Overseas report

Myanmar's submergible bridge welcomed by the Japanese flag

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Introduction

On May 11, 2019, a ceremony was held to inaugurate the Ohnwar Bridge, which had been constructed in the Magway Region of the Republic of the Union of Myanmar by Japan International Infrastructure Partners (JIP), a certified NPO, through the grant aid of the Ministry of Foreign Affairs of Japan (MOFA).

When we got off the car, we were greeted by people waving the Japanese flag and the Myanmar flag on both sides for more than 100 meters to the venue (Photo 1).

It was a great honor to have such a grand opening ceremony for a simple bridge project.

The fact that such a grand opening ceremony was held for a simple bridge project shows how much the bridge is desired by the people in the rural areas of Myanmar.

In the following, I would like to report on the submergible bridge construction project that we, JIP, are undertaking in rural areas of Myanmar.

Photo 1: Villagers waving the Japanese flag to welcome the JIP delegation.

The JIP was established in 2006 under the NPO Act by a group of volunteers who had been involved in intergovernmental cooperation projects with developing countries at the Ministry of Construction and the Ministry of Land, Infrastructure, Transport and Tourism, and had long-term experience in overseas technical cooperation to contribute their knowledge and experience to infrastructure development in developing countries. Among the many NPOs, JIP has been certified by the Governor of Tokyo as "contributing to the promotion of public interest through appropriate management and activities. The Ministry of Foreign Affairs (MOFA) provides necessary funds for economic and social development projects implemented by Japanese international cooperation NGOs in developing countries and regions for "projects that need to be implemented in close connection with foreign policy decisions, such as those that need to be implemented flexibly" (MOFA website). In principle,

projects are reviewed and adopted every single year, and the maximum amount is 100 million yen. For your information, JIP was granted more than 99 million yen in FY2018 for "Construction of Submergible Bridge and Technology Transfer Project in Myanmar Region", which was the highest amount among the projects adopted in the same year.

1. What is Submergible bridge?

A submergible bridge is a bridge that sinks under the water when the water level rises due to a river flood (Figure 1). It is a bridge that sinks below the water surface because the water surface rises, rather than sinking mechanically.

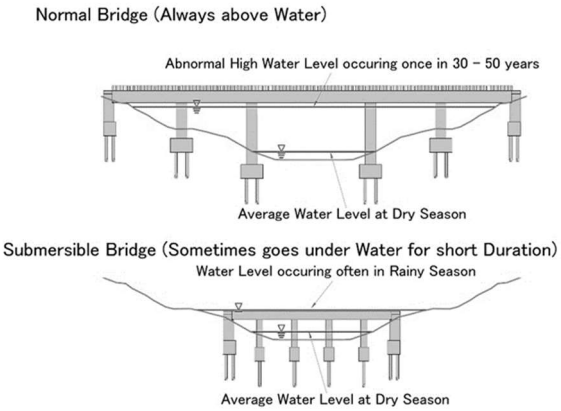

Figure 1: Drainage bridge and submerged bridge

If you go to the rural areas of Myanmar, you can walk across the rivers during the dry season because there is not much water in the rivers, but during the rainy season, you cannot cross the rivers and traffic is cut off.

When the depth of the water exceeds about 50 cm, it is. dangerous for adults to cross the river, and even more so for motorcycles and four-wheeled vehicles. When the depth of the water is large, it means that the current is also fast, and it is dangerous to go back and forth in a boat, even if it is a small one, and sometimes people lose their lives by capsizing. When the river is blocked, schools are temporarily closed, and education is affected.

If we try to build an ordinary bridge with the lower end of the girder sufficiently far from the surface of the water so that traffic will not be disrupted even in the event of a major flood, based on the water level, which is estimated to occur once in several decades, and taking the margin between the water level and the lower end of the girder, and adding the height of the girder itself, the height of the bridge surface becomes much higher than the height of the ground in front of and behind the bridge, and the attachment road must be sufficiently high and long. The cost of the bridge would be 10 times higher than that of the submergible bridge. It will take many years to build roads to many villages in the country. Therefore, JIP proposes the use of submergible bridges to secure the traffic in rainy season.

Although submergible bridges have existed in Japan for a long time, as the country became richer, they were replaced with bridges designed to be passable during floods.

