

Matadi Bridge (Le Pont Maréchal) Construction Project

JSCE "Matadi Bridge Construction Journal"

Reasons for taking up this project

The Matadi Bridge construction project was an infrastructure construction project to build a suspension bridge with a center span of 520m by Japan's ODA in the Democratic Republic of the Congo (hereinafter: Congo) in 1979-1983. Before completion of the Northern and Southern Bisan Seto Bridges, which are typical suspension bridges in Japan, this project was completed in Africa over 20,000km away from Japan, and highly appreciated as an excellent example of Japan's ODA.

In terms of the bridge technology at that time, this project was the largest suspension bridge being used for roadway and railway in Africa. Several structural and construction advanced ideas were applied, such as its compositional structure being the stiffening truss method using an orthotropic steel deck, and the adoption of the PWS (Parallel Wire Strand) for the main cable.

The Japan Society of Civil Engineers takes up the Matadi Bridge construction project, because

- 1) Both detail design and construction were contracted in a package deal, and this contract led to smooth operation, and various ideas used in the construction, finally enabled to shorten 14-months more than planned.
- 2) Through technology transfer to the Congolese engineers via the man-to-man method on the site, superior personnel were cultivated.
- 3) Not only those directly involved construction companies in this project but relevant government ministries, the JSCE, government overseas assistance agencies, public corporations, etc., came together to provide technical support, such as the establishment of a Matadi Bridge technical committee at the JSCE, chaired by Professor Manabu Ito (The University of Tokyo).
- 4) Regardless of the fact that the Japanese engineers could not enter for about 20 years after 1991 due to political instability in the Congo, maintenance was conducted by the Congolese engineers themselves. This was due to the technology transfer which was conducted in the desirable way of having the Congolese engineers continue to study what they had learned from the Japanese engineers.

1 Project Background

The Matadi Bridge is a suspension bridge crossing the Congo River, which flows through the Congo and is located in the center of the African continent (see Figure 1). Congo has abundant mineral resources such as copper and cobalt etc., but the production area is centered in the eastern region, which is called the Copper Belt. And there being no through transit railway route going from the eastern region to the

Atlantic Ocean in their own country, half of the amount produced had to be taken out via neighboring countries with unstable political situations. And so the realization of “national lines,” which would enable through transit railway routes by constructing the gap sections of the railway routes, were desired, and the Matadi Bridge filled the vital role of crossing the Congo River in those routes.

2 Project Chronology

2.1 Project Formation Stage

Formation Stage

October 1967	Basic study for new railway line between Port-Franqui and Kinshasa
April 1971	Joint statement of a plan to strengthening of transportation capacity between Matadi and Banana by Prime Minister Sato and President Mobutu
March 1972	Establishment of OEBK
November 1974	Conclusion of yen loan agreement (34.5 billion yen \doteq 100 million dollars) covering the project to construct a railway between Banana and Matadi
1975	Delay due to changes in economic climate
July 1977	Appeal by the government of Congo to narrow down only the “Matadi Bridge”

In 1967, the government of Japan implemented a basic study for a new railway line between Port-Franqui and Kinshasa. After series of discussions, the government of Congo concluded that it was necessary to prioritize among the “national lines” the construction of the Matadi-Banana railway connecting the Banana Port, and Matadi.

In 1971, after accepting this conclusion, the plan to strengthening of transportation capacity between Matadi and Banana was announced by Prime Minister Sato and President Mobutu in a joint statement.

In 1972, OEBK (Organisation pour l'Équipement de Banana et Kinshasa: Organization for Banana-Kinshasa Facilities) was established under the jurisdiction of the

Congo Transportation and Communication Ministry as an organization to strengthening of transportation capacity between Matadi and Banana.

In 1974, yen loan agreement for 100 million dollars (34.5 billion yen) covering the project to construct a railway between Matadi and Banana was concluded.

However, it was found that the construction costs would exceed the initially expected 100 million dollars, due to international inflation resulting from the subsequent oil crisis. And railway construction project was set back due to a worsening of the finances of the government of Congo caused by a drop in copper prices.

