Republic of the Philippines

Ex-Post Evaluation of Japanese Technical Cooperation Project

"Strengthening the Flood Management Function of DPWH"

External Evaluator: Miyuki Koga, Octavia Japan Co., Ltd.

0. Summary

This project aimed to strengthen the flood management function of the Department of Public Works and Highways (hereinafter referred to as "DPWH") through research and development, training, development of information management system, implementation of pilot projects, and establishment of internal support system. The project is in line with the "Mid-Term Philippine Development Plan (2004-2010)", which places importance on expanding investment in flood control infrastructures. The project also responds to the needs of the Philippines to strengthen flood management functions because the country is affected by many natural disasters. Thus the project is consistent with the Philippine development policy and needs. In addition, the project is consistent with Japan's ODA policy as it is in line with the "Country Assistance Plan for the Philippines". Therefore, relevance is high. Through this project, engineers at the Flood Control and Sabo Engineering Center (hereinafter referred to as "FCSEC") became able to lead flood control for small rivers, and the targets for the project outputs and the project purpose were largely achieved. In addition, the project is contributing to the design and construction of appropriate flood control and sabo structures; thus effectiveness and impact are also high. Although the project period was within the plan, the project cost slightly exceeded the plan; thus efficiency is fair. The project remains consistent with the development policy and needs of the Philippines after the project completion. Most of the experienced engineers who accumulated knowledge and skills through this project are still working at DPWH, and flood control budget has been on the increase within DPWH; thus no problems are observed in the technical and financial aspects of the implementing agency. However, shortage of staff is evident in the implementing agency despite the fact that their responsibilities have been increasing; thus some problems are observed in terms of the institutional aspects of the implementing agency. Therefore, sustainability is fair.

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

1. Project Description

Project Location[1]

Pilot Project Site (Kinanliman River)

1.1. Background

In the Philippines natural disasters such as floods, debris flows and others occur frequently. On the other hand, there was no dedicated office within DPWH although DPWH was mandated to develop flood control and sabo infrastructure. As a result, the development of flood control and sabo infrastructure was insufficient in terms of quality and quantity. In response to such a situation, the government of the Philippines established FCSEC under DPWH in 1999 and requested Japanese assistance for strengthening the flood management function. Recognizing the urgency of improving flood control and sabo technologies in the Philippines, JICA implemented the "Project for Enhancement of Capabilities in Flood Control and Sabo Engineering of DPWH" (January 2000 - June 2005). Through the said project (hereinafter referred to as "the previous project"), FCSEC engineers became able to plan and implement training in design, construction and maintenance. However, it was pointed out that technologies did not reach a certain level in terms of practical application as well as river and sabo engineering research, which required improvement. In addition, the need was confirmed to improve the capability of executing the entire cycle of flood control projects—planning, designing, construction and maintenance. Based on such situations, it was decided that this project should be implemented as a subsequent project.

1.2. Project Outline

Overall Goal	More effective and appropriately designed flood control and sabo structures/facilities plans are implemented by DPWH in accordance with the technical standards, guidelines and manuals.

[1] This project targets the entire Philippines while pilot projects were implemented as part of this project at three sites indicated in the Project Location picture above.

Project Purpose		The flood management function of DPWH is strengthened through research and development, training, information management, implementation of pilot projects and creation of the internal support mechanism.
Outputs	Output 1	Pilot projects are implemented using the technical standards, guidelines and manuals.
	Output 2	Research is conducted for developing/updating technical standards, guidelines and manuals, and assessing efficient countermeasures for flood control and sabo.
	Output 3	Improve knowledge and skills of DPWH engineers on flood control and sabo through training programs.
	Output 4	Information Management System is established for a more effective flood management function of DPWH.
	Output 5	The internal support mechanism is created to sustain the development of technology and organization in the field of flood control and sabo engineering.
Inputs		Japanese Side: 1. Experts (19 persons in total) 6 persons for Long-Term (3 fields, 2 persons each) 13 persons for Short-Term 2. Eight Trainees Received (counterpart training in Japan) 3. None for Third-Country Training Programs 4. Equipment Approximately 5.3 million peso 5. Local Cost Approximately 7.7 million peso Philippine Side: 1. 27 counterparts 2. Land and facilities, Project Office 3. Local Cost Approximately 53 million peso 4. Pilot Project 45 million peso[2]
Total Cost		390 million yen
Period of Cooperation		July 2005 – June 2010
Implementing		The Flood Control and Sabo Engineering Center (FCSEC)

[2] The pilot project cost borne by the Philippine side is reported to be 53 million peso according to a document provided by JICA. On the other hand, according to FCSEC, the fund provided through this project is 45 million peso, while additional 25 million peso was secured by the District Engineering Office for the Kinanliman River pilot site (70 million peso in total).

Agency	The Department of Public Works and Highways (DPWH)
Cooperation Agency in Japan	River Bureau, the Ministry of Land, Infrastructure and Transport (at that time)
Related Projects	"Project for Enhancement of Capabilities in Flood Control and Sabo Engineering of DPWH" (Technical Cooperation Project, January 2000 - June 2005) "The Project for Construction of Hydraulic Laboratory Building" (Grant Aid, EN signed on June 27, 2001, Detailed Design: 46 million yen, Construction: 799 million yen)

1.3. Outline of the Terminal Evaluation

It was judged that each output and the project purpose were largely achieved. In particular, it was positively received that the engineers, who had developed the basic knowledge of flood control through the previous project, acquired concrete technical skills and became able to provide technical guidance to field office[3] staff by actually engaging in the entire cycle of planning, design, construction and maintenance. However, an issue remained in terms of sustainability; and it was deemed essential that FCSEC should become a permanent office within DPWH in order for the overall goal to be achieved.

1.3.1. Achievement of Project Purpose at the time of the Terminal Evaluation

FCSEC was the only office within DPWH which had the function of accumulating flood control technologies, and its technical level reached the extent that it could influence DPWH's policy decisions on flood control. Therefore, it was judged that the project purpose was achieved except for the sustainability aspect.

1.3.2. Achievement of Overall Goal at the time of the Terminal Evaluation

It was confirmed that 4 field offices had constructed flood control structures in accordance with FCSEC's technical standards and manuals by the time of the terminal evaluation, which was considered insufficient. Similarly, FCSEC developed the National Flood Management Framework Plan (NFMFP) and presented it at the cabinet meeting of the National Disaster Coordinating Council (NDCC) in February 2006; however, the plan was not approved officially. On the other hand, this project was thought to have various spillover effects, and no negative effect was observed; thus other impacts were judged to be significant. Although it was not certain at the time of the terminal evaluation whether

[3] In this report, DPWH's "regional offices" and "district engineering offices" are referred to as "field offices" when combined.

or not the overall goal would be achieved, there was an expectation that the number of flood control structures constructed in accordance with FCSEC's technical standards, guidance and manuals would increase as FCSEC gradually gained popularity. However, for the overall goal to be achieved, it was considered necessary that FCSEC should become a permanent office.

1.3.3. Recommendations at the time of the Terminal Evaluation

Based on the above, the following recommendations were made to those involved in the project.

① DPWH and other concerned agencies should make FCSEC a permanent office.

② DPWH and FCSEC should allocate appropriate number of technical posts and secure operational budget for FCSEC. It is also suggested that a system should be established to allow skilled, mid-level and young engineers to work together so that technologies are surely transferred to the next generation.