2. JIP Submergible Bridge Project

First year: Yoma Bridge, Bago Region

In the flood of September 17, 2015, a bridge that residents of Chautaga District, Bago Region had built over the Itone River flowing through their land was washed away. The bridge, which was built by the residents by themselves, was washed away two years in a row (Photo 2 and 3). This is the beginning of JIP's submergible bridge project.

Photo 2: Itonecreek Bridge before it was washed away.

Photo 3: The scene after the bridge fell (Residents had no choice but to cross the bridge on foot, and if it rained, they would not be able to go to school)

Since the bridge was so important that the residents built it by themselves, and since students could no longer attend school, it was realized that outside assistance was urgently needed. We decided to apply to the Ministry of Foreign Affairs to conduct a field survey with the help of a research gran in the spring of 2016, and a survey team from JIP was dispatched to Myanmar from May 23 to June 1, then a report was prepared as soon as the team returned to Japan. The project progressed smoothly with the groundbreaking ceremony on December 7 (Photo 4), and the opening ceremony of the new bridge, named Yoma Bridge, was held on May 12, 2017.

The Yoma means "mountain range," and the Bago Hills, which can be seen from the site, are familiar as the mountains of the hometown, as well as a word with a good sense of language for the people of Myanmar.

Photo 4: Commemorative photo of the groundbreaking ceremony, surrounded by school children.

One of the characteristics of N-REN (the name of grant aid from the Japanese Ministry of Foreign Affairs) is its mobility, as the bridge was built in just over a year after Mr. Asakura visited the area. However, this would not have been possible without the staff who stayed in Myanmar for a long period of time to provide guidance and supervision to the builders as well as to coordinate with government agencies.

The bridges that the residents built by themselves were simply piers made of bricks piled up with mortar, and bridge girders made of rails lined with boards. However, there are many such bridges in rural areas.

Photo 5: Construction is possible even in rural areas and use of cast-in-place piles.

The Yoma Bridge is 60 meters long, and the foundation is not made of ready-made driven by a large pile-driving machine, but of field-driven piles that can be installed even in rural areas with poor road conditions (Photo 5). The higher the height of the bridge girder, the lower the number of times it sinks into the water, but the higher the bridge surface, the more it is subjected to the impact of driftwood flowing over the surface. Determining the height of the bridge girders is a major issue, but since no water level observation has been conducted and rainfall data is only available monthly at a flat area a short distance away, there is no way to calculate the flood discharge and convert it into water level using runoff calculations. In the end, we had to decide based on the memory of local old people. Nevertheless, after experiencing two rainy seasons since the construction, the number of times and duration of flooding seems to be within the expected range.

Second year: in two areas of the Magway region

From the beginning of our research, we knew that there were many potential sites for submergible bridges in the Magway area. At that time, I saw a picture on Facebook of school children crossing the river with their school supplies and lunch boxes held high above their heads.

Photo 6: School children commuting to school with school supplies above their heads.

In addition, a delegation of local councilors from the Magway region heard rumors and visited the site of the Yoma Bridge construction, which led to the development of the project in the Magway region.

In FY2017, three submergible bridges were constructed: Teza Bridge (46 m long + 37 m culvert) and Thein Linh Bridge (66 m long) in Tayet area, and Tulia (Sun) Bridge (66 m long) in Aung Lang area. At Teza Bridge site, students of the Thaiet National Technical College visited us and we gave them explanations and guidance (Photo 7). Teza was the name of General Aung San, the founding father of Myanmar, when he was a young man, and Thein Lin was also his childhood name. The name of the Sun Bridge was also chosen by the local people, who gave it a splendid name. This is a sign that the wishes of the local people have come true, and they are happy.

Photo 7: Explanation and guidance to the students of the National Thaiet Technical College who visited the site of Teza Bridge.

Shortly after the opening ceremony on or around May 10, the entire Magway region experienced its first flood in decades on June 12. Reports came in with photos that many bridges were damaged, including a 200-meter-long bridge, but the JIP's submergible bridge was not damaged. Of course, the bridge was completely submerged, but we received photos of an incredible amount of driftwood caught in the piers and girders. Many villagers gathered to pile up the driftwood and remove it before the water receded as " their own bridge" (Photo 8).

Photo 8: Villagers disposing of a pile of driftwood on Teza Bridge.

