding funds, ⑥ Practicable Execution Plan (since 1990), which placed safe and punctual operation during the morning rush-hour within 12 to 20 minute interval as the top priority, had to be established, before embarking on materializing the goal of “operation of trains at 6 to 10 minute intervals during the morning rush-hour” indicated in ③ above. In addition to the construction delay and uncertainty in fund procurement, retardation in decision making regarding the commuter rail system plan as well as within the process from bidding to contracting have also been pointed out as the reasons for such changes in the Master Plan (Reference 1).

## 3.2 Human resource development by in-house engineers of PMS

For improving lines, constructing, managing and maintaining an overall modern railway system demands an organized (systematized), wide-ranging and high-level capabilities. However, such tasks above mentioned for realizing and managing an integrated modernized railway system was an area in which Indonesian Railway staff were entirely inexperienced. Therefore, a personnel training was required at first, as well as the importation of experiences and know-hows from outside sources regarding railway system maintenance/management/ operation and remodeling their railway into the modern one. The task was undertaken by PMS. PMS was conducted in four stages as shown in Table 2.

Figure 2 shows an organization chart of the project implementation. PMS was positioned at the same level of PMG and was responsible for advising all the organizations. The following items ①–⑩ show what Japanese experts planned to convey technically to Indonesian engineers through PMS.

① Propose basic technical conditions (system selection criteria, design standards, etc.) for modern railway system.
② Devise an overall plan for the project and adjust according to situational changes.
③ Set overall action plan for the project and adjust according to situational changes.
④ Develop a more detailed action plan for sub-projects that have high priority.
⑤ After the action plan is established, advise its implementation.
⑥ Propose the basic ideas for operation and maintenance of the railway system after its completion.
⑦ Propose the basic ideas about operation of the modern railway system
⑧ Advise concerned organizations regarding technical issues that occur during the project.
⑨ Transfer the technology and know-how to the Indonesian side regarding planning, implementation, operation, and maintenance of modern railway systems. Regarding the management of the operation and maintenance, JICA project-type technical cooperation called “Modernization of Railway Staff’s Education and Training System” was implemented between 1992 and 1997 in coordination with this project, and experts were dispatched from JR West, JR Central and JR Kyushu.
⑩ Assist the Indonesian side in evaluating the effect of the project

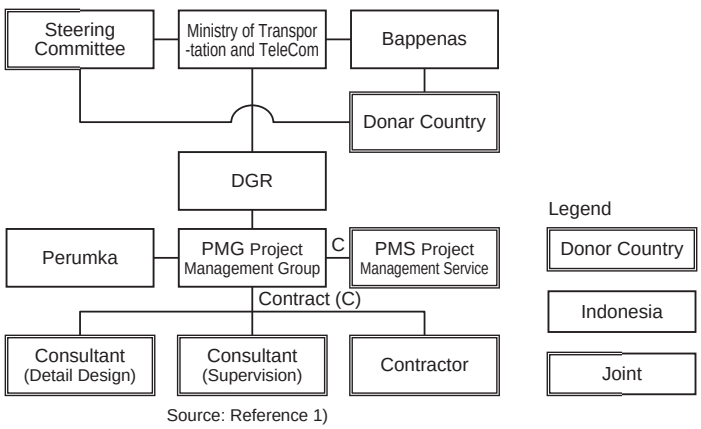


Figure 2: Organization Chart of Project Implementation and PMS

Source: Reference 1)

# 4 The Outcome and the Lessons Learned

To make the functions of urban railways work sufficiently, a wide range of items must be dealt with such as investigation, planning, design, construction, operation and maintenance, but the goal was accomplished through the Master Plan made by JICA and through the technical transfers made via PMS. Through this effort, design and construction including electrification and double tracking became independently possible in Indonesia.

The optimum and realistic project environment was maintained by readjusting the order of priority of the action plans, and changes of the Master Plan even after hitting the walls many times due to fund issues, and construction process delays.

Back then, Indonesia did not have enough knowledge and experience to properly manage and operate a comprehensive, modern railway system; however, as a result of technical conveyance and transfer by PMS and a synchronized training program, local staff members eventually became skillful enough to appropriately operate trains, manage operations, and maintain the facilities of their modern railway by themselves. These are the result of the organic linkages among JICA's various cooperation methods, dispatches of JICA experts to local government agencies, OECF's (now JICA) ODA loan and the efforts made by PMS.

The development of Jabotabek railway system effectively eased the traffic congestion in urban areas and stimulated potential demands for railway transportation in the area. From 1987 to 1998, including the project period, the number of EMU cars and train operations doubled and tripled, and the number of commuters increased six times. Stability of 10-min interval operation had improved.