③ With regard to the development of the Master Plans (hereinafter referred to as "M/P") and the Feasibility Studies (hereinafter referred to as "F/S") for 12 river basins, DPWH should secure sufficient budget to carry out experiments on flood control structure at the Hydraulic Laboratory.

④ FCSEC and DPWH should adopt a human resource policy which allows engineers to engage in river related projects from planning to maintenance. Also, it is recommended that engineers take part in studies by visiting sites, making technical drawings, and gaining opportunities to lead the construction and maintenance, instead of leaving the entire work to consultants.

⑤ The 12 river basins, for which the M/P and F/S preparation began, are larger in scale than the ones targeted for the pilot projects. Therefore, JICA is recommended to make the necessary preparation, such as dispatching Japanese experts who can provide technical advice to FCSEC engineers.

2. Outline of the Evaluation Study

2.1. External Evaluator

Miyuki Koga, Octavia Japan Co., Ltd.

2.2. Duration of Evaluation Study

Duration of the Study: November 2013 – September 2014

Duration of the Field Study: January 19 – February 1, 2014, April 20 – 26, 2014

2.3. Constraints during the Evaluation Study

A total of 191 field offices were requested to answer the questionnaire for the beneficiary survey conducted as part of this evaluation study; however, the number of respondents was 43. Therefore, it is necessary to take into account that the beneficiary survey results may not necessarily represent the average situation of the country.

3. Results of the Evaluation (Overall Rating: B[4])

3.1. Relevance (Rating: ③[5])

3.1.1. Relevance to the Development Plan of the Philippines

At the time of the project implementation, the "Mid-Term Philippine Development Plan (2004-2010)" and the "Medium-Term Public Investment Program (2005-2010)" were formulated in the Philippines. The former emphasized the importance of mainstreaming disaster response strategy and improving flood control infrastructures in "Chapter 3: Environment and Natural Resource," while the latter identified investment in flood control as one of the 10 main strategies. In addition, the "Strategic Plan of DPWH (2004-2010)" mentioned FCSEC's flood control works as one of the major strategies. Therefore, this project, which aims to strengthen the flood control management function, is consistent with the development policy of the Philippine government throughout the project period, from the project commencement up to the project completion.

3.1.2. Relevance to the Development Needs of the Philippines

In the Philippines natural disasters like flooding, slope failures and sediment runoff occur frequently. In 10 years from 2001 to 2010, more than 10,000 people were killed and over 4,000 people went missing because of typhoons, and the total damage amounted to approximately 247.4 billion peso[6] in the same period. In order to minimize such damages, it was highly important to plan, construct and maintain appropriate flood control structures. For that, it was essential to improve and strengthen the flood management function. Therefore, it can be said that this project, which aims to strengthen the flood management function, is consistent with the development needs of the Philippines.

3.1.3. Relevance to Japan's ODA Policy

The Country Assistance Program for the Philippines, which was developed by the Ministry of Foreign Affairs of Japan in 2000, identified 4 priority areas, one of which was "environmental protection and anti-disaster measures." In this plan the need was emphasized to "continue to provide aid for flood and sand control and earthquake-related

[4] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory
[5] ③: High, ②: Fair, ①: Low
[6] The figures are taken from the statistics provided by the National Disaster Risk Reduction and Management Council (NDRRMC) administered by the Office of Civil Defense (OCD).

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 prevention function of the Philippines and is in line with the above priority and sector assistance policy (environmental protection and anti-disaster measures). Therefore, it is consistent with the assistance policy of Japan.

This project has been highly relevant to the country's development plan, development needs, as well as Japan's ODA policy. Therefore, its relevance is high.

3.2. Effectiveness and Impact[7] (Rating: ③)

3.2.1. Effectiveness

3.2.1.1. Project Output

1) Output 1: "Pilot projects are implemented using the technical standards, guidelines and manuals"

Three pilot projects were implemented as part of this project. The objectives of the pilot projects were to confirm the applicability of the technical guidelines and manuals developed by the previous project through the actual use and to strengthen the technical skills of FCSEC and field office staffs by having them experience the entire cycle of flood control projects, such as planning, design, construction and maintenance. Out of these, output 1 was not fully achieved by the time of the project completion as it will be discussed below.

Indicator 1: At least 3 pilot projects (revetment, spur dike and sabo dam) are planned, designed, constructed and maintained

The pilot projects were implemented in three different places: Kinanliman River (revetment), Digmala River (revetment and spur dike) and Santa Fe River (sabo dam). For Kinanliman River, dike construction was planned to prevent river flooding. New technologies were introduced such as *netsugi* ("grafting") method[8], and by July 2009 about 270m of dike revetment was completed, which was maintained without problems at the time of the project completion. Digmala was an alluvial-fan river and had a characteristic of changing river courses. As bank erosion was anticipated, construction of revetment and spur dikes was planned to prevent houses and farm lands from flooding. It was completed before the project completion and was maintained without problems at the time of the project completion. As for Santa Fe River, construction of sabo dam was planned to prevent riverbed aggradation caused by runoff sediment and to prevent

[7] Sub-rating for Effectiveness is to be put with consideration of Impact.

[8] It is a method used to utilize the old revetment for a new revetment by building on the foundation. It has a benefit of reducing construction cost and waste.

associated flooding and sediment disasters. For the first time in the Philippines, low-cost "soil cement", a mixture of sediment and cement, was introduced to construct the dam body. At the time of the project completion in June 2010, the construction was behind schedule at about 80% completion rate. The delay was mainly caused by the fact that the Department of Budget and Management (DBM) typically issued budget execution orders late. Upon the issuance of the budget execution order in October 2009, sabo dam construction was carried out rigorously by concentrating project staff and construction workers. However, it was not possible to complete the construction within the project period.

It has been confirmed through the site inspections during the ex-post evaluation that the sabo dam itself is completed and that there is no major structural damage or problem with its function of preventing riverbed aggradations caused by runoff sediment. However, the "raising of the road embankment[9]", which was initially planned for the purpose of structurally strengthening the sabo dam, could not be confirmed[10]. At the time of the ex-post evaluation, the left wing of the sabo dam is sticking out. If it is left as it is, problems are anticipated in terms of traffic and dam protection[11]; thus it is thought necessary to raise the road embankment as per the initial plan.

2) Output 2: "Research is conducted for developing/updating technical standards, guidelines and manuals; and assessing efficient countermeasures for flood control and sabo"

As it will be discussed below, output 2 was completed without problems by the time of the project completion.

Indicator 1: Recommendation is made for the revision/ modifications/ updating of the technical standards, guidelines and manuals

A technical working group was formed in October 2008 with the aim of revising the

[9] According to former Japanese experts, a normal approach would be to have the sabo dam's wing tucked in the mountain thereby integrating the dam and the mountain; however, because there was a road on the left side of the dam with 7 meter distance to the mountain, it was planned to tuck the wing in the embarked road so as to stabilize the structure, aiming to reduce cost.

[10] The road construction was implemented by a District Engineering Office as a separate road improvement project. Based on what was gathered from the interviews with those involved in the project, the following can be said: (1) FCSEC's monitoring and follow up after the project completion was not sufficient; and (2) the plan to strengthen the structure by tucking the sabo dam wing in the embarked road was not well understood or communicated among the District Engineering Office.

