

# **Ex-Post Project Evaluation 2016: Package II-4 (the Philippines)**

**November 2017**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

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**Octavia Japan, CO., LTD.**

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Republic of the Philippines

FY 2016 Ex-Post Evaluation of Japanese Grant Aid Project

“The Project for the Bridge Construction for Expanded Agrarian Reform Communities  
Development, Phase II (Umiray Bridge)”

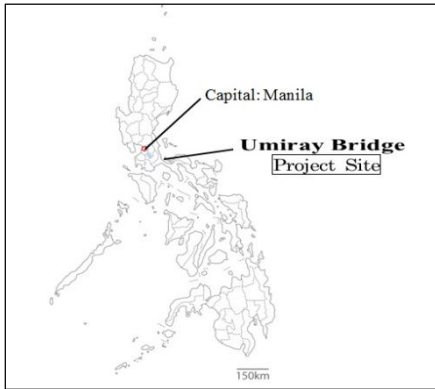
External Evaluator: Kenichi Inazawa, Octavia Japan Co., Ltd.

## **0. Summary**

This project constructed a bridge over the Umiray River at the provincial boundary of Aurora Province and Quezon Province in Luzon Island. The construction aimed to realize safe and smooth traffic and improve efficiency in transportation of goods in the agrarian reform communities (hereafter referred to as “ARCs”); thereby contributing to the social and economic development in the region. With regard to relevance, the Government of the Philippines is aiming to improve agricultural productivity in the ARCs as espoused in its *Philippine Development Plan (2011-2016)*, which also highlights the strategic development of transport infrastructures. Simultaneously, the Umiray Bridge, constructed under this project, plays an important role in facilitating smooth traffic access between Quezon and Aurora provinces in Region IV-A and Region III, respectively. Therefore, its relevance is high. Both the project cost and the project period fell within the original plan; thus, efficiency of the project is high. In terms of effectiveness and impact, the time required to cross the Umiray River has significantly reduced since the completion. Traffic has not been interrupted, even when the water level of the Umiray River rises due to typhoons and heavy rains. In addition, the beneficiary survey confirmed that this project is supporting improvements of agricultural productivity and contributing to the vitalization of the local economy. Thus, effectiveness and impact of this project are high. No major problems have been observed in the institutional, technical, financial aspects and current status of the operation and maintenance system. Therefore sustainability of the project effects is high.

In light of the above, this project is evaluated to be highly satisfactory.

## 1. Project Description



Project Location



Constructed Umiray Bridge and Access Road

### 1.1 Background

In the Philippines, lack of infrastructure development such as roads and bridges in the ARCs was a critical issue. In particular, since the eastern region of Luzon Island was prone to typhoons that are usually generated in the Pacific Ocean, sudden swelling of rivers due to heavy rainfall occurred frequently at Umiray River. For example, during the flood in 2004, 100 houses situated along the banks were washed away. The flood also killed 135 people, while 104 people were injured and 56 people went missing in Dingalan Municipality, Aurora Province. The Umiray River is flowing down along the boundary within both Barangay Umiray<sup>1</sup> in Dingalan Municipality, Aurora Province and Barangay Umiray in General Nakar Municipality, Quezon Province. Since there was no bridge at the site, using a small boat (hereafter referred to as “bangka”) was the sole way to cross the river. Some areas in the neighboring communities used to be isolated when the Umiray River was over flooded. Thus, there was an urgent need to establish safe and smooth traffic flows in the ARCs, improving the accessibility and stabilizing safety in the areas. Based on this situation, the Government of the Philippines requested the Japanese Government a grant aid project for constructing the Umiray Bridge.

### 1.2 Project Outline

The objective of this project is to realize safe and smooth traffic and improve efficiency in transportation of goods in the ARCs, by constructing a bridge over the Umiray River at the provincial boundary of Aurora Province and Quezon Province in Luzon Island, thereby contributing to the social and economic development in the region.

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<sup>1</sup> This barangay is located within both the Dingalan Municipality and General Nakar Municipality.

G/A Grant Limit / Actual Grant Amount	1,394 million yen / 793 million yen
Exchange of Notes Date /Grant Agreement Date	March 2012 / May 2012
Executing Agency	Department of Agrarian Reform
Project Completion	January 2014
Main Contractor	Shimizu Corporation
Main Consultant	CTI Engineering International Co., Ltd.
Basic Design	February to December 2008
Related Projects	<p><b>【Grant Aid Project】</b></p> <p>“The Project for the Bridge Construction for Expanded Agrarian Reform Communities Development” (2009)</p> <p>“The Project for Development of Agrarian Reform Communities in Marginal Areas” (2001)</p> <p><b>【ODA Loan Project】</b></p> <p>“Agrarian Reform Infrastructure Support Project (I)-(III)” (FY1995, 1999, 2007)</p> <p><b>【Other Donors’ Cooperation】</b></p> <p>“Agrarian Reform Community Project” (Asian Development Bank, 1999)</p> <p>“Agrarian Reform Community Project (2nd phase)” (World Bank, 2008)</p>

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Kenichi Inazawa, Octavia Japan Co., Ltd.

### 2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted with the following schedule.

Duration of the Study: August 2016 - November 2017

Duration of the Field Study: November 26 - December 8, 2016

March 22 - 29, 2017

### 3. Results of the Evaluation (Overall Rating: A<sup>2</sup>)

#### 3.1 Relevance (Rating: ③<sup>3</sup>)

##### 3.1.1 Consistency with the Development Plan of the Philippines

In 1993, the Philippine government formulated the *Agrarian Reform Community Development Strategy* as an approach to effectively achieve the objectives of agrarian reform and poverty reduction. In 2004, the government also formulated *the Medium-Term Philippine Development Plan (hereafter referred as to “MTPDP”) for 2004-2010*. The MTPDP positioned as a major strategy, the creation of 10 million jobs and the increase in productivity and income resulting from developing 2 million hectares of agribusiness lands to eradicate poverty of the farmers comprised by majority of the poor population.

At the time of ex-post evaluation, the government formulated the *Philippine Development Plan (2011-2016)* in 2011, which aimed at improving the agricultural productivity of the beneficiaries in the ARCs. The plan also highlighted the strategic development of transport infrastructures. In addition, the Department of Agrarian Reform (hereafter referred to as “DAR”), the executing agency of this project, formulated the agrarian reform *Policy Direction* in 2016 following the inauguration of a new government. This document talks about the improvement of farmers’ living conditions in the ARCs through such measures as enhancing agricultural productivity, supporting farmers and increasing job opportunities.

Therefore, this project which has been supporting the development of infrastructure in the ARCs was, and continues to be consistent with the development policy of the Philippines at the time of the planning, as well as at the time of the ex-post evaluation.

##### 3.1.2 Consistency with the Development Needs of the Philippines

At the time of ex-ante evaluation, due to lack of infrastructure development in the ARCs, there were a lot of areas in the Philippines without bridges. Thus, not only access to administrative services and medical institutions but transporting daily necessities was also limited. In particular, since the eastern region of Luzon Island was prone to typhoons that are usually generated in the Pacific Ocean, sudden swelling of rivers due to heavy rainfall occurred frequently at the Umiray River. The Umiray River is flowing down along the boundary between Barangay Umiray, Dingalan Municipality, Aurora Province and Barangay Umiray, General Nakar Municipality, Quezon Province. Since there was no bridge at the site, using bangka was

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<sup>2</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory and D: Unsatisfactory.

<sup>3</sup> ③: High, ② Fair, ① Low.

the sole way to cross the river. Under this circumstance, there was an urgent need to establish safe and smooth traffic flows in the ARCs, improving the accessibility and stabilizing safety in the areas.

At the time of ex-post evaluation, the Umiray Bridge, constructed under this project, plays an important role in facilitating smooth traffic access between Quezon and Aurora provinces in Region IV-A and Region III, respectively. This bridge is contributing to interactions among people, the vitalization of commercial transactions of agricultural and fishery products and the promotion of tourism in the surrounding areas<sup>4</sup>, including the ARCs. Additionally, as Dingalan Municipality (located north of the Umiray Bridge) and General Nakar Municipality (located south) are prone to typhoons, tropical cyclones and heavy rains, the bridge is utilized by local residents when they need to evacuate. Thus, the bridge functions as a disaster risk response.

Therefore, the project is consistent with the developmental needs brought to light by the ex-ante and ex-post evaluations.

### 3.1.3 Consistency with Japan's ODA Policy

*The Country Assistance Plan for the Philippines*, which was developed by the Ministry of Foreign Affairs of Japan in 2000, identified the following priority areas and sector assistance policy: (1) “strengthening the economy and overcoming growth constraints toward sustained economic growth”; (2) “rectification of disparities (alleviating poverty and redressing regional disparities)”; (3) “environmental protection and anti-disaster measures”; and (4) “human resources development and institution building”.

This project aimed to strengthen the economy and redress regional disparities of the Philippines by constructing a bridge and is in line with the above priority areas through country assistance plan and policy for economic cooperation operations. Therefore, it is consistent with the assistance policy of Japan.

In light of the above, this project has been highly relevant to the country's development plan and development needs, as well as Japan's ODA policy. Therefore its relevance is high.

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<sup>4</sup> The roads near the Umiray Bridge are not covered with asphalt and are narrow. Because of this, the transport of goods and traffic access is time-consuming. (However, as will be discussed in the Impact section, traffic accessibility has greatly improved as compared to the time before construction of the bridge.)

### 3.2 Efficiency (Rating: ③)

#### 3.2.1 Project Outputs

Table 1 shows the plan and actual outputs of this project.

Table 1: Outputs of the Project (Plan/Actual)

Plan (Before Project Commencement)		Actual (At the Time of Ex-Post Evaluation)
<b>【Japanese Side】</b>		
1	Construction of Umiray Bridge (bridge length: 358m, approach roads: 272m)	Implemented as planned
<b>【Philippine Side】</b>		
1	Acquisition of land for construction, relocation of houses	Implemented as planned
2	Customs clearance of equipment and materials	Not implemented
3	Maintenance of Inland transportation road	Implemented as planned
4	Securing of land required for the construction (site office, stock-piling yard, working yard)	Implemented as planned
5	Relocation of obstacles (electric and telephone poles, water pipes, agricultural canals etc.)	Implemented as planned

Source: Document provided by JICA, Answers to the questionnaires

The Japanese outputs were implemented as per the plan prepared. Also, the Philippine side's outputs were mostly implemented as per the plan. Meanwhile the only output not implemented by the Philippine side was “customs clearance of equipment and materials.” While this output was intended for imported goods and equipment that would incur custom duties, in reality these items could be procured domestically, meaning that there was no need for custom duty.



Photo 1: Constructed Umiray Bridge



Photo 2: Access Road  
(photo taken from General Nakar side)



### 3.2.2 Project Inputs

#### 3.2.2.1 Project Cost

The initially planned project cost was approximately 1,550 million yen. In reality, the project cost was approximately 866 million yen; thus, the project cost was lower than planned (approximately 56% of the plan). Table 2 shows the difference between the initially planned and actual cost of the project.

Table 2: The Initially Planned Project Cost and Actual Cost

(Unit: million yen)

	Planned	Actual
Japanese side	1,394	793
Philippine side	Approx. 156	Approx. 73
(Whole)	Approx. 1,550	Approx. 866

Source: JICA's document and answers to questionnaire

The main reason for this large change is the reduction of construction costs for the Japanese side. The construction company, contracted through competitive bidding, decided not to construct the temporary bridge (as was initially planned). They applied different construction methods, such as constructing a crane way in the Umiray River, fixing abutments and assembling a PG Girder before the erection work took place. As a result, construction costs were kept low. Applying such methods also led to the construction period being shortened. Project costs for the Philippine side were also within the initially planned budget (the budget for the initial plan was approx. 86.2 million PhP, whereas the actual cost was 32.7 million PhP). The main reason for this is the decrease of VAT<sup>5</sup> due to the reduction of construction cost for the Japanese side.

#### 3.2.2.2 Project Period

This project was planned to last for 37 months, starting from May 2012 to May 2015. The actual project period for the Japanese side was 21 months from May 2012 to January 2014, which was shorter than planned<sup>6</sup> (77% of the plan). This is mainly because of the construction

<sup>5</sup> It is 12% within the Philippines.

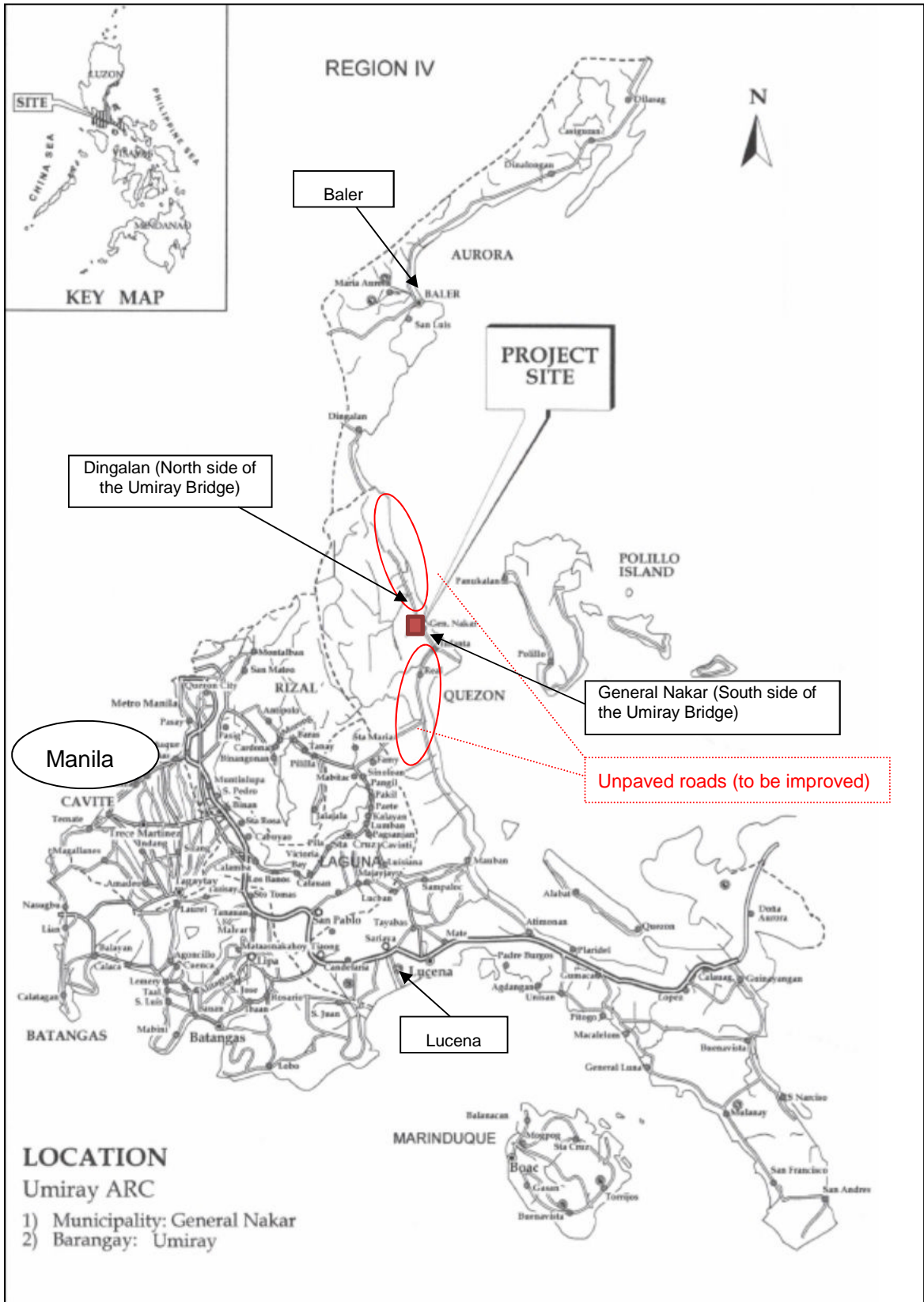
<sup>6</sup> It was confirmed through questionnaires and interviews with DAR headquarters and the Provincial Governments of Aurora and Quezon that the project period of the Philippine side spanned from January 2010 to October 2012. There

method applied by the contractor that shortened the project period, as explained above.

Influenced by the Japanese side's construction method, both the project costs and period were within the plan (project costs were 56% of the planned budget, whereas the project period was 57% of the planned period). The outputs were implemented within the plan, meaning that efficiency is high.

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was no particular delay.



Source: DAR

Figure 1: Project Related Map

### 3.3 Effectiveness<sup>7</sup> (Rating: ③)

#### 3.3.1 Quantitative Effects (Operation and Effect Indicators)

In order to achieve the project objective regarding the Umiray Bridge “to realize safe and smooth traffic and improve efficiency in transportation of goods in the ARCs”, the following operation and effect indicators were set at the time of ex-ante evaluation. Actual values for each indicator were also obtained through this evaluation study and the results of these analyses were as follows:

##### 3.3.1.1 Operation Indicator of the Project: Average time to cross the river

Table 3 shows the operation indicator of the project: average time to cross the river (baseline, target and actual).

Table 3: Operation Indicator of the Project:  
Average Time to Cross the Umiray River (baseline, target and actual)

Baseline 2011 (planned year)	Target	Actual*			
	3 years after the project completion (as of year 2018)	2013	2014 (Completion Year)	2015 (1 year after completion)	2016** (2 years after completion)
300 sec.	52 sec.	300 sec.	30-35 sec.	30-35 sec.	30-35 sec.
			55 sec.	55 sec.	55 sec.

Source: Document provided by JICA (baseline, target); answers to the questionnaire and actual measurements during the field survey (actual)

Note 1\*: Regarding the actuals for 2014-2016, the figures in the upper row show the average time taken to cross the river during non-peak time, while the figures in the lower row show the average time taken to cross the bridge during peak time.

Note 2\*\*: Before the project, achievement of the quantitative effect (target) was set at 2018, 3 years after the completion. However, this project was completed in 2014, and the latest year, 2016 is compared against the target year for analyzing the project effect.

This project was completed in January 2014. Concerning the operation indicator, the figure for 2013 and the year before (i.e., 300 seconds) refers to the time required to cross the Umiray River by bangka. After the project completion, the river can be crossed within 30-35 seconds during non-peak time, and even during peak time one can do so within 55 seconds. As a result of the significant time reduction, the flow of people and the distribution of goods have improved<sup>8</sup>.

<sup>7</sup> The sub-rating for Effectiveness is to be considered together with Impact.

<sup>8</sup> Before the commencement of the project, there was a long waiting time to board the boat. While crossing the river by the boat took only 300 seconds, people often had to wait one or two hours until they could get on the boat.

### 3.3.1.2 Effect Indicators of the Project:

#### 3.3.1.2.1 Annual Number of Days of Access Disruption

As shown in Table 4, there has been no single day during which access was disrupted since the completion, as per the initial plan. Traffic accessibility was secured even when the water level of the Umiray River increased due to typhoons and heavy rains.

Table 4: Effect Indicators of the Project: Annual Number of Days of Access Disruption  
(baseline, target and actual)

Baseline  Planned year (as of year 2011)	Target	Actual			
	3 years after the project completion (as of year 2018)	2013	2014 (Completion Year)	2015 (1 year after completion)	2016* (2 years after completion)
6 days	0 day	n/a	0 day	0 day	0 day

Source: Document provided by JICA (baseline, target); answers to the questionnaire (actual)

Note\*: Before commencement of the project, achievement of the quantitative effect (target) was set at 2018, 3 years after the completion. However, this project was completed in 2014, and the most current year, 2016 is the target year for achieving the project effect.

#### 3.3.1.2.2 (Reference Figures) Passenger Car Unit (PCU)

Concerning the Passenger Car Unit (hereafter referred to as “PCU”) shown in Table 5, the baselines and targets were set as a projection for before and after the completion of the Umiray Bridge. However, the projection was based on examples from the Bazal Bridge (another grant project funded by JICA, located near the city and market), which was implemented almost at the same time. It was not an accurate figure for traffic demand at the Umiray Bridge<sup>9</sup>. With respect to traffic volume, it was observed during the field survey that the actual demand is assumed to be around 300 PCU at Umiray Bridge. With the unpaved roads of the surrounding areas, 1,500 or more PCU would not be realistic for the traffic demand and comparisons of the target and actual. Considering the above, the PCU figures will be used as reference. On the other hand, traffic volume has been increasing gradually since the completion of the bridge (i.e., 200 PCU in 2015 and 300 PCU in 2016). As will be discussed below under 3.4 Impact, this is because there is an increasing number of two- and three-wheel motorbikes and also because public bus service began to operate.

<sup>9</sup> The baselines and targets set at before implementation of this project (both were estimated figures) were calculated by applying the trip ratio of the Bazal Bridge (indicating the daily flow of people who constitute the main traffic as a percentage) to the case of Umiray Bridge.

Table 5: Effect Indicators of the Project: (Reference Figures) Passenger Car Unit (PCU)  
(baseline, target and actual)

Baseline (as of year 2008's estimation)	Target	Actual			
	3 years after the project completion (as of year 2020's estimation)	2013	2014 (Completion Year)	2015 (1 year after completion)	2016* (2 years after completion)
1,541 PCU	2,001 PCU	n/a	93 PCU	200 PCU	300 PCU

Source: Document provided by JICA (baseline, target); answers to the questionnaire (actual)

Note\*: Before the project, achievement of the quantitative effect (target) was set at 2018, 3 years after the completion. However, this project was completed in 2014, and the latest year, 2016 is compared against the target year for analyzing the project effect.

### 3.3.2 Qualitative Effects (Other effects: Ensuring safe traffic at the time of flood calamities)

According to local residents living around the Umiray Bridge, the Provincial Governments of Aurora and Quezon and DAR, they can evacuate safely in the event of typhoons, heavy rains and tropical cyclones by crossing the bridge, and the issue of neighboring communities becoming isolated by the event was also solved. In light of the above, it is thought that the implementation of this project has secured safe traffic access and also plays a role in the evacuation of residents<sup>10</sup>.

## 3.4 Impacts

### 3.4.1 Intended Impacts

#### 3.4.1.1 Contribution to the social and economic development in the ARCs

It was expected that this project would increase transaction of agricultural products, vitalization of cooperatives' activities, increase of farmers' income, and increase in medical, educational and employment opportunity access. As part of this ex-post evaluation, a beneficiary survey was conducted, targeting drivers and residents who use the constructed Umiray Bridge. The survey took a total of 102, of which 50 were drivers and 52 were surrounding residents<sup>11</sup>. The questions and responses are summarized below.

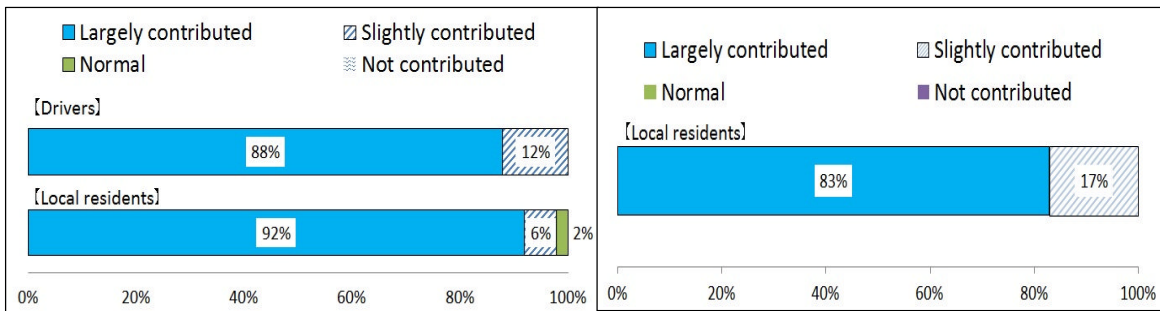
<sup>10</sup> Information could not be obtained regarding numbers of the injured and deaths due to typhoons and other disasters after the completion of the project, since there are no recorded data.

<sup>11</sup> The properties of the samples are: 1) those who have been crossing the Umiray River for the past 5 years or more (i.e., those who can tell the difference between before and after the project); 2) the targeted barangay was Barangay Umiray (Barangay Umiray on the Dingalan side and the General Nakar side); 3) sex ratio: 72% male and 28% female; 4) average age: 40 for drivers and 42 for local residents; 5) occupation (of drivers): 40% were engaged in three-wheel motorbikes (i.e., taxis), 50% in three-wheel taxis and agriculture, 6% in three-wheel taxis and as security guards, 2% were public bus drivers and 2% were ambulance drivers; 6) occupation (of residents): 31% were barangay staff, 25% were housewives, 23% worked in agriculture, 8% were shop owners and worked in the retail business and 13% had other occupations. The lists of drivers and residents were obtained from Barangay Umiray, the Umiray Agrarian Reform Beneficiaries Multi-Purpose Cooperative (UMARBEMPCO) and others. Samples for this beneficiary survey were drawn by selecting every third person, starting from the top of the list. The survey used

Concerning Question 1 regarding improvement of local farmers' incomes, both of the most drivers and residents answered "greatly improved". According to the interviews with the respondents, following comments were received: "Because of the completion of the Umiray Bridge, I began producing rice and corn. As transporting the goods to the markets became easier, the work became more profitable. Thanks to the fact that our income actually increased, we renovated our house (made the outside walls concrete) and purchased a motorbike." In the light of such a comment, it can be judged that the completion of the bridge is contributing to increasing incomes of local farmers in some cases. Quantitative data concerning exact agricultural income could not be obtained, since there is no record at Dingalan Municipality. Therefore, it is not clear to what extent the income has increased. Questions 2 to 4 concerned the relationship between the completion of the Umiray Bridge and improved access to public facilities, more job opportunities and increased educational opportunities. Only residents were asked about these questions; the answers were mostly positive, confirming that the project had contributed. According to the interviews with respondents, following comments were received: "Because the Umiray Bridge was completed, I purchased a two-wheel motorbike. Additionally, I move around more often because the public bus service began to operate. We became able to access not only markets, but also schools and work places that we had previously been unable to choose (because of the distance) even if we wanted to." Based on such a comment, it can be judged that this project is contributing to improved access to public facilities and also to increased job and educational opportunities in some cases. Question 5 was a question concerning the relationship between this project and local economies. It was confirmed that both drivers and residents felt that the completion of the Umiray Bridge was contributing to the vitalization of local economies. Respondents commented when interviewed, "The numbers of tourists and resort facilities have been increasing year by year. There are more vehicles passing, and it is becoming livelier." Thus, it can be judged that this project has played some role in vitalizing local economies.

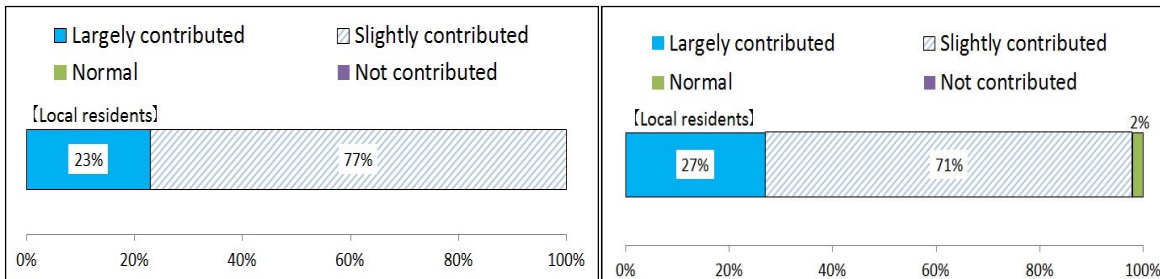
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face-to-face interviews using questionnaires. Regarding biases and notes for interpreting the result, it can be said that the results are not statistically significant because the sample size of this beneficiary survey was small.