At this time, the government of Japan

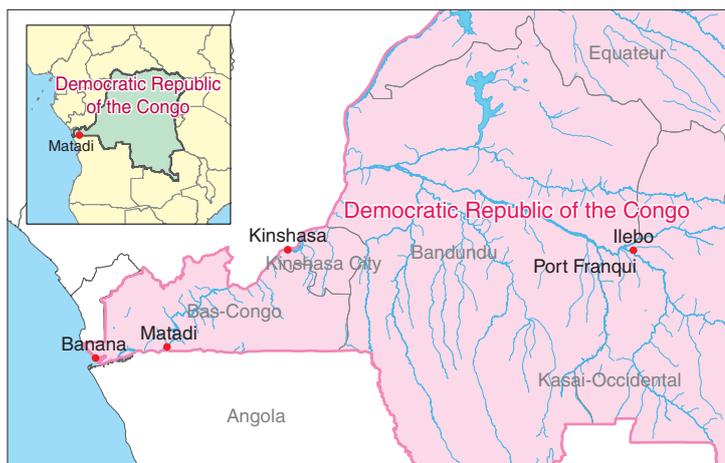


Figure 1: Location of the Matadi Bridge

proposed to narrow down the project to the construction of the Matadi Bridge and its access roads. But regarding the use of the 100 million dollars, in Congo it was coming to be decided to use it for plans other than the bridge such as regional urban development and pipelines led by the World Bank. However, through a series of negotiations by the Japanese side, in the end the government of Congo made a declaration

of intent to narrow the scope of the project down to the Matadi Bridge and its access roads, at the World Bank consulting group meeting.

In July 1977, the government of Congo made a formal request to the government of Japan stating that their desire to implement the project as scaled down to the Matadi Bridge and its access roads.

2.2 Project Execution Phase

Execution Phase

August 1978	Conclusion of revision to yen loan agreement to cover the Matadi Bridge and its access roads
September 1978	Establishment of Matadi Bridge technical committee at the JSCE
December 1978	Matadi Bridge construction contract
May 1983	Opening of Matadi Bridge

In August 1978, revision to the yen loan agreement to narrow the project down to the Matadi Bridge and its access roads were executed.

After the yen loan agreement revision, the necessity to support this project was recognized throughout the society of civil engineering in Japan, leading to the establishment of a Matadi bridge technical committee at the JSCE. A system was set up for this committee to discuss technologically

difficult issues and provide resultant measures for improvement to the site.

Warning was taken from the experience where the progress of the original project was set back due to inflation and fluctuations in the local currency, and also due to the fact that JARTS (Japan Railway Technical Service), which was recommended by the Overseas Economic Cooperation Fund (OECF) as a consultant, faced to suspend their consulting duties in Congo. Due to

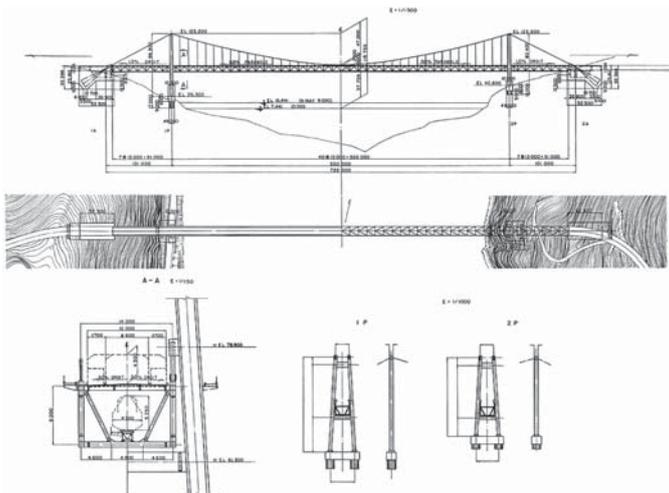


Figure 2:
General View of Matadi Bridge

suspension of consulting duties, a package contract which was signed between the ordering party and the contractor was employed without intervening consultation from the stages of basic design to detail design. On the other hand, standard bridge construction contracts are signed with three parties, i.e., neutral consultant, contractor and ordering party.