We also received a photo of Mr. K who was bitten by a poisonous snake, but since the Turia Bridge had been built, he was carried by car to a hospital in Aung Lang and survived (Photo 9).

Photo 9: Mr. K, who was bitten by a poisonous snake but was immediately

carried to the town through the Turia Bridge and survived.

Third year: Expansion in Magway region

It has been proven that the bridges built by JIP are strong and will not be washed away, and the number of requests has increased. In 2018, the Takin Bridge (Takin means "Master", the bridge length is 178m, 36m of which was covered by the Magway Region Government to cover the shortage of budget) in Tayet area (Photo 10), which was much needed but had been pending due to the long length of the bridge as well as the rapid changes in the river channel, Meta (Mercy) Bridge (76 m long) in Aung Lang District, and Ohnwar Bridge (66 m long) in Sid Thaya District, which is close to the border with Chin State and took two days to build from Yangon were built.

In addition, two bridges were built by the Embassy on the advice of JIP, and the submergible bridge seems to have been established in the Magway area.

Photo 10: Trucks now able to come to the village even in the rainy season.

Fourth year: Expansion to Sagaing Region and Kayin State

Seeing the achievements of the submergible bridges, the Magway Regional Government decided to build 8 bridges (later 9 bridges) with its own budget in FY2019. We, JIP, also wanted to expand the submergible bridge project to the whole country, so we applied to build three bridges in Sagaing Region and one bridge in Kayin State in response to many requests from all over the country. JIP will provide technical guidance for the 9 bridges to be constructed by the Magway Regional Government.

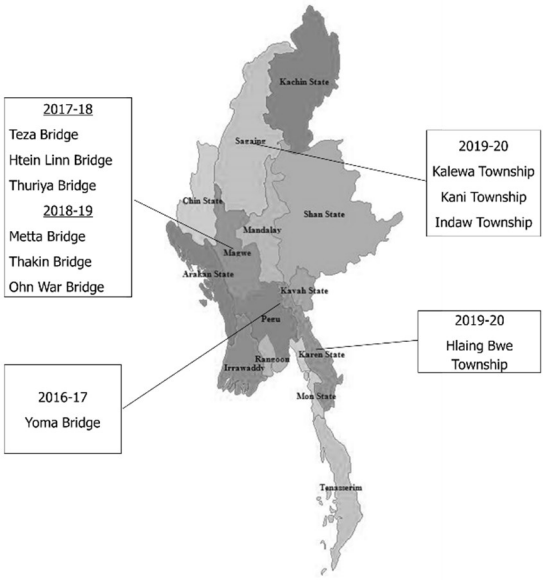

Figure 2: Location of the submerged bridge project

Conclusion

At the end of the military regime, the maintenance of major national highways was entrusted to the private sector, and BOT (Build, Operate, and Transfer) was established to cover the maintenance costs with the revenue from tolls collected by the private companies.

In May 2018, the newly appointed Minister of Construction, U Han Zou, inspected the Teza Bridge under construction. Later, the governor of the Magway Regional Government attended the opening ceremony of the Turia Bridge. The Minister was accompanied by senior officials of the central government, and the Governor was accompanied by a number of senior officials of the local government. From the enthusiasm of the opening ceremony, it was apparent that the local people had a strong desire to solve the traffic disruptions during the rainy season, and that they understood the effectiveness of the submergible bridge as a solution.

JIP has received requests for submergible bridges from more than 50 places in the Magway region alone, including the three bridges constructed in FY2017, and from about 100 locations nationwide,

and Vice President Asakura has visited most of them to confirm the necessity. Of course, JIP, which is only a non-profit organization, cannot respond to all these requests, and the engineers in Myanmar should plan, design, construct and maintain the bridges by themselves. Therefore, holding workshops for technology transfer is an important pillar of the project (Photo 11).

Photo 11: Engineers from the Regional Road Development Bureau practicing using PCs at the workshop.

JIP not only introduced the idea of a submergible bridge, but also demonstrated its potential by constructing it, and showed that there is a governmental demand for a submergible bridge. We believe that the significance and achievement of this project is very great. In the future, we would like to consider the possibility of securing and improving the traffic in rural areas, especially during the rainy season, while considering the submergible bridge as one of the alternatives to improve the traffic situation.