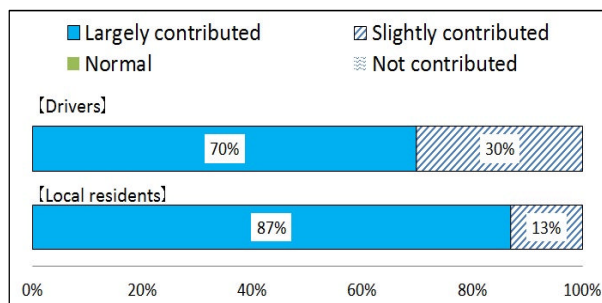
Question 1: How do you think that completion of the Umiray Bridge contributed to improve agricultural income of local farmers? (n= 50 of drivers, 52 of local residents)

Question 2: How you think that completion of the Umiray Bridge contributed to improve your access to public facilities? (e.g., church, school, hospital, market) (n= 52 of local residents)



Question 3: How do you think that completion of the Umiray Bridge contributed to increase job opportunities? (n= 52 of local residents)

Question 4: How do you think that completion of the Umiray Bridge contributed to increase education opportunities? (n= 52 of local residents)



Question 5: How do you think that completion of the Umiray Bridge contributed to improve local economy? (n= 50 of drivers, 52 of local residents)

(Reference) Changes in Volume of Agricultural Products

Table 6 shows changes in volume of agricultural products in the Dingalan Municipality, located to the north of the Umiray Bridge. As discussed at this impact section, it is assumed that completion of the Umiray Bridge has been contributing to transporting production inputs such



as seeds, seedlings and fertilizer and making it easier to purchase and less costly, and this is leading to increasing the volume of agricultural products.

(Reference) Table 6: Changes in Volume of Agricultural Products in the Dingalan Municipality

(Unit: ton)			
2012	2013	2014	2015
2,398	2,440	2,467	2,510

Source: Dingalan Municipality

### 3.4.1.2 Contribution to Economic Development

As shown in Table 7, tax revenues of the Dingalan Municipality increased due to the vitalization of its economy and rise in land prices<sup>12</sup>, which has increased their budget through collection of taxes. The Dingalan Municipality commented: “As a result of the improvement in traffic access after the completion of the bridge, the transportation of goods and the flow of people increased, and we have become able to publicize our municipality as an attractive tourist destination. We have more tax revenues due to the vitalization of the economy and less delinquent tax, and we have become able to put more focus on providing governmental services. We have also been able to increase our staff by 15%.” Therefore, it can be judged that the completion of the Umiray Bridge has been playing a role in vitalizing the economies of the surrounding areas.

Table 7: Budget of the Dingalan Municipality<sup>13</sup>

(Unit: PhP)	
2012	2015
64,799,000	93,866,083

Source: Dingalan Municipality

### 3.4.2 Other Positive and Negative Impacts

#### 3.4.2.1 Impacts on Natural Environment

The questionnaires and interviews with DAR, the Provincial Government of Aurora and Quezon, the Dingalan Municipality, the General Nakar Municipality and Barangay Umiray confirmed that there was no negative environmental impact during the project implementation. According to DAR, for example, the contractor set exclusive space for construction wastes, thereby avoiding negative influence on river and sea water quality.

<sup>12</sup> According to Dingaran Municipality, it has been influenced by the economic revitalization.

<sup>13</sup> Data 2013 and 2014 was not available since it was not provided by Dingalan Municipality. Only data regarding 2012 and 2015 was available.

It was also confirmed that the situation remains the same at ex-post evaluation. No particular negative impact was observed on air pollution, water quality, noise, vibration and ecological systems in the areas surrounding the constructed bridge.

Barangay Umiray, which is located closest to the Umiray Bridge, is mainly responsible for the environmental monitoring of this project. In some cases, the officials of Barangay Umiray report to supervising bodies, the Dingalan Municipality and the General Nakar Municipality, or even to higher bodies, such as the environmental departments of the provincial government of Aurora and Quezon. However, there has been no particular environmental issue since the completion of the project and no measures have thus been taken as a result of the monitoring.

#### 3.4.2.2 Land Acquisition and Resettlement

Under this project, 4 families in the Dingalan Municipality and 10 families in the General Nakar Municipality were subject to resettlement. All of these families were informal settlers residing along the road connecting to the Umiray Bridge. 40,000 to 100,000 PhP was paid to each family, not as compensation but as a relocation fund, based on DAR's internal regulation. The actual square meters of land acquired was approximately 5,700m<sup>2</sup> as planned. The relocation was carried out by the time of the commencement of construction works. The relocation site is located not far from the Barangay Umiray and the Umiray Bridge, and the relocated people are still living there. The payment was made from DAR's budget and the procedures were smooth. Apart from the relocation fund, DAR provided job support the service industry, such as catering workers and three-wheel motorbike drivers.

In addition, before implementation of this project, there were in total 14 bangkas operating in the Umiray River. It was expected that the boat owner and operator would be affected after the construction of the bridge. In reality, although they were affected by the completion of the Umiray Bridge, they understood the benefits of the project and accepted it. The interviews with DAR, the Dingalan Municipality, the General Nakar Municipality and the bangka operators confirmed that the boat operators had sufficiently understood that the completion of the Umiray Bridge would benefit many of the surrounding residents. At the time of ex-post evaluation, it was confirmed that the boat operators continue to work by connecting upstream and downstream movements of peoples and goods, and their income is secured.



Photo 3: Road Surface of the Umiray Bridge



Photo 4: Bangka on the Umiray River

### 3.4.2 Other Unintended Positive Impacts

Changes in the numbers of hotels, resort facilities and tourists in the Dingalan Municipality before and after the completion of the project are shown in Table 8.

Table 8: Data Related to Tourism in the Dingalan Municipality

	2012 (Before project)	2015 (1 year after completion)
Number of Hotels	0	2
Number of Resort Facilities	18	29
Number of Tourists	10,000	27,955

Source: Dingalan Municipality

Due to the construction of the Umiray Bridge, the accessibility has been improved. As a result, tourism is developing in the surrounding areas. The areas surrounding the bridge are characterized by beautiful scenery looking out to the Pacific Ocean, attracting domestic and international visitors coming for marine sports such as surfing. Particularly after the completion of the bridge, the number of hotels and resort facilities has increased and the number of visitors from Manila is increasing. As discussed above, the budget of the Dingalan Municipality has increased, partly because their tax revenue has increased due to the vitalization of the tourism industry.

Therefore, it can be judged that this project has been contributing on tourism development in the surrounding regions.

### < Summary of Effectiveness and Impacts >

After the completion of this project, the time required to cross the Umiray River has

significantly reduced. Traffic has not been interrupted, even when the water level of the Umiray River rises due to typhoons and heavy rains. In addition, the beneficiary survey confirmed that this project is supporting improvements of agricultural productivity and contributing to the vitalization of the local economy. Furthermore, the budget of the Dingalan Municipality, tourism-related data and interviews with the local barangay shows that the construction of the Umiray Bridge is contributing to the economic vitalization, in the surrounding areas. In light of the above, the effectiveness and impact of the project are high.

### **3.5 Sustainability (Rating: ③)**

#### **3.5.1 Institutional Aspects of Operation and Maintenance**

The executing agency of this project is DAR. Immediately before the completion of the project, DAR had a discussion with the Provincial Governments of Aurora and Quezon and the municipalities under its jurisdiction (the Dingalan Municipality and General Nakar Municipalities, respectively) about the operation and maintenance of the Umiray Bridge after its completion. Under the leadership of DAR, an operation and maintenance plan, the *10-Year Sustainability Plan for the Umiray Bridge Project*, was formulated. As a result, it was decided that Barangay Umiray, closest to the Umiray Bridge, would hold principal responsibility for operation and maintenance, the Provincial Engineering Office (hereafter referred to as “PEO”) of the Provincial Governments of Aurora and Quezon would be responsible for major repairs. On the other hand, DAR is to supervise the operation and maintenance of the Umiray Bridge. Interviews confirmed that coordination and communication among the relevant institutions was smooth.

Based on the above plan, Barangay Umiray is responsible for the whole and day-to-day operation and maintenance. The barangay staffs are to carry out routine works such as cleaning, de-weeding and the painting of the balustrade parapet. Meanwhile, the PEOs of the Provincial Governments of Aurora and Quezon conduct major periodic maintenance twice a year, which includes inspection of the bridge girder and bolts and repairs using heavy machinery.

Regarding the number of staff, although Barangay Umiray is not assigning a specific number of staff for the operation and maintenance of the Umiray Bridge, it is observed that about 5 to 10 people are usually engaged in the task. On the other hand, the PEO of the Provincial Governments of Aurora and Quezon are supposed to assign 11 and 50 staff respectively. However, the number of required staff depends on the nature of the operation and maintenance work. In any case, in light of the structure scale of the Umiray Bridge and the

requested operation and maintenance, it is judged that the number of the staff is enough.

Furthermore, Dingalan and General Nakar Municipalities, the Provincial Government of Quezon and Aurora, as well as the Department of Public Works and Highways (hereafter referred to as “DPWH”) are considering of upgrading the surrounding roads, including the Umiray Bridge, from provincial to national roads. The Umiray Bridge is one of the main infrastructures connecting the 2 provinces. If the roads are upgraded to a national road, the Umiray Bridge will also be consequently converted into a national bridge. As a result, it can be thought that DPWH will assist the periodical maintenance activities with sufficient amount of the budgets.

Therefore, it can be judged that there is no problem with the institutional aspect of this project at the time of ex-post evaluation.

### 3.5.2 Technical Aspects of Operation and Maintenance

No particular high-level technologies are needed to operate and maintain the Umiray Bridge. Barangay Umiray simply cleans, de-weeds and paints the balustrade parapet. The required tasks therefore are not of a particularly high level.

The PEO of the Provincial Government of Aurora is responsible for the training of technical staff. Some of this technical trainings relate to the supervision of construction sites and bridge technologies, while some are technical training offered by DPWH. The situation is the same for the PEO of the Provincial Government of Quezon. Periodic training is conducted and the offices are staffed with experienced personnel. Staff interviews during the field survey also confirmed that they had sufficiently understood the importance of operation and maintenance. In addition, it was also confirmed that on-the-job training (OJT) is given to newly recruited staff.

Technical maintenance manuals are available at both of the PEOs. Interviews confirmed that these manuals were referred to as needed.

Therefore, no major problems have been particularly observed concerning the technical aspect of the operation and maintenance concerning this project.

### 3.5.3 Financial Aspects of Operation and Maintenance

As discussed in 3.5.1, Barangay Umiray is mainly responsible for maintaining the Umiray Bridge. The bridge is located in this barangay, and its northern side, Dingalan, spends 25,000 PhP/year while its southern side, General Nakar, spends 50,000 PhP/year on maintenance

costs<sup>14</sup>. Since the actual maintenance tasks are cleaning, de-weeding and the painting of the balustrade parapet, there is therefore no need for a large budget. Budgets for barangays are directly disbursed by the central government on a yearly basis<sup>15</sup>, and the maintenance costs for Barangay Umiray are disbursed every year based on the *10-Year Sustainability Plan for the Umiray Bridge Project*.

The maintenance costs of the PEOs of the Provincial Governments of Aurora and Quezon, responsible for major maintenance works carried out every 3-5 years at necessary base, are shown in Table 9<sup>16</sup>. When interviewed about the maintenance costs, the PEOs of the Provincial Governments of Aurora and Quezon commented: “While we cannot say that the allocated operation and maintenance budgets are high, the minimum amounts needed have been allocated.”

Table 9: Maintenance Costs of Aurora and Quezon Province  
(Unit: 1,000PhP)

	2014	2015	2016
Aurora Province	4,485*	5,333*	5,000*
Quezon Province	13,000**	13,000**	13,000**

Source: PEOs of the Provincial Government of Aurora and Quezon

Note\*: The 2014/2015 figures are actuals and the 2016 figures are allocated budgets.

Note\*\* : All figures are allocated budgets.

In light of the above, no particular problems are observed regarding the financial aspect of the operation and maintenance of this project.

#### 3.5.4 Current Status of Operation and Maintenance

It has been confirmed through site visits during the field survey that the Umiray Bridge is fully functional as an appropriate civil structure at the time of the ex-post evaluation, thanks to proper maintenance works. Traffic interruptions due to defects or insufficient maintenance and damage to a road surface were not observed. Therefore, it can be judged that there is no major problem with the maintenance status of the Umiray Bridge.

Spare parts for the Umiray Bridge are procured as appropriate when replacement or repairs are needed (i.e., spare parts are not usually stocked, but are procured as needed.) Some spare parts can be procured locally without much time, while importing parts can take time from

<sup>14</sup> Mainly purchase of painting/cleaning equipment, etc.

<sup>15</sup> The cost item for this is “Barangay’s Internal Revenue Allotment or IRA”.

<sup>16</sup> However, the figures in the table are not limited to the Umiray Bridge and constitute the maintenance costs for the entire province.

application to the completion of the procurement. However, there has been no major problem after project completion.

No major problems have been observed in the institutional, technical, financial aspects and current status of the operation and maintenance system. Therefore sustainability of the project effects is high.

## **4. Conclusion, Lessons Learned and Recommendations**

### **4.1 Conclusion**

This project constructed a bridge over the Umiray River at the provincial boundary of Aurora Province and Quezon Province in Luzon Island. The construction aimed to realize safe and smooth traffic and improve efficiency in transportation of goods in the ARCs; thereby contributing to the social and economic development in the region. With regard to relevance, the Government of the Philippines is aiming to improve agricultural productivity in the ARCs as espoused in its *Philippine Development Plan (2011-2016)*, which also highlights the strategic development of transport infrastructures. Simultaneously, the Umiray Bridge, constructed under this project, plays an important role in facilitating smooth traffic access between Quezon and Aurora provinces in Region IV-A and Region III, respectively. Therefore, its relevance is high. Both the project cost and the project period fell within the original plan; thus, efficiency of the project is high. In terms of Effectiveness and Impact, the time required to cross the Umiray River has significantly reduced since the completion. Traffic has not been interrupted, even when the water level of the Umiray River rises due to typhoons and heavy rains. In addition, the beneficiary survey confirmed that this project is supporting improvements of agricultural productivity and contributing to the vitalization of the local economy. Thus, effectiveness and impact of this project are high. No major problems have been observed in the institutional, technical, financial aspects and current status of the operation and maintenance system. Therefore sustainability of the project effects is high.

In light of the above, this project is evaluated to be highly satisfactory.

### **4.2 Recommendations**

#### **4.2.1 Recommendations to the Executing Agency**

As a result of the completion of the Umiray Bridge, the flow of people and the distribution of goods have improved in the surrounding areas of the municipalities of Dingalan and General

Nakar. On the other hand, the transportation of goods and traffic access from production sites to markets still take time, as the roads connected to the bridge are not paved. In order to further vitalize the flow of goods and people, it would be preferable for the DPWH and other relevant institutions to proceed with the idea of widening and paving these surrounding roads.

#### 4.2.2 Recommendations to JICA

None.

#### 4.3 Lessons Learned

##### Importance of the early institutionalization of the post-completion operation and maintenance plan for the project outputs

Immediately before the completion of the project, DAR discussed the post-completion operation and maintenance of the Umiray Bridge with the related organizations. The *10-Year Sustainability Plan for the Umiray Bridge Project* was formulated. It was decided that Barangay Umiray would be principally responsible for daily operation and maintenance, and that in the case of major repairs being needed, the PEOs of the Provincial Governments of Aurora and Quezon would take charge. As a result, the decision has made clear demarcation of responsibilities among the organizations, and the condition of operation and maintenance has been kept in good condition. Therefore, it can be said that the early identification and institutionalization of which organization should carry out operation and maintenance, in what way and with what budget, is an important element for immediate and sustained project effects.

##### Usefulness of collection of impact quantitative data (baseline value)

In this ex-post evaluation, the change (after 2012) in volume of agricultural products and amount of tax revenue after commencement of the project was collected as quantitative data of impact, and it was subject to review in evaluation judgment (data before the commencement was not available). Originally, in terms of these quantitative data, it is desirable that baseline values be collected before the commencement, compared and verified with the same data transition from the beginning of the project until the project completion, and evaluation judgment would be made. However, the baseline values were not collected at the preliminary survey stage (before 2011). JICA and the executing agency should collect such data as much as possible during the formation of similar grant aid projects and utilize them for monitoring and ex-post evaluation after the project completion.



Republic of the Philippines

FY 2016 Ex-Post Evaluation of Japanese Grant Aid Project

“The Project for Improvement of the Meteorological Radar System”

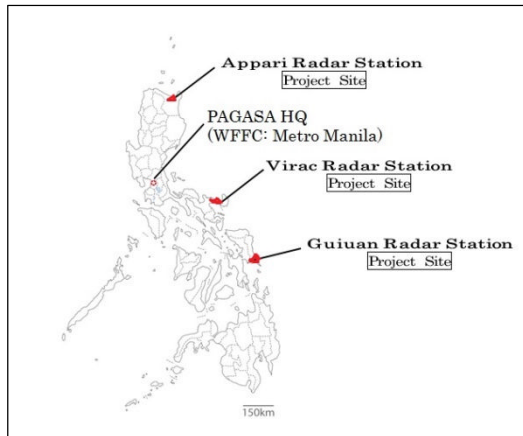
External Evaluator: Kenichi Inazawa, Octavia Japan Co., Ltd.

## **0. Summary**

By developing the existing meteorological radar systems at Virac, Aparri and Guiuan, this project aimed to improve tropical cyclone observation capabilities and upgrade accuracy of weather forecasts of the Philippine Atmospheric, Geophysical and Astronomical Services Administration (hereinafter referred to as “PAGASA”); thereby contributing to reduce risk in disaster caused by tropical cyclones and other severe weather phenomena. The implementation of this project is judged to be consistent with the development policy and needs of the Philippines both at the time of planning and ex-post evaluation. This project also has consistency with Japan’s ODA policy. Therefore, its relevance is high. While the project cost was within the initial planned budget, the project period was longer than initially planned. Thus, the efficiency of the project is judged to be fair. Quantitative effects have almost been achieved at the Virac, Guiuan and Aparri stations. In addition, PAGASA headquarters (Weather and Flood Forecasting Center (hereafter referred to as “WFFC”)) receive real time rain and wind information generated by the meteorological radar systems, based on which they can continuously monitor for 24 hours and issue typhoon information every hour. Furthermore, it was confirmed through interviews that local governments have been able to secure enough lead time before evacuating local residents based on the typhoon forecast announced by PAGASA. In short, there is possibility that this project has been indirectly contributing to reduce casualties and damages due to natural disasters. Thus, effectiveness and impact of this project are high. In terms of sustainability, no major problems have been observed in the institutional, technical, financial aspects and current status of the operation and maintenance. However operation of the meteorological radar station at Virac that was damaged by Typhoon Nock-Ten (local name: Nina) in December 2016 is suspended at the time of ex-post evaluation. Therefore sustainability of the project effects is fair.

In light of the above, this project is evaluated to be satisfactory.

## 1. Project Description



Project Location



Metrological Radar Tower at Virac

### 1.1 Background

Due to the aging of the meteorological radar systems at Virac, Aparri and Guiuan which were originally developed in 1994, it was difficult to conduct radar monitoring for PAGASA. Since these existing radar systems had no Doppler radar function<sup>1</sup>, monitoring stormy wind generated by tropical cyclone on a real time basis, including direction of rainfall motion, and detection of local severe storm associated with tornados in the Pacific Ocean and the coastal areas was not possible. Therefore, PAGASA was unable to accurately locate cyclone centers or intensities of the numerous tropical cyclones and detect heavy rainfall area due to unavailability of wind convergence area data. Based on this situation, the Government of the Philippines requested from the Japanese Government a grant aid project for developing the meteorological radar system of PAGASA.

### 1.2 Project Outline

The objective of this project is to improve tropical cyclone observation capabilities and upgrade accuracy of weather forecasts of PAGASA, by replacing the existing Virac, Aparri and Guiuan meteorological radar system; thereby contributing to reduce risk in disaster caused by tropical cyclones and other severe weather phenomena.

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<sup>1</sup> Doppler function is able to monitor wind velocities up to a maximum of 75 m/s and to detect the directions of rainfall motion within a 200-km radius. It is possible to accurately monitor the direction of strong winds and rainfalls caused by typhoons, as well as storms including tornados, which develop very quickly and cause real time damage. Additionally, it is also possible to identify areas with heavy rainfall from the wind convergence area data.

Grant Limit / Actual Grant Amount	23 million yen (Detailed design) & 3,350 million yen (Main work) / 23 million yen (Detailed design) & 3,169 million yen (Main work)
Exchange of Notes Date / Grant Agreement Date	March, 2009 (Detailed design) & October, 2009 (Main work) / May, 2009 (Detailed design) & November, 2009 (Main work)
Executing Agency	Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)
Project Completion Date	September, 2013
Main Contractor	Marubeni Corporation / Shimizu Corporation (JV)
Main Consultant	Japan Weather Association (JWA)
Basic Design	June 2008 to February 2009
Related Projects	<p><b>【Grant Aid Project】</b>  “The Project for the Improvement of Capabilities to cope with Natural Disasters Caused by Climate Change” (2010)  “The Programme for Rehabilitation and Recovery from Typhoon Yolanda” (2014)</p> <p><b>【ODA Loan Project】</b>  “Meteorological Telecommunication System Development Project” (1990)</p> <p><b>【Technical Cooperation】</b>  “Project for Enhancing Capacity on Weather Observation, Forecasting and Warning” (2014-2017)  “Project for Strengthening Capacity of Integrated Data Management of Flood Forecasting and Warning” (2016-2019)</p> <p><b>【Other Donors’ Cooperation】</b>  “Establishment of Early Warning System in the Philippines” (Korea International Cooperation Agency (KOICA), 2007)  “Strengthening the Disaster Preparedness Capabilities for Meteorological and Hydrological Hazards” (Taipei Economic and Cultural Office, National Science Commission, 2008)  “Hazard Mapping and Assessment for Effective Community based</p>

	<p>Disaster Risk Management” (United Nations Development Programme (UNDP), 2006)</p> <p>“Feasibility Study Grant for the PAGASA Met Hydro Telecom System Upgrading Project” (U.S. Trade and Development Agency (USTDA), 2008)</p>
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## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Kenichi Inazawa, Octavia Japan Co., Ltd.

### 2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted with the following schedule.

Duration of the Study: August 2016 - November 2017

Duration of the Field Study: January 11 - 28, 2017

April 19 - 26, 2017

## 3. Results of the Evaluation (Overall Rating: B<sup>2</sup>)

### 3.1 Relevance (Rating: ③<sup>3</sup>)

#### 3.1.1 Consistency with the Development Plan of the Philippines

At the time of planning, the government of the Philippines formulated *The Medium-Term Philippine Development Plan for 2004 to 2010* (MTPDP) in 2004. The plan embodied the 10-point agenda. Its number five thrust was to mitigate the occurrence of natural disasters to prevent the loss of lives and properties. The government also formulated *The Four-Point Action Plan* after the series of tragedies in 2004 that hit Aurora and Quezon Provinces and some neighboring areas. The components of the action plan were to strengthen 1) PAGASA’s forecasting capability, 2) public information campaign on disaster preparedness, 3) capacity building for local government units in identified vulnerable areas, and 4) mechanisms for government private sector partnership in relief and rehabilitation. In addition, the government also formulated *The National Science and Technology Plan for 2002-2020* (NSTP 2020), which was a long-term plan that defined the direction of Science and Technology (S&T) development in the Philippines until year 2020. Among the priority sectors identified for the

<sup>2</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory and D: Unsatisfactory.

<sup>3</sup> ③: High, ②: Fair, ①: Low.

S&T development included natural disaster mitigation, which pointed toward the urgent implementation of this project to minimize damage caused by natural disasters.

At the time of ex-post evaluation, the *Philippine Development Plan (2011-2016)* recognizes that climate change and related natural disasters would lead to more poverty and the deterioration of environmental quality. In acknowledgement of this, the Philippine government formulated the *Disaster Risk Reduction and Management Act (Republic Act 10121)* in 2010 and placed importance on the *Formulation of the National Disaster Risk Reduction Framework*, using an integrated method to manage a variety of disasters, including natural and human-induced disasters. In consideration of these, PAGASA formulated the *PAGASA Strategies and Programs 2016* in 2016, which stresses the importance of improving their systems for forecasting natural and human-induced disasters. Furthermore, the central government also enacted *Republic Act 10692 or An Act Providing for the Modernization of PAGASA*, in 2015. The act covers PAGASA's modernization of its physical resources and operational techniques, which shall entail the acquisition and/or upgrading of state-of-the-art instruments, equipment, facilities and systems, with emphasis on weather and flood monitoring and warning system and agro-meteorological observation system to strengthen services for agriculture and food security.

Therefore, this project is, and continues to be consistent with the development policy of the Philippines at the time of planning, as well as at the time of ex-post evaluation.

### 3.1.2 Consistency with the Development Needs of the Philippines

At the time of planning, the existing meteorological radar systems at Virac, Aparri and Guiuan located at the most strategic places for monitoring tropical cyclones hitting/crossing the country were constructed in 1994, financed by Japanese ODA loan "Meteorological Telecommunication System Development Project", and were more than 15 years old. Due to the aging of the existing radar systems, it became difficult to conduct radar monitoring. In addition, since the existing radar systems had no Doppler radar function, PAGASA was unable to monitor stormy wind generated by tropical cyclone on a real time basis, including direction of rainfall motion, and detection of local severe storm associated with tornados in the Pacific Ocean and the coastal areas; it was not possible for PAGASA to accurately locate cyclone centers or intensities of the numerous tropical cyclones and detect heavy rainfall area due to no wind convergence area data in the radar observed data. Furthermore, there was no data communication system to transmit the meteorological radar data such as rainfall intensity, wind

speed/direction inside PAGASA. Thus, considering adequate protection of life and property from tropical cyclone, it was imperative to improve the situation as soon as possible in order to provide continuous and timely dissemination of the storm signal warning and tropical cyclone information to the public.

At the time of ex-post evaluation, typhoon attacks on different areas and routes are increasing in the Philippines, in addition to expansion of its scales. For this reason, PAGASA plans to have 20 meteorological radar systems in total established by 2020 (there are 14, including the radar systems at Virac, Guiuan and Aparri at the time of ex-post evaluation), with the aim of improving their systems for monitoring typhoon routes and movements as well as heavy rainfall. In addition, PAGASA aims to improve the accuracy of weather forecasts and strengthen its institutional systems with the goal to reduce catastrophic effects of natural and human disasters through enhanced meteorological research using latest scientific technologies, human resource development and strengthened organizational development.

Therefore, the project is consistent with the development needs brought to light at the time of planning and ex-post evaluation.

### 3.1.3 Consistency with Japan's ODA Policy

The *Country Assistance Plan for the Philippines*, which was developed by the Ministry of Foreign Affairs of Japan in 2000, identified the following priority areas and sector assistance policy: (1) “strengthening the economy and overcoming growth constraints toward sustained economic growth”; (2) “rectification of disparities (alleviating poverty and redressing regional disparities)”; (3) “environmental protection and anti-disaster measures”; and (4) “human resources development and institution building”. With regard to (3), it is stipulated that “because frequent large-scale natural disasters constrain development, and also tend to impact more heavily on the poor, we will continue to provide aid for flood and sand control and earthquake-related measures, while also assisting in developing the necessary systems and capacity in related government institutions from a medium- to long-term perspective.”

This project aimed to strengthen the disaster monitoring function of the Philippines and is in line with the above priority and sector assistance policy ((3) environmental protection and anti-disaster measure). Therefore, it is consistent with the assistance policy of Japan.

In light of the above, this project has been highly relevant to the Philippine's development plan and development needs, as well as Japan's ODA policy. Therefore its relevance is high.

### 3.2 Efficiency (Rating: ②)

#### 3.2.1 Project Outputs

Table 1 shows the plan and actual outputs of this project.