[11] According to former Japanese experts, "If it is left as it is, scour could occur just downstream of the wing and behind the left-side wall had water run behind the left wing (on the road). In addition, the wing would have to stand along inside the flooding stream, so it would be vulnerable to the force of sediment and stream. Moreover, there is a concern that external forces might have an unintended effect because the ways the right side and the left side of the sabo dam are connected to the mountain are different. Therefore, it is necessary to raise the road embankment as it was initially planned so as to integrate the sabo dam wing with the mountain, making it structurally-sound."

technical standards, guidelines and manuals, and recommendations and revisions were made as planned.

Indicator 2: Appropriate countermeasures based on actual field requirements are recommended

Technical assistance such as flood control assessment was provided based on the requests from District Engineering Offices (hereinafter referred to as "DEO") and Local Government Units (hereinafter referred to as "LGU"). In addition, it was confirmed through interviews with DEO staff and the beneficiary survey[12] that FCSEC's advice responded to the field requirements and the needs of DEOs[13].

Indicator 3: Alternative low cost flood control and sabo structures are developed

Through this project, construction of sabo dam using soil cement was demonstrated for the first time in the Philippines, and related technologies were transferred to FCSEC and DEOs. Based on these results, the "Manual on Soil Cement" was developed. It was confirmed through the interviews with DEO staff that the benefits of soil cement were acknowledged to some extent. On the other hand, a comment was made, "Although we are keen to use soil cement, it is not easy to request the budget because soil cement is not listed in the DPWH Standard Specifications[14] as a cost item." According to the Bureau of Research and Standards, which oversees issues related to standards and specifications, certain procedures[15] are needed to approve new materials or products in the presence of the Bureau staff. Although the Bureau was one of the Joint Coordination Committee (hereinafter referred to as "JCC") members of this project, no bureau staff accompanied to the pilot project site where soil cement was introduced. Thus a negotiation will be necessary to add soil cement to the DPWH Standard Specifications as an approved cost item. While it is clear that this issue needs to be followed up, it was groundbreaking that low-cost soil cement was used for the dam body for the first time in the Philippines. Therefore, it can be judged that this indicator was largely achieved.

Indicator 4: Reports on the usage/ applicability of the technical standards, guidelines and manuals are prepared

Four different technical reports were prepared on the usage/ applicability of the

[12] A beneficiary survey was conducted targeting DPWH Regional Offices and DEOs based on self-administered questionnaires. (Requests were sent to 191 offices targeted by this project, and answers were received from 43 individuals.)

[13] 76% of the 38 individuals who answered this question selected "Yes, FCSEC's technical assistance responds to the needs of field offices." (The remaining 24% answered "I do not know.")

[14] This guideline is commonly called "blue book"; and it specifies construction materials and products that are commonly used by DPWH.

[15] More specifically, it is mandatory to follow the following steps: (1) experiment and evaluation; (2) implementation of a pilot project on a small scale; (3) observation for one year and evaluation; (4) implementation on a full scale; and (5) observation for five years and evaluation. It is based on the Department Order 189 issued on August 8, 2002.

technical standards, guidelines and manuals[16].

3) Output 3: "Improve knowledge and skills of DPWH engineers on flood control and sabo through training programs"

With the view to obtain knowledge of flood control and sabo, a total of 558 DEO technical staff participated in the training program which had a total of 22 sessions on 4 different topics. As it will be described below, targets were achieved for all the indicators.

Indicator 1: Increased level of proficiency of engineers of more than 100 offices through the training on planning and design of flood control structures

Technical staff of 111 field offices attended the training.

Indicator 2: Increased level of proficiency of engineers of 40 offices through the training on planning and design of sabo works engineering

Technical staff of 45 field offices attended the training.

Indicator 3: Increased level of proficiency of engineers of more than 100 offices through the training on construction supervision of flood control and sabo projects

Technical staff of 107 field offices attended the training.

Indicator 4: Increased level of proficiency of engineers of more than 100 offices through the training on maintenance of flood control and sabo structures

Technical staff of 109 field offices attended the training.

The beneficiary survey[17] was conducted targeting the training participants (field office staff) using self-administered questionnaires. The results are summarized in Figure 1-4, from which it can be observed that there were no problems with the contents and quality of the training and that the outcome of the training is being utilized at the time of the ex-post evaluation.

[16] Through this project, a total of 6 documents (3 manuals and 3 technical standards and guidelines) were developed or revised. While there has been an instruction to refer to these technical documents when implementing flood control projects, soil cement is not recognized as a standard cost item in the DPWH Standard Specifications. Therefore, there seems to be some coordination issue within the department.

[17] As it was discussed above, 191 DPWH field offices were requested to answer the questionnaire, and 43 staff members sent in their answers.

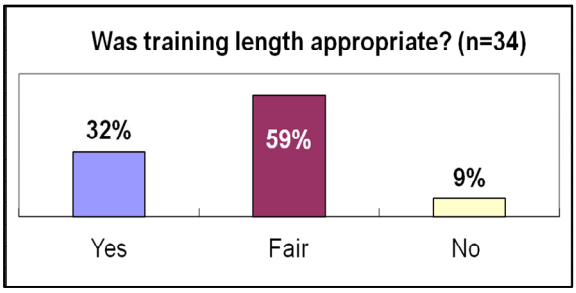

Figure 1: Length of the Training

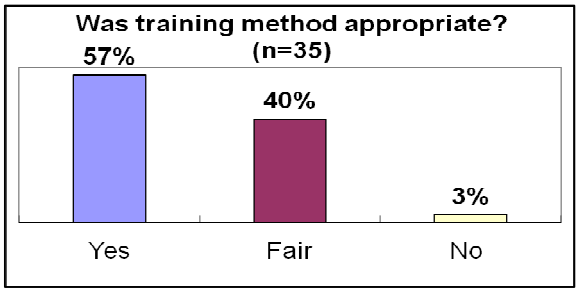

Figure 2: Training Method[18]

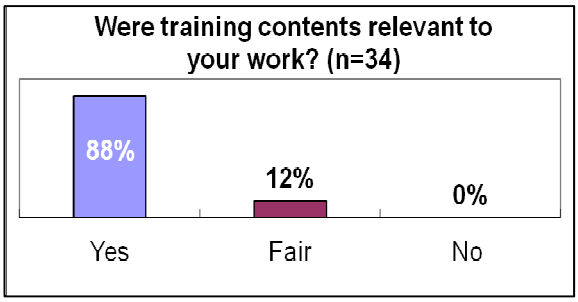

Figure 3: Training Contents

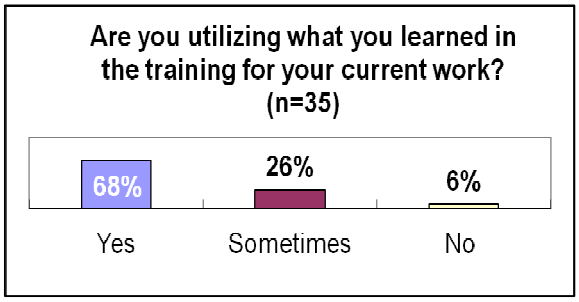

Figure 4: Utilization of the Training

As a result of the interviews with field office staffs and the beneficiary survey, a number of comments requesting the continuation of the flood control training were made, such as this: "There are some colleagues who could not attend the training, and we also have many young staff newly recruited. We would like the flood control training to continue in the future." While FCSEC has not organized any flood control training since the project completion, flood control is included in DPWH's regular training[19] organized by the headquarters. In such occasions FCSEC staff members serve as resource persons. In addition, some regional offices have taken the initiative in organizing flood control training courses[20]. Therefore, it can be observed that there is a great demand for the continuation of the flood control training.