PMS continued their role, giving proper advice against external pressure. In particular, when Indonesia's economic situation worsened due to the sharp drop in oil prices during the PMS-1 period, certain international organization advised the scaling-down and suspension of investments in this project. However, the PMS team maintained their objections, claiming the ambiguity of such indications, conveyed the effectiveness of this project, persuaded Indonesian authority officials, deepened this international organization's understanding of the project, and strove to continue making progress in the project.

# 5 Current Trends

PT.KCJ (Jakarta Commuter Railway), which is divided from PT.KAI (the Indonesian railway) , is in charge of operation and maintenance of railway system in the concerned area , and is operating trains at 5-min intervals for 2 hours (at the section in the south of Manggarai Station). Jakarta Post reported that daily passengers of 1 million passengers was achieved on April 8, 2017, according to the director of PT.KCJ.

Used but well-maintained EMUs were provided by Toei (Tokyo Metropolitan Subway), Tokyo Metro, Tokyu and JR East, and this supply of EMUs enables the service of highly frequent operation.

Besides the above, the South/North line of the Jakarta subway is currently under construction with Japanese ODA loan, the East/West line of the same is also currently under plan. Quadrupling track and

electrification efforts between Manggarai and Bekasi (and even to Chikarang, east end of Jabodetabek) are also implemented with Japanese ODA loan.

Photo: Elevated Railway with noise barrier in Jabotabek Project

Photo: Elevated Station

## Reference


1. Tomoyoshi Hata, “Indonesia Jakarta Metropolitan Urban Railway Development Project and PMS” *JARTS*, No.162, Japan Railway Technical Service, 2000
2. Tomoyoshi Hata, “Inedonesia Jabotabek Project –The Past and the Present” *JARTS*, No.223, Japan Railway Technical Service, 2014
3. *Urban/Suburban Railway Transportation in Jabotabek Area*, JICA, 1981

## Abbreviations

JARTS: Japan Railway Technical Service, founded by JNR

JIC: Japan International Consultants for Transportation Co.,Ltd, the successor of JARTS and its capital contributed by ten leading railway companies.

JNR: Japanese National Railways

JR: Japan Railways of 7 companies. the successors of JNR

HSR: High Speed Rail

This manuscript was created by the infrastructure and international cooperation/International contributions archive working group in the Japan Society of Civil Engineers, interviewing the following persons on February 29, 2016. We would like to express our appreciation here. Lastly, we had received various materials from Mr. Tomoyoshi Hata, who had participated in the Indonesian project for 40 years, including his time working at PMS. We hereby give our deepest appreciation to all of these people.

## Biography

**Sadaaki Kuroda, Dr.Eng.**

Advisor, JIC
1956 Joined JNR. Worked mainly as track engineer in the fields of construction, maintenance and research. Deputy Director of Quality Control Division, Senior Engineer of International Department, dispatched to UN ESCAP (Economic and Social Commission for Asia and the Pacific) and assigned as Chief of Railway Section of Transport Division.
1985 Joined JARTS. Assigned President (2000). Worked for various international railway projects including Eurotunnel, Great Belt Link in Denmark and JABOTABEK.
2004 Retired from President of JARTS, assigned as Special Advisor.
2012 Joined JIC and assigned as Advisor.
In this project, he worked as Deputy Leader of ITSI, JICA Study relating to Master Plan and also as Project Manager of PMS-3. Through the period, he strongly backed-up PMS projects for construction, operation and maintenance as Senior Executives of JARTS.

**Toru Fukushima**

Senior Engineering Advisor, JIC
1973 Joined JNR.
1987 Manager of Railway Facilities Dept. Worked at Rehabilitation Plan of North Railway Line in Java Is. Double Tracking /Electrification Plan of Railway in Kuala Lumpur Metropolitan Area
1991 Director of International Div, CJR (Central Japan Railway Co., Ltd.)
2000 Deputy Director General of Technology Div in charge of overseas cooperation, CJR
2013 Joined JIC as Deputy Director General of Engineering Headquarters Div., As Project Manager he worked HSR Project in Java Is.
In this project, he strongly advised Plan of Training Center Project for Indonesian Railways. Also he dispatched trainers from JR. He explained the railway system to the JABOTABEK trainees, who devoted the modern and efficient railway system.

**Naonori Yamada**

Technical Advisor, JIC
1963 Joined JNR. Worked track/civil structure maintenance as well as construction. Worked teaching and management in Central Railway Academy, JNR.
1987 Railway Facilities Dept., JARTS. Worked in PMS. Worked as track engineer of HSR (Taipei-Kaohsiung) in Taiwan.
2013 Advisor (Civil Engineering) Worked FS of HSR (Rio-Sao Paulo) in Brazil, HSR (Jakarta-Bandung) in Java Is. HSR (Bangkok-Chiang Mai) in Thailand and HSR (Munbai-Ahmedabad) in India.
In this project, he joined PMS as Chief of detail design of track structures, its execution plan and maintenance plan as well as track alignment plan. Through these works he made technology transfer to Indonesian engineers in Jabotabek project.