Table 1: Outputs of the Project (Plan/Actual)

Plan (Before Project's Commencement)		Actual (At the Time of Ex-Post Evaluation)
<b>【Japanese Side】</b>		
[Equipment Procurement and Installation]		
1	Meteorological Radar System: Three units (Virac, Aparri, Guiuan)	Implemented as planned.
2	Meteorological Radar Data Display System: Four units (WFFC, Virac, Aparri, Guiuan)	
3	Meteorological Data Satellite Communication System (Very Small Aperture Terminal; hereinafter "VSAT <sup>4</sup> "): Four units (WFFC, Virac, Aparri, Guiuan)	
[Facility Construction]		
1	Radar Tower Building (including furniture for equipment): Three sites (Virac, Aparri, Guiuan)	Implemented as planned.
<b>【Philippine Side】</b>		
1	Demolition of the existing facilities and building	Implemented as planned.
2	Renovation of the existing building for the Staff Quarter	
3	Removal of the existing radar system, Installation of step-down transformer(s) for 150kVA power supply for the Radar Tower Building	
4	Construction of an access road	

Source: Document provided by Japan International Cooperation Agency (JICA), Answers to the questionnaires by PAGASA

Although there were minor design changes<sup>5</sup>, the outputs of the Japanese side were mostly implemented as planned.

Meanwhile, the meteorological radar tower at Guiuan was completely damaged by Typhoon Haiyan (local name: Yolanda) in November 2013<sup>6</sup>. The tower was then rehabilitated through a new grant aid project, the "Program for Rehabilitation and Recovery from Typhoon Yolanda". The construction and the procurement of equipment was implemented as per the design and

<sup>4</sup> It is a high speed data transmitting system utilized by satellites.

<sup>5</sup> Cf. There were minor changes from Basic Design (BD) to Detailed Design (DD). The main changes are explained as follows:

-Virac: Pile No. 2 moved 1,600 mm to north and pile No. 5 moved 1,600 mm to south. As drilling of well which was supposed to be potable water supplier was cancelled, agglomerations of spring water was activated instead. Then, a cubage unit of accumulation expanded and a function of filtration was added.

-Aparri: Direction of radar tower building changed.

-Guiuan: Location of radar tower building moved 2 m to north

<sup>6</sup> Although this system/facility was completed in September 2013 by this project, it was damaged two months later.

scale set out in this project; it was completed in December 2015<sup>7</sup>. Since then, there has been no typhoon damage, and the operation status remains good at the time of ex-post evaluation.

Subsequently, the structure of the meteorological radar tower at Virac was partially damaged by Typhoon Nock-Ten (local name: Nina), which occurred in December 2016. Photo 1 and 2 show the actual condition of damages caused by the typhoon. The electricity supply has been shut off since early January 2017, in order to avoid further damage due to many leakages inside the station which were caused by the typhoon. Since there is no electricity supply, the station is not operational at the time of ex-post evaluation. Meanwhile, PAGASA is considering to conduct the rehabilitation work using its own budgets for the radar tower at Virac, as of April 2017. According to PAGASA, the radar tower will be operational shortly.



Photo 1: Some solar panels were damaged by typhoon Nock-Ten



Photo 2: Water leakage sometimes occur from cracks in the ceiling caused by typhoon Nock-Ten

### 3.2.2 Project Inputs

#### 3.2.2.1 Project Cost

The initially planned project cost was approximately 3,961 million yen. In reality, the project cost was approximately 3,333 million yen; thus, the project cost was lower than planned (approximately 84% of the plan). Table 2 shows the difference between the initially planned and actual cost of the project.

<sup>7</sup> The Grant Agreement was signed in May 2014.



Table 2: The Initially Planned Project Cost and Actual Cost

	Planned Cost	Actual Cost
Japanese side	3,406 million yen	3,169 million yen
Philippine side	Approx. 555 million yen (=Approx. 214 million PHP <sup>8</sup> )	Approx. 164 million yen (=Approx. 71.74 million PHP <sup>9</sup> )
Total	Approx. 3,961 million yen	Approx. 3,333 million yen

Source: JICA's document (Planned, Actual), answers to questionnaire (Actual)

The cost was kept within the planned budget because: 1) the construction costs for the Japanese side were minimized through competitive tendering, and 2) the costs for the Philippine side were greatly reduced because, while the initial budget included consumption and import taxes for the procurement of equipment, these were largely exempted by the Philippine government after the project commenced.

### 3.2.2.2 Project Period

This project was planned to last for 51 months, starting from May 2009 to July 2013. The actual project period was 55 months from May 2009 to November 2013, which was longer than planned (approximately 108% of the plan). The main reason for the delay was that the construction of a road connecting to the meteorological radar tower at Guiuan (to be borne by the Philippine side) took more time than planned, including the procedure until work commencement and the work itself (approx. four months delay)<sup>10</sup>. With regard to completion date of the development of each metrological radar station, which includes the work to be borne by the Philippine side, it was in December 2011 at Virac, in May 2013 at Aparri, and in November 2013 at Guiuan.

While the project cost was within the initial planned budget, the project period was longer than initially planned. On the other hand, the outputs were implemented as per plan. Thus, the efficiency is judged to be fair.

<sup>8</sup> Exchange rate: PHP 1.00=Approx. JPY 2.60, as of August 2008

<sup>9</sup> Exchange rate: PHP 1.00=Approx. JPY 2.29 (Note: The exchange rate was calculated by taking the average rate for the period of the Philippine side's project period, November 2011 – November 2015, based on rates issued by the IMF's International Financial Statistics (IFS).)

<sup>10</sup> According to PAGASA, it took some time for negotiation on land acquisition with the owner of one of the lots for access road.

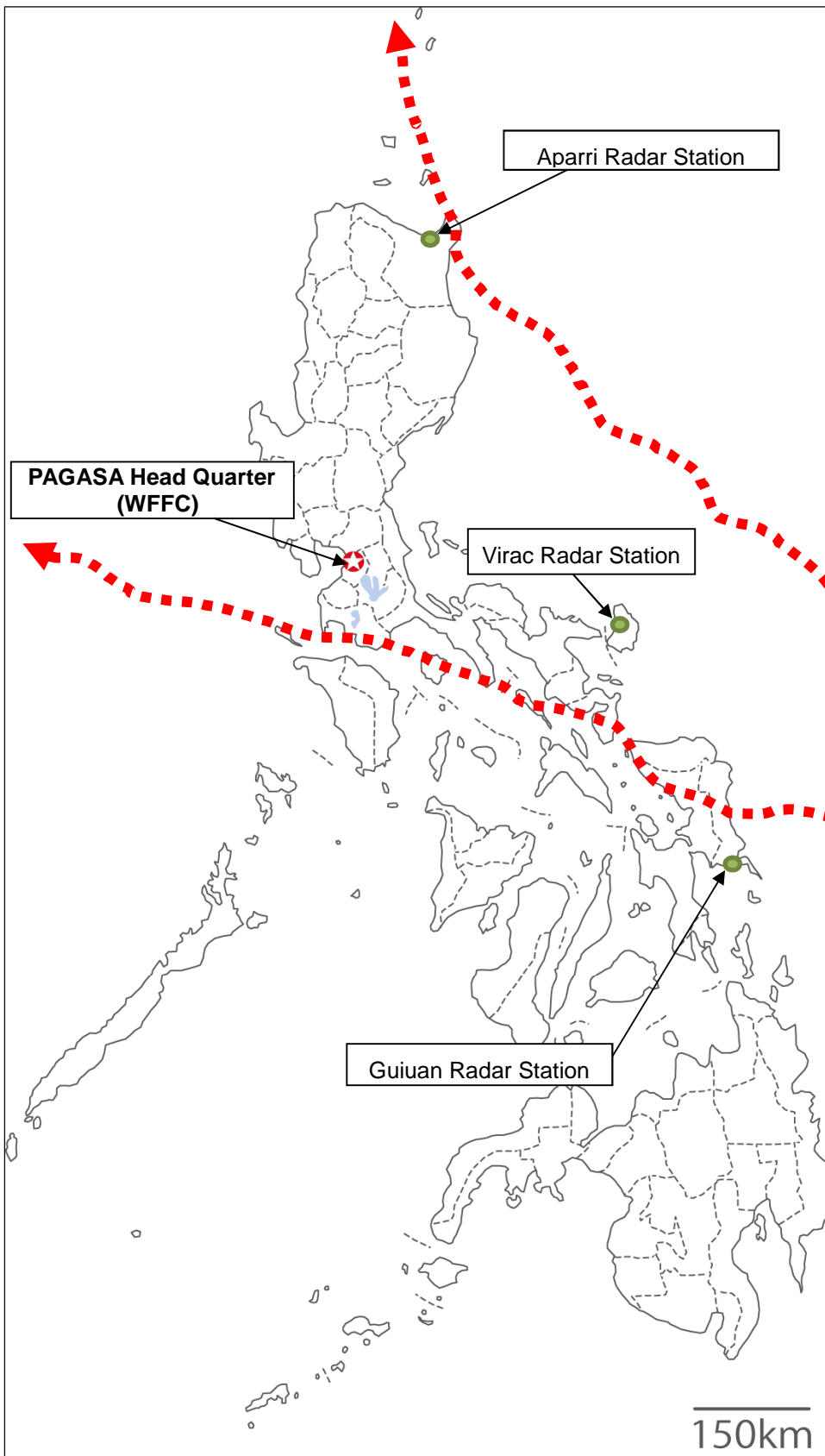


Figure 1: Location of Radar Stations Developed under this Project  
 (Red dotted lines indicate the two most frequent routes for the typhoons in the Philippines, in recent times.)

### 3.3 Effectiveness<sup>11</sup> (Rating: ③)

#### 3.3.1 Quantitative Effects (Operation and Effect Indicators)

##### (1) Operation Indicator of the Project: Enhancement of Cyclone Monitoring Capability of PAGASA

This project aimed to improve cyclone monitoring capabilities through the development of systems for the meteorological radar stations at Virac, Aparri and Guiuan. Table 3 shows the operation indicator of the project: Enhancement of Cyclone Monitoring Capability of PAGASA (baseline, target and actual).

Table 3: Operation Indicator of the Project:  
Enhancement of Cyclone Monitoring Capability of PAGASA (baseline, target and actual)

Baseline (2008)	Target (2014) (One year after the completion of the project)	Actual				
		2012	2013 (Completion year)	2014 (One year after the completion)	2015 (Two years after the completion)	2016 (Three years after the completion)
The range for detecting a precipitation intensity of 1 mm/h or more: a radius of 300km	The range for detecting a precipitation intensity of 1 mm/h or more: a radius of <u>450km</u> <sup>12</sup>	<b>[Virac]</b> Target has been achieved since May 2012. (However since the end of December 2016, Virac station has suspended its function due to damages brought about by Typhoon Nina.)				
		<b>[Aparri]</b> N/A (Not yet completed.)				
		<b>[Guiuan]</b> N/A (Not yet completed.) In November 2013, super-typhoon Yolanda completely damaged the Guiuan station. The radar system operated only for two months, from September to November 2013, thus this evaluation based its judgment on the performance of this period. Target was achieved during then. The station was rehabilitated by a new JICA grant aid project by December 2015. Since then, the function has been working well and target has been achieved.				
No capability to monitor tropical cyclonic wind velocity	The tropical cyclonic wind velocity <u>maximum of 75 m/s within a</u>	<b>[Virac]</b> Same as above description.				
		<b>[Aparri]</b> N/A (Not yet completed.) Same as above description.				

<sup>11</sup> The sub-rating for Effectiveness is to be considered collectively with Impact.

<sup>12</sup> According to PAGASA, “detection range of precipitation intensity 1 mm/h or more” can sometimes go up to 550 km radius when Doppler function works to its maximum effect.

	<u>200-km radius</u> <sup>13</sup> becomes measurable.	.)	
		<b>[Guiuan]</b>	
		N/A (Not yet completed .)	Same as above description.
No capability to detect the direction of rainfall motion	The direction of rainfall motion within a <u>200-km radius</u> becomes detectable.	<b>[Virac]</b>	
		Same as above description.	
		<b>[Aparri]</b>	
		N/A (Not yet completed .)	Same as above description.
		<b>[Guiuan]</b>	
		N/A (Not yet completed .)	Same as above description.

Source: Document provided by JICA (baseline, target); answers to the questionnaire (actual)

As shown in Table 3, “the range for detecting a precipitation intensity of 1 mm/h or more becomes a radius of 450 km”, “the tropical cyclonic wind velocity maximum of 75 m/s within a 200-km radius becomes measurable” and “the direction of rainfall motion within a 200-km radius becomes detectable” have been achieved at Virac following its completion in May 2012. As stated in 3.2.1 Project Outputs section under Efficiency, the radar station at Virac was partially damaged by Typhoon Nock-Ten (local name: Nina), which occurred at the end of December 2016; it is currently not operational at the time of site visit for the ex-post evaluation (end of April 2017). Swift restoration would be preferable in order to maintain the capability of monitoring rainfall, wind velocity and typhoons. At Aparri, target for operation indicators has been achieved following its completion in August 2013. At Guiuan, as described in 3.2.1 Project Outputs section under Efficiency, the station was damaged by Typhoon Haiyan (local name: Yolanda) in November 2013, and was rehabilitated by a new grant aid project to the same design and scale in December 2015. The station is operational without problems at the time of ex-post evaluation; target for operation indicators has all been achieved. However, the original station was only operational from September to November 2013, and thus the two month period is used as the point for the evaluation judgement. As a result, this project contributed to strengthen PAGASA’s disaster monitoring functions during the period.

One of the significant reasons for which target for operation indicators has been achieved was that the Doppler function was introduced into the meteorological radar systems in this

<sup>13</sup> According to PAGASA, “monitoring capability of tropical cyclonic wind velocity maximum 75m/s” can go up to 250km radius when Doppler function works to the maximum effect.

project. The function can monitor wind velocities up to a maximum of 75 m/s and detecting the directions of rainfall motion within a 200-km radius, etc. are possible. Before this project began, there was not a single radar station with the Doppler function in the Pacific Ocean area surrounding the Philippines, except Baler radar station located in the eastern part of Luzon Island.

(2) Effect Indicator: Enhancement of Capability of PAGASA for the issuance of public storm signal warning (Detection of tropical cyclone expected to come to the Philippines within the next 36 hrs.)

With regard to the effective indicator shown in Table 4, with the introduction of Doppler meteorological radar systems at Virac, Aparri and Guiuan, 24 hour continuous surveillance during typhoons became possible after 2013. More concretely, PAGASA headquarters (WFFC) gained the ability to receive real time information on rainfall and wind levels from the meteorological radar systems at Virac, Aparri and Guiuan; they were able to swiftly issue typhoon warning signals and information (mainly, position and strength of tropical cyclone) on an hourly basis to the organizations such as shown in Figure 2. (It used to be at best every six hours (four times per day) before the project began.)

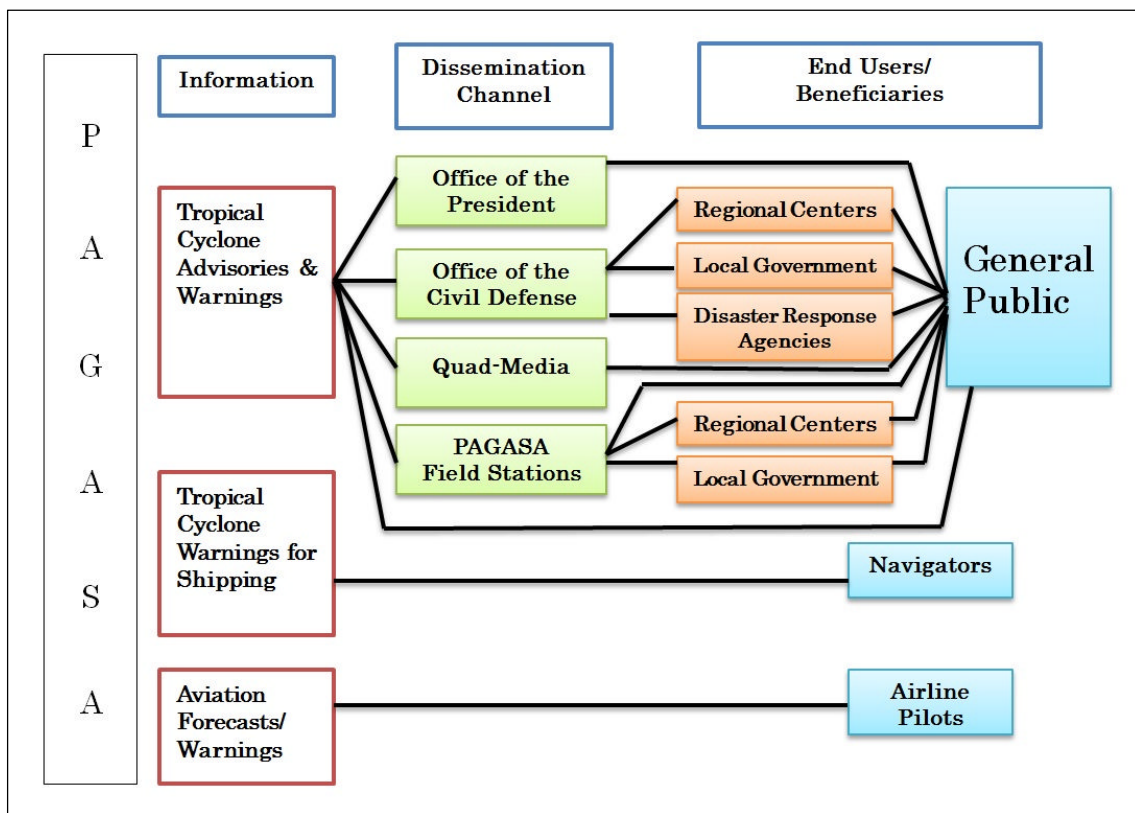
Table 4: Effect Indicator of the Project:  
 Enhancement of Capability of PAGASA for the issuance of public storm signal warning  
 (Detection of tropical cyclone expected to come to the Philippines within the next 36 hrs.)  
 (baseline, target and actual)

Baseline (2008)	Target (2014) (One year after the completion of the project)	Actual				
		2012	2013 (Completion year)	2014 (One year after the completion)	2015 (Two years after the completion)	2016 (Three years after the completion)
4 times a day (every 6 hrs)	<u>Hourly issuance</u> (Position and strength of tropical cyclone)	N/A	Target has achieved since 2013: <u>Hourly issuance</u> (Position and strength of tropical cyclone)			

Source: Document provided by JICA (baseline, target); answers to the questionnaire (actual)

The typhoons, storms and direction forecasts monitored at each of the project's meteorological radar stations are first transmitted to PAGASA headquarters (WFFC). Then, as explained in Figure 2 (Warning Dissemination Chart), the typhoon forecasts announced by PAGASA headquarters are transmitted to local governments, other related ministries and general citizens through the Office of the President, the Office of Civil Defense, the media and

PAGASA’s field stations. The general public can get typhoon forecast information through radio, television, newspapers, social media and smartphone application software.



Source: PAGASA

Figure 2: Warning Dissemination Chart

### 3.3.2 Qualitative Effects (Improvement of the staff’s operation skills)

This project became a trigger for improving the capabilities of PAGASA’s technical staff engaged in meteorological forecasting and radar systems. In addition, it is contributing to the improved accuracy of weather forecasting. Weather forecasters at PAGASA headquarters (WFFC) and the employees of the meteorological radar stations at Virac and Aparri were interviewed about whether or not their technical skills had improved over the course of implementing this project. The following comments were received: (1) From WFFC: “Through this project, we believe that the capabilities and accuracy of monitoring cyclones and issuing typhoon warning signals have improved and that citizens are increasingly trusting PAGASA’s weather forecasts. On the other hand, it is becoming more difficult to predict the scale and nature of typhoons year by year, and more accuracy in weather forecasting is increasingly required. It is therefore necessary to be constantly equipped with a broad range of technical skills such as renewal of equipment, improvement of technical operation, etc. In addition, we

also think that we need to improve our operational capabilities as an organization.” (2) From Virac: “We see a change from before the project commenced in that our staff is more motivated to carry out their daily tasks because they can now deal with the latest systems, such as the Doppler function.” (3) From Aparri: “With the introduction of the latest systems, such as the Doppler function, we always feel the need to upgrade our IT and analytical skills.”

Based on the comments above, it can be presumed that this project is playing a role in boosting staff motivation in the workplace, while also improving the accuracy of weather forecasting through improvements of technical capabilities.

### **3.4 Impacts**

#### **3.4.1 Intended Impacts**

##### **3.4.1.1 Contribution to the reduction of risks in disaster caused by tropical cyclones and other severe weather phenomena**

It was expected that this project would reduce risk in disaster caused by tropical cyclones and other severe weather phenomena. For a reason nowadays thought to be caused by climate change, the characteristics of natural disasters are changing; typhoons are increasingly accompanied by spontaneous storms and thunder, and some typhoons take routes that have never been seen before. However, the following comments were given about the impact of this project by the project related people:

The management team of the Provincial Disaster Risk Reduction Management Office (PDRRMO) of Cagayan and that of its subordinate office, the Municipal Disaster Risk Reduction Management Office (MDRRMO) of Aparri commented in interviews: “Before this project began (before 2009), one must admit that the accuracy of the weather information PAGASA was providing to the general public and local governments was very low. It was not rare for weather forecasts to turn out to be wrong, and there was not a great deal of trust in them. However, with the new radar stations, the accuracy of PAGASA’s weather forecasts and warnings has become high, and subsequently the public’s trust on PAGASA has become high. Based on the information provided by PAGASA, we have promptly instructed residents to evacuate during typhoons. One of the most significant factors is thought to be the existence of the radar station at Aparri, which has a Doppler radar. For example, when Typhoon Haima (local name: Lawin, a super typhoon occurred in October 2016) hit the area, residents were constantly in touch to ask for the predicted direction of the typhoon; based on PAGASA’s typhoon route forecast information, we think that we were able to provide prompt and relevant information to

the people. If PAGASA’s information had not been trustworthy, the casualties (6) enumerated in Table 6 would have been more. In addition to being able to predict expected typhoon courses and future rainfall based on PAGASA’s weather forecasts and warnings, we think it is also useful for preparing evacuation sites and giving instructions to residents.” Based on such comments, it can be said that through the project, PAGASA is able to provide accurate weather warnings from the radar stations that enable local governments to secure sufficient lead time to evacuate residents during typhoons. As a result, it can be judged that the project significantly contributes to minimizing casualties and damages to assets. Therefore, it can be assumed that there is possibility that damages occurred by natural disasters have been alleviated.

(Reference) Related to above comments, Table 6 shows the numbers of deaths, injured, missing and affected persons due to typhoons in recent years for the province of Cagayan, where the Aparri radar station is located.

(Reference) Table 6: Casualties and affected persons in the Province of Cagayan (2013-2016)  
(Unit: person)

Natural disaster & Year	Casualties			Affected Persons
	Death	Injuries	Missing	
Typhoon Odette (2013)	0	0	0	12,785
Typhoon Vinta (2013)	2	11	0	287,826
Typhoon Luis (2014)	1	1	0	47,310
Typhoon Dodong (2015)	0	0	0	6,825
Typhoon Ineng (2015)	0	3	0	75,891
Typhoon Lando (2015)	1	2	0	157,362
Convergence of Monsoon and Easterlies (2015)	0	1	0	88,071
Typhoon Lawin (2016)	6	111	0	856,243

Source: Provincial Climate Change & Disaster Risk Reduction Management Office, Province of Cagayan



Photo 3: Metrological Radar Tower at Aparri

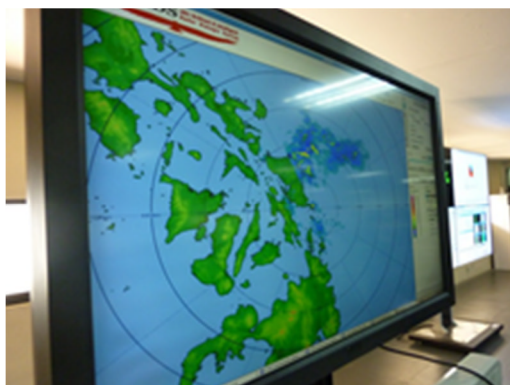


Photo 4: Typhoon Observation at WFFC



### 3.4.2 Other Impacts

#### 3.4.2.1 Impacts on the Natural Environment

Through the questionnaires, interviews and field inspections, it was confirmed that the meteorological radar stations at Virac, Aparri and Guiuan have not caused any negative impact (Noise, vibration, air pollution, occurrence of dust due to vehicle passage, etc.) on the environment during the implementation of the project, as well as after its completion.

Since the completion of the project, environmental monitoring has not been conducted concerning the facilities and equipment developed by this project. Neither PAGASA nor its supervising body, the Department of Science and Technology (DOST), has established any monitoring system. According to PAGASA, if negative issues concerning the environment were to arise, the Department of Environment and Natural Resources (DENR) would look into the matter first and try to address the issue in collaboration with local governments. However, since there have been no problems throughout till the ex-post evaluation, there is no actual case to verify this point.

#### 3.4.2.2 Land Acquisition and Resettlement

Under this project, no resettlement occurred as a result of this project<sup>14</sup>. While a site for the construction of an access road at Virac was subject to land acquisition, land owned by local government (some hundred square meters<sup>15</sup>) was provided to PAGASA for free. In the case of the site at Aparri, an area of land (about 5,000 m<sup>2</sup>), including an access road, was given by the local government for free<sup>16</sup>. Similarly at Guiuan, it was not subject to land acquisition. (A site for constructing an access road (about 975 m<sup>2</sup>) was originally owned by PAGASA.)

#### < Summary of Effectiveness and Impacts >

With regard to the quantitative effects, “the range for detecting a precipitation intensity of 1 mm/h or more becomes a radius of 450 km”, “the tropical cyclonic wind velocity maximum of 75 m/s within a 200-km radius becomes measurable” and “the direction of rainfall motion within a 200-km radius becomes detectable” have almost been achieved at the Virac, Guiuan and Aparri stations<sup>17</sup>. In addition, PAGASA headquarters (WFFC) receive real time rain and

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<sup>14</sup> The project sites at Virac, Aparri and Guiuan were on hills or coastal areas and far from residential areas; no resettlement was thus necessary.

<sup>15</sup> It was not possible to identify accurate area figures.

<sup>16</sup> There was no particular need to pay compensation to the local governments. Things were processed smoothly.

<sup>17</sup> Although the meteorological radar station at Virac is not operation at the time of ex-post evaluation, it can be judged that these actual indicators for all stations have almost achieved.

wind information generated by the meteorological radar systems, based on which they can continuously monitor for 24 hours and issue typhoon information every hour. Furthermore, it was confirmed through interviews that local governments have been able to secure enough lead time until local residents evacuate based on the typhoon course forecasting announced by PAGASA. In short, there is possibility that this project has been indirectly contributing to reduce casualties and damages due to disasters. Based on these factors, this project has achieved its objectives, and therefore effectiveness and impact of the project are high.

### **3.5 Sustainability (Rating: ②)**

#### **3.5.1 Institutional Aspects of Operation and Maintenance**

The executing agency of this project is PAGASA<sup>18</sup>. PAGASA mainly works on meteorological monitoring, communication, analysis, flood forecasting and warnings, as well as related studies and promotions.

Concerning operations at the meteorological radar stations, two observation systems exist: normal observation and special observation. Normal observation is conducted once a day. Special observation commences when typhoon, heavy rain and/or storms are detected by the meteorological radar, and are then conducted every hour (24 times a day). Information is reported to PAGASA headquarters (WFFC) in real time using telephones, email, radios, meteorological data satellite communication system (VSAT), etc. The special observation ends when the typhoon moves outside of the range of the meteorological radar or outside of the Philippine Area of Responsibility (PAR).

The main maintenance works taking place at the meteorological radar stations are daily cleaning, inspection and repairs of the structures inside the compound, as well as surveillance to prevent thefts inside the premises. In addition, the maintenance of the radar systems includes equipment inspection (including data output analysis), the renewal and management of IT software and the changing of parts.

PAGASA has a total of 855 employees (as of December 2016). The number of staff at the meteorological radar stations at Virac, Aparri and Guiuan, constructed by this project, and at PAGASA headquarters (WFFC), are shown in Table 7, 8, and 9:

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<sup>18</sup> PAGASA is under the Department of Science and Technology (DOST) and plays a key role in providing meteorological information to national disaster prevention and management efforts. PAGASA is supervised by DOST.