4) Output 4: "Information management system is established for a more effective flood management function of DPWH"

As it will be discussed below, each indicator was largely achieved, and this output was achieved without problems.

[18] "Training method" refers to a group size and balance between lectures and practices.
[19] This includes the Candidate District Engineer Course conducted semi-annually and the Comprehensive Field Engineers Training conducted annually.
[20] For example, Regional Office III organized training on flood control planning and design by inviting 3 engineers from FCSEC. Similarly, Regional Office II planned and implemented the training for DEOs by utilizing training materials developed by this project.

Indicator 1: Networks with other related agencies/organizations are established for improved data sharing and coordination

FCSEC established networks with DPWH field offices by providing jurisdiction maps and collecting/updating information on flood control structures. In addition, through various technical working groups, information was shared with relevant organizations outside DPWH, such as the Philippine Atmospheric, Geophysical and Astronomical Services Administration (hereinafter referred to as "PAGASA"), the National Water Resources Board (hereinafter referred to as "NWRB"), the Philippine Institute of Volcanology and Seismology (hereinafter referred to as "PHIVOLCS"), the Department of Environment and Natural Resources (hereinafter referred to as "DENR") – River Basin Control Office (hereinafter referred to as "RBCO"), the Metropolitan Waterworks and Sewerage System (MWSS) and the Office of Civil Defense (hereinafter referred to as "OCD").

Indicator 2: Coordination meetings /seminars on flood and sabo management are held with other related agencies /organizations at least once a year

With the aim of sharing information on the piloting of flood control and sabo technologies, a number of seminars were held and attended by different offices/divisions of DPWH, the National Economic Development Authority (hereinafter referred to as "NEDA"), PAGASA, NWRB, PHIVOLCS, LGUs, universities and NGOs.

Indicator 3: Adequate data and information are collected, analyzed and compiled in the database

At the end of 2006 FCSEC collected information concerning the locations and types of flood control structures that existed in the country[21]. The data was updated in 2009[22]. At the time of the ex-post evaluation, the established database is utilized by the Bureau of Maintenance to examine the maintenance budget requests from field offices. According to the Bureau of Maintenance staff, they have been partially updating the database handed over by FCSEC based on the lists of flood control structures submitted by field offices when they request maintenance budget. However, as a result of the rationalization[23] which was implemented across DPWH, the number of the bureau staff dramatically reduced from 153 to 83, and update of the database has not been sufficient[24].

According to FCSEC, DPWH is envisaging the upgrading of the flood control database at the time of the ex-post evaluation. The current database contains a list of locations and types of flood control structures existing in the country. In the future, however, more

[21] Information was gathered from 138 DEOs.
[22] Data was collected from 112 DEOs.
[23] Rationalization was carried out across the nation among government institutions based on the President's Executive Order No. 366. The idea is to streamline the organizations with the aim of making the government more efficient. DPWH was also obliged to reduce its staff significantly.
[24] For example, database was only updated for Luzon and not for the entire country in 2013.

useful database is expected by incorporating GPS mapping of rivers and flood control structures and by using information gathered for the M/P and F/S that have been developed thus far. FCSEC is expected to provide technical inputs concerning the database contents and the ways of establishment and management[25].

Although the database is expected to be upgraded in the future, the contribution of this project is significant in a sense that information on flood control structures, which had not been existed in the country, was collected and compiled as database. Therefore, it can be judged that this indicator was achieved.

Indicator 4: Annual Report is submitted at the end of the year. FCSEC Newsletter is published twice a year.

While FCSEC Newsletters were issued 4 times during the project period, it was not as frequent as the initial plan (twice a year), except for the year of 2007[26]. On the other hand, reports for NEDA were submitted every quarter, which was more frequent than planned. Therefore, it can be judged that this indicator is largely achieved.

5) Output 5: "The internal support mechanism is created to sustain the development of technology and organization in the field of flood control and sabo engineering"

At the time of the commencement of this project, FCSEC was a project management office with a temporal status within DPWH. This meant that FCSEC staff members except for the management were all contract employees. It was thus considered crucial to establish a system so that those who developed technical skills through the previous project and this project would stay and contribute to the flood management of DPWH even after the project. It was thought that flood control and sabo technologies could be accumulated within DPWH if FCSEC became a permanent office of DPWH; and this output aimed to establish an internal support mechanism which would facilitate such a process. However, as it will be discussed below, this indicator was not achieved within the project period. On the other hand, the development on the issue of FCSEC's permanency after the project completion will be discussed later in "3.4 Sustainability."

Indicator 1: Recommendations in support of the project objectives / goals are approved by the JCC

JCC and Technical Working Group (hereinafter referred to as "TWG") were formed in order to promote this project. The objective of JCC was to monitor the whole project, and it was chaired by Assistant Secretary of Planning Service and attended by DPWH's main offices/bureaus (Planning Service, the Bureau of Design, the Bureau of Research and

[25] FCSEC thinks that the upgrading of database is an important mission and is seeking technical assistance from countries like Japan.
[26] Newsletter was issued in March 2007, December 2007, December 2008 and January 2010.

Standards and the Bureau of Maintenance). On the other hand, TWG was formed mainly to share information on pilot projects, and its members were DPWH's main offices/bureaus. Although a number of attempts were made by those engaged in the project through JCC, no decision was made to support the idea of making FCSEC a permanent office before the project completion. This is mainly because the implementation of the rationalization which began in 2004 was extended for a long period of time. It was extremely difficult to separate the discussion of FCSEC's permanency from the department-wide rationalization process.

Indicator 2: ①Plan/document on the sustainability of the project gains is submitted to and approved by DPWH management

Although a number of attempts were made by FCSEC and those involved in the project through JCC and others, permanency of FCSEC was not approved before the project completion. As discussed above, it was due to the prolonged rationalization process which was carried out in the whole department.

3.2.1.2. Achievement of Project Purpose

Project Purpose: "The flood management function of DPWH is strengthened through research and development, training, information management, implementation of pilot projects and creation of the internal support mechanism"

This project aimed to strengthen flood management capacity of FCSEC and field office staffs. It was confirmed through this evaluation survey that FCSEC engineers enhanced their capacity by the time of the project completion to the extent that they would be able to manage flood control for small rivers and to handle standard hydraulic experiments. Conventionally, flood control structures used to be constructed without thoroughly considering the predicted river flows during heavy rain and the characteristics of rivers in the Philippines. FCSEC staff developed capabilities to the extent that they could lead appropriately planned flood control measures by engaging in the planning, design and construction management of the three small-scale rivers selected for the pilot projects. As for hydraulic experiments, FCSEC could not independently implement the experiments without Japanese experts' guidance before the project commencement. Through this project, a number of experiments were conducted: hydraulic experiments to evaluate the effects and impacts of flood control structures (7 times); experiments to evaluate the suitability of low-cost flood control structures (4 times); and experiments to evaluate

other flood control related aspects (6 times)[27]. Through these experiments, FCSEC developed technical skills to independently plan, design, construct, implement, collect and analyze data for hydraulic experiments[28]. The fact that engineers were nurtured in such a way that they became able to plan, implement and supervise flood control projects in accordance with the characteristics of the rivers through this project can be considered as one factor that contributed greatly to the achievement of the project purpose. The extent to which each indicator was achieved will be discussed below.

