Ex-Post Project Evaluation 2012: Package II-4 (the Philippines)

August 2013

JAPAN INTERNATIONAL COOPERATION AGENCY

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Preface

Ex-post evaluation of ODA projects has been in place since 1975 and since then the coverage of evaluation has expanded. Japan's ODA charter revised in 2003 shows Japan's commitment to ODA evaluation, clearly stating under the section "Enhancement of Evaluation" that in order to measure, analyze and objectively evaluate the outcome of ODA, third-party evaluations conducted by experts will be enhanced.

This volume shows the results of the ex-post evaluation of ODA Loan projects that were mainly completed in fiscal year 2010, and Technical Cooperation projects and Grant Aid projects, most of which project cost exceeds 1 billion JPY, that were mainly completed in fiscal year 2009. The ex-post evaluation was entrusted to external evaluators to ensure objective analysis of the projects' effects and to draw lessons and recommendations to be utilized in similar projects.

The lessons and recommendations drawn from these evaluations will be shared with JICA's stakeholders in order to improve the quality of ODA projects.

Lastly, deep appreciation is given to those who have cooperated and supported the creation of this volume of evaluations.

August, 2013

Masato Watanabe
Vice President
Japan International Cooperation Agency (JICA)

Disclaimer

This volume of evaluations, the English translation of the original Japanese version, shows the result of objective ex-post evaluations made by external evaluators. The views and recommendations herein do not necessarily reflect the official views and opinions of JICA. JICA is not responsible for the accuracy of English translation, and the Japanese version shall prevail in the event of any inconsistency with the English version.

Minor amendments may be made when the contents of this volume is posted on JICA's website.

JICA's comments may be added at the end of each report when the views held by the operations departments do not match those of the external evaluator.

Republic of the Philippines

Ex-Post Evaluation of Japanese ODA Loan Project
"Agno River Flood Control Project (Phase II) (Phase II-B)"

External Evaluator: Masumi Shimamura
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0. Summary

This project aims to reduce flood damage in the project area by constructing flood control facilities and conducting the Information Education and Communication program (IEC program) for the Local Government Units (LGUs) and residents. Mitigation of flood damage has been achieved by the project－construction of floodway and diversion structures, river improvement, and construction of bridges－and the results of local interview and beneficiary survey have shown local residents' satisfaction to the benefit of the project. The project has also contributed to the improvement and enhancement of the people's living environment, and the economic and social development. In light of this, the project is deemed as to have yielded positive effectiveness and impacts in various ways. In addition, the IEC program conducted in the project has drawn much attention as a good practice which had promoted awareness of the LGUs and local residents for disaster prevention and enhancement of disaster prevention measures. The project objective to contribute to the reduction of flood damage, enhancement of people's living environment and sanitation situation, and development of local economy and society is consistent with Philippines' development plan and development needs, both at the time of appraisal and the ex-post evaluation, as well as Japan's ODA policy at the time of appraisal, therefore its relevance is high. Project efficiency is fair because while the project cost was lower than planned, the project period was longer than planned. As regards operation and maintenance, some uncertainty has been observed in terms of financial prospects of the LGUs, therefore sustainability of the project effect is fair.

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

1. Project Description

Project Location

Agno River after improvement

1.1 Background

The Philippines is exposed to severe geographical and climatic conditions. Approximately twenty typhoons out of around thirty, occurring on the Pacific Ocean every year, approach the country and around ten of them land. Frequent earthquakes and volcanic eruptions also occur in the country as well. In addition to this, the people in the country frequently suffers from fierce flood and mudslides during rainy seasons because of the country's social and economic conditions that urban areas have developed in flat and low-lying, flood-prone areas. Such disasters have become serious impediments to socioeconomic development in the Philippines, and steady countermeasures are needed to control flood and mudslides.

The Agno River flows through the broad Pangasinan Plain in central Luzon, and then empties into the Gulf of Lingayen. The Agno is the fifth largest river in terms of basin area in the Philippines, draining 5,952 km^2 (approximately the same area as the drainage basin of the Abukuma River in Japan). In this plain, where about 1.33 million people live and their main occupation is farming, flood caused by typhoons and localized torrential downpours has been an annual occurrence. This situation has been worsened by accumulations of mud on the riverbed caused by an eruption on Mt. Pinatubo in the south, thus making the area even more susceptible to flooding. Japan International Cooperation Agency (JICA) had, prior to implementing this project, assisted the urgent emergency repair project for dredging and bank protection on the lower reaches of the Agno River, however, project in the middle section in the basin has been essential to implement drastic flood control measures.

These backgrounds at that time have shown urgent necessity for flood damage mitigation in the project area by implementing this project in order to improve living

environment and sanitation situation[1] of residents and to achieve socioeconomic development of the Agno River drainage basin.

1.2 Project Outline

The objective of this project is to reduce flood damages in the Agno River drainage basin by constructing diversion and floodway structures, and repairing and constructing dikes and bridges in the middle section of the Agno River, which flows through both Provinces of Pangasinan and Tarlac, thereby improving the area's living environment and sanitation situation, and contributing to its socioeconomic development.

	Phase II	Phase II-B
Loan Approved Amount / Disbursed Amount	6,734 million yen / 6,315 million yen	2,789 million yen / 2,776million yen
Exchange of Notes Date / Loan Agreement Signing Date	September, 1998 / September, 1998	March, 2001 / May2001
Terms and Conditions	Interest Rate: 1.7%, Repayment Period: 30years (Grace Period: 10years) Conditions for Procurement: General Untied Consultant Interest Rate: 0.75% Repayment Period: 40years (Grace Period: 10years) Conditions for Procurement: Partially Untied (II) / Bilateral Tied (II-B)	
Borrower / Executing Agency	The Government of the Republic of the Philippines / Department of Public Works and Highways (DPWH)	
Final Disbursement Date	March, 2010	September, 2009
Main Contractor (Over 1 billion yen)	C.M.Pancho Construction Inc. (Philippines) / Toa Corporation (Japan) / Daewoo Engineering & Construction Co.,Ltd. (Korea)	China State Construction Engineering Corporation (China) ・ Ciriaco Corporation (Philippines) (JV)
Main Consultant (Over 100 million yen)	Nippon Koei Co., Ltd. (Japan) ・Basic Technology and Management Corporation (Philippines) ・PKII Engineers (Philippines) (JV)	

[1] Mitigation of health damage due to overflow of sewage water, drifting and scattering of decomposed matters etc.

Feasibility Studies, etc.	JICA Feasibility Study (1991)
Related Projects	ODA Loan (JICA) - Agno and Allied Rivers Urgent Rehabilitation Project (Loan Agreement signing on 1995) Technical Cooperation (JICA) - JICA Experts dispatched to DPWH (Section related with river management) - Strengthening the Flood Management Function of DPWH (Technical Cooperation Project) (July, 2005–June, 2010) - Strengthening of Flood Forecasting and Warning System for Dam Operation (Technical Cooperation Project) (October, 2009–November, 2012) Grant Aid (JICA) - Project for Improvement of Flood Forecasting and Warning System in the Pampanga and Agno River Basins (2007–2008)

2. Outline of the Evaluation Study

2.1 External Evaluator

Masumi Shimamura, Mitsubishi UFJ Research and Consulting Co., Ltd.

2.2 Duration of Evaluation Study

Duration of the Study: September, 2012–August, 2013

Duration of the Field Study: November 18–December 15, 2012, March 31–April 13, 2013

3. Results of the Evaluation (Overall Rating: B[2])

3.1 Relevance (Rating: ③[3])

3.1.1 Relevance with the Development Plan of the Philippines

At the time of appraisal, the government of the Philippines identified, in its Medium-Term Philippine Development Plans (1993–1998, 1999–2004) the importance of mitigation of flood damages, disaster prevention measures, and comprehensive watershed management through development of flood control facilities. The objective of the project

[2] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[3] ③: High, ② Fair, ① Low

aiming to reduce flood damage in the Agno River drainage basin was consistent with the Philippines' medium-term development plans. The project had been also recognized as one of the priorities in the Medium-Term Philippine Development Plan (1999–2004) of the Department of Public Works and Highways (DPWH).