Also, as a measure to simplify the document procedures, the minister authority was transferred to the director of the OEBK to approve design modifications below a certain amount.

In 1978, construction work started, based on the anticipation that unforeseeable circumstances could occur at any time, quick completion was strived for by implementing things which could be done first as quickly as possible, and arrangements for each process to be done in parallel.

As efforts by the contractors, in order to completely secure building precision and material quality, local engineer management and construction management was all conducted by Japanese with detailed process planning.

In order for the project to succeed it was necessary for the construction period to be shortened as much as possible, and enabled to shorten more than planned 14 months by conducting types of work which could be done in parallel simultaneously as much as possible, such as by the superstructure and substructure being ordered together, and finally the Matadi Bridge was completed in May 1983.

Technical transfer via the man-to-man method wherein construction was advanced while the Congolese engineers and the Japanese engineers worked together on the site.

2.3 Maintenance and Management after the Construction of the Matadi Bridge

After Completion

1985	Introduction of the Matadi Bridge toll fare system
September 1991	Outbreak of insurrection in Kinshasa, the Japanese engineers evacuated the country (from this until 2009 Japanese could not enter the country)
2003-2008	Bridge painting done by Congolese engineers
August 2009	Condition survey of the Matadi Bridge main cable
May 2013	30th year anniversary of the completion of the Matadi Bridge

After the completion of the Matadi Bridge, securing the funds for maintenance of the bridge was a serious issue considering the national financial condition.

In 1985, the OEBK introduced a system to collect a toll fare in order to implement proper maintenance and the OEBK was made able to manage the fare collection on their own.

The Congolese engineers received knowledge and know-how via training on management and maintenance in Japan over a period of one year before the Matadi Bridge was transferred to the government of Congo, and they learned to put this to practical use in the maintenance.

In September 1991, regardless of the fact

that the Japanese engineers were not able to be dispatched to Congo from the outbreak of the insurrection in Kinshasa, the Congolese engineers maintained the Matadi Bridge over the subsequent period of approximately 20 years. Furthermore, referencing the “arrangement”, “orderliness”, “cleaning”, “hygiene”, and “discipline” which are utilized in the Japanese manufacturing and service industries, periodic cleaning was implemented and trash collection boxes were set up.

In 2009, with the recovery of political stability in Congo, the Japanese engineers conducted a survey of the main cable rust condition, and based upon this survey, anti-rust on the main cable was provided by the government of Japan.

3 Project Features

3.1 Technology Transfer via Man-to-man Method

Technology transfer such as knowledge, experience, and know-how to the Congolese engineers was conducted via the man-to-man method with on-site work and meetings. This method was implemented not only in the technology department but also the administrative department. By working together with the accumulated number of 74 Japanese engineers, the Congolese engineers learned not only technical matters but the Japanese ideas and sense of responsibility regarding work. In addition to this kind of on-site support, the JICA (Japan International Cooperation Agency) conducted training of a total of 30 project counterparts in Japan in order to deepen the Congolese engineers’ understanding of Japan while also strengthening their sense of trust in the Japanese.

Through these various efforts, the Congolese engineers eventually became independent and able to conduct the maintenance according to the bridge



Photo: Counterparts Who Came to Japan

maintenance inspection manual and draft survey reports, and furthermore became able to manage the toll fare collection themselves.

Once they were unable to receive direct support from the Japanese engineers, they requested a support from the Japanese engineers via communication through personnel channels, and became able to implement maintenance over many years, such as purchasing the paint using the Matadi Bridge toll fares and painting the bridge.

3.2 Support from Japan

Another feature of the project was the fact that there was plenty of technical, organizational, and personnel training support from Japan. In particular, the Matadi Bridge technical committee at the JSCE played a large role, and in the 4 years from March 1979 the technical committee meetings in Japan were held 14 times and the local technical committee meetings were held 10 times.