1) Indicator 1: Policies and Regulations of DPWH which reflect recommendations provided by FCSEC

No policy or regulation reflecting FCSEC's recommendation was developed during the project period (July 2005-June 2010). The Department Order No. 28 was issued on January 31, 2005, which made it mandatory "for DPWH technical staff engaged in flood control management to use the technical guidelines and manuals developed by FCSEC." However, this order was issued before the commencement of this project. Similarly, Planning Service issued a memorandum on November 8, 2010 to all regional offices, notifying them about the manuals that revised and developed by this project. This memorandum was issued after the project completion. Therefore, this indicator was not sufficiently achieved.

2) Indicator 2: Utilization of technical standards guidelines and manuals by DPWH Regional and District Engineering Offices

According to the questionnaire-based study conducted during the terminal evaluation (February 2010), 8 out of 10 field offices were referring to the technical standards, guidelines and manuals developed by FCSEC at that time. Although this result might not represent the average situation of the country considering the small number of responses, it can be observed that most of the field offices were using the guidelines and manuals. Therefore, it can be said that this indicator was largely achieved[29].

Although the first indicator was not sufficiently achieved, the second indicator was generally achieved. In addition, FCSEC's technical staff improved their technical skills to the extent that they would be able to lead flood control measures for small rivers and regular hydraulic experiments. Therefore, it can be judged that the project purpose has

[27] These experiments were conducted at the hydraulic laboratory building which was completed in 2002 with the "Project for Construction of Hydraulic Laboratory Building", Japan's grant aid project.
[28] However, they needed advice from Japanese experts if the experiment was complicated.
[29] As it will be discussed later in "3.2.2 Impact", presumably more field offices are currently utilizing the manuals at the time of the ex-post evaluation.

been largely achieved.

3.2.2. Impact

In 2008 DPWH commenced the preparation of M/P and F/S for 12 river basins nationwide. For this, a steering committee was established, and the Head of FCSEC was nominated as vice-chairperson. On the other hand, FCSEC's Project Manager was nominated as chairperson of the technical working group established for the M/P and F/S preparation. This means that a framework was established in which FCSEC could systematically provide technical inputs to DPWH's flood control projects. Additionally, after the completion of this project in June 2010, flood control related M/P and F/S implemented/supervised by DPWH were all handed over to FCSEC based on the memorandum issued on January 11, 2012. In other words, a system in which FCSEC technically assesses all flood control projects of DPWH has been established.

3.2.2.1. Achievement of Overall Goal

Overall Goal: "More effective and appropriately designed flood control and sabo structures/facilities plans are implemented by DPWH in accordance with the technical standards, guidelines and manuals developed by FCSEC"

As it will be explained below, the overall goal has been largely achieved.

1) Indicator 1: Number of flood control and sabo structures/facility that are designed and constructed in accordance with the technical standards, guidelines and manuals formulated and produced by FCSEC

Through the beneficiary survey, it was confirmed that more than 28 flood control and sabo structures have been newly designed or constructed in accordance with FCSEC's technical standards, guidelines and manuals. Some field offices have not been able to do so due to budget constraints. One example of a flood control structure which has been newly designed/constructed in accordance with FCSEC's technical standards, guidelines and manuals would be Digmala River, one of the pilot project sites. After the completion of the pilot project, DEO constructed concrete revetment (roughly 180 meters, with the construction cost of approximately 5 million peso, completed in March 2013) by requesting its own fund. According to DEO staff, they utilized FCSEC's technical standards and guidelines at each stage of the planning, construction and maintenance. It was also indicated that the structure was planned and designed based on scientific evidence by utilizing what they learned from the pilot project. Therefore, this can be considered as one of the positive impacts of this project.

2) Indicator 2: Disaster Mitigation Plans which reflected recommendations provided by FCSEC

FCSEC developed the National Flood Management Framework Plan (NFMFP) and presented it at the cabinet meeting of the National Disaster Coordinating Council (NDCC) in February 2006. According to the questionnaire answers, the plan was handed over to DENR-RBCO[30] and incorporated in the "Philippine River Basin Management and Development Master Plan." It was difficult to obtain accurate information on the status of the "Philippine River Basin Management and Development Master Plan" despite the fact that it was attempted during the evaluation study. On the other hand, information was available concerning the "Integrated River Basin Management Development M/P" which is being developed under the leadership of the DENR[31] at the time of the ex-post evaluation. DPWH is a member of the steering committee for the said M/P; and normally FCSEC staff members attend the meetings representing DPWH[32]. Based on the above fact, it can be interpreted that FCSEC's technical recommendations are incorporated in the disaster reduction plan of the Philippines through the said M/P and others. Therefore, it can be said that this indicator has been virtually achieved.

3.2.2.2. Other Impacts

3.2.2.2.1. Impact on Natural Environment

It was confirmed through the questionnaire and interviews that there was no negative impact on the natural environment in and around the pilot project sites.

3.2.2.2.2. Resettlement and Land Acquisition

Through the questionnaire, field visits and interviews, it was confirmed that there was some land acquisition. At the Kinanliman River pilot site in Real, Quezon, one landowner existed; thus FCSEC exchanged a memorandum of understanding with the LGU at the planning stage, explained the objectives, necessity and the implementation plan of the pilot project and obtained the landowner's consensus. As a result, the procedures went smoothly without any particular problem. There was no case of resettlement.

3.2.2.2.3. Other Indirect Impacts

1) Kinanliman River, one of the pilot project sites, used to change its course whenever

[30] RBCO was established by President Order 510 issued on March 5, 2006.

[31] According to the recent policy direction of the Philippines, flood control measures need to be planned and implemented within the framework of integrated river basin management and development. DENR coordinates flood control sector along with other sectors that are associated with river basins.

[32] For example, DENR held a steering committee meeting for the Integrated River Basin Management and Development M/P on April 10, 2014, and FCSEC staff attended the meeting representing DPWH.

there was heavy rain, and there was frequent flooding. According to the former chairperson of the barangay[33], the river which was 12-meter-wide almost doubled its width when a large-scale typhoon hit the area in 2004. Houses of roughly 300 households were destroyed, and they were forced to resettle. After the construction of the revetment by this project, the river never flooded until the time of the ex-post evaluation; and more than 2000 residents can live without worrying about river flooding.

2) Around Digmala River, which is one of the pilot project sites, residents used to be affected by flood almost every year. The situation was very serious as their houses would be under water for several months in a year[34]. After the construction of spur dikes and revetment by this project, the houses never flooded. When a fairly large-scale typhoon attacked the area recently in October 2013, water did not come to the houses. It was said that 20-30 households residing near the structures became able to live without fear thanks to this pilot project.

3) According to the questionnaire answers, there are some other cases: in one case revetment and spur dikes were constructed thereby bank erosion problem was addressed in Enrile; and in another case slope protection led to the mitigation of bank erosion at various sections in Cagayan and Parua River, Concepcion, Tarlac.

4) After the completion of this project, FCSEC staff took part in post-disaster rapid surveys as flood control experts in 2011 and 2012. It demonstrates that FCSEC's technologies and knowledge are utilized within and outside DPWH for disaster responses in the Philippines.

5) According to the questionnaire answers and the interviews with the implementing agency, FCSEC receives more than 5 requests for technical assistance every year from organizations other than DPWH at the time of the ex-post evaluation. In addition, FCSEC helped hydraulic experiments that were conducted by engineer-major university students in the country. Furthermore, FCSEC receives requests from LGUs for technical standards, guidelines and manuals. FCSEC also receives requests from community-based organizations and other concerned organizations to give lectures on flood control and sabo. Therefore, it can be observed that FCSEC is contributing to the flood control efforts of the country outside DPWH.