At the time of ex-post evaluation, the Philippine Development Plan (2011–2016) stipulates the importance of conservation of watersheds, and development of efficient and appropriate infrastructure in order to reduce flood damages. The Philippine Development Plan specifies following strategies to be pursued.

- Prioritize the construction of flood management structures in highly vulnerable areas
- Apply Climate Change Adaptation strategies in the planning and design of flood management structures
- Develop mechanism to expedite immediate financing for the repair and rehabilitation of flood management structures
- Increase LGU and community participation in disaster prevention measures and maintenance of flood management structures
- Implement disaster risk reduction and management from both structural and non-structural infrastructures (flood forecasting, flood warning system, evacuation plan, etc.)

In addition, the policy of the National Water Resources Board, an institution under the Department of Environment and Natural Resources (DENR), states the importance of water resource management, taking into account countermeasures of water related disasters. The project is consistent with the Philippines' development policy, and continuous support for flood prevention measures is highly important.

The project would be categorized as flood control sector or disaster risk reduction and management sector[4] at the time of ex-post evaluation, instead of environmental and natural resource sector being categorized at the time of appraisal, given the strategies stipulated in the Philippine Development Plan (2011–2016).

3.1.2 Relevance with the Development Needs of the Philippines

Pangasinan Plain where the Agno River flows, is primarily an agricultural land[5], and

[4] One of the important pillars the National Water Resources Board puts up is "mitigation of water related disasters and hazards". The Philippine government recognizes the importance of coordination among relevant departments/agencies and the LGUs in undertaking comprehensive water resource management including disaster prevention measures. The National Water Resources Board under the DENR puts up policies consistent with this.

[5] Agricultural land area in Pangasinan Province and the percentage of agricultural land in Pangasinan Province are as follows: 1991: 193,439 ha (36.0%), 2002: 160,697 ha (29.9%)

has been suffering, from frequent flood damages caused by typhoons and torrential rains at the time of appraisal.[6] Furthermore, this situation has been worsened by accumulations of mud on the riverbed caused by an eruption on Mt. Pinatubo in the south (1991). Therefore, urgent measures were needed to control flood and mudslides.

At the time of ex-post evaluation, the Development Plan of Pangasinan Province (2010–2015) indicated the importance of constructing flood management structures. Pangasinan Province was attacked by super typhoon Pepeng in October 2009 and suffered from immense damages,[7] which brought much-needed attention to continue reducing flood damages. In addition, the Agno River Basin Watershed Management Plan, prepared by the DENR after the typhoon Pepeng, emphasized the importance of comprehensive disaster risk reduction measures and pointed out the significance of practical disaster prevention activities and coordination among the LGUs, local communities and related institutions in reforestation in upstream areas and water resource management measures.

3.1.3 Relevance with Japan's ODA Policy

The objective of the project was consistent with the government of Japan's assistance policies and the assistance policy by JICA at the time of appraisal. The Ministry of Foreign Affairs of Japan's Country Assistance Strategy for the Philippines (August, 2000) stipulated in its "Disaster Prevention" section that "Japan has been putting effort in supporting for flood prevention measures and recovery from volcano damages, and will continue to support for flood control, erosion control and earthquake countermeasures as well as institutional and capacity development of relevant government agencies from medium- and long-term perspective. This is because frequent occurrences of large-scale natural disasters inhibit development and are likely to have enormous effects to the poor people." Moreover, Overseas Economic Cooperation Strategy by JICA (2000) emphasized its support for disaster prevention sector, focusing mainly on flood prevention. In fact, most of the support provided in that sector in the Philippines comes from the Japanese government.

Source: National Statistics Office

[6] (1) Number of major typhoons/monsoon rainfalls, (2) Affected number of people, (3) Damage to agricultural production for major typhoons and monsoon rainfalls which hit the project area before and after the time of appraisal are as follows:

- 1995: (1) 4, (2) 128,906 people, (3) 2.3 million pesos
- 1996: (1) 3, (2) 60 people, (3) 11.2 million pesos
- 1997: (1) 1, (2) N.A., (3) 17.1 million pesos
- 1998: (1) 3, (2) 238,608 people, (3) N.A.
- 1999: (1) 3, (2) 811,426 people, (3) 189.8 million pesos

Source: Region I Disaster Risk Reduction and Management Council

[7] 63 dead, more than 1.22 million people affected, 2,274 houses damaged, more than 6,760 million pesos as total amount of damages

Since the onset of the project, there has been no change in the assistance policies of the government of Japan or JICA, which might affect the direction of the project. Thus, the consistency of the project with the Japanese assistance policies is still maintained.

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

3.2 Effectiveness[8] (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)[9]

The project aimed at reducing flood damages by improving flood control ability of the Agno River to respond to 10-year return period flood. Table 1 summarizes recent damages by major typhoons in the project area based on available data.

Table 1: Damages by Recent Major Typhoons in the Project Area

Year and month of major typhoons	Name of typhoons	Number of persons affected	Number of dead or missing persons	Number of damaged houses	Damage to agricultural production (mil. pesos)	Damage to infra-structure facilities (mil. pesos)	Maximum high water level at Bayambang Bridge (m)	Total rainfalls for four days at the times typhoon (mm) Station: Dagupan
August 2004	Marce/Nina	578,861	21	N.A.	314.4	51.1	25.20	N.A.
July 2006	Henry	40,026	5	N.A.	13.3	N.A.	22.45	N.A.
May 2008	Cosme	974,451	48	139,409	3,732.0	931.1	22.45	N.A.
May 2009	Emong	236,268	47	41,894	1,127.4	1,019.4	20.69	N.A.
October 2009	Pepeng	1,224,740	63	2,274	4,180.2	2,581.0	26.40	566.8
October 2010	Juan	538,098	11	10,531	1,776.7	65.1	20.37	N.A.
Project completion: February 2011								
June 2011	Falcon	94,848	1	28	95.8	61.7	20.75	N.A.
August 2011	Mina	69,606	2	22	137.9	44.2	22.00	388.7
September 2011	Pedring	99,245	2	380	560.8	22.9	N.A.	N.A.
August 2012	Monsoon Rains	324,849	5	N.A.	481.6	236.4	22.37	N.A.

Source : Utilized data from both Region I Disaster Risk Reduction and Management Council, and Pangasinan Provincial Disaster Risk Reduction and Management Council

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

[9] At the time of appraisal, Operation and Effect Indicators including maximum flood, maximum high water level, damaged amount etc. had been established, however, adequate measurement has not taken place, therefore, analysis was made based on available data at the time of ex-post evaluation.

Maximum high water level data from DPWH Bureau of Research and Standards
Rainfall data from Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)

Note1) Damages are combined damages from flooding and rainstorm, and cannot be separated.
Note2) Damaged amount are damages from each typhoon.
Note3) The observation point for maximum high water level was identified as Wawa Station (where water from the adjacent Tarlac River flows into the Agno River) at the time of appraisal, however, available appropriate data at the time of ex-post evaluation was at Bayambang Bridge
Note4) The magnitude of each flood is not clear

Differences among each typhoon's scale, including size, strength, duration of stay, and route of passage, and ambiguity of magnitude of flood for each typhoon caused difficulty in making simple comparisons between typhoons, however, comprehensive analysis was endeavored taking into consideration the interview results from local residence as described below

When comparing two major typhoons before and after the project－Pepeng (October 2009) and Mina (August 2011)－the total amount of rainfalls for four days when Mina approached the project area was 388.7 mm, which fell little below that of Pepeng, which amounted to 566.8mm. The number of persons affected by Mina was less than one-seventeenth of that of Pepeng and the amount of damage caused by Mina (damage to agricultural production and infrastructure facilities) was well below that of Pepeng. When comparing the maximum high water levels of these typhoons, while water level during Pepeng typhoon was 26.4m, that of Mina was 22.0m. From these data, it can be supposed that the project has contributed to lowering the water height of the Agno River during times of flooding.[10]

After the completion of the project, typhoons including Falcon, Mina, and Pedring, and monsoon rainfalls attacked the project area, however, interviews with local residents during the field survey showed that no flood damage has occurred after the project completion. According to the beneficiary survey (to be described later), over 95% of respondents answered "no damage" or "small damage" after the project completion. Judging all the facts in a comprehensive manner, the project is deemed as to have realized its effects sufficiently.