Table 7: Staff at Each Meteorological Radar Station

(Unit: No. of Staff)

Position	Meteorological Radar Station <sup>19</sup>		
	Virac	Aparri	Guiuan
Chief Meteorological Officer	1	1	1
Assistant Meteorological Officer	1	0	1
Observer/Radar Operator	4	4	3
Electronic Engineer/Technician	(4)	(4)	(3)
Mechanical Technician	(4)	(4)	(3)

Source: Answers to questionnaire

Note\*: Figures in brackets represent Observer/Radar Operators who also work as Electronic Engineers /Technicians and Mechanical Technicians. This means that they work in teams to play multiple roles.

Table 8: Staff of “Quick Response Team<sup>20</sup>” of Radar System at WFFC

(Unit: No. of Staff)

Position	PAGASA Headquarters (WFFC)
Chief of Meteorological Equipment and Maintenance Section	1
Officer-in-charge of Radar Maintenance Unit	1
Meteorological Radar Engineer	2
Meteorological Radar Technician	4

Source: Answers to questionnaire

Table 9: Staff of “Quick Response Team” of Communication/ICT at WFFC

(Unit: No. of Staff)

Position	PAGASA Headquarters (WFFC)
Electronic Engineer (Communication, VSAT, GPRS <sup>21</sup> /EDGE <sup>22</sup> Equipment)	1
Electronic Technician (Communication, VSAT, GPRS/EDGE Equipment)	4
ICT/Software Engineer (Network & Computer Equipment + Software Maintenance)	1
ICT/Software Technician (Network & Computer Equipment + Software Maintenance)	9

Source: Answers to questionnaire

With regard to the number of staff, staff at PAGASA headquarters (WFFC) and the Virac and Aparri meteorological radar stations commented in interviews: “The necessary numbers of

<sup>19</sup> Each meteorological radar station is under the respective PAGASA Regional Services Division (PRSD). Virac is under the Southern Luzon-PRSD, Aparri is under the Northern Luzon-PRSD and Guiuan is under the Visayas-PRSD. Each Division allocates operation and maintenance budgets to each station, in order to carry out the activities.

<sup>20</sup> At PAGASA headquarters (WFFC), a quick response team has been formed with a view to providing assistance to meteorological radar stations and to quickly respond to any malfunctions of the meteorological radar systems and VSAT.

<sup>21</sup> It is abbreviation of “General Packet Radio Service”. It is a packet oriented mobile data service on the 2G and 3G cellular communication system's GSM (Global System for Mobile Communications).

<sup>22</sup> It is abbreviation of “Enhanced Data GSM Environment”. It is a digital mobile phone technology that allows improved data transmission rates as a backward-compatible extension of GSM.

staff have been allocated to carry out operation and maintenance works. We would not say that there is any shortage.” In fact, there is an increasing focus on meteorological forecasting and flood forecasting and warnings at PAGASA recently, as will be discussed in 3.5.3 Financial Aspects of Operation and Maintenance. Moreover, the budget allocated by the central government to PAGASA is on the increasing trend. As a result, the demanded workload has also increased, and the number of staff, especially at headquarters, is on the increase.

Based on the above, it can be judged that there are no particular problems concerning the institutional aspects of the operation and maintenance of this project.

### 3.5.2 Technical Aspects of Operation and Maintenance

Since the completion of this project, training sessions have been given to staff at PAGASA headquarters (WFFC), and at each radar station, on a regular basis. For example, practical training sessions, such as the following, have been conducted: “Rainfall Warning System (RWS) Training/Workshop for Forecasters (2013)”; “Training Seminar on Radar Observation and Data Interpretation (2013)”; “Training Course on Probabilistic Quantitative Precipitation Forecasting (PQPF) (2014)”; “Meteorological Technicians Training Course (2015)”; “Disaster Risk Reduction and Management Training for PAGASA Employees (2016).” In addition, On the Job Training (OJT) is also given to newly recruited staff. Particularly, in order to become a weather forecaster, one must have an engineering certificate upon graduating from university, and upon joining PAGASA one must go through a year-long weather forecasting training course as well as a month-long practical, hands-on training course.

Interviews with staff at PAGASA headquarters (WFFC), and at each radar station, confirmed that they understood the importance of their operation and maintenance duties and the specifications of the equipment procured through this project. In addition, the interviews confirmed that the staff responsible for the operation and maintenance of equipment have ample work experience and are equipped with the technical skills to promptly address any problems associated with the functionality and operations of the equipment.

During the project implementation, there were technical supports and advices from the Japanese consultant regarding the operation of the radar station. Support in terms of trainings were organized and conducted both at WFFC and radar stations to enhance the capacity of personnel in data interpretations and usage, operations and maintenance of the radar system.

A maintenance manual was provided by the consultant from this project, and each member of staff at the meteorological radar stations refers to the manual as needed in order to carry out

their day-to-day duties.

In light of the above, it can be judged that there are no particular problems with the technical aspects of the operation and maintenance of this project.

### 3.5.3 Financial Aspects of Operation and Maintenance

Table 10 shows PAGASA's total budgets for the last three years. The amount has significantly increased since the commencement of the project. This is because PAGASA's duties, in terms of meteorological forecasting, communications, analyses, forecasting and warning (including for floods), along with related research and advocacy works, have increased recently and thus the budgets have also increased. The amount almost tripled from 2014 to 2015 as a result of the central government recognizing the importance of PAGASA's roles and duties. According to PAGASA, they have been allocated the same level of budget since 2016.

Table 10: PAGASA's Total Budgets

(Unit: 1,000 PHP)

2013	2014	2015
1,452,205	1,256,104	3,464,214

Source: PAGASA

Table 11 shows the operation and maintenance budgets of WFFC and those allocated to PAGASA's Regional Services Divisions (PRSDs) that administer the radar stations at Virac, Aparri and Guiuan for the last three years. The operation and maintenance budgets of WFFC, as well as those of PRSDs that administer the radar stations at Virac, Aparri and Guiuan, are also on the increase<sup>23</sup>. Executive staff at WFFC and chief officer at the Virac and Aparri radar stations commented in interviews: "The necessary budgets have been allocated in recent years and financial matters do not interrupt our duties. Also, the budgets in the near future will be estimated as same level as the current status."

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<sup>23</sup> It was not possible to identify the O&M budget of each individual radar station.

Table 11: O&M Budgets of WFFC and Regional Services Division (PRSD)  
(Unit: 1,000PHP)

	2013	2014	2015
WFFC	22,853	59,131	56,808
Southern Luzon-PRSD (Virac radar station is under their jurisdiction)	8,240	11,675	11,675
Northern Luzon-PRSD (Aparri radar station is under their jurisdiction)	16,481	23,350	23,350
Visayas PRSD (Guiuan radar station is under their jurisdiction)	15,794	22,377	22,377

Source: PAGASA

Note: It was not possible to obtain the O&M amount of each metrological station and proportion which each PRSD provides.

In light of the above, it can be judged that there are no particular problems with the financial aspects of the operation and maintenance of this project.

#### 3.5.4 Current Status of Operation and Maintenance

Concerning systems for maintaining the facilities and equipment at the meteorological radar stations established by this project, the staff at each radar station clean and repair daily, weekly or monthly<sup>24</sup> in accordance with the category of the maintenance work. In the case of the meteorological radar system requiring a major repair beyond the capacity of PAGASA to deal with, local suppliers (local representations of Japanese companies) will be called upon to address the matter.

Spare parts are managed by PAGASA headquarters. According to PAGASA, there have been no problems in terms of shortages or delayed delivery related to the procurement of spare parts at the time of ex-post evaluation.

In terms of the metrological radar station at Virac, the electricity supply has been shut off since early January 2017, in order to avoid further damage due to many leakages inside the station which were caused by Typhoon Nock-Ten (local name: Nina). Since there is no electricity supply, the station is not operational at all, as of late January 2017. Meanwhile, PAGASA headquarters (WFFC) is considering to conduct the rehabilitation work about the radar tower at Virac, as of April 2017. According to PAGASA, the radar tower will be operational shortly.

<sup>24</sup> The different categories of the maintenance works are as follows: daily maintenance tasks at each meteorological radar station, including cleaning inside the facility and a simple check of equipment functionality; weekly tasks are equipment inspections, including data output analyses; and monthly tasks are inspections of the radar antenna and frequency data.

#### <Summary of Sustainability>

With regard to PAGASA's operation and maintenance systems at the time of ex-post evaluation, the necessary numbers of staff are secured to carry out operation and maintenance works. Concerning the technical aspects, training has been held regularly, and staff members are well-experienced. Regarding the financial aspects, through observation and interviews with the staff at WFFC as well as at Virac and Aparri meteorological radar stations, it can be judged that budgets of operation and maintenance regarding the meteorological radar systems developed by this project are sufficient. However, the meteorological radar tower at Virac that was partially damaged by Typhoon Nock-Ten (local name: Nina) in December 2016 is suspending at the time of ex-post evaluation. It should be rehabilitated as early as possible. Based on the above, the sustainability of this project can be fair.

## **4. Conclusion, Lessons Learned and Recommendations**

### **4.1 Conclusion**

By developing the existing meteorological radar systems at Virac, Aparri and Guiuan, this project aimed to improve tropical cyclone observation capabilities and upgrade accuracy of weather forecasts of PAGASA; thereby contributing to reduce risk in disaster caused by tropical cyclones and other severe weather phenomena. The implementation of this project is judged to be consistent with the development policy and needs of the Philippines both at the time of planning and ex-post evaluation. This project also has consistency with Japan's ODA policy. Therefore, its relevance is high. While the project cost was within the initial planned budget, the project period was longer than initially planned. Thus, the efficiency of the project is judged to be fair. Quantitative effects have almost been achieved at the Virac, Guiuan and Aparri stations. In addition, PAGASA headquarters (WFFC) receive real time rain and wind information generated by the meteorological radar systems, based on which they can continuously monitor for 24 hours and issue typhoon information every hour. Furthermore, it was confirmed through interviews that local governments have been able to secure enough lead time before evacuating local residents based on the typhoon forecast announced by PAGASA. In short, there is possibility that this project has been indirectly contributing to reduce casualties and damages due to natural disasters. Thus, effectiveness and impact of this project are high. In terms of sustainability, no major problems have been observed in the institutional, technical, financial aspects and current status of the operation and maintenance. However operation of the meteorological radar station at Virac that was damaged by Typhoon Nock-Ten (local name:

Nina) in December 2016 is suspended at the time of ex-post evaluation. Therefore sustainability of the project effects is fair.

In light of the above, this project is evaluated to be satisfactory.

## **4.2 Recommendations**

### **4.2.1 Recommendations to the Executing Agency**

It is recommended that PAGASA rehabilitate the meteorological radar station at Virac, which was partially damaged by Typhoon Nock-Ten (local name: Nina) in 2016, as early as possible in order to maintain its capabilities of monitoring rainfall, wind velocity and typhoons.

### **4.2.2 Recommendations to JICA**

None.

## **4.3 Lessons Learned**

### Importance of site selection and swift development regarding metrological radar station

In this project, Virac, Appari, Guiuan were selected for development of metrological radar stations. As shown in Figure 1, typhoons in the Philippines are passing over these stations very frequently. It was significant and urgent to develop the stations in these areas. Meanwhile, the typhoon's size and route in the Philippines are changing and forecast is becoming complicated year by year (according to PAGASA, it is because of influence of climate changes), it is necessary for PAGASA to respond by constantly improving typhoon monitoring. In order to carry out accurate typhoon monitoring, it is said that the appropriate selection of project site and the swift development of the stations are always necessary.



Republic of the Philippines

FY 2016 Ex-Post Evaluation of Japanese Grant Aid Project  
“The Project for Evacuation Shelter Construction in Disaster Vulnerable  
Areas in Province of Albay”

External Evaluator: Kenichi Inazawa, Octavia Japan Co., Ltd.

## **0. Summary**

This project developed designated evacuation shelters in existing schools in the Province of Albay, aiming to strengthen the function of facilities for safe evacuation of residents during eruption of the Mayon Volcano, and during mudslides, debris flow, or flooding caused by typhoons, torrential rainfall, etc, as well as to ensure a learning environment at normal times. Regarding the relevance, the Philippine government has placed an emphasis on disaster preparedness through legislation such as the Disaster Risk Reduction and Management (Republic Act). In the Province of Albay too—the target area of this project—the provincial government is moving ahead with the development of evacuation centers, mainly targeting barangay<sup>1</sup> facilities. 26 facilities in total were developed in 2015, and there are plans to continue rolling these out in the future. Moreover, the project is also in line with the assistance policy of the Japanese government; thus, its relevance is high. Regarding the efficiency, although the costs of this project were almost as originally planned, the project period was partly delayed due to the necessity of site improvements at some schools, in addition to construction delays arising from disposal of excess soil during site preparation, and so the project period exceeded initial plans. Thus, project efficiency is fair. As for effectiveness and impact, as a result of development of schools designated as evacuation shelters by this project, target values for operation and effect indicators were largely achieved, including accommodation capacity of the evacuation shelters, number of classrooms which is usable as evacuation shelters, square meters of capacity at evacuation shelters per person, and congestion per room during evacuation. Also, as results of the beneficiary survey show, given the fact that resident satisfaction with the facilities developed through this project is high, and that impacts including improved awareness of disaster prevention and evacuation activities and contribution to disaster risk reduction were also confirmed, its effectiveness and impact are high. Regarding the sustainability, the roles and responsibilities of operations and maintenance at the time of the

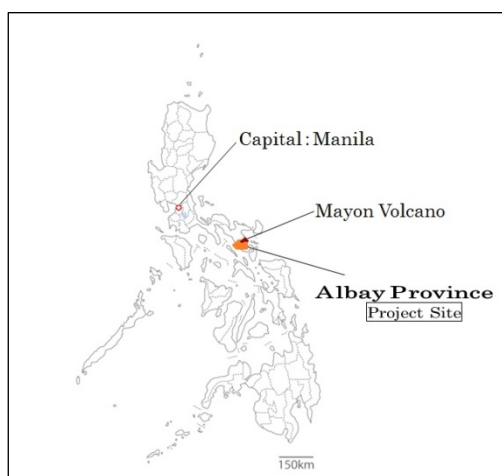
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<sup>1</sup> Indicates the minimum unit of a municipality representing a village or district. In Albay Province, there are 720 barangays, 15 municipalities (the level of organization above barangays), and 3 cities.

ex-post evaluation were not necessarily clear among stakeholder organizations such as the provincial government of Albay, Albay Public Safety and Emergency Management Office (hereinafter referred to as “APSEMO”), Albay Provincial Office of the Department of Education, local municipalities, etc. (for example, each school designated as an evacuation shelter has not been allocated budget for expenses capable of supporting large scale repairs, and it is unclear which organization takes the lead on this) Thus, sustainability of the project is fair.

In light of the above, this project is evaluated to be satisfactory.

## 1. Project Description



Project Location



Schools Designated as Evacuation Shelters  
Developed under This Project  
(Sto. Domingo Central Elementary School)

### 1.1 Background

The Province of Albay is one of the most disaster-prone areas in the Philippines. The province is faced with natural disasters such as lava flows, pyroclastic flow, volcanic bombs, and falling ash accompanying eruption of the Mayon Volcano, located in its center, as well as mudslides, debris flows, and flooding caused by typhoons. Additionally, because Albay is located near the subduction zone of the Philippine Sea Plate with the Eurasia Plate, the risk of earthquakes and coastal tsunami damage is high. The 1993 eruption of the Mayon Volcano left 77 dead and more than 12,000 household evacuees. The Mayon Volcano erupted again in 2000 and 2006, while in December 2009 the alert level was raised due to lava extrusion, with the surrounding residents obliged to evacuate.<sup>2</sup> In addition, major typhoons<sup>3</sup> in 2006 damaged

<sup>2</sup> Evacuation period was about one month.

<sup>3</sup> These major typhoons were Typhoon No. 15 (Philippine name: Milenyo) and No. 21 (Philippine name: Reming).

many public facilities and houses, recording many human casualties.<sup>4</sup> Meanwhile, the Province of Albay was faced with a shortage of evacuation shelters capable of receiving evacuees in the event of a disaster. Its central elementary schools<sup>5</sup>, which are positioned for use as evacuation shelters, were built at least 30 to 50 years ago and many of their buildings have deteriorated, raising safety concerns. For this reason, many residents refused to use these as evacuation shelters. Therefore, the development of evacuation facilities in Albay was an urgent task.

## 1.2 Project Outline

The objective of this project is to strengthen the function of facilities for safe evacuation of the surrounding inhabitants in times of eruption of the Mayon Volcano, lava flows and pyroclastic flows due to typhoon and heavy rain, and flooding, as well as to ensure the educational environment at ordinary times, by constructing evacuation shelters with special facilities at the existing schools of the province of Albay, thereby contributing to alleviate risks of disaster in the area.

G/A Grant Limit / Actual Grant Amount	739 million yen / 715 million yen
Exchange of Notes Date /Grant Agreement Date	August 2011 / August 2011
Executing Agency	Provincial Government of Albay
Project Completion	November 2013
Main Contractor	Iwata Chizaki Inc.
Main Consultant	Mohri. Architect & Associates, Inc.
Basic Design	July 2010 to March 2011 (Implementation Period of Preparatory Study)
Related Projects	[Technical Cooperation] · Improvement of Earthquake and Volcano Monitoring System (2004-2006) · Enhancement of Earthquake and Volcano Monitoring and Effective Utilization of Disaster

<sup>4</sup> Typhoon No. 15 (Philippine name: Milenyo) left 14 dead and 176 injured in the Province of Albay, and an affected population of about 700,000. Typhoon No. 21 (Philippine name: Reming) left 10 injured (none dead), 1 missing person, and an affected population of about 1,060,000 people. No evacuee number data was obtained.

<sup>5</sup> Although there is no rigid definition of the differences between central elementary schools and ordinary schools, "central elementary schools" have characteristics such as large number of children in a municipality under the provincial government, and are located near municipal buildings. Other "elementary schools" tend to be located outside of town centers and in barangays.

	<p>Mitigation Information Project in the Philippines (2010-2015)</p> <ul style="list-style-type: none"> <li>· The Study on Comprehensive Disaster Prevention around Mayon Volcano (Development study) (1998-2000)</li> <li>· Disaster Risk Reduction and Management (DRRM) Capacity Enhancement Project (2012–2015)</li> <li>· Disaster Risk Reduction and Management Capacity Enhancement in the Philippines (Dispatch of experts) (2012)</li> <li>· Regional Revitalization in Disaster Prone Area (Training Program for Young Leaders) (2016)</li> <li>· Dispatch of Japan Overseas Cooperation Volunteer (Albay Provincial Disaster Risk Reduction Management Office) (2013–2015)</li> </ul> <p>[Grant Aid]</p> <ul style="list-style-type: none"> <li>· The Project for Improvement of Earthquake and Volcano Monitoring System (1998)</li> <li>· The Project for Improvement of Earthquake and Volcano Monitoring System (Phase 2) (2002)</li> <li>· The Project for Improvement of the Meteorological Radar System (2009)</li> <li>· The Programme for the Improvement of Capabilities to cope with Natural Disasters Caused by Climate Change (Non-project grant aid) Improvement of the Flood Forecasting and Warning System for Bicol River (2009)</li> </ul> <p>[Other Programs]</p> <ul style="list-style-type: none"> <li>· (Spanish Agency for International Development Cooperation : AECID) Project for Evacuation Shelter Reconstruction (2007–2011)</li> </ul>
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## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Kenichi Inazawa, Octavia Japan Co., Ltd.

### 2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted with the following schedule.

Duration of the Study: August 2016 - November 2017

Duration of the Field Study: November 8 - 25, 2016

March 15 – 22, 2017

### 2.3 Constraints during the Evaluation Study

At each school designated as an evacuation shelter developed under this project, it was confirmed that local residents living near the building stayed due to the typhoons and heavy rain, after the completion of project. However, there is no evacuation record related to eruption of the Mayon Volcano. The evacuation period for residents during occurrence of typhoons and heavy rain is 1 to 2 days in case of a lengthy typhoon (usually staying only in the night at around 6 to 12 hours on average). Meanwhile, if the volcano did erupt, a longer period of use (about 1 to 2 months) could be expected.. Therefore, this ex-post evaluation confirmed result during the occurrence of typhoons and heavy rains through the beneficiary survey, but it is necessary to note that the situation is different from the case of forced evacuation for a longer duration due to the volcano.

## 3. Results of the Evaluation (Overall Rating: B<sup>6</sup>)

### 3.1 Relevance (Rating: ③<sup>7</sup>)

#### 3.1.1 Consistency with the Development Plan of the Philippines

Prior to the start of this project, the Philippine government formulated the *Philippine Development Plan 2011-2016*, in which disaster risk mitigation and management were a main priority for action. In 2009, the government also formulated the *Strategic National Action Plan 2009-2019* to minimize the damage caused by disasters. In addition, the government enacted the *Philippine National Disaster Reduction and Management Act* in 2010 with the aim of passing disaster reduction and management-related legislation. Meanwhile, the provincial government of Albay formulated the *Integrated Disaster Preparedness Program in Albay Province/Bicol Region, Philippines 2009-2013* (also referred to as “the Master Plan”). In this Master Plan, the establishment of a risk map and emergency measures, development of emergency shelters, early warning system and assistance for communication for evacuation procedures were listed.

At the time of ex-post evaluation, the aforementioned *Philippine Development Plan 2011-2016* continues to be effective. In connection with this Plan, in 2010 the Philippine government passed the *Disaster Risk Reduction and Management Act (Republic Act No. 10121)*; thus, the Philippine Government has made it a legal requirement to formulate a national disaster risk reduction framework adopting an integrated method of managing various disasters such as natural disasters and human disasters. Meanwhile, in the current international community,

<sup>6</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory and D: Unsatisfactory.

<sup>7</sup> ③: High, ②: Fair, ①: Low.

*Sustainable Development Goals (SDGs)* with the target year of 2030 were announced in 2014. As one of the targets, “significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses caused by disasters with a focus on protecting the poor and people in vulnerable situations<sup>8</sup>.” Furthermore, through the 3<sup>rd</sup> UN World Conference on Disaster Risk Reduction held in 2015, Sendai Framework for Disaster Risk Reduction 2015-2030 (hereinafter referred to as “SFDRR”) was adopted. SFDRR has specified four priority actions, such as 1) Understanding disaster risk, 2) Strengthening disaster risk governance to manage disaster risk, 3) Investing in disaster risk reduction for resilience, and 4) Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction. The Philippine government has been participating in these international frameworks. In addition, the provincial government of Albay has taken on a substantial role in administrating this project and through its subsidiary organization the APSEMO, it has enacted the *Disaster Risk Reduction and Management Plan* (created in 2008, revised in 2014). This Plan places an emphasis on developing an organizational structure related to disaster risk management.

Based on the above, at the time of the ex-post evaluation, the Philippine central government and the provincial government of Albay have each developed disaster reduction and management policies. Therefore, both at the time of planning and ex-post evaluation, the project is in line with policies and measures in the national plans and the sector plans.

### 3.1.2 Consistency with the Development Needs of the Philippines

Prior to the start of this project, the Province of Albay was proceeding with disaster risk reduction measures through the construction of evacuation shelters to take in evacuees in the event of a disaster, as well as planning evacuation routes and constructing an early warning system. However, there was a shortage of evacuation shelters, and the central elementary schools, which were positioned for use as evacuation shelters, were built at least 30 to 50 years ago and many of their buildings have deteriorated, raising safety concerns. Moreover, such schools designated as evacuation shelters were overcrowded at times of evacuation, and many lacked equipment necessary for evacuation accommodation, such as toilets, kitchens, and water supply facilities. Many residents thus refused to use these as evacuation shelters. Therefore, the development of appropriate facilities in the province was an urgent task.

At the time of the ex-post evaluation, the provincial government of Albay was moving ahead

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<sup>8</sup> It corresponds to Target 11.5 of SDG's Goal 11.

with improvement of evacuation centers for the purpose of coping with natural disasters, mainly targeting barangay facilities. In 2015, a total of 26 sites were developed. According to APSEMO, although the provincial government's budget is limited, in order to respond to expansion of natural disasters and climate change, they suggested that the need to develop evacuation facilities is still high.<sup>9</sup> Municipal Disaster Risk Reduction Management Offices (hereinafter referred to as “MDRRMO”)—local municipalities<sup>10</sup> under the jurisdiction of the Province of Albay—play a central role for the schools designated as evacuation shelters developed by this project, conducting on-site training on natural disaster-related themes for local residents and children. Specifically, the MDRRMOs conduct quarterly training on themes such as evacuation drills in case of earthquake/tsunami/landslide/flooding/volcanic eruption/typhoon, as well as first aid training for injuries and disaster readiness during the rainy season.

Based on the above, the need for disaster reduction and management measures (including development of evacuation shelters and on-site training, for instance) continues to be emphasized in the Province of Albay even at the time of ex-post evaluation; therefore, it can be judged that the project is consistent with development needs both at the time of planning and at the time of ex-post evaluation.

### 3.1.3 Consistency with Japan’s ODA Policy

The Country Assistance Plan for the Republic of the Philippines prepared by Japan’s Ministry of Foreign Affairs in June 2008 listed support for the independence of the poor and improvement of their living environments as priority development challenges. It clearly indicated that, "As a support measure for the protection of life from natural disaster, we will provide prompt emergency support and assistance with reconstruction and rebuilding to areas affected by catastrophic damage due to sudden natural disasters."

Based on this assistance plan, the Japan International Cooperation Agency (JICA) prepared the Country Assistance Implementation Policy for the Republic of the Philippines in July 2009. Among its provisions, JICA has indicated its policy to promptly offer emergency physical, humanitarian, and financial support in the event of a disaster, based on the scale of the disaster.

This project provides assistance to reduce disaster risk in the Philippines, and it can be confirmed as consistent with the emergency and reconstruction assistance indicated in the

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<sup>9</sup> Furthermore, at the time of ex-post evaluation, there were more than 350 evacuation facilities in the Province of Albay. According to APSEMO, the number of evacuation centers still to be developed is significant, but no response was received on specific numbers.

<sup>10</sup> The Libon, Oas, Polangui, Santo Domingo, and Manito municipal buildings, and the Legazpi town hall.

aforementioned country-specific assistance plan and country-specific assistance implementation policy. It can thus be judged as consistent with Japan's ODA policy.

In light of the above, this project has been highly relevant to the country's development plan and development needs, as well as Japan's ODA policy. Therefore its relevance is high.



Photo 1: Polangui North Central Elementary School



Photo 2: Gogon Central Elementary School

### 3.2 Efficiency (Rating: ②)

#### 3.2.1 Project Outputs

This project carried out the development of classroom buildings and auxiliary facilities for the schools designated as evacuation shelters (Oas South Central Elementary School, Sto. Domingo Central Elementary School, Polangui North Central Elementary School, Manito Central Elementary School, Gogon Central Elementary School, and Libon Community College). Table 1 shows the planned and actual output of this project.

Table 1: Outputs of the Project (Plan/Actual)

Plan		Actual
<b>【Outputs to be borne by Japanese side】</b>		
Development regarding the following classroom facilities at schools designated as evacuation shelters (a total of 79 classrooms)		Implemented as planned.
1	Oas South Central Elementary School (Oas Town): 11 classrooms	
2	Sto. Domingo Central Elementary School (Sto. Doming Town): 9 classrooms	
3	Polangui North Central Elementary School (Polangui Town): 11 classrooms	
4	Manito Central Elementary School (Manito Town): 19 classrooms	
5	Gogon Central Elementary School (Legazpi City): 9 classrooms	
6	Libon Community College (Libon Town): 20 classrooms	
Development of auxiliary facilities such as machinery rooms including generators, shower rooms, kitchens, laundry rooms, toilets, management offices at the schools designated as evacuation shelter		Implemented as planned.



【Outputs to be borne by Philippine side】	
Demolition of existing facilities, cutting and filling, concrete paving, electricity connection, telephone connection, water connection, fire extinguisher, VAT, bank commission	Almost implemented as planned.

Source: Answers to the questionnaires

As shown in Table 1, outputs to be borne by the Japanese side were implemented as planned. Outputs to be borne by the Philippine side were also almost implemented as planned. However, as explained in the column below, the ongoing situation is such that four facilities developed in this project have limited electrical power supply, while one facility has limited water supply.