6) The preparation of M/P an F/S for the 12 river basins was on-going at the time of the project completion. At the time of the ex-post evaluation, M/P and F/S are completed for the 12 river basins plus 2 additional river basins, while 9 are on-going and 2 are being updated. Apart from this, 3 M/P and F/S are being developed by FCSEC in house[35]

[33] It is the smallest administrative division of the Philippines. It composes cities and municipalities and is equivalent to a village, district or ward.
[34] It is based on the resident interviews.
[35] Normally, a formulation of M/P and F/S is contracted out to a private firm. In this case, FCSEC developed

without contracting it out to private consulting firms. Base on the above, it can be observed that FCSEC's M/P and F/S supervision and implementation capability has improved steadily since the project completion, through which FCSEC is contributing to the construction of appropriate flood control structures.

7) Based on the instruction of DPWH Secretary, submission of the "Project Impact Assessment (PIA)" became mandatory for fund requests concerning flood control projects[36] after February 2014. PIA requires quantification of expected effects and impacts of the proposed flood control project, and to make the calculations, FCSEC's technical standards, guidelines and manuals need to be referred to. Therefore, FCSEC has been receiving many requests for the technical standards, guidelines and manuals. It can be observed that FCSEC's guidelines and manuals are widely utilized and contributing to the quality improvement of flood control projects after the project completion.

8) FCSEC's technical inputs were requested and incorporated in the development of PIA format. In addition, FCSEC is leading the planning and implementation of the PIA orientations that DPWH is organizing for field offices at the time of the ex-post evaluation. After the orientations it is likely that more detailed guidance on PIA preparation will be necessary, which FCSEC is expected to lead as well. Based on the above, FCSEC is making concrete contributions to the quality improvement of DPWH's flood control projects through PIA and others after the project completion.

9) As a result of the beneficiary survey targeting regional office and DEO staffs who participated in this project (43 responded out of the total beneficiaries of 270), the majority (76%) said that "FCSEC's technical support responded to the needs of their offices." Additionally, all the respondents (100%) said that "FCSEC was contributing to the nurturing of flood control experts in the Philippines." Furthermore, 76% indicated that they were "highly satisfied (22%)" or "satisfied with FCSEC (54%)." Similarly, 79% said that they were "highly satisfied (13%)" or "satisfied with this project (66%)." Based on the above results, it can be observed that the contributions of this project and FCSEC are well-received by field office staffs.

In light of the above, DPWH's flood management capacity was strengthened to a certain extent, as seen in the fact that FCSEC engineers became able to lead flood control measures for small rivers and regular hydraulic experiments. Thus it can be said that the project purpose was generally achieved by the time of the project completion. In addition, there are many cases in which effective flood control and sabo structures have been designed or constructed in accordance with FCSEC's technical standards, guidelines and

TOR, selects and procures consultants, supervises and controls the quality of the study.

[36] It is based on the memorandum issued on February 7, 2014.

manuals; thus the overall goal has been achieved. Furthermore, the project and FCSEC are well received by the field offices, and many other positive impacts are observed, while no particular negative impact is observed. This project has largely achieved the project purpose and the overall goal; therefore, effectiveness/impact of this project is high.

3.3. Efficiency (Rating: ②)

3.3.1. Inputs

Inputs	Plan	Actual
(1) Experts	・Long term experts in 4 different fields: 228 months in total (48 months for sabo expert, 180 months in total for experts other than sabo, 4 persons in total) ・Several short term experts	・Long term experts in 3 different fields: 170.2 months in total (49.4 months for sabo expert, 120.8 months in total for experts other than sabo, 6 persons in total) ・13 short term experts
(2) Trainees received	A few persons yearly	8 persons in total (main training fields: Hydraulic Model Experiment, Flood Control Administration, Research and Survey Management, Disaster Risk Management, River Information Management, etc.)
(3)Third-Country Training Programs	None	None
(4) Equipment	Main equipment: - Equipment for surveying and manual updating - Equipment for hydraulic experiments and research - Equipment for establishing information filing and dissemination system	Main equipment: mostly as listed on the left-hand column (approx. 5.3 million peso[37])

[37] It is equivalent to approx. 11.8 million yen if converted using the average rate for the project period, which is 1 peso = 2.23 yen.

Total Project Cost	approx. 370 million yen	approx. 390 million yen
Total Local Cost	Project Operation Cost: N/A Pilot Projects: 50 million peso[38] Total: N/A	Project Operation Cost: approx. 53 million peso[39] Pilot Projects: approx. 45 million peso[40] Total: 98 million peso (Total: approx. 219 million yen[41])

3.3.1.1. Elements of Inputs

Through the questionnaire and field interviews, it was confirmed that Japanese experts provided appropriate technical support. According to FCSEC staff, they were able to obtain practical knowledge by visiting sites together with the Japanese experts, observing the actual situations of the rivers and learning how to identify problems and measures to be taken. It was also said that FCSEC staff could immediately seek the Japanese experts' advice whenever they had doubts or questions in their work, and was able to carry out their duties with confidence. However, it was also pointed out that in some cases Japanese experts required time before beginning to demonstrate their best abilities due to language problems and different cultures. It was suggested that it might be worth considering assigning one person for more than 3 years[42] in the case of long-term experts.

As part of this project, 8 persons from DPWH attended different training courses in Japan. It was confirmed through the questionnaire and DPWH staff interviews that these training courses provided DPWH staff with valuable opportunities to experience high-standard technologies and management methods[43].

With regard to the equipment provided by this project, it was confirmed through the questionnaire and interviews that the procured equipment was generally utilized properly. Additionally, there were JICA long-term experts, apart from this project, who were

[38] It is equivalent to approx. 112 million yen if converted using the average rate for the project period, which is 1 peso = 2.23 yen.
[39] It is equivalent to approx. 118 million yen if converted using the average rate for the project period, which is 1 peso = 2.23 yen.
[40] According to JICA's document, the total fund contributed by the Philippine side to the pilot projects is 53 million peso. However, according to FCSEC, the fund contributed through the project is 45 million peso, and DEO secured and contributed additional 25 million peso for the Kinanliman River site. Therefore, there is a possibility that the total amount contributed by the Philippine side to the pilot projects is 70 million peso.
[41] The amount was calculated using the average exchange rate for the project period, which is 1 peso = 2.23 yen.
[42] However, in case long term experts are loaned by the ministries, system may not allow the assignment of one expert for more than 3 years. Moreover, there are benefits associated with replacing Japanese experts in the middle of the project because new perspectives and thinking can be introduced.
[43] According to the questionnaire answers and interviews with DPWH's Bureau of Design staff, sabo and coastal engineering are the two areas in which Japan is considered as one of the pioneers; thus great demand exists for training courses in Japan. Comments were received, requesting further technical assistance in these areas, such as trainings in Japan and dispatching experts.

assigned to DPWH during the implementation of this project. Synergy was observed between these experts and the project. For example, the experts had technical knowledge of flood control and were able to provide technical advice on FCSEC's studies and revision of the technical standards and guidelines. Because these experts belonged to DPWH headquarters, they advocated flood control measures promoted by FCSEC within the headquarters, liaising between FCSEC and DPWH headquarters in some cases.

3.3.1.2. Project Cost

The actual project cost was 390 million yen as compared to the plan of 370 million yen; thus it was higher than planned (105% of the plan). There is no clarity as to why the project cost exceeded the plan[44].