Furthermore, the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) established the Agno River Flood Forecasting and Warning Center in the project area with the grant aid from Japan (Project for Improvement of Flood Forecasting and Warning System in the Pampanga and Agno). This

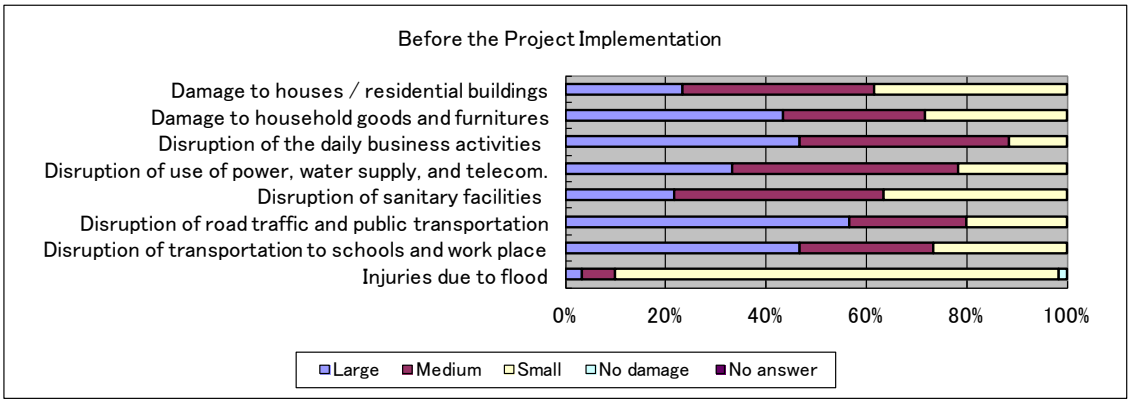
[10] According to the DPWH, discharge capacity of the Agno River is 4,000m^3/sec., and it is designed that during times of flooding, water would flow into the widened floodway at 3,000 m^3/sec and to the guide channel which flows into the original Agno River at 1,000m^3/sec as a result of the development of closure dike which realigned the River. (See footnote 12 for explanation of closure dike.)

Center aims to reinforce its flood forecasting and warning capacity through Japan's technical cooperation (dispatch of JICA experts etc.), which has given further positive effects on this project. The PAGASA installed water height, rainfall measurement stations in seven places where flood risk is high in the Agno River drainage basin, and sends data to relevant institutions and the PAGASA headquarters in Manila on water level records collected automatically 24 hours a day. In the case of occurrence of typhoons or monsoon rainfalls, the PAGASA analyzes measuring results twice a day, every early morning and evening, based on the early warning system and sends out evacuation alert and related information to local residents through media via the Provincial Disaster Risk Reduction and Management Council (PDRRMC) in Pangasinan Province. Evacuation directives are also put out by the governor of Pangasinan Province. The flood forecasting and warning system has been functioning effectively and has contributed to urgent transmission of flood forecasting and warning to residents for evacuation measures.

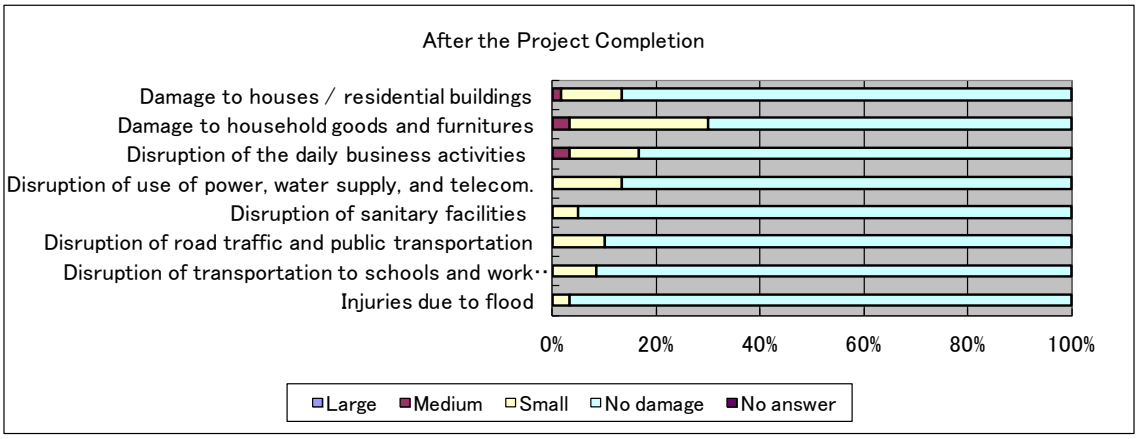
3.2.2 Qualitative Effects

3.2.2.1 Mitigation of Flood Damage

The results of the beneficiary survey[11] to residents and farmers in the project area on typhoon and monsoon rainfall damages before and after the completion of the project are summarized in Figure 1. The results show that the project has greatly contributed to mitigate flood damages on all items enumerated in the figure, including damage to houses and damage to household goods and furniture.



[11] Beneficiary survey was conducted in three municipalities in the project area, Bayambang, Bautista and Alcala, consisting of 116 barangays. Ten barangays were randomly selected from each municipalities followed by a random selection of six households from each barangay, totaling to 60 households. (Data collection method: hearing investigation)



Source: Results from the beneficiary survey

Figure 1: Comparison of Flood Damage Before and After the Project (N=60)

According to the executing agency, three municipalities, Bayambang, Bautista and Alcala, have benefited most from mitigation of flood damages thanks to this project. The municipality of Bayambang is the center of economic activities in the project area with big market and large population (115,521 people as of 2010). The municipalities of Bautista and Alcala are major agricultural production areas. The Poponto Swamp is reported to effectively function as evacuation area from flood for local residents. In fact, the Poponto Swamp is utilized as a natural flood control basin in the project, therefore, water comes into the basin during times of flooding. As such, the area has been targeted for development, including installation of the Evacuation Mound Centers (EMCs) and elevation of local roads for residents living on agriculture and inland water fishing in the swamp.

According to the interview with the beneficiaries (residents) during filed survey, the area around the closure dike[12] (the municipality of Alcala) has not suffered from flood damage by typhoons and monsoon rainfalls (rainy season: from June to November) any longer after the project completion. There were also such responses indicating that there has been no flood occurrence after the project completion, which has made possible for residents to live in peace, even though they had suffered from flood damages twice or three times a year before the project. Some residents pointed out that the EMCs constructed in the Poponto Swamp have contributed to mitigate flood damages and have been utilized effectively by the local people during times of flooding. Because the Poponto Swamp is always inundated during typhoons and rainy seasons, these EMCs are

[12] Closure dike is a type of dike that blocks the water flow of the main river and to channel the water into a planned diversion. (The project aims to channel 25% of the 10-year return period flood to the main river (1,000m^3/sec) and the rest of 75% to a diversion (3,000m^3/sec) in order to mitigate flood.)

regarded as important facilities for local residents for flood countermeasures.[13]

Closure Dike (taken from side)