Column: Basic infrastructure challenges in facility operations

Before commencing this project, in order to make use of the lessons learned from similar projects in the past, the need for “securing a stable supply of electricity and water” was cited as one of the lessons from the Grant Aid to Bangladesh “Project for Construction of Multipurpose Cyclone Shelters”,<sup>11</sup> in the ex-ante evaluation. However, the following challenges were also confirmed in this project.

Limited power supply (4 facilities)

As shown in Table 1, although the service wiring work (which was the responsibility of the Philippines side) was completed at the schools designated as evacuation shelters, power transformers essential for stable electrical supply had not been procured or installed at some schools, at the time of ex-post evaluation. Specifically, the supply of electricity is limited at four facilities: Oas South Central Elementary School, Sto. Domingo Central Elementary School, Polangui North Central Elementary School, and Manito Central Elementary School. For example, at Manito Central Elementary School, almost no power is supplied to the facilities other than the principal's office. Although it is possible to supply power to facilities using a diesel generator in case of emergency, these generators consume a large amount of fuel and are not always in use. (Thus, a power transformer is required to connect to the grid for stable power supply.) The background to this problem involves unpaid charges for electricity use by contractors during the project implementation. As a result of

<sup>11</sup> Source: joint evaluation with UNICEF (1997)  
<http://www.mofa.go.jp/mofaj/gaiko/oda/shiryo/hyouka/kunibetu/gai/h10gai/h10gai04.html>

interviews at various schools designated as evacuation shelters, it became evident that the arrangements for payment (who was required to pay, as well as when and how) were unclear from the very start of this project. The provincial government of Albay has already issued to Albay Power and Energy Corporation (APEC) the requisite funds<sup>12</sup> for procurement and installation of transformers at these schools designated as evacuation shelters; however, by the time of the ex-post evaluation, APEC has not procured or installed these transformers. APEC's policy is not to procure or install transformers until the unpaid amount for electricity charges is paid.

#### Limited water supply (1 facility)

At Manito Central Elementary School, there is no water supply service throughout the town; instead, the water supply pipe is used to convey water from a spring. However, there is only one water supply pipe, which is impossible to supply large amounts of water. For this reason, it is considered necessary to work to improve the water supply situation inside the school, such as by increasing the amount of water supplied by increasing the number of water supply pipe.

Some factors indicate a failure to make full use of the lessons learned from previous projects at the beginning of the project—for example, the need to carefully consider issues such as the fact that although design and installation largely proceeded smoothly with regard to facility construction, there was inadequate discussion and confirmation about the burden of maintenance costs (such as electricity costs) after the project completion, and the water supply in the school buildings was not to be judged sufficient for the expanded facilities (schools) despite having only a single water supply pipe.

### 3.2.2 Project Inputs

#### 3.2.2.1 Project Cost

The initially planned project cost was approximately 809 million yen (project cost from the Japanese side was 739 million yen, while project cost from the Philippine side was approximately 70 million yen). In reality, the project cost was approximately 784 million yen

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<sup>12</sup> According to APSEMO, a total of 700,000 PHP (about 1.55 million yen, applying the exchange rate for mid-November 2016).

(project cost from the Japanese side was approximately 715 million yen, while project cost from the Philippine side was approximately 69 million yen); thus, the project cost was almost as planned (approximately 97% of the plan).

#### 3.2.2.2 Project Period

Completion of this project was scheduled within 22 months from August 2011 to April 2013. The actual period (28 months from August 2011 to November 2013) exceeded the planned period (127% compared to the plan). Major factors contributing to this delay include: 1) Design changes related to site improvement occurred at Oas South Central Elementary School after the project started, requiring unexpected time; 2) The issue of excess soil disposal by ground preparation at Manito Central Elementary School (which was the responsibility of the Philippine side), which had not started at the commencement of the main construction work. Despite the supervising construction consultant and the contractor making further requests for disposal of the soil to the provincial government of Albay, the provincial government took some time for processing and internal approval, delaying the progress of the entire construction.

Although the project cost was almost as planned, the project period exceeded the plan. Therefore, efficiency of the project is fair.

### 3.3 Effectiveness<sup>13</sup> (Rating: ③)

#### 3.3.1 Quantitative Effects (Operation and Effect Indicators)

At the time of planning of this project, baseline and target design values for the following were set as operation indicators of quantitative effect: 1) Accommodation capacity of the evacuation shelters meeting the standard size; 2) Number of classrooms which meets the standard size and is usable as evacuation shelters; and 3) Accommodation area per user as an evacuation shelter. However, since the grounds for setting the target design values for 3) were discovered to be unclear through this evaluation study, as there was a problem with confirming and analyzing the actual design value, confirmation and analysis relating only to target design values and the actual design value for 1) and 2) were carried out. These are listed in Table 2, with the results of their analysis also explained.

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<sup>13</sup> The sub-rating for Effectiveness is to be considered together with Impact.

Table 2: Operation Indicators of this Project (baseline, target, and actual)

Indicator	Baseline	Target design	Design value after project completion		
	2010	2016	2014	2015	2016 (as of November)
	Planned year	Three years after project completion	One year after project completion	Two years after project completion	Three years after project completion
1) Accommodation capacity of the evacuation shelters meeting the standard size (Unit: person)	4,040	7,200	6,960	6,960	7,200*
2) Number of classrooms which meet the standard size and is usable as evacuation shelters (Unit: number)	101	180	174	174	180**

Source: Document provided by JICA, answers and interview results with each school designated as evacuation shelter, local municipalities, and provincial engineering office of Albay

Note\*: 7,200 people since November 2016 (due to the impact of Typhoon Glenda in July 2014, the roof and windows of the Polangui municipal office were damaged and became unusable. For this reason, from among the classrooms of Polangui North Central Elementary School (which was developed as part of this project) 6 classrooms were temporarily used as municipal facilities, although this use was halted in November 2016. After that, it was used as a school and evacuation shelter, and user capacity was increased.)

Note\*\*: 180 classrooms after November 2016 (As mentioned above, 6 classrooms became available in November 2016.)

The operation indicators in Table 2 can be explained as follows:

In this project, as target values after the project completion, the number of users accommodated per classroom was designed to be 40 people, with some extra margin allowed. The number of classrooms meeting the standard size<sup>14</sup> and capable of use as evacuation shelters was planned to be 180 classrooms, including 101 existing classrooms. This project planned to increase the user capacity to accommodate 7,200 people. Regarding design values after the project completion, it was confirmed that the number of such classrooms was 180 classrooms and that user capacity per classroom was 40—which means that the actual user capacity was  $180 \times 40 = 7,200$ . Therefore, it can be judged that the target design values were satisfied at the

<sup>14</sup> The Department of Education's standard size for classrooms is  $63 \text{ m}^2 (=7 \times 9 \text{ m}^2)$ , but before this project started, many classrooms in the target schools were smaller in area at about  $48 \text{ m}^2 (=6 \times 8 \text{ m}^2)$ . These values are excluded from Table 2.

time of ex-post evaluation.

In addition, this project used the following three categories as effect indicators of quantitative effect: 1) Congestion per room during evacuation (average); 2) Number of evacuees per toilet (average); and 3) Mitigation of overcrowded condition at school room, with baseline values and target values being set at time of planning. Through this evaluation study, actual values for each category after project completion were obtained. These are listed in Table 3, with the outcomes of their analysis also explained.

Table 3: Effect Indicators of this Project (baseline, target, and actual)

Indicator	Baseline	Target design	Actual		
	2010	2016	2014	2015	2016 (as of November)
	Planned year	Three years after project completion	One year after project completion	Two years after project completion	Three years after project completion
1) Congestion per room during evacuation (average) (Unit: average no. of person)	94	53	35 to 50*	35 to 50*	No record of evacuation
2) Number of evacuees per toilet (average) (Unit: average number of person)	55	26	Unable to calculate (Congestion was alleviated.) **37.4	Unable to calculate (Congestion was alleviated.)	No record of evacuation
3) Mitigation of overcrowded condition at school room (Unit: average no. of schoolchildren per classroom at all target school)	No baseline and target were set.		Approx.30 to 40	Approx.30 to 40	Approx.30 to 40

Source: Document provided by JICA, answers and interview results with each school designated as evacuation shelter, local municipalities, and provincial engineering office of Albay

Note\*: Room overcrowding was based on interviews with school staff in the 6 facilities visited as part of this study. Almost all staff gave a response of 35 to 50 people.

Note\*\*: Based on the actual example of Typhoon Glenda in July 2014, a value of 37.4 people was obtained, estimated from Manito Central Elementary School only.

The effect indicators in Table 3 can be explained as follows:

1) There was no data measured or recorded regarding actual values for “Congestion per room

during evacuation", but from interviews with staff at each school designated as an evacuation shelter, almost all gave a response of 35 to 50 people per classroom. Based on these answers, it can be observed that target values have largely been achieved. In 2016, there was no record of evacuation during occurrence of a natural disaster at any of the target schools, so the outcome was "No record of evacuation." 2) "Number of evacuees per toilet" was unable to be calculated because adequate numerical values and information as evidence for number of evacuees were not available<sup>15</sup>. As reference, from the results available, citing the example of 2,616 people evacuated to Manito Central Elementary School as a result of Typhoon Glenda in July 2014, this was estimated to be 37.4 people.<sup>16</sup> Although this number did not achieve the target value (26 people), it was confirmed to be less than the baseline value (55 people). For all categories, when the staff of local municipalities and schools designated as evacuation shelters were interviewed, many respondents mentioned that the circumstances of use and degree of congestion of toilets at time of evacuation in 2013 and 2014 was better than before project completion. For this reason, it is judged that this project contributed to easing congestion of toilet use. In 2016, there was no record of evacuation during occurrence of a natural disaster at any of the target schools, so the outcome was "No record of evacuation." 3) " Mitigation of overcrowded condition at school room" is an indicator measuring the usage situation during normal times (when used as a school), and through interviews and on-site inspections at each facility, it was confirmed that roughly 30 to 40 students were taking classes. As mentioned above, in addition to larger classroom sizes than previously, since the number of classrooms has increased by this project, it is judged that classroom overcrowding had been eased compared to before the start of this project. (Photograph 3 below shows a classroom developed by this project, while photograph 4 shows the state of existing classrooms. Note that Photograph 3 shows the room seems less tight and more spacious.)

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<sup>15</sup> Although only fragmentary numbers of evacuees accommodated were available, this evaluation study was able to ascertain numbers for the facilities described below:

(1) During Typhoon Glenda (July 2014): 2,616 people at Manito Central Elementary School, 87 households at Libon Community College; (2) During Typhoon Ruby (December 2014): 684 people at Manito Central Elementary School, 248 households at Libon Community College; (3) During Tropical Storm Amang (January 2015): 165 people at Manito Central Elementary School; (4) During Typhoon Nona (December 2015): 105 households (437 people) at Gogon Central Elementary School, 835 people at Manito Central Elementary School, 295 households at Libon Community College. This evaluation study was only able to ascertain numbers for Manito Central Elementary School, Gogon Central Elementary School, and Libon Community College. No data from other facilities were available. Although the Mayon Volcano erupted in September 2014, no accommodation of evacuees occurred in any facility of this project.

<sup>16</sup> The calculation formula was: 2,616 people divided by (number of existing toilets [24] + new toilets [46] installed by this project) = 37.4 people.



Photo 3: Oas South Central Elementary School  
(Classroom size developed under this project:  
 $7 \times 9=63 \text{ m}^2$ )



Photo 4: Sto. Domingo Central Elementary School  
(Existing classroom size:  $6 \times 8=48 \text{ m}^2$ )

### 3.3.2 Qualitative Effects (Other Effects)

(Raising disaster reduction awareness among residents in target evacuation areas)

It was expected that the disaster reduction awareness of residents in areas to be evacuated would be raised, and residents would proactively use these evacuation shelters, by constructing schools designated as shelters through this project. At the time of ex-post evaluation, the MDRRMO of each municipality in which the project's facilities are located plays a central role in regularly carrying out on-site training for local residents and children, presuming hypothetical evacuation situations at the time of natural disaster. Specifically, MDRRMOs conduct quarterly workshops on content including evacuation drills in case of earthquake / tsunami / landslide / flooding / volcanic eruption / typhoon, as well as first aid training for injuries and disaster readiness during the rainy season.<sup>17</sup> Since this project facilities were designed with enough capacity for courtyard space, corridors, classrooms, etc., they are able to handle large-scale training and workshops. Through interviews with residents and the MDRRMO, this evaluation study has confirmed that residents are familiar with these facilities and that disaster reduction awareness has been sufficiently ensured by active participation in on-site training and workshops. From the above, it is observed that this project has also contributed to improving disaster reduction awareness among the surrounding residents.

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<sup>17</sup> The number of participants in each workshop is difficult to state precisely, although it ranges broadly from 100 to 1,000, depending on scale of implementation.



Photo 5: Disaster Countermeasures and Evacuation Drills by Local Municipality (Source: Polangui North Central Elementary School)



Photo 6: Life-saving Kit Deployed at Schools Designated as Shelters

### 3.4 Impacts

#### 3.4.1 Intended Impact

##### 3.4.1.1 Contribution to Mitigation of Disaster Risk

In this evaluation study, a beneficiary survey was conducted, by a face-to-face interview using a questionnaire format for residents living near schools designated as an evacuation shelter developed by this project. Libon Community College and Sto. Domingo Central Elementary School were selected as the two target sites<sup>18</sup> and a total of 101 samples from residents with experience of evacuation were obtained.<sup>19</sup> From the responses to the various questions, a generally high degree of satisfaction was confirmed for the questions regarding use of the classrooms developed by this project, as per Figure 1. Through interviews with residents, comments such as "The classrooms are spacious. The interior is bright, and I don't recall any shortages during the evacuation" were obtained. Regarding the questions about auxiliary facilities (toilets/showers/laundry/washroom facilities) in Figures 2 to 5, although some

<sup>18</sup> Among the 6 target facilities of this project, Libon Community College was chosen because it had the largest number of classrooms and auxiliary facilities developed (see Table 1). Sto. Domingo Central Elementary School was chosen because it is located closest to the Mayon Volcano. (Despite the fact there has been no evacuation of local residents due to eruption of the Mayon Volcano after the project completion, there is a high possibility of this school being used as an evacuation shelter during future evacuations.)

<sup>19</sup> Sample size was 53 at Libon Community College and 48 at Sto. Domingo Central Elementary School. Sample characteristics were as follows: (1) All people have experience of evacuation to this project's facility due to typhoons or heavy rain both before and after the project; (2) Gender: 11% male, 89% female; (3) Occupation: 64% homemakers, 15% self-employed/company employees/factory workers, 14% barangay staff, 6% farmers, 1% students. Although the percentage of females was large with regard to (2) Gender, this was because the beneficiary survey was conducted on weekdays, during the daytime, when women were most often at home. On weekends, many families leave their homes and it was difficult to acquire many male samples. With regard to prospects of bias and the interpretation of results, it is judged that statistically significant results were not obtained for the population because the current beneficiary survey does not represent strictly equal interval sampling.



responses suggested "I never used it during evacuations,"<sup>20</sup> a generally high degree of satisfaction was confirmed. Interviews with residents obtained comments such as "It is clean. Overall, the facility is new and easy to use."; therefore, it can be observed that the auxiliary facilities developed by this project were also well received. Figure 6 is a question about the degree of improvement in the sanitary environment when using the auxiliary facilities outlined above, to which many responded "It has improved" or better. Comments from residents were also obtained to the effect that "Because there is an orientation about how to use the facility and how to dispose of garbage during evacuation, a better sanitary environment is maintained. I think we should use the new facility as cleanly as possible." As a result, it is observed that the sanitary environment of the auxiliary facilities has improved after the project completion. Figure 7 is a question about changes in understanding and awareness of disaster reduction and evacuation activities, to which many responded "It's improved" or better. Likewise, residents commented that, "On-site training and workshops on disaster reduction are being held for residents. Awareness of disaster reduction has increased even at normal times. At times of evacuation, the local municipality is supportive and evacuees cooperate with each other." From the comments obtained, it can be judged that understanding and awareness of disaster reduction and evacuation activities are high. Figure 8 is a question related to the degree of contribution of this project to disaster risk mitigation, to which many responses suggested that the project contributed. Interviews with residents yielded comments such as, "There were no casualties or missing persons after the latest typhoon or heavy rain, and we know that the structure (vertical supports, outer walls) of the facility is robust and very safe. It feels safer than evacuating to/waiting at home." Based on the responses above, it seems that residents have come to depend upon the facilities developed by this project, while at the same time, it is judged that the project has been effective in raising understanding and awareness concerning disaster prevention and evacuation activities, as well as raising awareness toward disaster risk reduction.

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<sup>20</sup> This is because accommodation time at facilities is short. During typhoons and torrential rains, evacuated residents stay for 1 to 2 days at most (they usually stay only overnight, for about 6 to 12 hours on average).

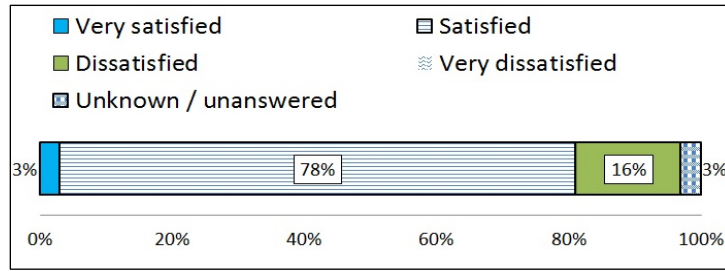


Figure 1: Satisfaction Level When Using the Developed Classroom at Evacuation (N=101)

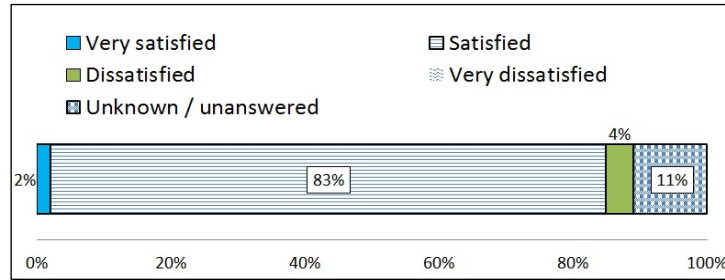


Figure 2: Satisfaction Level When Using the Developed Toilets (N=101)

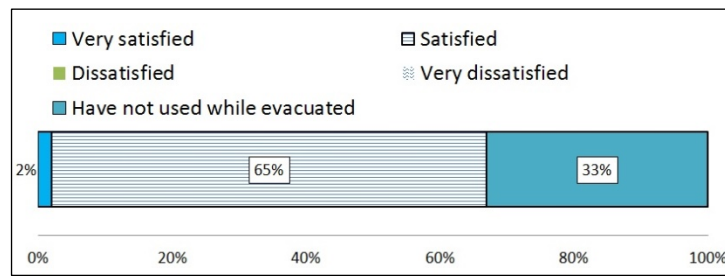


Figure 3: Satisfaction Level When Using the Developed Showers (N=101)

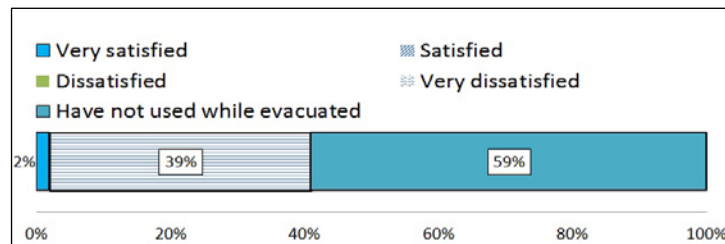


Figure 4: Satisfaction Level When Using the Developed Laundry (N=101)

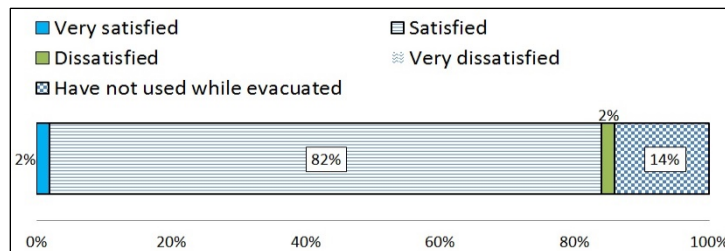


Figure 5: Satisfaction Level When Using the Developed Washroom (N=101)

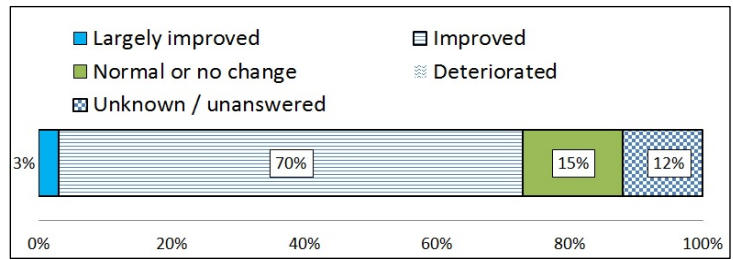


Figure 6: Sanitary and Environmental Conditions When Using the Auxiliary Facilities Regarding Figures 2 to 5 (N=101)

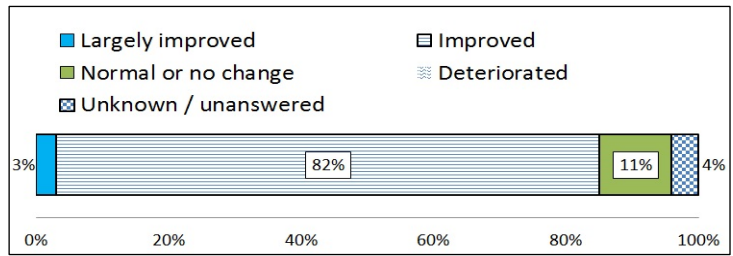


Figure 7: Changes in Understanding/Awareness of Disaster Reduction and Evacuation Activities (N=101)

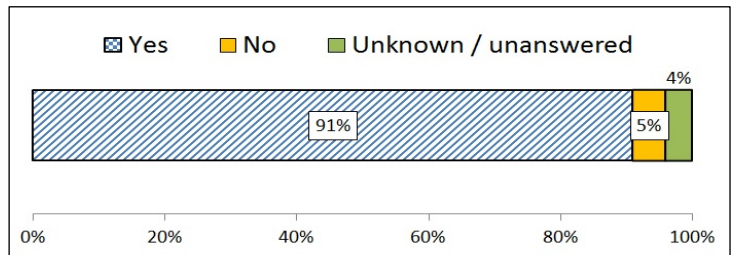


Figure 8: Contribution Degree of this Project to Disaster Risk Mitigation (N=101)

### 3.4.2 Other Positive and Negative Impacts

#### 3.4.2.1 Impacts on Natural Environment

During the project implementation, it was confirmed through a questionnaire for APSEMO and interviews with staff at APSEMO and various schools designated as evacuation shelters that there was no negative environmental impact. Moreover, it was also confirmed by observation during this field survey and interviewing staff of various schools designated as evacuation shelters that there was no negative impact on air pollution, water quality, noise and vibration, or the ecosystem.

Each school designated as an evacuation shelter is responsible for environmental monitoring of this project. If a serious problem arises, the school will report to the local municipalities with jurisdiction and the municipalities will take steps to resolve the problem. However, since no

serious problem concerning the environment has been found after completion of this project, no particular countermeasure has been implemented based on the results of monitoring.

#### 3.4.2.2 Land Acquisition and Resettlement

There were no cases of land acquisition or resettlement in this project.

#### 3.4.2.3 Other Unintended Positive Impacts (Consideration to elderly people, pregnant women, and those with disabilities)

Ramps and booths for wheelchairs were installed in every school designated as an evacuation shelter in this project. During evacuation caused by occurrence of a natural disaster, elderly people, pregnant women, and those with disabilities among local residents are to be preferentially evacuated under the initiative of the local municipalities. In addition, the courtyard was developed for easier accessibility, in order to be able to see from anywhere in the classrooms and auxiliary facilities, and therefore consideration is also given to the use at night. Thus, in this project, efforts to ensure priority evacuation for the more vulnerable population have been confirmed.

The operation and effect indicators for the schools designated as evacuation shelters developed by this project such as accommodation capacity of the evacuation shelters, the number of usable classrooms, accommodation area per user, and degree of overcrowded condition per room were mostly achieved, and it can be judged that their functions in terms of evacuation shelters have been improved. It also can be judged that the overcrowded condition during use as classrooms at normal times has been alleviated and that the educational environment is improving. In addition, according to the results of the beneficiary survey, residents' level of satisfaction with the facilities developed by this project is high, and impacts such as improved awareness of disaster reduction and evacuation activities and the project's contribution to disaster risk reduction have also been confirmed.

This project has largely achieved its objectives. Therefore effectiveness and impact of the project are high.

### 3.5 Sustainability (Rating: ②)

#### 3.5.1 Institutional Aspects of Operation and Maintenance

In this project, APSEMO bears overall responsibility as the executing agency, under the

jurisdiction of the provincial government of Albay. Meanwhile, the institutional aspects of operation and maintenance of the six schools designated as evacuation shelters developed by this project are as follows.

APSEMO is responsible for operation and maintenance of the schools designated as evacuation shelters during evacuation of residents. APSEMO coordinates with the Albay provincial office and the Legazpi municipal office of the Department of Education, as well as local municipalities under the jurisdiction of the Province of Albay, and has responsibility during times of evacuation.<sup>21</sup>

At normal times, each of the schools designated as evacuation shelters is in charge of the operation and maintenance. The municipality of Libon is responsible for the operation and maintenance of Libon Community College; the Legazpi municipal office of the Department of Education is responsible for Gogon Central Elementary School; while the Albay provincial office of the Department of Education is responsible for four facilities: Oas South Central Elementary School, Sto. Domingo Central Elementary School, Polangui North Central Elementary School, and Manito Central Elementary School.<sup>22</sup> In actuality, however, the roles and responsibilities of each organization are not clear. It is unclear which organization bears responsibility for specific operations and maintenance, or whether and how to divide the burden of operation and maintenance costs. Particularly remarkable is the case of four facilities: Oas South Central Elementary School, Sto. Domingo Central Elementary School, Polangui North Central Elementary School, and Manito Central Elementary School.<sup>23</sup> Although the Albay provincial office of the Department of Education allocates a regular operation and maintenance budget (Maintenance and Other Operating Expenses, hereinafter referred to as "MOOE"<sup>24</sup>) for school management to each school designated as an evacuation shelter, this does not include the funds able to cover large-scale repair works. Even when these four facilities request such funds

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<sup>21</sup> When this project's facilities are used as evacuation shelters in event of a disaster, each school's disaster prevention committee (composed mainly of staff at each school) constructs and operates a coordinated response with APSEMO, the local municipality and other stakeholders in each barangay. Through interviews with these stakeholders, this evaluation study has confirmed that a collaborative system for evacuation of local residents was established at an early stage and that evacuation activities are undertaken swiftly.

<sup>22</sup> There are 19 staff members (full-time employees) engaged in the operation and maintenance of APSEMO, 4 in the Albay provincial office and 10 in Legazpi municipal office of the Department of Education, and 13 in the municipality of Libon. The provincial Engineering Office under the provincial government of Albay also performs activities such as regularly (quarterly) visiting each school designated as an evacuation shelter, monitoring maintenance and operation, if necessary, reporting on matters to the provincial government.

<sup>23</sup> One such example is the case of Manito Central Elementary School, as per the column "Basic infrastructure challenges in facility operations." Even if the school wants to increase the number of water supply pipe, it is not clear whether local municipalities will handle this or whether the Albay provincial office of the Department of Education will handle it, and the division of operation and maintenance costs is unclear.

<sup>24</sup> Department of Education budget. In the Philippines, allocated amounts are determined according to the number of enrolled children and then allocated to each school.

from their local municipalities, it is unclear which organizations should allocate these funds in the first place. Therefore, it is desirable that stakeholder organizations including APSEMO, the Albay provincial office of the Department of Education, and local municipalities promptly clarify the systems and responsibilities of operation and maintenance. As described in the column earlier (“Basic infrastructure challenges in facility operations”), despite the necessity of “securing a stable supply of electricity and water” being cited as one of the lessons learned from similar past projects in the ex-ante evaluation of this project, it is concerning that a satisfactory response has not yet been made.