3.3.1.3. Period of Cooperation

The actual project period was 60 months (5 years) from July 2005 to June 2010, which was as per the plan.

The elements of inputs were appropriate for the outputs, and the project period was within the plan. Thanks to the collaboration between the Japanese experts and FCSEC staff, the outputs and the project purpose were generally achieved before the project completion. However, there were some periods during which the number of FCSEC engineers assigned to the project was fewer than planned[45]. Also, the execution of the project operation cost from the Philippine side tended to be delayed. Moreover, the project cost exceeded the plan. Therefore, the project was not necessarily efficient.

Although the project period was within the plan, the project cost exceeded the plan. Therefore, efficiency of the project is fair.

3.4. Sustainability (Rating: ②)

3.4.1. Related Policy towards the Project

At the time of the ex-post evaluation, the Philippine government formulated the "Philippine Development Plan" (2011-2016), which aims to "mitigate flood risk with river basin management and the development of efficient and appropriate infrastructures." In addition, DPWH's "Strategic Infrastructure Policies and Programs" (2012-2016)

[44] It was not clear from the documents provided by JICA. Related information could not be obtained from concerned JICA offices, either. Judging from the fact that the man-month (MM) of long-term experts was actually 170.2MM as compared to the plan of 228 MM, it is possible that short-term experts had to fill in the gap created by the reduced MM of long-term experts, as a result of which the cost became high.

[45] The number of FCSEC engineers assigned to handle the five project outputs were fewer than what would have been ideal; however, even with the limited number of FCSEC engineers, project outputs were mostly attained thanks to the strong participation of the DEOs for the pilot projects and the Training Division (AMMS) for the training.

identifies the "effective flood control program" as one of the 5 strategic programs. Therefore, this project continues to be consistent with the development and sector policy of the Philippines after the project completion.

While the necessity of flood control measures has long been recognized in the Philippines, it is increasingly becoming important and a policy priority after the project completion. During the field study, interviews were conducted with DPWH, the National Disaster Risk Reduction and Management Council (hereinafter referred to as "NDRRMC")[46], PAGASA, NWRB and JICA Philippine Office, and they all indicated that the need for flood control measures has been increasing in the country recently. This is because there is a growing focus on climate change issues globally, and the topic of disaster risk reduction and management is receiving increased attention. It is also because the country experienced a number of serious natural disasters in recent years including the super typhoon. According to the statistics of NDRRMC, on average there were 43 floods in a year during the project implementation period (2005-2010), whereas 142 floods were reported in 2012 alone, which is more than twice the yearly average. In addition, DPWH's flood control budget has been increasing in proportion to the total budget[47], which reflects the increasing importance of flood control within DPWH.

One of the factors that might have contributed to the increasing importance of flood control within DPWH is JICA's continuous effort. JICA Philippine Office meets with DPWH management semi-annually for the "Project Implementation Review" (hereinafter referred to as "PIR"). PIR is an occasion to discuss all JICA supported projects in the presence of DPWH Secretary. Through PIR, JICA continuously advocated the importance of flood control and promoted the idea of FCSEC's permanency after the completion of this project. In addition, JICA headquarters and JICA Philippine Office worked toward continued skill development of FCSEC staff by utilizing other JICA projects such as ODA loan projects and training scheme[48]. It seems that these efforts led to FCSEC's permanency, which will be discussed below. It is also possible that these efforts encouraged well-trained FCSEC staff to stay with DPWH.

3.4.2. Institutional Aspects of the Implementing Agency

The Department Order No. 87 was issued in September 2013, based on which the Flood Control Management Cluster (hereinafter referred to as "FCMC") was established under the Unified PMO. The mandate of FCMC is to oversee the entire flood control (including donor-supported and self-funded projects). The Department Order No. 107 was then

[46] It is administered by the OCD.
[47] It will be discussed in more details in "3.4.4 Financial Aspects of the Implementing Agency."
[48] For example, Japanese consultants assigned to the ODA loan project worked collaboratively with FCSEC staff. This way FCSEC staff had the opportunities to refresh their flood control knowledge.

issued in November 2013, based on which FCSEC was transformed to the Flood Control Management Office (hereinafter referred to as "FCMO"). At the time of the ex-post evaluation, FCMO has a permanent status within DPWH.

The responsibilities of FCMO have been certainly on the increase since the project completion. Based on the memorandum dated March 25, 2014, FCMO also became in charge of rural water supply projects[49], in addition to the tasks already mentioned above: (1) supervision of all M/P and F/S; (2) development and management of flood control related database; (3) PIA orientations; and (4) detailed guidance on PIA preparation.

On the other hand, FCMO has 7 engineers[50] apart from Project Manager at the time of the ex-post evaluation. It has been almost promised that these 7 engineers will be given permanent positions, and FCMO has a plan to recruit 3 young engineers (level 2, Job Order)[51]. In addition, there is a prospect that about 3 staff will be added (most likely Job Orders) given the significant expansion of FCMO's duties and responsibilities[52]. Therefore, it is possible that FCMO will be staffed with 13 engineers apart from Project Manager.

It can be interpreted that FCMO's responsibilities have been increasing because former FCSEC enhanced its capability through this project, which has its own significance. However, the reality faced by FCMO is that its staffing level is not keeping up with the increasing budget and workload. Although the number of staff is expected to increase in the near future, staff shortage is evident at the time of the ex-post evaluation. Therefore, it can be judged that there are some concerns in the institutional aspects of the implementing agency[53].

3.4.3. Technical Aspects of the Implementing Agency

Based on the questionnaire and the field study, it was confirmed that most of the former FCSEC staff members who developed skills through the previous project and this project are still working at DPWH at the time of the ex-post evaluation. Almost all the members, except for the ones who retired or emigrated aboard[54], are contributing to DPWH's flood

[49] The decision was made because FCSEC's Project Manager had prior working experience in water supply.
[50] The composition is 1 level-V engineer, 3 level-IV engineers and 3 level-III engineers. The levels represent hierarchies of engineers. There are five levels from level I (lowest) to level V (highest).
[51] At the time of the ex-post evaluation, they are trying to identify candidates who are suitable for the posts.
[52] According to FCMO's Project Manager, it has been orally promised by DPWH's management.
[53] It is right after the rationalization implementation, and there are ceilings to limit the number of permanent engineers within FCMC. Thus there are not many options at present other than filling the gap with contact employees. However, according to FCMC's Director, they "acknowledge the increasing workload of FCMO, and understand that staff shortage is an issue. It is possible to consider increasing the number of FCMO staff further, and if necessary, the idea of increasing the number of permanent staff can be considered in the future." Utilization and nurturing of human resources to be newly recruited would be necessary; the institutional aspects need strengthening in order to cope with the increasing amount of duties.
[54] Out of the engineers who existed during this project, one person retired, and another person immigrated aboard.

control management after the project completion. Therefore, it can be said that FCMO is equipped with sufficient technical levels.

In light of the above, most of the former FCSEC engineers who developed their skills through the project are most probably going to stay with DPWH as permanent employees; thus there are no major concerns in terms of technical sustainability. However, as the results of beneficiary survey indicated, there is a great demand for continuous flood control training for field offices. Additionally, the demand for coastal engineering is increasing due to the recent large-scale storm surge disasters[55]. There is an urgent need in the Philippines to nurture human resources in this field. Furthermore, with a view to developing human resources for the next generation, DPWH recognizes the need for a system in which FCMO's experienced engineers properly train and coach new young engineers to be recruited in the future. Therefore, it is recommended that efforts should be made toward further technical improvement.