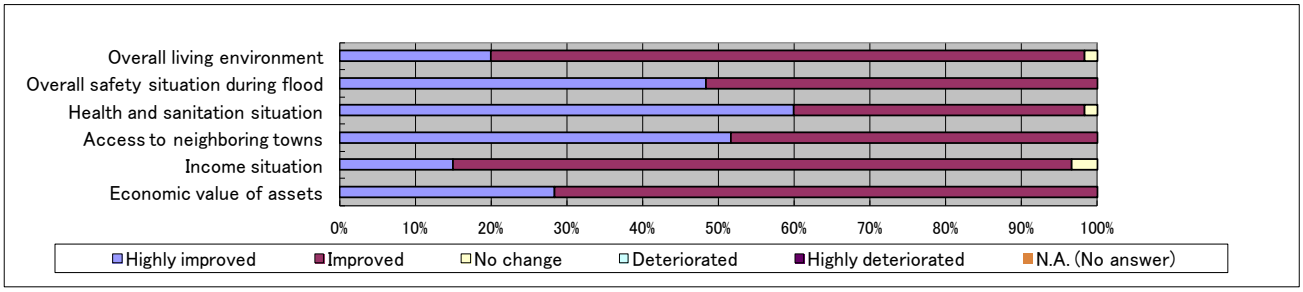
Poponto Swamp

3.3 Impact

3.3.1 Intended Impacts

3.3.1.1 Improvement of Living Environment in the Project Area

Regarding changes of living environment after the project completion, results of the beneficiary survey to local residents and farmers in the project area is summarized in Figure 2. According to the beneficiary survey results, more than 95% of respondents answered that all the items including overall living environment, overall safety situation during flood, health and sanitation situation were "highly improved" or "improved", thus, it can be confirmed that their living conditions after the project completion have improved. Furthermore, as for effects on economic value of assets, all the respondents answered the situation has "highly improved" or "improved."



Source: Results from the beneficiary survey

Figure 2: Respondents' Living Environment After Project Completion (N=60)

[13] For example, local residents nearby the EMC in Manambong Sur pointed out during the field survey that local residents (124 families) evacuated for five days in the EMC at the time of flood in August 2012. It was also pointed out that the EMC was able to avoid inundation when super typhoon Pepeng hit the area in October 2009, and therefore, the EMC has been effectively utilized.

The results of interview survey from the beneficiaries (local residents) during the field survey are shown below. Every respondent showed satisfaction with positive impacts from the project on improvement of living environment (especially increased crop yields and income by the creation of new agricultural lands, and improved stability and predictability of farm work).

- Construction of closure dike has changed alignment of the Agno River, turning a land between the old Agno River and the closure dike into productive agricultural lands. Three barangays[14] (villages) in the municipality of Alcala have largely reaped the benefits of the change and the unused land prior to the project is now in use as agricultural lands.
- After the project completion, crop yields and income have increased[15] since arable areas expanded. Additionally, the project has contributed to secure stability and predictability of farm work and has stabilized living conditions of local residents.
- Local residents' relief of anxiety from flood damages has induced construction of new houses in the area and thus resulted in population increase.

The EMCs in the Poponto Swamp have contributed to provide education and other opportunities such as business, agricultural, and community activities in ordinary times in addition to being effectively utilized as evacuation facilities during times of flooding as mentioned before. For example, the EMC which was visited during the field survey is utilized as nursery school, kindergarten, and elementary school (243 students in total) in ordinary times.[16] Another EMC is used for T-shirt printing business (20 staffs in total).[17] Other EMCs are used as storage of agricultural products (corns, palays, onions, etc.), sports gym, community center, and so on.

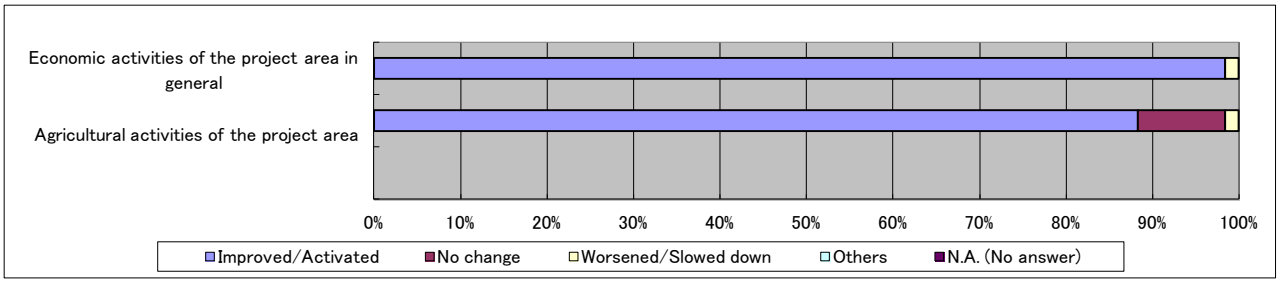
New agricultural land

Manambong Sur EMC

14 Three barangays are Gualsic, Laoac, Anulid.
15 The households interviewed during the field survey pointed out that their income increased by 40 thousand pesos.
16 Manambong Sur EMC
17 Wawa EMC

3.3.1.2 Promotion of Economic and Social Development in the Project Area

Figure 3 summarizes the beneficiary survey results to residents and farmers in the project area regarding the effects on regional economy after the completion of the project. Over 98% of residents responded “economic activities in the project area in general have been improved” and over 88% responded “agricultural activities of the project area has been activated”. Therefore, it can be considered that the project has given positive impact on local economy.



Source: Results from the beneficiary survey

Figure 3: Effects on Economy of the Project Area (N=60)

The results of interview survey to the beneficiaries (local residents) during the field survey include their comments saying “economy and business activity in the village have been activated with increase in the number of shops after the project completion”. As for the influence on agricultural activity, their responses are shown below. They suggest that the project has contributed to the increase in the level of convenience to transfer and to transport agricultural products, which led to activate their agricultural activities.

- Hector Mendoza Bridge constructed by the project has connected the municipalities of Alcala and Bautista even at the time of flood occurrences. Furthermore, with permanent connection between the municipalities of Bayambang, a center of economy in the project area, where markets are located, and Alcala, the agricultural production area, farmers in Alcala have been able to save time, cost and labor for transporting products. Hector Mendoza Bridge has been functioning as farm-to-market road as well.
- The closure dike and the earth dike constructed along the Bayambang floodway by the project have also contributed to improve traffic convenience as well as transport for agricultural products as farm-to-market road.[18]

[18] The family interviewed during the field survey mentioned that it took one hour by bike to get to the nearest highway before the closure dike was constructed but after the project, it takes only 10 minutes.

Hector Mendoza Bridge

Closure Dike (taken from the top)

As regards agricultural production data, Tables 2 and 3 show the yield trend of palay (rice) and corm in the whole Pangasinan Province, respectively. Only the data up to a year after the project completion (February 2011 to 2012) was available at the time of ex-post evaluation, which makes it difficult to judge evident correlation between the data shift and the project. However, yields of palay and corn are, in general, showing an upward trend. It is necessary to get hold of future data in order to see the contribution of the project.

Table 2: Palay Production in Pangasinan Province

	2006	2007	2008	2009	2010	2011	2012
Palay production in the whole Pangasinan Province (metric tons)	976,198	1,011,115	1,027,289	802,108	940,700	958,270	1,057,580
Palay production growth in the whole Pangasinan Province (%)	16.79	3.58	1.60	(21.92)	17.28	1.87	10.36

Source：Bureau of Agricultural Statistics

Table 3: Corn Production in Pangasinan Province

	2006	2007	2008	2009	2010	2011	2012
Corn production in the whole Pangasinan Province (metric tons)	199,227	199,120	211,229	207,528	230,521	249,070	285,180
Corn production growth in the whole Pangasinan Province (%)	5.44	(0.05)	6.08	(1.75)	11.08	8.05	14.50

Source：Bureau of Agricultural Statistics

The shift in farm population in the project area and the whole Pangasinan Province is shown in Table 4. Comparing the farm population in the municipalities of Bayambang, Bautista, and Alcala, which have gained the most benefit from the project, with that of the whole Pangasinan Province, the growth rate of the three municipalities has shown higher

figure (7.11%) than that of the whole Pangasinan Province (5.49%). Because only the data available were for 2009 and 2011, it cannot be concluded that the figures show statistically significant result. The project, however, has contributed to increase farm population and to activate agriculture in the project area.