Therefore, it is judged that some concerns remain about the institutional aspects of operation and maintenance of this project.

### 3.5.2 Technical Aspects of Operation and Maintenance

Regarding times of evacuation, APSEMO, the Albay provincial office and Legazpi municipal office of the Department of Education, and the municipality of Libon regularly conduct training for employees on disaster reduction, communications technology, etc. Themes of training conducted recently include “Training for administrative staff for disaster risk reduction and adaptation to climate change” and “Climate change workshop” organized by APSEMO, as well as “On the Job Training during tsunami occurrence” and “Information and Communication Technology (ICT) capacity building training” organized by the Albay provincial office and Legazpi municipal office of the Department of Education, and “Training on power and water supply operations” organized by the municipality of Libon. Each organization also conducts On the Job Training (OJT) for new staff. The content of this training ranges from orientation sessions after hiring to practical training.

It was confirmed through staff interviews that faculty and staff at each school designated as an evacuation shelter recognized the importance of routine operation and maintenance at normal times for the facilities developed by this project. It was also confirmed that problems with technical aspects have not yet occurred in the current state of operation and maintenance.<sup>25</sup> There is no particular manual covering the operation and maintenance of the schools designated as evacuation shelters.<sup>26</sup> Personnel at each facility rarely need to receive a high level technical

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<sup>25</sup> With regard to years of experience, it was confirmed that the staff of each organization largely comprises a mix of young and more experienced staff, and that work-based experience is generally shared. No particular lack of experience or knowledge was evident. Since all organizations are public institutions, staff have entered via the civil service examinations, and have deepened their experience and knowledge through work and training. Most positions are occupied by employees who have obtained at least a 4-year university degree.

<sup>26</sup> Due to the nature of the facility’s structure, highly difficult levels of maintenance and management are not

and professional training on operation and maintenance.

Thus, it can be judged that there is no concern about technical aspects of operation and maintenance for the facilities developed by this project.

### 3.5.3 Financial Aspects of Operation and Maintenance

Table 4 shows MOOE (target schools for this project are Oas South Central Elementary School, Sto. Domingo Central Elementary School, Polangui North Central Elementary School, and Manito Central Elementary School) allocated to all 555 schools under jurisdiction of the Albay provincial office of the Department of Education. Table 5 shows MOOE (target school for this project is Gogon Central Elementary School) allocated to all 56 schools under the jurisdiction of the Legazpi municipal office of the Department of Education. Table 6 shows operation and maintenance costs allocated by the municipality of Libon to Libon Community College.

Table 4: Maintenance and Other Operating Expenses (MOOE) Which Albay Provincial Office of the Department of Education Allocates to Schools  
(Unit: 1,000 PHP)

2013	2014	2015
87,129	89,313	114,554

Source: Albay provincial office of the Department of Education

Table 5: Maintenance and Other Operating Expenses (MOOE) Which Legazpi Municipal Office of the Department of Education Allocates to Schools  
(Unit: 1,000 PHP)

2014	2015	2016
13,856	14,175	17,914

Source: Legazpi municipal office of the Department of Education

Table 6: Maintenance and Other Operating Expenses (MOOE) Which Municipality of Libon Allocates to Libon Community College  
(Unit: 1,000 PHP)

2013	2014	2015
4,468	4,392	6,000

Source: Municipality of Libon

Tables 4 to 6 show the allocation of operation and maintenance-related expenses for the previous three years. Although these generally show an increasing trend, allocated amounts are determined by the number of students enrolled each year. According to interviews with the

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required.

Albay provincial office and the Legazpi municipal office of the Department of Education and the municipality of Libon about operation and maintenance costs, comments from each suggested that the allocated amounts were not necessarily sufficient and that only the minimum necessary budget was being allocated. The allocated amounts are devoted to relatively minor expenditure such as school operating expenses, extracurricular activities expenses, equipment purchase expenses, utility expenses, and similar. On the other hand, as stated in 3.5.1 Institutional Aspects of Operation and Maintenance, particularly for the four facilities under the jurisdiction of the Albay provincial office of the Department of Education (Oas South Central Elementary School, Sto. Domingo Central Elementary School, Polangui North Central Elementary School, and Manito Central Elementary School), these schools do not have the budget required for large-scale repairs. For this reason, each organization—APSEMO, the Albay provincial office of the Department of Education, and the local municipality—should clarify the system for allocating the operation and maintenance budget, and should strive to secure the budget.<sup>27</sup>

Therefore, it can be judged that slight concerns remain about the financial aspects of operation and maintenance for the facilities developed in this project.

#### 3.5.4 Current Status of Operation and Maintenance

Regarding operational status at normal times, one classroom is used as an office room, while the other classrooms are used as ordinary classrooms for children. The office is used for multiple purposes such as practical disaster response training, residents' meetings, PTA meetings, etc. Meanwhile, regarding the maintenance status at normal times, an appropriate number of office and cleaning staff are assigned and facilities such as toilets, laundry rooms, kitchens, shower rooms, etc. are largely kept clean.<sup>28</sup>

Regarding operational status at times of evacuation, whenever a large typhoon arrives APSEMO coordinates and contacts local municipalities with instructions to evacuate, and local municipalities take prompt action in coordination with each facility. The office room is used as an evacuation shelter and disaster management administrative office. Local residents are

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<sup>27</sup> Furthermore, at the time of ex-post evaluation, the provincial government of Albay is considering implementing an insurance premium program after the latter half of 2017 using a government-connected insurance company to cover costs for evacuation shelters (including for the schools designated as evacuation shelters developed in this project) when large-scale repair expenses are necessary due to damage caused by natural disasters. Every year, the provincial government would pay an insurance premium to the insurance company, and the insurance company would pay for any repairs needed for damaged facilities.

<sup>28</sup> Among these, the kitchens, shower rooms, laundry rooms, and generators are hardly used at normal times. However, cleaning and regular inspections are carried out. One exceptional case is the kitchen at Sto. Domingo Central Elementary School, which is effectively used to feed children of poor families.



familiar with appropriate timing for evacuation<sup>29</sup> and actions are undertaken quickly and smoothly both on the administrative side and the residents' side. The evacuation period for residents during occurrence of major typhoons is usually 6 to 12 hours, or 1 to 2 days in case of a lengthy typhoon.<sup>30</sup> Meanwhile, regarding the state of operation and maintenance at the time of evacuation, after residents return home, the facility staff and local municipal personnel clean up and return the facilities to their original state.

In the municipality of Polangui, due to the impact of Typhoon Glenda in July 2014, the roof and windows of the Polangui municipal office were damaged and became unusable. For this reason, from among the classrooms of Polangui North Central Elementary School (developed as part of this project) 6 classrooms were temporarily used as municipal facilities, although this use was halted in November 2016.

Based on the above, some minor problems have been observed in terms of the institutional and financial aspect. Therefore sustainability of the project effects is fair.

## **4. Conclusion, Lessons Learned and Recommendations**

### **4.1 Conclusion**

This project developed designated evacuation shelters in existing schools in the Province of Albay, aiming to strengthen the function of facilities for safe evacuation of residents during eruption of the Mayon Volcano, as well as mudslides, debris flow, or flooding caused by typhoons, torrential rainfall, etc, in addition to ensuring a learning environment at normal times. Regarding the relevance, the Philippine government has placed an emphasis on disaster preparedness through legislation such as the Disaster Risk Reduction and Management (Republic Act). In the Province of Albay too—the target area of this project—the provincial government is moving ahead with the development of evacuation centers, mainly targeting barangay facilities. 26 facilities in total were developed in 2015, and there are plans to continue rolling these out in the future. Moreover, the project is also in line with the assistance policy of the Japanese government; thus, its relevance is high. Regarding the efficiency, although the costs of this project were almost as originally planned, the project period was partly delayed due

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<sup>29</sup> The background for this is that in the Province of Albay, on-the-job training and seminars on disaster risk reduction are regularly implemented by local governments, and are considered successful, in addition to the fact that residents have built up experience and familiarity with evacuation procedures during natural disasters up to today.

<sup>30</sup> After completion of this project, the Mayon Volcano erupted in September 2014, but there is no record of evacuation to any school designated as an evacuation shelter developed by this project. If the volcano did erupt, a longer period of use (about 1 to 2 months) could be expected.

to the necessity of site improvements at some schools, in addition to construction delays arising from disposal of excess soil during site preparation, and so the project period exceeded initial plans. Thus, project efficiency is fair. As for effectiveness and impact, as a result of development of schools designated as evacuation shelters by this project, target values for operation and effect indicators were largely achieved, including accommodation capacity of the evacuation shelters, number of classrooms which is usable as evacuation shelters, square meters of capacity at evacuation shelters per person, and congestion per room during evacuation. Also, as results of the beneficiary survey show, given the fact that resident satisfaction with the facilities developed through this project is high, and that impacts including improved awareness of disaster prevention and evacuation activities and contribution to disaster risk reduction were also confirmed, its effectiveness and impact are high. Regarding the sustainability, the roles and responsibilities of operations and maintenance at the time of the ex-post evaluation were not necessarily clear among stakeholder organizations such as the provincial government of Albay, APSEMO, Albay Provincial Office of the Department of Education, local municipalities, etc. (for example, each school designated as an evacuation shelter has not been allocated budget for expenses capable of supporting large scale repairs, and it is unclear which organization takes the lead on this) Thus, sustainability of the project is fair.

In light of the above, this project is evaluated to be satisfactory.

## **4.2 Recommendations**

### **4.2.1 Recommendations to the Executing Agency**

- The supply of electricity is not stable at several facilities developed by this project: Oas South Central Elementary School, Sto. Domingo Central Elementary School, Polanguí North Central Elementary School, and Manito Central Elementary School. With leadership from the provincial government of Albay, it is considered necessary for the stakeholder organizations (APSEMO, the Albay provincial office of the Department of Education, and local municipalities) to promptly discuss and determine which organization is responsible for paying the unpaid electricity charges to handle this matter.
- At Manito Central Elementary School, water supply pipe is used to convey water from a spring. However, there is only one water supply pipe, which makes it impossible to supply large amounts of water. With leadership from the provincial government of Albay, it is considered necessary for the stakeholder organizations (APSEMO, the Albay provincial office of the Department of Education, and the local municipalities) to promptly discuss the

water supply situation and facility budget in order to achieve an increase in the number of water supply pipe as well as water supply volume.

- Regarding operation and maintenance of this project, it remains unclear which organization essentially has the responsibility for specific operation and maintenance, as well as which organization should bear the operation and maintenance costs. Particularly remarkable is the case of four facilities: Oas South Central Elementary School, Sto. Domingo Central Elementary School, Polangui North Central Elementary School, and Manito Central Elementary School. With leadership from the provincial government of Albay, it is considered necessary for the stakeholder organizations (APSEMO, the Albay provincial office of the Department of Education, and local municipalities) to promptly discuss and clarify this issue as soon as possible.

#### 4.2.2 Recommendations to JICA

- In regard to the above points, it is recommended that the JICA Philippines Office monitor the status of progress for the above recommendations and follow up with the executing agencies as necessary.

### 4.3 Lessons Learned

#### Necessity of establishing a system to demarcate responsibility for operation and maintenance at an early stage

- It is believed that either before project commencement or during project implementation, stakeholder organizations (the provincial government of Albay, APSEMO, the Albay provincial office of the Department of Education, and local municipalities) should have clarified and agreed upon the institutional aspects of operation and maintenance post completion. Despite the necessity of "securing a stable supply of electricity and water" being cited in the ex-ante evaluation of this project as one of the lessons learned from similar past projects, because the post-completion institutional aspects of operation and maintenance remains unclear, electricity and water supply are not necessarily adequate at some facilities. In order to share and maintain a common vision of the institutional aspects of operation and maintenance, including details of practical and specific maintenance tasks and projected budgetary requirements, it is suggested that stakeholder organizations (the Albay provincial government, APSEMO, the Albay provincial office of the Department of Education, and local municipalities) mutually discuss and clarify concrete aspects of

sharing of roles and responsibilities at the project formation stage and during project implementation, as well as creating an agreement document in a practical and sustainable form and ensuring subsequent communication among the relevant organizations in order to regularly confirm and share information.

Republic of the Philippines

FY2016 Ex-Post Evaluation of Technical Cooperation Project

“The Project on Topographic Mapping for Peace and Development in Mindanao”

External Evaluator: Tokiko Ito, Octavia Japan Co., Ltd.

## 0. Summary

The topographic map at a scale of 1:50,000 of Mindanao was not updated since the printed maps<sup>1</sup> was produced in the 1950's. This project updated the information gathered by new satellite imageries and field identification and developed digital topographic maps<sup>2</sup>. For the overall goal, the project aimed for the development projects in the Mindanao area to be implemented in the future by utilizing the maps in planning the development of the region.

This project is fully consistent with the development policies and development needs of the Philippines and Japan's ODA policy, and thus, the relevance is high. By this project, new information required for production of the digital topographic maps was collected by satellite imagery and field identification. However, as a result of the verification of the data for printing, the data for GIS applications and the printed maps from the data for printing (hereafter referred to as “updated printed maps”) by National Mapping and Resource Information Authority (hereafter referred to as “NAMRIA”) after the completion of the project, NAMRIA judged that the digital topographic maps as final products have not reached the level acceptable as completed products. Moreover, although the map users, mainly Local Government Units (hereinafter referred to as “LGU”), received information on how to utilize the digital topographic maps, it cannot be judged that the knowledge and skills for utilization had been conveyed. Furthermore, regarding the recommendation for the environment of utilization of the digital topographic maps, the recognition and ownership of the implementing agency and others are low, and so, it cannot be judged that the knowledge for improvement of environment for utilization was conveyed. Thus, the project purpose has not been achieved. Regarding the overall goal, after the completion of the project, among the digital topographic maps, the data for printing was corrected and approved and all the map sheets of the updated printed maps were printed. But, the awareness among the users about the issued maps is low and the actual

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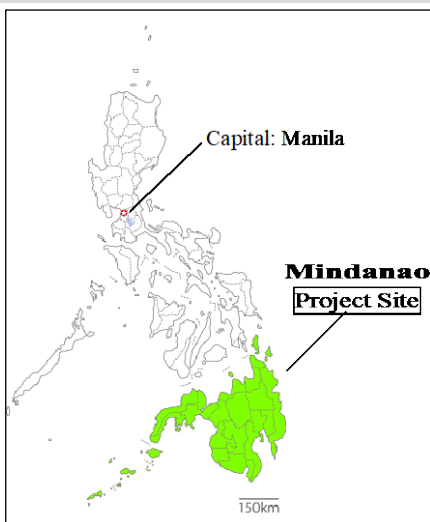
<sup>1</sup> “Printed Map” is a topographic map that is printed.

<sup>2</sup> “Digital Topographic Maps” include “Data for Printing” (PDF and TIFF) and “Data for Geographic Information System (hereinafter referred to as “GIS”) Applications” (Shapefile). Shapefile is composed of a set of plural files having roles such as graphic information and attribute information (for example, the extension is .shp, .shx, .dbf, .sbn, .sbx etc.), and consists of layers of many files with different information. (Source: <http://www.pasco.co.jp/recommend/word/word028/>: Accessed on June 1, 2017). Spatial information has various forms of expression. In this project, vector data drawing points, lines, and planes are used as the data for GIS applications. (Source: <https://www.esri.com/gis-guide/gis-datamodel/gis-datamodel/>: Accessed on June 1, 2017)

utilization is limited. The data for GIS applications has been corrected and has not been distributed except for a few cases, and so, actual utilization is very limited and it was difficult to confirm the status of utilization at some provided locations. Thus, the effectiveness and impact are low because the realization of the effect from the project implementation was not confirmed. The project cost was within the plan. Although the project period was extended based on the change of the plan, it cannot be judged that the data for GIS applications was completed at the time of completion of the project. Accordingly, the efficiency is fair. Regarding sustainability, there are no major problems in terms of the policy background and technical aspects. With respect to the organizational and financial aspects of the implementing agency and others, it cannot be judged whether or not it will be directed to promotion of the utilization as the data for GIS applications has not been utilized. Therefore, the sustainability of the project effects is fair.

In light of the above, this project is evaluated to be unsatisfactory.

## 1. Project Description



Project Location



Completed Updated Printed Map of the Topographic Map

### 1.1 Background

Before the project, the Government of the Republic of Philippines (hereinafter referred to as “GOP”) advocated reconstruction and development in conflict affected areas for the peace and stability of the nation in *Philippine Development Plan 2004-2010*. It was expected to efficiently formulate development plans in Mindanao, the southern region of the country, and to effectively develop projects and promote implementations based on the development plans. The topographic maps provide the basic geospatial information essential for development, but the

topographic maps of Mindanao at that time was only the old printed maps produced in the 1950s. Therefore, renewal of the topographic maps was required. The GOP requested the Government of Japan for a study on the digital topographic maps at a scale of 1:50,000. In response to this request, the Japan International Cooperation Agency (JICA) has designated NAMRIA as a counterpart organization (hereafter referred to as “C/P organization”) and Mindanao Development Agency (hereinafter referred to as "MinDA") as a relevant organization, signed the *Implementation Arrangement* (hereinafter referred to as "I/A") in January 2010, and the project was implemented from March 2010 until March 2013.<sup>3</sup>

## 1.2 Project Outline<sup>4</sup>

Overall Goal		By utilizing the digital topographic maps in the development planning of the Mindanao area, development projects in the Mindanao area will be implemented in the future.
Project Purpose		The digital topographic maps at a scale of 1:50,000 of the Mindanao area, which can be utilized for development plan of the province / region level in the Mindanao area, are updated, and stakeholders utilizing the maps recognize the methods of utilizing the topographic map.
Outputs	Output 1	Satellite Imagery at the appropriate scale covering the area shown in Attachment I of I/A shall be acquired.
	Output 2	Existing conditions relevant to the project including organization set-up, mapping system, facilities management and ground control points shall be reviewed.
	Output 3	Map production shall be undertaken using digital mapping technology in accordance with Survey Operation Manual of JICA
	Output 4	Recommendation for the wide and effective use of the topographic maps produced under the project shall be prepared.
Total Cost (Japanese Side)		1,143 million yen
Period of Cooperation		March 2010 - March 2012 (Extended Period: April 2012 - March 2013)
Implementing Agency		NAMRIA
Other Relevant Agencies / Organizations		MinDA, LGUs: Region, Province, City, Municipality, Barangay in Mindanao. <sup>5</sup> Regional Offices of National Government Agencies: Development of Environment and National Resources (hereinafter referred to as “DENR”), National Economic and Development Authority, hereinafter referred to as “NEDA”), Department of

<sup>3</sup> After signing I/A, the responsibility was handed over to MinDA from the Mindanao Economic Development Council (hereinafter referred to as “MEDCo”) in 2010.

<sup>4</sup> Based on the ex-ante evaluation sheet, I/A, and final report, summary and indicators are organized and re-set for ex-post evaluation, changes are stated in the attachment.

<sup>5</sup> Under the central government in the Philippines, there are 17 regions (Region) and there is a hierarchical structure of local administration beneath. It is a three-layer structure of (1) Province and highly urbanized city, (2) City (Constituent City) and Municipality, and (3) Barangay (Minimum administrative unit).

	Transportation and Communication, Department of Agriculture (hereinafter referred to as “DAR”) etc.
Supporting Agency/Organization in Japan	N/A
Related Projects	<p>【Technical Cooperation】</p> <ul style="list-style-type: none"> <li>- Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan (February 2006 – March 2008)</li> <li>- Comprehensive Capacity Development Project for the Bangsamoro (hereinafter referred to as “CCDP”) (July 2013 – July 2019)</li> </ul>

### 1.3 Outline of the Terminal Evaluation

This project is the Technical Assistance related to ODA Loan, but because the project set a product, the digital topographic maps, as the project purpose, the terminal evaluation was not conducted.

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Tokiko Ito, Octavia Japan Co., Ltd.

### 2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted with the following schedule.

Duration of Study: August 2016 – November 2017

Duration of Field Study: January 11 – 29, 2017 and April 20 – 29, 2017

### 2.3 Constraints during the Evaluation Study

As for the project summary and indicators of this project, the content of the ex-ante evaluation sheet, I/A, the final report were slightly different from each other as shown in the attached history of changes of PDM. In this ex-post evaluation, based on each of these documents, log frames and indicators were arranged and reset for evaluation. In addition, the information collected before the field survey was limited. The fact that NAMRIA did not acknowledge the digital topographic maps, final products, as completed products, was found out at the time of the survey and survey items had to be added on the spot. The product, digital topographic maps, was set as the project purpose in this project as mentioned earlier, so the evaluation of the impact and sustainability was judged with reference to the concept of



“Technical Cooperation for Development Planning”.

### 3. Results of the Evaluation (Overall Rating: D<sup>6</sup>)

#### 3.1 Relevance (Rating: ③<sup>7</sup>)

##### 3.1.1 Consistency with the Development Plan of Philippines

At the time of planning, the GOP put “peace and stability of the state: reconstruction and development in conflict-affected areas” in policy through the *Philippine Development Plan (2004-2010)*. Among them, by updating and digitizing the topographic maps of the Mindanao area, efficient formulation of the development planning for the region and effective promotion of development and implementation of development projects were expected. At the time of completion of this project, the GOP continued to promote peace and stability that supports national development through *Philippine Development Plan 2011-2016* (hereinafter referred to as “*PDP 2011-2016*”). In “*PDP 2011-2016*”, the GOP furthermore offers, a) to mainstream support system that can contribute to an objective decision-making, b) empower the local governments with new capacities that can improve their service delivery, and c) provide a means for citizens to access vital information.

In MinDA's *Mindanao 2020 Peace and Development Framework Plan* (hereinafter referred to as “*Mindanao 2020*”) on the development of Mindanao for 20 years from 2011, strengthening the capabilities of the LGUs, regional offices of national government agencies, and academic and research institutions for utilization of GIS and mapping is identified as a strategy to activate stakeholders for the regional development planning. In other words, from the start of the project to the completion, in the country, the development of the geospatial information management environment for development by the local government was promoted. From the above, this project was highly consistent with the development policy of the GOP.

##### 3.1.2 Consistency with the Development Needs of Philippines

At the time of the start of the project, the topographic map at a scale of 1:50,000 of the Mindanao area was only the printing version and was made about 60 years ago. Recent years, changes in geospatial information due to natural disasters, etc., were large, and it was urgent to formulate the land use plan, hazard map etc., in the area. The needs for the renewal of topographic map, especially the needs for the topographic data for GIS applications, were very

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<sup>6</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

<sup>7</sup> ③: High, ②: Fair, ①: Low

high. Furthermore, at the time of ex-post evaluation continuously from the time of project formulation, the officer of the Mapping and Geodesy Branch (hereinafter referred to as “MGB”) of NAMRIA, the officer of Knowledge Management Division of MinDA, and the provincial level of planning and development officer at Region XI considered the topographic map at a scale of 1:50,000 as important information for development planning (geospatial planning and project planning) and decision making for private and academic sectors in addition to governmental agencies. According to the MinDA officials, planning for a specific area requires a topographic map at a scale of 1/10,000 for the town level and development partners of Mindanao, but the topographic map of 1:50,000 scale by NAMRIA should be used as the base map information<sup>8</sup> by government agencies and LGUs according to the guidance of NEDA. Therefore, it can be said that updating the topographic map and producing the data for printing and data for GIS applications by this project were consistent with the development needs.

After the start of the project, it was agreed that the Basilan Island and the southern islands of the Autonomous Region in Muslim Mindanao (hereinafter referred to as “ARMM”), which had been excluded from the initial plan of topographic map area, were added to cover the entire Mindanao area.<sup>9</sup> This was because there were security problems due to conflict affected areas and hampered development, and as the situation had been improved somewhat before the project was implemented, as a result, the change was agreed. Also from the viewpoint of Peacebuilding Needs and Impact Assessment (hereinafter referred to as “PNA”), the change of the target site contributes to the reduction of the instability factors and is recognized as reasonable<sup>10</sup>.

### 3.1.3 Consistency with Japan’s ODA policy

At the time of ex-ante evaluation, the Ministry of Foreign Affairs’ *Country Assistance Plan for the Philippines (2008)* set three priority areas. One of which was “peace and stability of

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<sup>8</sup> Various geospatial information is being developed according to each purpose by various stakeholders such as the national government, local governments, and private business operators, etc. Although such geospatial information secures a certain degree of precision, it will cause deviation within the range of accuracy, so it is necessary to use a common position criterion when preparing geospatial information. “Base map information” refers to information that serves as a reference for position in a digital map. (Source: <http://www.gsi.go.jp/kiban/towa.html>: Accessed on July 3, 2017)

<sup>9</sup> Regions in Mindanao are as follows: Zamboanga Peninsula (Region IX), Northern Mindanao (Region X), Davao Region (Region XI), Soccsksargen (Region XII), Caraga (Region XIII) and ARMM.

<sup>10</sup> At the time of ex-post evaluation, at the interview, several departments of ARMM also expressed high expectations to the updated topographic map. According to the consultant, MinDA was concerned about dealing with the exclusion of the islands in ARMM. If the area had been excluded from the targeted area, there was a possibility that discontents could have come out from ARMM, and the official of MGB of NAMRIA also stated that as the topographic map is for peace, it was impossible to exclude some areas in Mindanao. It cannot be denied that there was a possibility that the reconciliation process could have been affected if ARMM disagreed with the treatment of areas being excluded from the topographic map targets.

Mindanao”. The priority was given to the support for the goal of withdrawing Mindanao from the poorest areas and consolidating the peace of Mindanao. In addition, based on *Support Package for Peace and Stability in Mindanao* announced in 2002 by the Ministry of Foreign Affairs, a) support for policy formulation and implementation targeted at the ARMM government, b) improvement of basic human needs, and c) peace-building were clearly stated as priority areas. JICA stated “Peace and Development of Mindanao” as a cooperation program in the *Country Assistance Strategy for the Philippine* at the time of ex-ante evaluation. This project contributes to the implementation of development projects in the Mindanao area, as the peace agreement between the GOP and the Moro Islamic Liberation Front progresses, and is judged as highly consistent with Japan’s ODA policy.

Accordingly, this project was highly relevant to the Philippines’ development plan and development needs, as well as Japan’s ODA policy. Therefore, its relevance is high.

### **3.2 Effectiveness and Impact<sup>11</sup> (Rating : ①)**

#### **3.2.1 Effectiveness**

Upon this evaluation, based on the description of the ex-ante evaluation sheet, I/A and final report, the project purpose, outputs and each indicator are re-organized as attached, effectiveness and impact are analyzed, and level of achievement is judged<sup>12</sup>.

##### **3.2.1.1 Achievement of Project Purpose**

In this project, as shown in Table 1, four outputs were set in order to achieve the project purpose, “the digital topographic maps at a scale of 1:50,000 of the Mindanao area, which can be utilized for development plan of the province / region level in the Mindanao area, is updated, and stakeholders utilizing the maps recognize the methods of utilizing the topographic maps”. At the time of completion of the project, the Output 1 and 2 on the acquisition of information required for the production of the digital topographic maps were generally achieved and it was confirmed that Output 3 on the production and the Output 4 on the utilization of the topographic maps were partially achieved.

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<sup>11</sup> The sub-rating for Effectiveness is to be considered together with Impact.

<sup>12</sup> As stated in the attachment, the ex-ante evaluation sheet has one project purpose, but at the stage of I/A attached with the final report, there are two project purposes and no indicators are stated. In addition, the Project Purpose 1 and Output 3 and Project Purpose 2 and Output 4 stated at the time of the final report are similar.