3.4.4. Financial Aspects of the Implementing Agency

According to the data provided by the implementing agency, FCMO (former FCSEC)'s study budget has been increasing significantly in recent years: 13 million peso (2012), 97 million peso (2013), and 208 million peso (2014). In addition, DPWH's flood control budget has been increasing in proportion to the total budget (capital outlays): 6% (2010), 12% (2011), 11% (2012 and 2013), 18% (2014). According to FCMO's Project Manager, these budget levels are sufficient to carry out the required tasks; and therefore, it can be judged that there are no concerns with the financial aspects.

Some problems have been observed in terms of the institutional aspects of the implementing agency. Therefore, sustainability of the project effects is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1. Conclusion

This project aimed to strengthen the flood management function of DPWH through research and development, training, development of information management system, implementation of pilot projects and establishment of internal support system. The project is in line with the "Mid-Term Philippine Development Plan (2004-2010)", which places importance on expanding investment in flood control infrastructures. The project also responds to the needs of the Philippines to strengthen flood management functions because the country is affected by many natural disasters. Thus the project is consistent

[55] After the super typhoon, Typhoon Haiyan ("Typhoon Yolanda"), which attached the Philippines in November 2013 killing more than 6,000 people, there is an urgent need to strengthen measures against storm surge disasters in the Philippines.

with the Philippine development policy and needs. In addition, the project is consistent with Japan's ODA policy as it is in line with the "Country Assistance Plan for the Philippines". Therefore, relevance is high. Through this project, engineers at FCSEC became able to lead flood control for small rivers, and the targets for the project outputs and the project purpose were largely achieved. In addition, the project is contributing to the design and construction of appropriate flood control and sabo structures; thus effectiveness and impact are also high. Although the project period was within the plan, the project cost slightly exceeded the plan; thus efficiency is fair. The project remains consistent with the development policy and needs of the Philippines after the project completion. Most of the experienced engineers who accumulated knowledge and skills through this project are still working at DPWH, and flood control budget has been on the increase within DPWH; thus no problems are observed in the technical and financial aspects of the implementing agency. However, shortage of staff is evident in the implementing agency despite the fact that their responsibilities have been increasing; thus some problems are observed in terms of the institutional aspects of the implementing agency. Therefore, sustainability is fair.

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

4.2. Recommendations

4.2.1. Recommendations to the Implementing Agency

1) As one of the consequences of the steady improvement of FCMO's technical levels through this project, FCMO's responsibilities have been increasing significantly since the completion of this project. Financially, it has been addressed as FCMO's study budget has increased in recent years. Institutionally, however, the number of staff has not been increased since the project completion, and staff shortage is evident with respect to the ever-increasing workload. It is recommended that DPWH expedite the process of recruiting young engineers, as it is already approved. It is also recommended that FCMO should consider increasing the number of staff further to ensure that FCMO is institutionally sound for the expected workload.

2) It is recommended that FCMO should explore realistic and effective on-the-job training systems in which technologies are smoothly transferred from the experienced engineers to young engineers, thereby steadily developing human resources for the next generation.

3) With regard to one of the pilot project sites (sabo dam) where road embankment was not raised as per the initial plan, it is recommended that FCMO should coordinate with the Bureau of Quality and Safety and Nueva Vizcaya Sub DEO and promptly take appropriate measures to prevent the functions of the sabo dam and the road from being

compromised in the future.

4) It is recommended that DPWH continue organizing flood control training for field offices by utilizing FCMO staff and training materials developed/used by this project.

5) Although soil cement was piloted in this project, it is not listed in the "DPWH Standard Specifications" as DPWH's standard cost item. It is recommended that FCMO thoroughly discuss with the Bureau of Research and Standards and take necessary actions toward its approval.

4.2.2. Recommendations to JICA

1) Debris flow is one of the serious problems in the Philippines[56], and sabo is becoming widely recognized as one of the effective measures against debris flow. It is significant that FCSEC staff gained theoretical understanding of sabo and had the opportunity to put the knowledge into practice through the pilot project under Japanese experts' guidance. On the other hand, sabo is still a relatively new field in the Philippines, and it is only one pilot project that FCSEC staff got to experience from the planning stage. Thus more experiences are needed in the future. In particular, there is an urgent need to develop human resources who can handle detailed designs of sabo structures. DPWH is interested in learning further from Japan's experiences and cases because Japan is considered as one of the pioneers in the field of sabo. Therefore, it is recommended that JICA consider providing further training opportunities and dispatching experts in relation to sabo so that DPWH will eventually be able to manage detailed designs of sabo structures independently.

2) Due to the super typhoon in November 2013, there is an urgent need in the Philippines to prepare for storm surge disasters. Accordingly, it is viewed important to strengthen the country's coastal engineering capacity. Thus it is recommended that JICA consider the possibility of extending assistance to DPWH in the field of coastal engineering.

3) DPWH is envisaging the upgrade of the flood control database under the leadership of FCMO. The existing database contains information on locations and types of flood control structures that exist in the country and is mainly used to examine and manage the maintenance budgets for flood control projects. When the existing database was established, almost everything was done manually, including sending the request documents to field offices, collecting the documents, and inputting the collected information. Inevitably, it required significant amount of time, and data management is certainly not easy because updating the information will also require significant time and

[56] After the eruption of Mount Pinatubo in 1991, the area was devastated with mudflow called lahars. Because of such large-scale disasters, the need for debris flow measures began to be acknowledged in the Philippines.

efforts. At the time of the ex-post evaluation, better-scaled maps are available that did not exist at the time of the project implementation. Additionally, database related technologies have advanced greatly since the time of the project implementation. DPWH believes that more accurate and faster data gathering and uploading, along with on-line data sharing between multiple offices, will be possible with the utilization of GPS, GIS and mobile devices. While the database if upgraded can serve as a basis for future flood control projects, there is limited capacity within DPWH to fully utilize the above-mentioned new database technologies. Therefore, it is recommended that JICA explore the possibility of providing technical assistance in this field.

4.3. Lessons Learned

1) Pilot Project as an Effective Approach for Process-Focused Capability Building

A pilot project approach was taken in this project. It provided DPWH staff with the opportunity to experience the entire cycle of flood control projects under the guidance of Japanese experts, including planning, design, construction and maintenance. By putting the knowledge they obtained thus far into practice, DPWH staff members were able to acquire concrete skills. This project focused more on the “learning process” which was directly linked to the project purpose, rather than on the outcomes of the pilot projects. For such types of technical cooperation projects, it is thought that sound capacity building will be possible if the opportunity is provided by taking the pilot approach to “practice” the knowledge obtained through training and research.

2) Utilizing ODA Loan and Training Scheme for Technical Cooperation Projects

At the time of the completion of this project, there were concerns about the project’s sustainability. JICA Philippine Office utilized opportunities like PIR to discuss with the high officials of DPWH semi-annually and tried advocating the importance of flood control and FCSEC’s permanency. JICA headquarters also made efforts to utilize and nurture FCSEC staff continuously after the project completion by encouraging the collaboration between FCSEC and other projects such as ODA loan projects. These efforts seem to have achieved good results because FCSEC became a permanent office by the time of the ex-post evaluation, and FCSEC’s core members are still working at DPWH and contributing to the country’s flood control projects 4 years after the project completion. Therefore, it can be said that steady and continuous efforts—linking the project to new or on-going projects and utilizing various occasions to discuss with high officials of the implementing agency—are effective for completed projects that have sustainability issues.