Table 4: Comparison of Farm Population Shift in the Project Area and those in Pangasinan Province

	2009	2011	Growth from 2009 to 2011
Farm population in project area: the municipalities of Bayambang, Bautista, and Alcala	10,331	11,066	7.11%
Farm population in the whole Pangasinan Province	160,093	168,881	5.49%

Source：Pangasinan Province Statistical Office

3.3.2 Other Impacts

3.3.2.1 Impacts on the Natural Environment

The Environmental Impact Assessment (EIA) was conducted for the project and Environmental Compliance Certificate (ECC) was issued by the DENR in January 1997. The EIA was also carried out for Hector Mendoza Bridge and the DENR issued the ECC in 1996.[19]

According to the executing agency, no particular issue has been observed since the executing agency has made guidance to the contractors to give necessary environmental consideration during project implementation, and the contractors have taken necessary measures[20] based on the EIA.

As regards environmental monitoring during project implementation, a monitoring team (consisting of DPWH, DENR, LGUs of concerned province and municipalities, consultants etc.) conducted monitoring activities every quarter. All project sites including locations where the EMCs were constructed were subject to monitoring, and the results were compiled in quarterly reports. (Major check items were water quality, air quality, noise, landscape, erosion, and river ecology.)

No particular issue has been observed on the natural environment as a result of the environmental monitoring. Although there were some temporary effects, such as issue of muddy waters due to dredging work of the river, and scattering of dust and noise along access roads due to transportation of construction materials by truck, each of them was

[19] According to the executing agency, it was not necessary to conduct new EIA after change of scope. The ECC which has been approved is comprehensive and covers the successive phase for the project in upper river which is currently under preparation by the DPWH.

[20] Concrete mitigation measures were as follows: installation of sand bags to prevent outflow of mud (a measure to mitigate effect on water quality and ecological environment), watering the access road (a measure to mitigate effect on air quality), limiting time for construction work (a measure to mitigate noise), and properly siphoning of dredged materials onto pre-selected areas (a measure to mitigate effect on topography and geology) etc.

minor and remedied in short-term. Moreover, no particular issue on natural environment during construction and after the project completion has been pointed out in the interviews with local residents during the field survey. Furthermore, no particular objection was identified as a result of beneficiary survey (see footnote 11) － 28 respondents out of 60 beneficiaries said that there was temporary effect on natural environment during construction, such as muddy waters, scattering of dust and noise, however, 54 respondents (nearly 90% of the total respondents) answered “natural environment has improved” or “there has been no effect on natural environment after the project completion”.

3.3.2.2 Land Acquisition and Resettlement

The executing agency has carried out procedures for land acquisition and compensation payments following the DPWH’s guideline (Infrastructure ROW Procedural Manual, April 2003) which is based on the Philippines’ regulation. According to the interviews with local residents during the field survey, consultations were conducted including dissemination of information and public hearing regarding the contents of the project prior to its launch. Consultations with landowners regarding compensation payments for land acquisition were carried out on continuous basis. No particular issue have been observed for land acquisition procedures since the process has taken place appropriately including public hearing and consultations based on the Philippines’ regulation.

However, unexpected issues came about in the course of land acquisition. The executing agency had to cope with the situation by design change (changing the alignment of flood control structures etc.). Concretely, some landowners planted trees (mahoganies) in the project site after the project plan was made public－these landowners intended to obtain more compensation. In face of such situation, the executing agency changed the design of structures in order to avoid land owned by landowners who did not agree with the amount of compensation proposed, and to minimize effects of resettlement on local residents.

As a result, the final number of landowners to whom the executing agency paid compensation for land acquisition was 528. Of which, 151 households all moved to neighboring sites which they owned. They were newly identified landowners for relocation due to change of alignment of flood control structures as mentioned above. Because each of them preferred to move to nearby sites which they owned, there was no need for the executing agency to develop alternative sites. (The executing agency coped with the situation by paying compensation for lands and buildings.) Livelihood programs were no longer necessary because their main livelihoods were farming and there was no change in the way of their living. No particular issue was pointed out by residents

regarding land acquisition in the interviews during the field survey.

The executing agency made efforts to gain understanding from residents for implementing the project. In fact, the executing agency has carried out consultations with local residents including those living in the Poponto Swamp through social development survey and the IEC program which were undertaken in the consulting service of the project. Since the Poponto Swamp, in particular, was planned to be used as a natural flood control basin and therefore, water was expected to flow in during times of flooding, the executing agency constructed 23 EMCs which have been elevated by 2.8 to 3.5 meters in order to cope with 10-year return period flood. Furthermore, the IEC program was provided to residents during project implementation in order to enhance awareness for disaster control and to reinforce disaster prevention measures. (See Column 1 for details of the IEC program.)

Column 1: The IEC Program

・ Objective

To gain the understanding of residents about the expected increased flooding in the Poponto Swamp after the project, and to provide support so as to enhance their awareness and strengthen flood prevention measures (flood risk management).

・ Concrete Activities taken place under the program

The IEC program consisted of following two major components: (1) the information campaign on the implementation of the project, and (2) the training for electro-mechanical facilities of the EMCs. As regards (1), on barangay level, target barangays were divided into 6 groups and 6 workshops in total were conducted from 3rd to 17th August 2009, and on municipality level, workshops were conducted in each town hall from 1st to 4th September 2009. As regards (2), targeted barangays were divided in to 6 groups, and basic and advanced training courses were conducted for 6 times respectively from 4th to 20th August 2009. Concrete activities were as follows:

- Survey on existing conditions of the EMC facilities, situation during times of flooding, and disaster prevention activities
  - State of inspection and operation and maintenance of the EMC facilities (generators, electric lights, pumps for ground water etc.)
  - State of utilization of the EMCs during times of flooding as well as ordinary times
  - State of damage during times of flooding (damaged area, water level, duration, etc.)
  - State of disaster prevention activities for flood prevention
- Project information sessions (conducted in 4 municipalities and 23 barangays where

the EMCs were constructed)

- Dissemination of project information
- Enhancement of awareness for disaster prevention activities and management of the EMC facilities
- Sharing information on good practices regarding disaster prevention activities and management of the EMC facilities

➢ Basic and practical training for the EMC facilities

- Utilization, management, and operation and maintenance methodology of the EMCs during times of flooding as well as ordinary times
- Operation and maintenance methodology on the EMC facilities (generators, electric lights, pumps for ground water etc.)

➢ Preparation of manuals and public relations activities of the project

- Preparation of manuals for operation and maintenance of the EMC facilities (electric-mechanical equipments, and sanitary facilities)
- Setting up notice boards for effective utilization of the EMCs
- Education and publicity on project information and project benefits
- Development and dissemination of tools on project information interpretation

・ Progress

Residents in the Poponto Swamp well understood the expected increased flooding after the project completion through the project information campaign. Their understanding and awareness on good practice for flood prevention measures has deepened and their actual prevention measures have been reinforced. It was confirmed through interviews with local residents during the field survey that awareness on flood disaster prevention has been strengthened in that residents have been stockpiling foods and medicines, strengthening attention towards flood forecasting and warning system, and promptly evacuating to the EMCs. Through training on operation and maintenance of electro-mechanical facilities of the EMCs, participants acquired necessary knowledge and skills to cope with maintenance troubles of electrical system and to operate engine and generator set.

・ Reasons why the IEC program is performing well

It can be considered that the IEC program performed well because local residents and the LGUs have gained more benefits than had disadvantage of expected increased flooding in the Poponto Swamp by the project, and the IEC program facilitated communication between the executing agency and local residents, which led local residents' deeper understanding of the project, and thereby support for implementing the project has grown.