[Technical Side]

Matadi Bridge technical committee at the JSCE verified the Japanese best technology to be mobilized in this project. In Japan

they provided advice and support mainly on design issues, and locally on execution.

[Rules and Regulations Side]

The OECF (presently the JICA), which provided the yen loan, adjusted the decision authority from headquarters to local.

JICA, in charge of technical cooperation, considered the Japanese engineers annual leave rules in flexible.

[Personnel Training Side]

Committee members at JSCE went to Congo many times to directly guide the Congolese engineers.

4

Learned Lessons

Unfortunately, the construction of a railway network connecting Matadi and Banana, which was the original goal of this project, has not been realized, but through the enthusiasm of many involved persons including Japanese engineers, the construction of the Matadi Bridge and its access roads were completed without any setbacks. It is also admirable that even though the construction was extremely difficult, separated from Japan by more than 20,000km in Africa. With the effort of involved personnel, the construction was shortened 14 months more than planned.

Furthermore, by having the Congolese engineers working together with the Japanese engineers on-site, the Japanese engineers could transfer to the Congolese engineers not simply technology but also their attitude toward work and train a large number of superior personnel. Japanese technical transfer stands upon the capacity for the development of human relations. Professional and personal engagement led the counterparts forward the deepening

of personal identification and emotional investment to the project. This can account for the building of strong and trusting relationship with Japan even up until now. While teaching technical know-how can be lead to a well-built bridge, it is the transfer of the qualities of discipline method, and responsibility, that sustained the life of this project.

Furthermore, the large contribution to the technical support and fostering of mutual trust made by the establishment of Matadi Bridge technical committee at the JSCE and the technological support by not only directly involved parties but throughout society of civil engineers in Japan must be remembered.

ODA infrastructure construction projects are often criticized as the peddling of influence toward Japan. However, as the experiences in this project show, it is clear that even in cases of yen loan projects support is given not only by involved parties but throughout the public works field, heavily contributing to technology transfer

and personnel training, and it is necessary to continue to undertake such efforts in the future.

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Interviews were conducted for this paper with the following people on December 11, 2013, and it was drafted by the Infrastructure International Cooperation and Contribution Archives WG of Japan Society of Civil Engineers. We wish to thank them here. Furthermore, the general view of Matadi Bridge (Figure 2) was provided by IHI Co., Ltd.

Biography

Yasuo Mizohata

JR East Consultants Company,
 Advisor
 1965 Joined Japanese National Railways
 Worked on tunnel projects, railway depot improvement projects in Yokohama, Shinjuku, etc., construction projects in Gala Yuzawa Ski Area and the Yamagata and Akita Shinkansen.
 In this project he took part in the planning as the on-site Matadi bridge construction office chief from 1981 until its completion in 1983.

Masaaki Tatsumi

Oriental Consultants Co., Ltd,
 Advisor
 1972 Joined Honshu-Shikoku Bridge Authority
 Worked on the construction of the Seto Ōhashi bridge, Akashi Kaikyō Bridge, etc.
 From 1999, he was involved in overseas business at Oriental Consultants Co., Ltd.
 In this project he was in charge of managing the construction of the superstructure as the assistant director of the Matadi bridge construction office from 1981 to 1983.

Masanobu Takamatsu

FUJI P.S CORPORATION, Advisor
 1972 Joined Japanese National Railways
 1987 Joined Japan Railway Construction Public Corporation
 Worked mainly in Shinkansen construction, project of Railway-Road Continuous Grade Separation Project in Kyushu area, construction of new Shinkansen, and construction of urban railways in the Tokyo area. As major projects, he experienced the construction of the Chikuhō Line, the Minatomirai Line, Rinkai Line, and Tsukuba Express Lines.
 In this project he was in charge of bridge construction planning and construction agreement drafting in the OEBK bridge division from 1977 to 1979.