Table 1 Achievement of Output

Output	Indicator	Actual
Output 1	Gross area of acquired satellite imagery	New ALOS <sup>13</sup> satellite image data of almost the same area as target area of the topographical map (100,500km <sup>2</sup> ) changed in June 2010 was obtained.
Output 2	Number of ground control points and products	Survey data at 315 ground control points (in which 220 points was quantity of the contract) required for aerial triangulation using satellite images was acquired by December 2010. The project implementation consultant (hereafter referred to as “the Consultant”) verified that the products of each survey were sufficiently accurate.
	Number of pricking (leveling) points and products	Data of 220 pricking points required for aerial triangulation of satellite image were acquired. The Consultant verified the products according to <i>SPECIFICATION 2008</i> <sup>14</sup> and the work was completed by December 2010.
	Gross area of field identification	The field identification survey of totally about 100,500km <sup>2</sup> which was the target area of topographic map agreed with the GOP was conducted and the Consultant verified the outcome according to <i>SPECIFICATION 2008</i> etc. In addition, field completion work was conducted, but it was impossible to conduct surveys in 2% of the area due to entry restrictions for security reasons. It was agreed to supplement with secondary data and interviews.
Output 3	Orthophoto data	The orthophoto data at a scale of 1:50,000 is stored in the DVD as a final product and submitted at the time of completion of the project.

<sup>13</sup> Abbreviation for Advanced Land Observing Satellite. ALOS was one of the world’s largest land observation technology satellites at the time, launched by the Japan Aerospace Exploration Agency (JAXA) in January 2006. (Source: <http://jp.alos-pasco.com/alos/>, [http://www.sed.co.jp/sug/contents/satellite/satellite\\_alos\\_avnir2prism.html](http://www.sed.co.jp/sug/contents/satellite/satellite_alos_avnir2prism.html): Accessed on June 1, 2017)

<sup>14</sup> It was agreed that the topographic mapping work of this project conforms to the *SPECIFICATION 2008*: 1:50,000 scale topographic map specification, the symbolization specification, orthophoto creation manual, prepared in the “Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan” (February 2006 - March 2008). Similarly, “Overseas Survey and Mapping (Basic Maps)” designated by JICA in 2006 and the operation manual of 2007 by JICA have been used. For orthophotography, in aerial photography, distortion occurs as it covers from high buildings and mountainous areas, and from the center of the picture to the outer periphery. In such a state, it cannot measure nor overlap with the actual map. Therefore, correcting this distortion is called orthorectification, and the aerial photograph applied with this correction is called orthorectified image (orthophoto). (Source: <http://www.pasco.co.jp/recommend/word/word058/>: Accessed on June 1, 2017)

	Produced topographic maps	By the time of completion of the project, NAMRIA confirmed and signed the contents for the draft of the updated printed maps as a C/P organization before delivery. NAMRIA received data for printing and data for GIS applications from JICA which JICA regarded as final products. But NAMRIA had not completed to check the contents by this time. As a result of the verification after that, there were map sheets of which data for printing and for GIS applications were not with satisfactory accuracy for NAMRIA and have not been approved by NAMRIA as completed products. Thus, the digital topographic maps were produced but it cannot be said that they were completed.
Output 4	Contents of realistic recommendation for implementation and method of recommendation	In order to utilize the topographic maps, the study on topographic map utilization to members of Technical Coordinating Committee (hereinafter referred to as “TCC”) <sup>15</sup> was conducted, and based on the results, recommendations for utilization were summarized. It was reported through the Technology Transfer Seminar and the Final Report. However, the implementing agency and others do not recognize the positioning of the contents of the final report to be so important.

Table 2 shows the achievement of the project purpose at the time of project completion.

Table 2 Achievement of Project Purpose

Project Purpose	Indicator	Actual
“The digital topographic maps at a scale of 1:50,000 of the Mindanao area, which can be utilized for development plan of the	The topographic maps are composed with the information by field identification according to the survey standard and updated information based on the latest images.	Information from field identification in accordance with JICA “ <i>Kaigai sokuryo sagyo kitei (Heisei 24 nen)</i> (Overseas Field Identification Operation Regulations (2012 Edition))” and the specification for the Philippines <i>SPECIFICATION 2008</i> was collected, new ALOS satellite images of the target area and existing archive data of ALOS and SPOT satellite images were acquired, and the topographic maps were produced. The digital topographic maps (data for printing and data for GIS applications) were officially received at the time of project

<sup>15</sup> TCC is composed of LGU representatives in the target area. The consultant decided the members. TCC members cooperated with field identification and the topographic map utilization study, participated in the technology transfer seminar, and conducted verification of the topographic maps, etc. The actual members were not confirmed at the ex-post evaluation because the implementing agency and others have kept no record.

<p>province / region level in the Mindanao area, are updated, and stakeholders utilizing the map recognize the methods of utilizing the topographic maps.”</p>		<p>completion. However, by the verification after the completion of the project, problems such as inconsistencies of the terrain were confirmed. This is considered to be a problem of quality control (accuracy) other than the work process described in the specification. It is judged that the digital topographic maps (data for printing and data for GIS applications) updated with the latest information cannot be said to be completed at the time of project completion.</p>
	<p>The necessary knowledge and skills for updating and utilizing the topographic maps are conveyed to the stakeholders</p>	<p>Through the technology transfer seminar and the final report, the recommendations mainly about the use of digital topographic maps and arrangement of conditions such as required technical and organizational aspects: GIS related software and knowledgeable personnel, were explained to NAMRIA, MinDA and LGUs etc., the users of the maps. Both NAMRIA and MinDA recognize that the contents of the seminar were comprehensive and there were points in the recommendations that can be agreed by the implementing agency and the related agency, but the contents of the recommendations of the report were made mainly by the Consultant and participation of the Philippine side was limited. MinDA also considers that there is no signature of the Philippine government in the final report and the report is not officially positioned. For these reasons, the implementing agency and others are not well aware of the contents of the recommendations except for the strengthening of the utilization capacity of users, which has been the identified issue by themselves since the beginning of the project.</p>

Regarding the Indicator 1 of the project purpose, “The topographic map is composed with the information by field identification according to survey standard and updated information based on the latest images”, the digital topographic maps (data for printing and data for GIS applications) were submitted to NAMRIA at the completion of the project. The ALOS satellite image data of almost the same area as the project target area (100, 500km<sup>2</sup>) was acquired by the Consultant during the project implementation. As the amount of the clouds photographed in the images exceeded the standard for 20% of the area, archive data of existing ALOS and SPOT<sup>16</sup>

<sup>16</sup> Abbreviation for Satellite Pour l'Observation de la Terre. SPOT is the earth observation satellite of the National Space Research Center of France developed in 1986. From the time of the start and during the implementation of the project, SPOT 1 to 5 were developed. (Source: [http://www.sed.co.jp/sug/contents/satellite/satellite\\_spot.html](http://www.sed.co.jp/sug/contents/satellite/satellite_spot.html),

satellite images was adopted after consultation between the Consultant and JICA (Output 1). The field identification study was conducted according to *Gomanbun no ichi chikeizu zushiki (Heisei gannen ban)*(*Diagram of Topographic Map at a Scale of 1:50,000 (Heisei 1 version)*) by Geographical Survey Institute, the Ministry of Construction of Japan, *Overseas Field Identification Operation Regulations (2012 Edition)* by JICA, and *SPECIFICATION 2008*, the specification of the Philippine, in Central Mindanao, Northern Mindanao, and South Mindanao by three subcontractors in the Philippines. Regarding the contents, the number of designated ground control points, the number of pricking (leveling) points and the actually implemented area of this field survey (field identification and field completion), NAMRIA acknowledged that it was a comprehensive study of information for both contents and volume required for the digital topographic map production at the time of ex-post evaluation (Output 2). However, it was judged that there was a problem in accuracy of the some of the map sheets of the digital topographic maps (data for printing and data for GIS applications) which were produced from those information and confirmed and submitted to NAMRIA as final products by JICA at the time of completion of the project as a result of verification by NAMRIA afterwards (Output 3). After the completion of the project, upon request from NAMRIA to JICA, the digital topographical maps (data for printing and data for GIS applications) were corrected by the Consultant. By the time of ex-post evaluation, the updated data for printing was approved by NAMRIA, in June 2014. However, NAMRIA considers that there was still a problem with accuracy in data for GIS applications and continues the correction work on its own. By the time of ex-post evaluation, the correction of 52 map sheets out of all 227 map sheets of the Mindanao area was completed. It was said that it would take several more years to complete all.

In relation to the Indicator 1 of the project purpose, regarding Output 3, “Map production shall be undertaken using digital mapping technology in accordance with Survey Operation Manual of JICA”, judged to be partially achieved, because final verification was carried out by NAMRIA and LGUs mainly based on the print charts from just before the project completion, November 2012, until after the completion of the project, November 2013. As a result, inconsistencies such as mismatches of name of locations, position of roads and bridges and points of interest, etc., were found among the orthophoto data, the data for printing and the data for GIS applications in some of the map sheets and NAMRIA did not approve the maps. It was also confirmed that some of the map sheets were produced seemingly based on the old information and not on the latest information. In NAMRIA, it is required for its projects to be

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<http://www.intelligence-airbusds.com/en/143-spot-satellite-imagery>: Accessed on June 1, 2017)

approved by the Administrator who is the chief executive officer. With regard to the topographical maps, the manager of the department, the Director of MGB, approves. At the time of ex-post evaluation, NAMRIA still could not determine that the data for GIS applications was completed although there was pressure from government agencies etc. Based on this circumstance, it cannot be said that a part of map sheets of the digital topographic maps (data for printing and data for GIS applications) were made up of utilizable updated information at the time of completion of the project. From the above, it is judged that the Indicator 1 of the project purpose was not achieved by the time of completion of this project.

The verification of the topographic maps was carried out step by step even before the final verification. The Consultant conducted a confirmation of legends and things to be deleted, etc. in accordance with the specification agreed with NAMRIA before the compilation work that was performed in Japan. In the middle of drafting work, verification by the TCC was carried out, and at the final stage, from December 2012 to February 2013, the opportunities of verification by NAMRIA staff in Japan were set up. At the stage of final draft, all pages of the printed maps of the topographic maps were signed by NAMRIA for the confirmation of receipt. However, according to the Director of MGB, NAMRIA, the area of verification by the TCC consisting of only some representatives was limited and the time for verification by NAMRIA was insufficient, but inconsistencies were pointed out. Inconsistencies of the data were more widely confirmed by NAMRIA even after the completion of the project. In the Director's opinion, it was possible for NAMRIA staff to quickly make verifications and corrections from time to time if the compilation work was carried out in the Philippines. Furthermore, NAMRIA assumed that the Consultant would continue to respond to the correction even after the completion of the project and, before the final products were submitted, signed the draft of updated printed maps for confirmation of contents and receipt as a formality. This perception of NAMRIA is an understanding based on verbal communication with the Consultant, and there is no agreement by written document. There has been a business relationship between the local affiliate of the company of the Consultant and NAMRIA, although the affiliate was not involved in this project. So, it is possible that the relationship affected NAMRIA to think that it might be possible to keep correspondence even after the completion of the project and affected NAMRIA's perception of the completion of the project. According to the official of MGB, NAMRIA, NAMRIA had actually contacted the local affiliate for the correction work of data for GIS applications since 2014.

According to the Consultant, there are usually errors such as inconsistency of the name of



place or the position of the specific target when the topographic maps are produced. When they responded to a request based on the evaluation report of the verification result by NAMRIA, in November 2013, they have corrected the points that they judged necessary. To that effect, according to the Consultant, they explained to NAMRIA and agreed upon the actions that were taken, in February 2014, but there is no agreement by written document. On the other hand, according to NAMRIA's Deputy Director of MGB and the section manager for verification, etc., there were still points to be corrected by the Consultant, and there was no remark that they had agreed not to request additional amendment. In this way, there are differences in opinions between NAMRIA and the Consultant concerning the verification process and the accuracy of the final product.

Next, regarding the Indicator 2 of the project purpose, “the necessary knowledge and skills for updating and utilizing the topographic maps are conveyed to the stakeholders”, according to NAMRIA and the Consultant, NAMRIA has skills to update topographic maps. By a self-evaluation, MinDA has improved the knowledge of geospatial data management and understood the needs for cooperation with stakeholders and for improvement of the environment for coordination needs through this project.

In relation to promotion of utilization, a study on map utilization to grasp the knowledge, environment and the needs for utilization of the digital photographic maps of the concerned users was implemented in this project. By the technology transfer seminar and the final report, the techniques required, the use and the improvement of environment for utilization of the topographic maps were recommended to the users of NAMRIA, MinDA and LGUs<sup>17</sup> (Output 4). Although the data for GIS applications with accuracy that NAMRIA can approve was not completed by the time of the ex-post evaluation, at the user interview<sup>18</sup> for ARMM and the planning development personnel of provinces and cities in Region XI, it was confirmed that they recognized the use of the topographic maps and the needs to utilize the data of GIS

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<sup>17</sup> The main recommendations of the final report are as follows: 1) Basic information: base map, theme map, scale, GIS, explanation of GIS analysis; 2) Direction for using topographic maps in Mindanao: management based on the project cycle management, planning of a framework plan by cooperating between sectors and administrative levels, improvement of the ability of regions and provincial officials to utilize maps and GIS and thematic maps to be updated/produced at each local administrative level, MinDA's coordination ability required for updating GIS data, thematic maps to be updated in ARMM, utilization and improvement of NAMRIA's GeoPortal site.

<sup>18</sup> The user interviews were implemented to those as below; Regional offices of national government agencies of Region XI: DAR, DENR and Mines and Geosciences Bureau; Planning and development office of 5 Provinces: Davao del Norte, Davao del Sur, Davao Oriental, Davao Occidental and Compostela Valley, and 2 cities: Davao and Tagum; ARMM: DAR, DENR, Department of Agriculture and Fisheries, Department of Interior and Local Government, Department of Tourism, Department of Public Works and Highways, Technical Management Services-Office of the ARMM Regional Governor; Planning and development office of ARMM and Cotabato city; Davao Integrated Development Program supporting LGUs; 1 banana export and plantation company in Davao city; and 1 conflict monitoring NGO in Davao city. Moreover, information other than Region XI was interviewed to the officials of Four Area Management Offices (East, West, South and North) of MinDA.

applications was high. The seminar seems to have played the role of PR of the digital topographic maps. But it is possible that the recognition of the data for GIS applications spread wider due to the government policies and dissemination of free GIS software from the time of project completion to the ex-post evaluation. On the other hand, at the time of ex-post evaluation, according to the implementing agency and others, it was said that additional practical training was necessary for the users such as LGUs to acquire knowledge and skills for production of thematic maps. Even at the interview with the map users, it is also apparent that the environment of acquiring techniques, GIS related software and human resources, has not necessarily been improved. One of the reasons for this may be because there is no data for GIS applications for utilization.

With regard to the Indicator 2 of the project purpose, the Output 4, “Recommendation for the wide and effective use of the topographic maps produced under the project shall be prepared”, which is partly achieved, NAMRIA and the Consultant became lecturers, and the technology transfer seminars were held in two places for half a day each in November 2012. Participants were each 197 and 171 people from the regional office of national government agencies, LGUs from regions, provinces, cities, municipalities and Barangay, NGOs and others of all the regions in Mindanao. In the half-day program, the contents of the project, the study results, digital topographical maps, operation method of GIS software, the uses of thematic map<sup>19</sup> etc. were introduced. In addition, a CD of PowerPoint documents and videos etc. used in the seminar were distributed to the seminar participants. According to officials of MGB, NAMRIA and MinDA, the contents of the seminar was comprehensive to a certain extent and appropriate, but the time duration was short and the session was only by a lecture style and there was no session of an on-site training. Compared with the software operation, the time for the use of data for GIS application, production of thematic maps etc., was limited. Thus, there was a difference in the degree of comprehension depending on participants. The implementing agency and others acknowledged the lack of the user's ability of techniques to utilize the digital topographic maps and initially requested the capacity building within the project, but it was not implemented. In addition, the license of the introduced GIS software, ArcGIS, was expensive

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<sup>19</sup> The thematic map is “a map drawn with emphasis on a specific subject”. On the map, there are “a map representing specific theme on a general map such as a topographic map as a base map and a map produced by field identification survey for a certain purpose from the beginning”, and “representative of the former one are geological maps and land classification diagrams and the latter are cadastral maps and navigation charts, etc.”. “There are various kinds of thematic maps such as urban planning charts, disaster prevention diagrams, various statistical maps, etc.” “Urban maps and road maps”, “cultural property distribution map” and “evacuation center map” are kind of thematic maps. (Source: [https://navi.ndl.go.jp/research\\_guide/entry/theme-honbun-601004.php](https://navi.ndl.go.jp/research_guide/entry/theme-honbun-601004.php): Accessed on June 1, 2017)

although it was the standard GIS software and there was no other software with the same functions at that time. During the interview at the ex-post evaluation, it was also heard that it was not yet realistic for many LGUs to obtain the software although the necessity of improving the environment for GIS utilization was recommended. Even at the time of ex-post evaluation, the conditions for the digital topographic map utilization: GIS related software, techniques and human resources, were not necessarily arranged.

It is said that the implementing agency and others were not involved in the creation of the recommendations subjectively, and the contents of the seminar and the recommendation of the final report were created and presented by the Consultant. At the time of ex-post evaluation, MinDA officials said that the contents of the recommendations of the final report were checked and generally agreed. However, there was no high motivation to implement and coordinate as recommended in the report as it is understood that the report was not the one approved by the GOP officially. The Director of MGB, NAMRIA has no particular opinion on the contents. After the completion of the project, there was a low recognition for the position of the recommendations by the implementing agency and others responsible for promoting and coordinating the utilization.

In this project, the purpose of the Technology Transfer Seminar was thought to be to disseminate the digital topographical maps to the stakeholders, the main users, and it is considered that the final report was for the implementing agency and others. The prepared Technology Transfer Seminars and the contents of the recommendations were comprehensive and useful referring to the techniques and system arrangement for utilizing the digital topographic maps towards NAMRIA, MinDA and the users. It is important that the digital topographic maps are actually utilized after they are issued. However, the perception and ownership of the implementing agency and others are low regarding the contents of the recommendations about the utilization environment for the digital topographic maps which were thought to be necessary for promoting those utilization. From the above, it is difficult to judge that consideration for feasibility about the recommended contents and the methods for having common opinions with and getting recognition of recommendation from the implementing agency and others were appropriate. Thus, the indicator of the output 4 is considered to be partially achieved. It cannot be judged that the knowledge and technique for utilization had been conveyed to the stakeholders. Therefore, it is judged that achievement of the Indicator 2 of project purpose is fair.

As described above, the project did not satisfactorily achieve its project purpose because

the digital topographic maps, the data for printing and the data for GIS applications, with accuracy that NAMRIA could approve were not completed at the time of completion of the project and because it cannot be judged that the stakeholders who were to utilize the maps were conveyed with the knowledge and technique for utilization although they received information on the use of the maps.

### 3.2.2 Impact

#### 3.2.2.1 Achievement of Overall Goal

Regarding the overall goal, “by utilizing the digital topographic maps in the development planning of the Mindanao area, development projects in the Mindanao area will be implemented in the future”, between the project completion and the ex-post evaluation, the data for printing has been completed. NAMRIA is on the process of correcting the data for GIS applications at the time of ex-post evaluation. By March 2016, NAMRIA printed out all the map sheets of the data for printing and the map sales offices of NAMRIA in DENR of all regions sell them. According to the sales officer of Region XI in Davao City, mainly private enterprises have purchased the printed maps. The topographic maps are available free of charge for the government agencies through an application to NAMRIA. It is not free for private enterprises and organizations etc. Distribution of data for printing (PDF) is started on a request basis.<sup>20</sup> It is said that a part of the map sheets can also be referenced in the GeoPortal on NAMRIA’s website<sup>21</sup>. Because the data for GIS applications did not satisfy the accuracy which NAMRIA can accept, it has not been distributed in general. There were some cases that NAMRIA has confirmed the usages and provided the data for GIS applications in exchange for payment or free of charge after notifying that the data was still being corrected.<sup>22</sup> According to the JICA Philippine office, which holds the intellectual property rights of the digital topographic maps of this project together with NAMRIA based on the agreement in I/A, the data for GIS applications is shared to CCDP of JICA and is utilized.<sup>23</sup>

Both NAMRIA and MinDA have not carried out public relations activities on the updated printed maps map yet. At the time of ex-post evaluation, according to MinDA officials, the usage of printed maps are a material for presentation, an attachment of materials and a reference

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<sup>20</sup> NAMRIA has distributed the data for printing to the Philippine National Police, Philippine Institute of Volcanology and Seismology, LGUs, etc. The utilization purposes could not be confirmed through the ex-post evaluation.

<sup>21</sup> The data for printing posted on the GeoPortal can be browsed but cannot be downloaded.

<sup>22</sup> It is used for humanitarian assistance and disaster response. It is utilized for JICA “Davao City Infrastructure Development Plan and Capacity Building Project” (January 2017 – implemented at present).

<sup>23</sup> The purpose of utilization could not be confirmed through ex-post evaluation.

for planning. However, in the user interview mainly for regional offices of national government agencies and LGUs, the completion of the updated printed maps, the sale at the NAMRIA map sales office, free of charge provision to government agencies, and the location of the sales office were unknown. Cases of utilization of updated printed maps were not confirmed. In January 2017 during the field survey of the ex-post evaluation, at the Mines and Geosciences Bureau of Region XI, the updated printed maps attached to the application for permission of the mining investment plan of one company submitted in the same month was observed. At the bureau, usually a printed map is attached to the application form in order to indicate the investment location. Until then, they had only seen the old version of the printed maps, and it was the only case that the updated printed maps were attached. With regard to this case, it was not possible to confirm whether the user utilized it because it was an updated printed map or not. According to the NAMRIA's map sales officer in Region XI, there was an impression that the purchasers often purchased the updated printed maps upon introduction by the officers rather than those seeking them. Since the sales volume of the old version of printed maps before updating could not be compared with, it has not been confirmed whether or not the sales amount and utilization have increased after the update. According to the MinDA official, MinDA would carry out PR and distribution when all the digital topographic maps were completed. Some LGUs, NGOs and companies, etc. which have participated in the technology transfer seminar and answered the interview possess the skills to utilize the data for GIS applications and have been awaiting issuance of the data with large expectation. There are inquiries about purchasing the digital topographic maps to NAMRIA and MinDA from LGUs, companies and other donors.<sup>24</sup>

Although high expectations on the digital topographic maps from LGUs, NGOs and private enterprises were acknowledged, the data for GIS applications accompanied by the accuracy that NAMRIA can approve and distribute is incomplete. The utilizations of data for printing and the updated printed maps have been started. However, in the Mindanao area, at the interviews with the planning and development personnel of the region, province and city level in Region XI including relatively developed Davao City in Mindanao area and ARMM, there were not any information of seeing or obtaining the topographic maps. It was said that the use of the printed maps was limited. These stakeholders are also subjects of the technology transfer seminar as the users of the digital topographic maps. From this, it is considered that the current awareness of the completed updated printed maps and the data for printing within the Mindanao area is still low. It is considered that it is hardly utilized for creating theme maps utilizable for

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<sup>24</sup> Under such circumstances, there was a LGU which inevitably processed data that seemed to be the PDF data for printing that was distributed at the seminar, and used it as project planning materials.

planning. From the above, the utilization of the digital topographic maps is limited, and it cannot be said that the overall goal has been achieved.

Table 3 Achievement of Overall Goal

Overall Goal	Indicator	Actual
<p>By utilizing the digital topographic maps in the development planning of the Mindanao area, development projects in the Mindanao area will be implemented in the future.</p>	<p>Actual utilization record of digital topographic maps: name of project, name of plan and use, recognition and referenced situation.</p>	<p>Although the data for printing is completed, the utilization record is limited as the data for GIS applications is incomplete, and distribution of the digitized materials is limited. The draft version of data for GIS applications is used for humanitarian relief and disaster response. For the updated printed maps, 300 copies of 227 map sheets each were printed. The sales started after July 2015 and by the end of February 2017, total 1,139 sheets of 420 map sheets in total were sold at map sales offices in DENR in the nation. At the sales office of Region XI in Davao city, main purchases were by companies. Although the above is the sales performance, the purposes of usage or the degree of utilization cannot be confirmed, and the basis for differentiating the degree of utilization as the updated version compared with the old version cannot be confirmed. Among LGUs which are the assumed topographic map users, it is assumed that there are many LGUs that are not informed of the issuance of updated printed maps within those interviewed during ex-post evaluation study, and their expectation for “digital” topographic maps is high for development planning. So, it is considered that the utilization example is limited. Therefore, it cannot be judged that the impact of this project was explicitly demonstrated from the confirmed cases of utilization of the updated printed maps.</p>

At the time of ex-post evaluation, NAMRIA continues the correction work to solve the problems of the accuracy of the data for GIS applications which were found after the project completion. NAMRIA has not approved the data as completed products. The awareness of the stakeholders of the regional offices of national government agencies and LGUs about the data for printing and updated printed maps was low, and their utilization records could not be confirmed. Although map purchases of the updated printed maps by the companies were confirmed, the reasons for utilization unique to the updated printed maps or the cases of purposes of usage were not confirmed. Thus, the effectiveness of this project implementation is

limited compared to the plan. Therefore, effectiveness and impact of the project are low.

### 3.3 Efficiency (Rating: ②)

#### 3.3.1 Inputs

Table 4 shows the plan and actual results of inputs.

Table 4 The Plan and Actual Results of Inputs

<b>Inputs</b>	<b>Plan</b>	<b>Actual (Project Completion)</b>
(1) Experts	Long-Term : Not listed Short-Term : Not listed Local consultant : Employed	Short-Term: 7 pax (Team Leader/ Field Identification/ Field Completion, Map Utilization, Control Point Survey 1 & 2, Field Identification/ Field Completion 1 & 2, Project Coordination/Field Identification, Field Completion) Local consultant: 3 companies, numbers of people unknown (Control points, pricking (leveling), Field survey and Field completion)
(2) Trainees received	Not listed	The Consultant's own expense
(3) Equipment	Mapping work in Japan	Equipment for mapping work in Japan: 4 million yen
(4) (others)	Not listed	0.6 million yen (the local cost)
Japanese Side Total Project Cost	Total 1,300 million yen	Total 1,143 million yen
Philippines Side Operational Expenses	Total cost: Not listed 1. Counterpart Allocation: Not listed Counterpart personnel expenses: Not listed 2. Equipment purchase: Not listed 3. Facilities: Not listed 4. Local cost: A part of training and development cost and implementation cost, utilities etc.	Total cost: Unknown 1. Counterpart Allocation: NAMRIA and MinDA (Counterpart), 50 pax and above: TCC members from regional offices of national government agencies, provincial planning and development department, City planning and development office, ARMM, and Bangsamoro Development Agency Counterpart personnel expenses: Unknown <sup>25</sup> 2. Equipment purchase: None 3. Facilities: Office for experts (1 room each in NAMRIA and MinDA) 4. Local cost: Travel and

<sup>25</sup> Although NAMRIA and MinDA could answer some expenses, the total amount was unable to answer.

		transportation of staff (NAMRIA: About 0.8million PHP <sup>26</sup> , MinDA: About 0.3million PHP, meetings, a part of training cost and implementation cost, utilities, internet. (NAMRIA: Amount unknown, MinDA: about 0.5 million PHP)
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Source : JICA, NAMRIA and MinDA

### 3.3.1.1 Project Cost

The target area of the topographic maps and the project period were changed (see “3.3.1.2 Project Period” below). The actual project cost was 1,143 million yen against the planned amount of 1,300 million yen and was within the planned amount, 88% of the planned amount. Not all the information on the input amount could be obtained from the Philippines side. By the time of ex-post evaluation, the Consultant additionally carried out a correction work with its own expenses. NAMRIA also continues correction work with their own expenses, mainly personnel expenses. The cost to complete the digital topographic maps is expected to increase in the future. Since the increased amount is unknown, it is not considered in the judgment of the efficiency.