＜Benefits＞

- Flood duration has been considerably shortened thanks to the drainage facilities installed in the Poponto Swamp by the project. In 2002, before the project commenced, flood duration in the municipality of Moncada, Tarlac Province, where part of the Poponto Swamp is located, used to be between 1 to 5 months but was reduced to between 2 to 30 days in 2009, after the drainage facilities were installed by the project. (See Table 5)

Table 5: Comparison of Flood Duration in the Municipality of Moncada, Tarlac Province

Nine Barangays in the Municipality of Moncada, Tarlac Province	Flood Duration in 2002 (Number of Days)	Flood Duration in 2009 (Number of Days)
Banaoang East	31	3
Banaoang West	90	7
Baquero Norte	60	30
Baquero Sur	90	30
Calapan	90	14
Camangaan West	150	7
Ablang-Sapang	7	2
Sta.Lucia East	120	30
Sta. Lucia West	60	30

Source：Technical Report on IEC Program (September, 2009)

- 23 EMCs constructed in the Poponto Swamp by the project have been used effectively as evacuation facilities during times of flooding and have also been utilized for other purposes during ordinary times such as school facilities, day care centers, barangay offices, crop storage, community events, business activities and so on. Hence, local residents enjoy benefits of the EMCs during times of flooding as well as ordinary times.
- Through trainings on operation and maintenance of electro-mechanical facilities of the EMCs carried out in the IEC program, local community has become empowered in managing the EMCs. The LGUs have also strengthened ownership to cope with flood control measures.

＜Disadvantage (not clearly recognized by local residents)＞

- Although it was expected that flood would increase in the Poponto Swamp after the

project completion due to the design of the project, local residents do not clearly recognize increase in flood occurrences. They have been suffering from flood every year during rainy season and typhoon season, and flooding has become part of their life. Moreover, thanks to the reduction of flood duration, local residents do not have a sense of additional increase in flood occurrences in particular. As such, it can be considered that disadvantage to local residents in the Poponto Swamp is minimal.

3.3.2.3 Other Impacts

＜Effects of direct hit of a super typhoon in project area during project implementation＞

During the project implementation, a super typhoon, Pepeng, directly hit the project area in October 2009, destroying an approach road to Grade Control Structure, which was constructed during the project. Agricultural lands were damaged by flood. Flood was contained within the areas of floodway thanks to urgent repair by the executing agency. The executing agency has put priority on repairing the approach road utilizing the 2013 operation and maintenance budget.

This project has largely achieved its objectives, therefore its effectiveness is high.

3.4 Efficiency (Rating: ②)

3.4.1 Project Outputs

Comparison of planned and actual project outputs is summarized in Table 6.

Table 6: Comparison of Planned and Actual Project Outputs (Phase II and Phase II-B)

Planned	Actual	Comparison
Civil Works (Phase II and Phase II-B)		
1) Bayambang Stretch Improvement 2) Guide Channel to Bayambang Stretch 3) Social Development for the Poponto Swamp (including construction of EMCs) 4) Resettlement Site Development for 149 households 5) Hector Mendoza Bridge	1) Bayambang Stretch Improvement 2) Guide Channel to Bayambang Stretch 3) Social Development for the Poponto Swamp (including construction of EMCs) 4) Hector Mendoza Bridge	1) Bayambang Stretch※ - Design change (re-alignment of stretch) took place - One of sluiceways not constructed and alternative drainage constructed 2) Guide Channel to Bayambang Stretch ※ - Design change (re-alignment of closure dike, design change of T-Head Spur Dike) took place ※Reasons for scope changes for 1) and2) above : Alignment was changed to avoid ROW issues - to avoid lands owned by landowners who did not agree with the amount of compensation proposed 3) Social Development for the Poponto

		Swamp - 1 EMC (San Vicente) not constructed, which end up in 23 EMCs, instead of 24 EMCs, in total 4) Resettlement Site Development - Not developed (there was no need because 151 households all chose to move to neighboring sites which they owned) 5) Hector Mendoza Bridge - As planned In addition to above, scope was added in order to repair damage due to direct attack of the super typhoon, Pepeng, in October 2009.
Consulting Service (Phase II and Phase II-B)		
1) Review of Detailed Design, Assistance in Tendering, Construction Supervision of the Project 2) Study, Design and Supervision of Social Development Measures for the Poponto Swamp and Resettlement Site Development 3) Preparation of Agno River Watershed Management Development Plan 4) Study on Sediment Balance for Tarlac River 5) Construction Supervision for Hector Mendoza Bridge Project (including environmental management) 6) Tarlac River "Overall" Improvement Works Stud	1) Review of Detailed Design, Assistance in Tendering, Construction Supervision of the Project 2) Study, Design and Supervision of Social Development Measures for the Poponto Swamp 3) Preparation of Agno River Watershed Management Development Plan 4) Study on Sediment Balance for Tarlac River 5) Construction Supervision for Hector Mendoza Bridge Project (including environmental management) 6) Tarlac River "Overall" Improvement Works Study 7) IEC Program	1) As planned 2) Scope deleted - Supervision of Social Development Measures for the Poponto Swamp was deleted due to unavailable GOP fund. 3) As planned 4) As planned 5) As planned 6) As planned 7) IEC Program - Additional scope

Source：Information from JICA at time of appraisal, results from questionnaire surveys, and interview survey results during field survey

There were scope changes and additional scope for the civil works. According to the executing agency, 1) re-alignment of the Bayambang stretch and construction of alternative drainage, and 2) re-alignment of the closure dike, design change of the T-head spur dike took place to avoid Right of Way (ROW) acquisition issues. In other words, such measures were taken in order to avoid lands owned by landowners who did not agree with the amount of compensation proposed, as well as to minimize impact of land acquisition. 3) 1 EMC was not constructed since the local barangay did not wish to set it up. 4) Resettlement site development was not implemented because all 151 households chose to move to neighboring sites where they owned, therefore, site development was no longer necessary.

In addition to the above scope change and additional scope, the following scope was added in order to repair damages caused by a direct attack of the super typhoon Pepeng in October 2009.

- Urgent repair of damaged dikes
- Regrading and widening of existing dikes
- Expanding existing floodways
- Removing sediments etc.

The scope change and additional scope which took place in order to restore typhoon damages are both considered as appropriate.

Agno River after improvement

T-head spur dike

There were changes and additions in consulting services. According to the executing agency, supervision of social development measures for the Poponto Swamp (see Table 6, 2)) was not conducted due to unavailable local fund. As an alternative, the IEC program targeting four municipalities and twenty three barangays (see Table 6, 7)) was newly added to the scope. As explained above, information campaign on the implementation of the project and practical training for electro-mechanical facilities of the EMCs were

provided to the concerned LGUs and local residents in the IEC program. As such, deletion of supervision of social development measures for the Poponto Swamp seems to have no substantial effect on the project.

Inputs for consulting service have increased substantially for Phase II, and decreased for Phase II-B, which are summarized in Tables 7 and 8.

The increase of inputs in consulting service for Phase II was due to the additional supervision work associated with additional scope and changes of civil works, and the increased supervision period (due to interruption of bid evaluation of civil works and delay in land acquisition) as a result of the extended project period. As regards Phase II-B, the main scope was the basic survey, assistance in design and tendering, and construction supervision for Hector Mendoza Bridge. As a result of efficient project implementation including civil works, all the work was completed with less amount of inputs compared with that of the original plan.

Table 7: Comparison of Planned and Actual Consulting Service for Phase II (M/M)

Phase II	Plan	Actual	Comparison
Foreign	254	293	Increased by 39
Local	348	491	Increased by 143
Total	602	784	Increased by 182

Source：Information from JICA at time of appraisal, results from questionnaire surveys, and interview survey results during field survey

Table 8: Comparison of Planned and Actual Consulting Service for Phase II-B (M/M)

Phase II-B	Plan	Actual	Comparison
Foreign	65	65	As planned
Local	285	105	Decreased by 180
Total	350	170	Decreased by 180

Source：Information from JICA at time of appraisal, results from questionnaire surveys, and interview survey results during field survey

3.4.2 Project Inputs

3.4.2.1 Project Cost

Both projects (Phase II and Phase II-B) were regarded as one whole project to carry out analysis on project cost. The total project cost, covering both Phase II and Phase II-B, was initially estimated at 16,654 million yen, of which Japanese ODA loan would cover 9,523 million yen, consisting of 6,734 million yen for Phase II and 2,789 million yen for Phase II-B. In actuality, total project cost was 13,041 million yen, of which Japanese ODA loan provided a total of 9,091 million yen－6,315 million yen for Phase II and

2,776 million yen for Phase II-B－resulting in a lower amount than the initial estimate (78% of the planned amount).

Despite the delay in project implementation schedule and the increase in the outputs, the yen equivalent total amount of project cost decreased mainly because of depreciation of local currency (Philippine peso) during the project implementation period.

3.4.2.2 Project Period

Both projects (Phase II and Phase II-B) were regarded as one whole project to carry out analysis on project period as well. The overall project period, covering both Phase II and Phase II-B, was planned as 144 months as opposed to 185 months including the extended loan period in reality, representing an expansion to 129% of the initial plan. Due to the delay in the schedule, the project involved extension of the loan disbursement period for Phase II in January, 2007–the loan disbursement deadline was extended to March 2010.

Table 9 shows comparisons of planned and actual project period for Phase II and Phase II-B, respectively, and the entire project

Table 9: Comparison of Planned and Actual Project Period

	Planned (at the time of Appraisal)	Actual (at the time of Ex-post Evaluation)	Comparison
Phase II	Sept. 1998*–Apr. 2005 (80 months)	Sept. 1998*–Feb. 2011** (150 months)	Delayed by 70 months
Phase II-B	Mar. 2001*–Jul. 2006 (64 months)	May 2001*–Mar. 2004** (35 months)	Shortened by 29 months
Total	144 months	185months	Delayed by 41 months

* Loan Agreement conclusion date
** With an agreement with the executing agency, project completion is considered at the time when the civil works were completed.

The delay in the implementation schedule was caused mainly by the design change in order to mitigate impact of land acquisition and relocation, as well as delay in construction period associated with change and additional project scope. As mentioned above, the executing agency changed the design in order to avoid lands where landowners planted mahoganies in the project site, and to minimize effects of resettlement. Incomplete documentation by the landowners also caused delays in the land acquisition process. In addition, interruption in bid evaluation for civil works for selection of contractors also delayed the project implementation process.

3.4.3 Results of Calculations of Internal Rates of Return (IRR)

Table 10 summarizes the result of recalculation of the economic internal rate of return (EIRR).

Table 10: Assumption and Results of EIRR Recalculation

	At the time of Appraisal	At the time of Ex-post Evaluation
EIRR	18.7% (Figure at the time of Phase II appraisal) 16.1% (Figure at the time of Phase II-B appraisal: for the entire project including Phase II)	15.8% (For the entire project - Phase II and Phase II-B)
Benefit	Expected amount of total flood damages mitigated (Amount of damage caused by 10-year return period flood or less)	Expected amount of total flood damages mitigated (Amount of damage caused by 10-year return period flood or less) *
Cost	Cost required to implement the project and increased O&M cost due to the project	Cost required to implement the project and increased O&M cost due to the project
Project Life	50 years after project completion	

* Utilized the same assumption with that at the time of appraisal for percentage of rise.

The recalculated figure for the entire project－Phase II and Phase II-B－became 15.8%, a little lower than the one at time of the appraisal (16.1%), which falls within the scope of the original assumption.

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

3.5 Sustainability (Rating: ②)

As regards sustainability of the project, recent changes in overall disaster prevention sector in the Philippines (enactment and enforcement of the new Act and the administrative instruction) are taken up in Column 2. This section analyzes project sustainability, taking into account such changes.

3.5.1 Institutional Aspects of Operation and Maintenance

The Project Management Office-Agno Flood Control System (PMO-AFCS) is responsible for operation and maintenance of flood control facilities and bridge constructed by the project. The PMO-AFCS is the local subordinate office under the Project Management Office-Flood Control (PMO-Flood Control [21]), a project

[21] The PMO-Flood Control, located in Manila, was established in January 11, 2013 with the DPWH Special Order No.17. (The previous Project Management Office-Major Flood Control and

management office of the DPWH. Under the PMO-AFCS, technical section in charge of operation and maintenance is deployed, along with management, financial and accounting sections. At the time of ex-post evaluation, 18 staffs out of total of 42 staffs in the PMO-AFCS were engineers responsible for operation and maintenance of the project.

Those staffs responsible for operation and maintenance of the project are also in charge of operation and maintenance of flood control facilities which were constructed by the Agno and Allied Rivers Urgent Rehabilitation Project, a Japanese ODA loan project, and moreover, they have also participated in implementation of the project. In this respect, it can be regarded that mechanism has been secured to maintain coherency and consistency between project implementation, and its operation and maintenance. Therefore, there is no particular problem observed in the institutional aspects of operation and maintenance of flood control facilities and bridges constructed by the project.

The LGUs are in charge of operation and maintenance of 23 EMCs in the Poponto Swamp. The Memorandum of Agreement (MOA) has been signed among the DPWH, heads of each city and barangay where the EMCs are constructed, and the EMCs have been officially handed over to each barangay from the DPWH－for 12 EMCs located in Tarlac Province in June 2005, and for 11 EMCs located in Pangasinan Province in March 2012. No particular issue has been identified on institutional aspects of the operation and maintenance of the EMCs－the LGUs have been undertaking operation and maintenance of the EMCs proactively and their supervision and budget allocation have been conducted by the Mayor's Office, based on the MOA.

3.5.2 Technical Aspects of Operation and Maintenance

The PMO-AFCS's 9 out of 18 engineers, who are in charge of operation and maintenance of the project, are veterans with experiences of more than 30 years on average. Other technical staffs also have rich experiences with average of around 10 years. They have participated in the project implementation and are knowledgeable about issues for considerations on operation and maintenance of the project, therefore, no particular issue is identified for technical capacity of the operation and maintenance staffs in the PMO-AFCS. Furthermore, as part of the consulting service of the project, 4 operation and maintenance staffs in the PMO-AFCS have participated in study tour to Japan and acquired necessary skills on maintenance of flood control facilities.

As regards operation and maintenance of the EMCs, 52 staffs from related LGUs (4 municipalities and 23 barangays) participated in the IEC program and had trainings on

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Drainage Projects, Cluster I and Cluster II merged to formulate the PMO-Flood Control.) The PMO-AFCS is under the administrative supervision of the DPWH Regional Office I. The PMO-Major Flood Control and Drainage Projects, Cluster II, requested the assistance of the PMO-AFCS in the implementation of the Agno River Flood Control Project, Phase II.

maintenance and troubleshooting of electro-mechanical facilities, and maintenance of engine and generator set. The training was conducted smoothly, and therefore, no particular problem was observed in technical aspect of operation and maintenance of the EMCs.

3.5.3 Financial Aspects of Operation and Maintenance

The annual operation and maintenance costs associated with the project are first estimated by the PMO-AFCS, then estimation will be reviewed by the PMO-Flood Control in Manila. Once approved, the budget is drawn out from the DPWH headquarters' ordinary budget and allocated to the PMO-AFCS.

As Table 11 shows, requested operation and maintenance budget for the project has been fully secured each year after the project completion (since 2011), and therefore, no particular issue has seen at the time of ex-post evaluation.