### 3.3.1.2 Project Period

The planned period took 25 months from March 2010 to March 2012, and the actual project period took 37 months from March 2010 to March 2013. That was longer than planned (148% of the planned duration). This is due to the extension of the project period by 12 months attributed to the completion of the field identification during the project implementation. Because the target area includes a conflict affected area and the presidential election was scheduled in 2011, due to security concern, there was a period during which entry for the field identification was not possible. According to the Director of MGB, NAMRIA and the MinDA official, it was thought that the influence of deterioration of security could be mitigated by dialogue with the concerned people, but in fact, it was affected. The implementing agency and others also agreed to change the project period. The entry restrictions caused by security problems are difficult to forecast in advance, and it is recognized that the circumstances of the extension of the project period were reasonable.

<sup>26</sup> At the time of the final report. 1 Philippine peso (PHP)= 2.244 yen. Exchange rate as of February 2013.



The digital topographic maps, data for printing and the data for GIS applications, submitted at the time of completion of the project was not approved because the data was not with satisfactory accuracy for NAMRIA. The data for printing was completed 15 months after the completion of the project, June 2014, after correction work by the Consultant. However, even by the time of the ex-post evaluation, 46 months after the project completion, it cannot be judged that the data for GIS applications was completed and that the project was completed within the project period.

### 3.3.2 Outputs

In relation to the outputs, during the project implementation, the target area and the specification of the topographic maps were changed as follows. Firstly, based on the request of the GOP, the target area of the digital topographic maps at a scale of 1:50,000 was changed to include the Basilan Island and the southern island areas and the total became area of 100,500km<sup>2</sup> at the discussion for the Inception Report in June 2010. In the initial plan by JICA, it was figured out that it would be difficult to enter the Basilan Island and the southern island areas from the security point of view. However, the security improved somewhat by the start of the project and it became possible to enter by requesting cooperation to the relevant LGUs from the implementing agency and others. Eventually in fact, the project could not obtain entry permission from LGUs in about 2% of the target area for the field completion work. JICA and the Consultant agreed in December 2011 to prepare the topographic maps with the secondary data in addition to the data collected during the field identification and field completion conducted by August 2012. Regarding the missing information, it was planned that NAMRIA also conduct additional survey and collect information including information from LGUs for the topographic maps as much as possible.

Furthermore, as a result of the request from the GOP, in February 2011, and consultation and examination of technical specifications with the Consultant, it was agreed to include 58,000km<sup>2</sup> of Bathymetric data to the target area of the topographic map in October 2011. According to NAMRIA, the Bathymetric data was included in the old version of the topographic maps produced in the 1950s. It should not be excluded in the updated version. Changes in the project target area are fully considered based on the provision of NAMRIA's existing Bathymetric data and secondary data, the coordination and consultation for entry permission to the ARMM area, and the implementation ability based on the experience of the Consultant. It is judged that the change was necessary to achieve the outputs. It was more

desirable to discuss whether the Bathymetric data should be included in the updated topographic maps at the time of the initial planning, but it is recognized that circumstances of the change were reasonable.

According to the official of MGB of NAMRIA, NAMRIA will not place all area boundaries on the topographic maps, because the boundary issue can cause political conflicts among LGUs, from province to Barangay level. It was decided to place the boundary as the marginal information<sup>27</sup> of the map. From the view point of PNA, in the Mindanao area which in particular include the conflict affected areas, it is considered that appropriate consideration was taken so as not to create new instability factors. It is recognized that the circumstances of the changes and correspondence in this project were relevant.

From the above, the project cost was within the plan at the time of project completion. Although the project continues to incur the cost after completion of the project due to the correction work of the digital topographic maps, the amount is unknown and is not considered for evaluation judgment. The plan of project period was extended by the change of plan during the project implementation and exceeded the originally planned period. The circumstances of the changes of the plan were reasonable, but it is not judged that the correction work of the data for GIS applications has been completed at the time of ex-post evaluation. Therefore, the efficiency of this project is fair.

### **3.4 Sustainability (Rating: ②)**

#### **3.4.1 Related Policy and Institutional Aspects for the Sustainability of Project Effects**

Even during the ex-post evaluation, the GOP prioritizes the regional development through the *PDP 2011 - 2016* and *Mindanao 2020* to realize peace and security in the Mindanao area. The GOP promotes the development planning utilizing topographical maps by strengthening the capacity of LGUs and transfer of authority to LGUs, and by authorizing the use of geospatial information to LGUs, regional offices of national government agencies, and academic research institutes. The digitization of the topographic maps in the Mindanao area in this project is in accordance with the development objectives of the *E-Government Master Plan 2.0 (2016-2022)*, which aims at utilizing information and communication technology to expand the access to government information and efficient supply of government services to public, to improve the government's decision-making and to strengthen international competitiveness. At the time of

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<sup>27</sup> Description of map and map symbols: the name of diagram, scale, legend etc. stated in the outline of the map sheet.

ex-post evaluation, sustainability in policy and institutional aspects was confirmed. Due to policies for the utilization of GIS data and map information for the development planning and high demands from actual operation, sustainability of policy is high.

#### 3.4.2 Organizational Aspects for the Sustainability of Project Effects

About the organizational aspects of NAMRIA, MGB is in charge of the production of topographic maps also at the time of ex-post evaluation. There are 10 staff members who have sufficient knowledge of topographical map updating. Almost enough number of staff is allocated to the work contents. It was confirmed that between the director and the staff in charge, information exchange regarding the approval process of the digital topographic maps was appropriately conducted in the department. The regional offices of national government agencies and the LGUs recognize that the topographic maps approved by NAMRIA are the base map information to be utilized for public plans. Established in 2010, MinDA has taken over the project from MEDCo, the relevant agency at the time of the initial plan. The Knowledge Management Division of MinDA is still in charge of the topographic map utilization and coordination in the Mindanao area at the time of ex-post evaluation.

Regarding the collaboration between the implementing agency and others, as the data for GIS applications was incomplete, distribution and dissemination matters were not coordinated at the time of ex-post evaluation between NAMRIA and MinDA. However, regarding technical part of the capacity development aspect in particular, MinDA planned a small-scale capacity development project for the thematic maps development for LGUs under the government budget in 2017 and coordinated with NAMRIA dispatching trainers for the training. It was confirmed through the interview that MinDA has an intention to engage in the distribution of the topographic maps that is normally done by NAMRIA when the data for GIS applications was completed. From the above, there are some issues to be addressed in the future, but sustainability in terms of organizational aspects for sustainable realization of the effect is expected.

#### 3.4.3 Technical Aspects for the Sustainability of Project Effects

At the time of ex-post evaluation, NAMRIA has sufficient knowledge of updating the topographic maps since the time the project was being implemented, as seen in the work of verifying and correcting the digital topographic maps of this project. In addition, the manual from *Study for Mapping Policy and Topographic Mapping for Integrated National Development*

*Plan* is utilized especially in the creation of small- and medium-scale topographic maps. Although there is no standard staff training internally on the technical side, NAMRIA has secured skills within the organization by dispatching staff to trainings to improve skills and to studying abroad at the higher education to acquire the latest techniques. At the time of ex-post evaluation, since the data for GIS applications with the accuracy NAMRIA can approve was not completed, it was not possible to confirm whether the produced topographical maps were actually updated at appropriate number of times and frequency and whether the NAMRIA's update plan of the maps of Mindanao area was prepared or not. However, NAMRIA is carrying out updating the topographic maps of other parts of the Philippines according to the plan, and NAMRIA's technical sustainability is considered to be secured.

On the other hand, as mentioned above, MinDA understands the importance of geospatial data management in the development planning, understands the necessity of cooperation and coordination to improve the environment to answer the needs of stakeholders, and coordinates to plan the training as required. The officials from four area management offices in Mindanao: East, West, North, and South, have been involved from the time of this project implementation and have shared information on the digital topographic maps. The officers are willing to coordinate in the area in charge. In order to promote the use of the digital topographic maps, it is necessary for the topographic map users to have the ability to utilize GIS software. There are some LGUs which present skills are considered to be low. Also, it was required to raise the capacity of GIS utilization of LGUs below the provincial level according to the results of survey of map utilization by the Consultant. In some LGUs, the participants of the technology transfer seminar have resigned, information gained at the seminar has not been handed over and related allocation of personnel and improvement of skills were not done. As discussed above, MinDA planned a skill training project for the thematic map development, it is thought that MinDA's coordination ability for promoting the utilization of the topographic map will be continued.

#### 3.4.4 Financial Aspects for the Sustainability of Project Effects

Table 5 shows the total budget of MGB, NAMRIA. The total amount increased from the time of project completion, financial year 2013, to the time of ex-post evaluation, financial year 2017, approximately by 90%: Personnel expenses increased by 45%, Maintenance and management expenses increased by 111%, and Capital and equipment etc. decreased by 35%. According to the officials of MGB, NAMRIA, the large increase of the budget is due to the increase in demand for production of hazard maps for the government disaster prevention

measures, etc. Meanwhile, the cost of printing the updated version of print topographic map and the cost of correcting the topographic map data for GIS applications were covered by the NAMRIA budget. Based on the fact that disaster management policy for creating hazard maps continues according to the *PDP 2011 - 2016*, the budget is expected to be secured in the future.

Table 5 Changes in the budget of MGB, NAMRIA

(Unit: Thousands PHP)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
Personnel	N/A	30,763	32,981	34,505	33,255	29,645	42,577	42,226	48,293
Maintenance and Management	N/A	300,316	249,212	195,427	261,317	205,617	536,914	584,089	552,185
Capital / Equipment	N/A	16,895	6,869	45,475	31,300	62,143	26,375	N/A	20,375
Total	353,094	347,974	289,062	275,407	325,872	297,405	605,866	626,315	620,853

Source: NAMRIA document

Note: N/A: Not Available. Detailed record of 2009 was not obtained

Table 6 shows the total budget of MinDA. The total amount increased from the time of project completion, Financial year 2013, to the time of ex-post evaluation, Financial year 2017, by 77%. It is said that since the establishment of MinDA in 2010, the total budget has been increasing year by year. Apart from this amount, MinDA has successfully acquired 2.8 million PHP from the national government budget for the capacity development training of LGUs for the utilization of topographic maps for the first time in Financial Year 2017, but it does not mean that the same scale of the budget for utilization promotion of the topographic maps in the future is secured.

Table 6 Changes in the budget of MinDA

(Unit: Thousands PHP)

	2010	2011	2012	2013	2014	2015	2016	2017
Total	51,672	56,164	60,016	84,716	101,951	103,328	117,201	149,931

Source: MinDA document

Although the prospects for the future budget is uncertain for both agencies, the development in Mindanao area is expected to be a priority issue also from now on and the

necessity of the topographic maps is high. Thus, it is conceivable that the possibility of deteriorating the financial situation is low.

From the above, no major problems have been observed in policy and technical aspects of implementing agency and others of this project. But, regarding the organizational aspects, the remaining matter is the coordination for distribution and dissemination of the digital topographic maps between NAMRIA and MinDA. Regarding financial aspects, both organizations have secured stable budgets and as mentioned above, the technical training for LGU users of the digital topographic maps is planned and budget acquisition directly from the central government budget is carried out by the implementing agency and others in 2017. However, according to the MinDA official, it is difficult to acquire the ability to utilize the data for GIS applications by participating in a one-time training, and many LGUs require further training. At the time of ex-post evaluation, NAMRIA continues to correct a part of the digital topographic maps, and the distribution and utilization of data for GIS applications were not initiated in Mindanao, including to MinDA. So, it was not possible to confirm the actual utilization and handlings by the LGU which are the main users. In addition, the recognition of the recommendations of the final report on the necessity of nurturing the environment for utilization of the digital topographic maps, policies for formulating development plans and personnel placement, was low by the implementing agency and others. Thus, it could not be confirmed whether or not the financial resources for promoting the use would actually be secured. Therefore, sustainability of the project effects is fair.

#### **4. Conclusion, Lessons Learned and Recommendations**

##### **4.1 Conclusion**

The topographic map at a scale of 1:50,000 of Mindanao which was not updated since the printed map was produced in the 1950's. This project updated the information gathered by new satellite imageries and field identification and developed the digital topographic maps. For the overall goal, the project aimed for the development projects in the Mindanao area to be implemented in the future by utilizing the maps in planning the development planning of the regions. This project is fully consistent with the development policies and development needs of the Philippines and Japan's ODA policy, and thus, the relevance is high. By this project, new information required for production of the digital topographic maps was collected by satellite imagery and field identification. However, as a result of the verification of the data for printing, the data for GIS applications and the updated printed maps by NAMRIA after the completion of

the project, NAMRIA judged that the digital topographic maps as final products have not reached the level acceptable as completed products. Moreover, although the map users, mainly LGUs, received information on how to utilize the digital topographic maps, it cannot be judged that the knowledge and skills for utilization had been conveyed. Furthermore, regarding the recommendation for the environment of utilization of the digital topographic maps, the recognition and ownership of the implementing agency and others are low, and so, it cannot be judged that the knowledge for improvement of environment for utilization was conveyed. Thus, the project purpose has not been achieved. Regarding the overall goal, after the completion of the project, among the digital topographic maps, the data for printing was corrected and approved and all the map sheets of the updated printed maps were printed. But, the awareness of the users about the issued maps is low and the actual utilization is limited. The data for GIS applications has been corrected and has not been distributed except a few cases, and so, actual utilization is very limited and it was difficult to confirm the status of utilization at those few destinations. Thus, the effectiveness and impact are low because the realization of the effect from the project implementation was not confirmed. The project cost was within the plan. Although the project period was extended based on the change of the plan, it cannot be judged that the data for GIS applications has been completed at the time of completion of the project. Accordingly, the efficiency at the time of completion of the project is fair. Regarding sustainability, there are no major problems in terms of the policy background and technical aspects. With respect to the organizational and financial aspects of the implementing agency and others, it cannot be judged whether or not it will be directed to actual utilization as the data for GIS applications has not been completed. Therefore, the sustainability of the project effects is fair.

In light of the above, this project is evaluated to be unsatisfactory.

**【Column: JICA's Performance】**

1. Supervision and Response to problems

This project was completed in March 2013. The evaluation report of digital topographic maps, the data for printing and the data for GIS applications, was submitted by NAMRIA in response to the request letter issued by JICA in November 2013. By this report, it was confirmed officially that there were problems in the accuracy of the digital topographic maps. By March 2014, the Consultant through JICA carried out the correction on the digital topographic maps, the data for printing and the data for GIS applications, and the corrected version was submitted to NAMRIA. As a result of the verification by NAMRIA, the data for printing was approved and the updated printed maps were printed by NAMRIA by June 2016. With regard to the data for GIS applications, the topographic maps with satisfactory accuracy for NAMRIA has not been completed, but JICA has recognized that the correction was

completed by the work carried out in 2014.

However, in the above letter issued by JICA to NAMRIA, JICA stated that JICA intended to assess whether the Consultant was responsible for items to be corrected when there were inconsistencies in the digital topographic maps. Moreover, JICA stated that they could not proclaim the project as completed as NAMRIA expressed that there were inconsistencies in the topographic maps. Thus, JICA had recognized that problem was occurring at that time, and it was necessary for JICA to make sure that the contents of work and its completion would be made for the correction by the Consultant. However, after the Consultant carried out the correction work in March 2014, JICA did not confirm to NAMRIA and the Consultant if the digital topographic maps were completed or not. According to the Consultant, it was verbally agreed with NAMRIA that the correction work had been completed, but there is no record of agreement by written document. The Consultant said that they reported to JICA that the correction work was completed, but it was verbal and there were no record by written document about reporting in JICA. According to the director of MGB, NAMRIA, they have not received any official response from JICA to NAMRIA's evaluation report by the time of ex-post evaluation. JICA recognized that the correction work itself was completed and has not particularly confirmed with NAMRIA because while JICA has been interacting with NAMRIA for external inquiries about the digital topographic maps, NAMRIA has not mentioned about data correction in particular.

From these circumstances, between NAMRIA and the Consultant, discrepancies in opinion on the level of accuracy of the data for GIS applications continue until the ex-post evaluation. As it is difficult to confirm professionally the accuracy of the topographic maps by JICA alone, it is considered that there is room for improvement in the verification method, such as introducing a third party's verification.

From the above, one of the reasons why the problem has been continued up to the present was considered that the communication among JICA, NAMRIA and the Consultant was actually between two parties, NAMRIA and the Consultant, rather than among the three parties, for both corresponding the digital topographic maps after the completion of the project and for confirming the accuracy of digital topographic maps submitted at the time of completion of the project and after correction work. There is no record of agreement by written document. Therefore, it is judged that there was room for improvement in JICA's project supervision method such as confirmation of the certain completion of project by JICA, confirmation of written contents of communication between NAMRIA and the Consultant, acquisition of agreement record by written document, etc.

## 2. Appropriateness of response to promote understanding of the implementing agency and others for JICA projects

The implementing agency and others did not clearly understand JICA's process on how to complete the project and how to handle the final report. The Director of MGB, NAMRIA has confirmed and signed the printed maps of topographic maps and that was regarded as admitting the project completion although the verification of the accuracy of the digital topographic maps was not actually completed. It was said that this was in response to what was verbally exchanged between NAMRIA and the Consultant that even after the project was completed, work can be continued by the Consultant. The official of the MinDA had proposed setting an opportunity such as a conference or ceremony to confirm the completion of the project even during the project implementation, but it was not set. The official pointed out that eventually the completion became unclear. Regarding the final report which is the final product of this project,



acknowledgement and ownership of the implementing agency and others are low and the recognition of the contents of the recommendation was low.

NAMRIA has implemented a project with JICA even before this project, but the experience of management of ODA including other donors is rather limited. MinDA is an organization shortly after its establishment, and this project was taken over from MEDCo. There is possibility that understandings of both institutions on the characteristics and procedures of each scheme of the JICA project were not sufficient. From the above, it is judged that it was necessary for JICA to contrive to promote understandings of JICA projects and to confirm the understanding by the implementing agency and others.

## **4.2 Recommendations**

### **4.2.1 Recommendations to the Implementing Agency**

1) Consideration for the methods of promotion of distribution and PR of the topographic maps and the method of information sharing between NAMRIA and MinDA

Both agencies should consider the methods for promotion of distribution and PR of the digital topographic maps and the updated printed maps. Specifically, explanation about NAMRIA's map sales office, the information on the GeoPortal and conditions for free distribution to government agencies can be done by utilizing the opportunities of gathering of users such as a training planned by MinDA. It is recommended that NAMRIA and MinDA arrange and improve information sharing methods concerning the update and issue of the new topographic maps in Mindanao area by NAMRIA from now on.

2) Reporting the progression status to JICA

It is recommended to NAMRIA to report to JICA the progress of the production of the digital topographic maps and consult appropriate actions with JICA.

### **4.2.2 Recommendations to JICA**

It is recommended to JICA to grasp the status of the data correction work by NAMRIA as soon as possible and to discuss and clarify with NAMRIA the definitions of the accuracy of the completed products that NAMRIA can accept in order to promptly complete the data for GIS applications and to consider response from now on, together with the department in charge in JICA.

## **4.3 Lessons Learned**

1) Setting appropriate definitions to measure the accuracy of the final products and indicators

In this project, there was a discrepancy among stakeholders, especially between NAMRIA

and the Consultant on the accuracy of the digital topographic maps. This is considered to be one of the causes why NAMRIA did not approve the digital topographic maps despite the fact that correction work was also done for the data for GIS applications after completion of the project. Although the *SPECIFICATION 2008* specified by the I/A states articles for quality control of the topographic maps, it does not indicate definitions and indicators that can be shared to measure the accuracy of digital topographic maps. The indicators of the project purpose and the outputs of the produced topographic maps are also not clear and lacking in the summary and the indicators in the project documents from the planning to completion. It was important that the utilizable digital topographic maps were updated and completed at the time of completion of the project, but the difficulties to have common recognition on the standard for “utilizable” could have arisen among stakeholders. In the future, in implementing similar projects, it is important to set indicators for evaluation that clearly define specifications and accuracy for the completed products and describe in a written document as much as possible by mutual agreement with the implementing agency, and to make it possible to comprehendible in the project purpose and outputs.

## 2) Setting appropriate verification method of a product

One of the reasons why the digital topographic maps with the accuracy that NAMRIA can approve was not completed at the time of ex-post evaluation was that the time was not sufficiently secured for NAMRIA’s verification work of the topographic maps, the data for printing and the data for GIS applications, which the Consultant produced in Japan. The verification work was not completed by the time of completion of the project. In addition, as mentioned in 1), although the specifications were agreed, quality control items were not checked and definitions of the accuracy were not agreed. It is necessary to consider a method for efficient verification. It was desirable to create conditions for verification together with the implementing agency: specifically, to set a schedule that enables NAMRIA to verify regularly, to build closer communication between NAMRIA and the Consultant, and to shift a part of the work in Japan to the work by local subcontractor. If it is difficult to set appropriate conditions for implementation, for the project of topographic map production of the same scale as this project, it is considered to be necessary to set a project period with sufficient duration of verification at the planning stage.

In this project, opportunities for confirming the contents of the final products and completion of the project were not set under the witness of a third party other than the

implementing agency and the consultant. In addition, it is hardly possible for the department in charge in JICA alone to verify the accuracy of topographic maps and all the final products, as expertise is required. So, in the future, in implementing similar projects, it is considered to be effective for JICA to build a verifiable system by conducting a verification by a third party with expertise at the time of completion of the project or setting a period of warranty against defect of the consultant.

### 3) Necessity of understanding JICA's project scheme and implementation procedure

Although the time of the project completion of this project was stated in I/A, etc., it is considered that NAMRIA did not fully understand the definition of the completion of this project and how to deal with the final products. The interaction with the Consultant led NAMRIA to expect that there would be responses even after the completion of the project. This affected the way that the project was completed, as it went without noticing officially that the verification was not yet completed. As a result, it was revealed after completion of the project that the final product was not the digital topographic maps with accuracy that NAMRIA could approve. NAMRIA and MinDA have not recognized that the final report was the final product of this project and that its content was the official recommendation of the project to the GOP. Thus, the implementing agency and others have not paid special attention to the recommendations concerning the activities after the completion of the project that have impact on the achievement of the overall goal. This ambiguity is considered to affect the realization of the effect of the project. From this, in the future for similar projects, it is desirable for JICA to promote understanding of the implementing agency regarding the final products, procedures, points to be heeded for each scheme of JICA projects prior to the start of the project.

### 4) Building close communication among JICA, implementing agency and the consultant

It was necessary for JICA to fully grasp the relationship and background between the implementing agency and the Consultant. Regarding the response to the verification of the digital topographic maps, NAMRIA expected responses even after the completion of the project and disapproved the level of correction works. In the future in similar circumstances, it is important to build smooth communication among three parties as much as possible at all times so as not to hamper project implementation due to lack of communication between the two parties.

The implementing agency and others were also interested in strengthening the capacity of

users from the start of the project. Activities were carried out based on the scope at the time of ex-ante evaluation sheet and I/A. As mentioned above, many of the user's technical skill were insufficient to utilize the digital topographic maps, and it can be perceived that the overall goal was too high to achieve if it were only with the methods of technology transfer taken in the project scope. The technology transfer seminar for users and the final report for the implementing agency and others concerning the recommendations were positioned as the countermeasures for the issues that rose. However, the Consultant planned and formulated the recommendations and the seminar mainly by themselves. The implementing agency and others remained with passive recognition. As a result, as mentioned in 3), the implementing agency and others have not given importance on the contents of the recommendation of the final report. Such discrepancies of the understanding continued until the completion of the project. It is thought that the explanation before and during the project implementation and the communication in order to have a proper common understanding among the three parties about the project scope and requests and expectations from the implementing agency and others were insufficient. It is necessary to consider means of management to promote understanding in order for project stakeholders to share viewpoints from planning stage.

Furthermore, as in this project, for responses to discovered issues regarding final products after the completion of a project, it is recommended that JICA and implementing agency and others recognize the magnitude of project effects that can be appear when a final product is completed, and that a JICA overseas office cooperate closely with the implementing agency and others in a timely manner, mutually confirms the progress status of a project and works readily to correct final products.

Attachment: Table 1 History of Changes of PDM

1) Ex-ante Evaluation Sheet (2009)

	Summary	Indicator
Overall Goal	By utilizing the digital topographic maps in the development planning of the Mindanao area, development projects in the Mindanao area will be implemented efficiently in the future.	Indicator: Actual utilization of the digital topographic maps (Title of project and Title of plan)
Project Purpose	The digital topographic maps at a scale of 1:50,000 in all the regions in Mindanao is produced	Indicator: Produced topographic maps
Output	Output 1: Documents required for producing the digital topographic map is collected.	Indicator 1: Gross area of acquired satellite imagery
	Output 2: Ground survey required for producing the digital topographic map is implemented.	Indicator 2-1: Number of control points and products Indicator 2-2: Number of pricking (leveling) points and products Indicator 2-3: Gross area of field identification
	Output 3: The work in Japan required for producing the digital topographic map is implemented.	Indicator 3-1: Orthophoto data Indicator: 3-2: Produced topographic map
	Output 4: Concerned people of the Philippine side (MEDCo and related agencies) can utilize the map.	Indicator 4: Number of seminar participants

2) I/A (January, 2010)

	Summary	Indicator
Overall Goal	* Not stated	* Not stated
Project Purpose	①The preparation of the digital topographic maps covering as shown in Attachment 1 at the scale of 1:50,000. ②The Implementation of the necessary support on wide and effective use of the digital topographic maps and GIS.	* Not stated
Output	Output 1: Review of Existing Conditions: Existing conditions relevant to the Project including organization set-up, mapping system, facilities management and control points shall be reviewed.	* Not stated
	Output 2: Satellite Imagery: Satellite Imagery at the appropriate scale covering as shown in Attachment 1 shall be acquired.	* Not stated
	Output 3: Map Production for covering the area as shown Attachment 1: Map production shall be undertaken using digital mapping technology in accordance with survey Operation Manual of JICA (for National Base Map)(2006).	* Not stated
	Output 4: Dissemination of the Final Products: Recommendations for the wide and effective use of the topographic data produced under the Project shall be prepared.	* Not stated

3) Final Report (March, 2013)

	Summary	Indicator
Overall Goal	* Not stated	* Not stated
Project Purpose	①Production of 1:50,000 digital topographic maps in all the regions in Mindanao: In accordance with the Rule and Regulations on Survey and Mapping, the digital topographic maps at a scale of 1:50,000 are produced as utilizing satellite stereo images, ground survey and existing topographic maps. ②Technical assistance required for the usage of the digital topographic maps: The Project Team studies current uses of maps in organizations of the TCC members. Based on the result of the study, the Project Team presents an example application at the technology transfer seminar.	* Not stated
Output	* Not stated	* Not stated
	* Not stated	* Not stated
	* Not stated	* Not stated
	* Not stated	* Not stated

4) Created for Ex-post Evaluation

	Summary	Indicator
Overall Goal	By utilizing the digital topographic maps in the development planning of the Mindanao area, development projects in the Mindanao area will be implemented in the future.	Indicator: Actual utilization record of digital topographic maps (title of project, title of plan and use, recognition and referenced situation)
Project Purpose	The digital topographic maps at a scale of 1:50,000 of the Mindanao area, which can be utilized for development plan of the province / region level in the Mindanao area, is updated, and stakeholders utilizing the map recognize the method of utilizing the topographic map.	Additional Indicator 1: The topographic maps are composed with the information by field identification according to the survey standard and update information based on the latest images. Additional Indicator 2: The necessary knowledge and skills for updating and utilizing the topographic maps are conveyed to the stakeholders.
Output	Output 1: Satellite Imagery at the appropriate scale covering the area shown in Attachment I of I/A shall be acquired.	Indicator 1: Gross area of acquired satellite imaginary
	Output 2: Existing conditions relevant to the Project including organization set-up, mapping system, facilities management and ground control points shall be reviewed.	Indicator 2-1: Number of ground control points and products Indicator 2-2: Number of pricking (leveling) points and products Indicator 2-3: Gross area of field identification
	Output 3: Map production shall be undertaken using digital mapping technology in accordance with Survey Operation Manual of JICA	Indicator 3-1: Orthophoto data 3-2: Produced topographic maps
	Output 4: Recommendation for the wide and effective use of the topographic maps produced under the project shall be prepared.	Additional Indicator 4: Contents of realistic recommendation and method of recommendation