Table11: O&M Budget Allocation for the Project (Note 1)

Year	Requested Amount (mil. pesos)	Allocation (mil. pesos)
2011	16.10+238.06 (Note 2)=254.16	254.16
2012	16.10	16.10
2013	32+355 (Note 3)=387.00	387.00

Source：Results from questionnaire surveys, and interview survey results during field survey

Note 1) The figures include operation and maintenance budget for Agno and Allied Rivers Urgent Rehabilitation Project

Note 2) In addition to ordinary operation and maintenance budget (16.1 million pesos), budget for repair (238.06 million pesos) was requested in order to repair damaged dike and bank protection etc. by monsoon rainfalls and typhoons (excluding Pepeng in October 2009)

Note 3) In addition to ordinary operation and maintenance budget (32 million pesos), budget to repair damaged dike and bank protection etc. by typhoon Pepeng, and removal of sediments (355 million pesos) was requested

The operation and maintenance cost indicated in Table 11 (including operation and maintenance costs for the Agno and Allied Rivers Urgent Rehabilitation Project, Japan's ODA loan project) includes not only ordinary operation and maintenance costs (daily maintenance of equipments and facilities, flood control activities, and other related costs) but also costs to repair damaged dikes and bank protection etc. caused by monsoon rainfalls and typhoons for the years 2011 and 2013. These budgets for repairs have been fully secured, which indicates that DPWH has prioritized budget allocation to this project. In addition, budget for urgent repairs from possible flood damages caused by heavy typhoons is to be allocated from the DPWH's Calamity Fund, which the funding source is separately categorized from the annual allocation of operation and maintenance budget.

On the other hand, the operation and maintenance cost for the EMCs are to be coped

with by each relevant LGU, however, required budget has not necessarily been secured. At the EMC sites during the field survey, some LGUs pointed out that there is no prospect for securing necessary budget to repair water supply system and generator set. Although situation varies depending on each LGU's financial status, some LGUs seem to be suffering from lack of funding. As one of financial sources for the LGUs, Local Disaster and Risk Reduction and Management Fund (LDRRMF) was newly established (see Column 2), which is expected to facilitate the LGUs to ensure securing necessary operation and maintenance budget for the EMCs. However, it is too early to make judgment on the actual enforcement of the Fund at the time of ex-post evaluation since it will depend on the operation and budget plan of the EMCs to be reflected in the Local Disaster and Risk Reduction and Management Plan (LDRRMP) (see Column 2)－the LDRRMP is expected for finalization in October 1, 2013. While the EMC construction cost accounted for small percentage of the whole project cost, it is important to secure necessary operation and maintenance costs for what the LGUs have committed in a sustainable manner, considering that the overall LGU's participation in sustainability of flood control projects is expected to increase, with steady enforcement of the Disaster Risk Reduction Management Act.

3.5.4 Current Status of Operation and Maintenance

The super typhoon Pepeng hit the project area in October 2009 and destroyed the approach road of the Grade Control Structure (GCS[22]) and dikes constructed by the project. The LGU (the municipality of Bautista) had undertaken urgent repair to the damaged approach road of the GCS but the road remained as a gravel road, and was not fully repaired at the time of ex-post evaluation. The PMO-AFCS intends to prioritize 2013 budget allocation to fully repair the GCS approach road (with concrete) and dikes. In fact, the GCS has been utilized by local residents for crossing. As urgent measures for residents, hanging bridge was constructed right next to the GCS after the Pepeng typhoon hit the project area.

The PMO-AFCS conducts periodic inspection and maintenance work such as removal of vegetation, soil and stone as well as cleaning of channels and diversions. Additionally, non-regular inspection and maintenance works are carried out every time typhoons or monsoon rainfalls approach the project area and the PMO-AFCS prioritizes inspection in important places such as dikes and guide channels. Furthermore, the PMO-AFCS monitors the status of sediments and obstacles. In emergency situation, urgent repair of damaged facilities is conducted using the Calamity Fund as mentioned above.

[22] Grade control structures are used to stabilize waterways, thereby reducing channel bed erosion and scouring.

The LGUs are responsible for the operation and maintenance of the EMCs, based on the MOA which stipulates the transfer of the property from the DPWH to respective LGUs. However, in 2 EMCs where site visit was conducted, water supply system and generator set were not functioning. As mentioned above, prospect for securing necessary budget for repair is uncertain and thus the current situation may continue.

Some uncertainties have been observed in terms of financial aspects of operation and maintenance, therefore sustainability of the project effect is fair.

Grade Control Structure

Hanging bridge

Column 2: Disaster Risk Reduction and Management (DRRM) Act of 2010 (RA 10121)
(Changes in Overall Disaster Prevention Sector in the Philippines and Effects on the Project)

In the Philippines, the DRRM Act has come into force in May 2010, and its administrative instruction has come into force in September 2010. The DRRM Act is a proactive regulation that substantially revised the previous Disaster Control Act (PD1566) which focused on measures during and after the occurrence of disasters. The new Act emphasizes the importance of forecasting and undertaking prior measures for possible future disaster risks (enhancing preparedness for risk and disaster prevention). The Act continues to point out the importance of taking prompt measures when disasters occur and undertaking adequate correspondence for restoration after the disaster. By the Act, establishment of Disaster Risk Reduction and Management Councils (DRRMCs) is obligated from the national level to the barangay level, and a hierarchy system is formed as shown in Figure 4.[23]

[23] The rate of organization for each DRRMC at each level is high since DRRMCs were reorganized based on the existing "Disaster Coordination Council"－prior to the DRRM Act, "Pangasinan Disaster Coordination Council" was in place which was enhanced into "Pangasinan DRRMC" after the enactment of the Act.

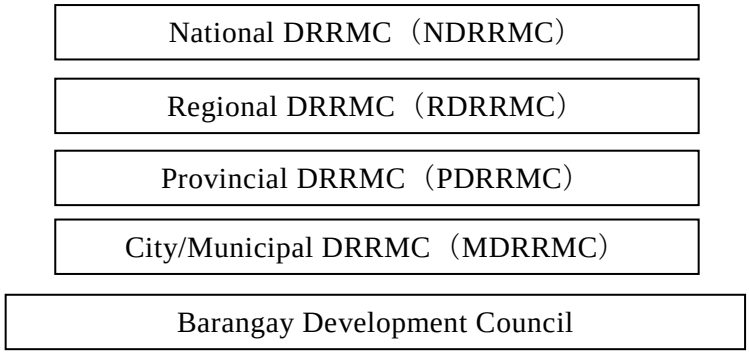

Figure 4: DRRM Structures[24] under the DRRM Act

With the enactment of the Act, budget allocation structures for the LGUs was revised, and the Local Disaster and Risk Reduction and Management Fund (LDRRMF) was established, which enables budget allocation focusing on preventive measures in advance. In addition, the Joint Memorandum Circular regarding the allocation and practical use of the LDRRMF has been signed in March 2010.[25] In concrete terms, based on the Local Disaster and Risk Reduction and Management Plan (LDRRMP) which the LGUs establish, more than 5% of Internal Revenue Allotment would be secured as the LDRRMF, and the LGUs would be able to apply up to 70% of the LDRRMF to allocate funds for prior measures. The rest of the 30% of the LDRRMF will be used for costs to cope with urgent measures when disasters occur.[26]

The PDRRMC in Pangasinan Province has organized a technical working group for disaster prevention management, consisting of a governor, provincial government and concerned organizations, the DPWH, the DENR, the Army, the Navy, the Police, the Coast Guard, the Fire Department and NGOs etc. as members. Its main activities focus on proactive measures including preparation of disaster prevention plans, disaster prediction and analysis, dissemination of disaster prevention activities and knowledge (providing trainings and seminars), sending out disaster related information, evacuation and rescue activities, securing and storing medicine and food and so on. Furthermore, as part of environmental advocacy program, the technical working group is committed to comprehensive watershed conservation activities such as participating in cleaning up the river, flood control facilities and drainage facilities, reforestation, and environmental education. In addition, the PDRRMC in Pangasinan Province undertakes disaster prevention measures and watershed conservation activities in collaboration with the Disaster Risk Reduction and Management Council (DRRMC) of each

[24] National/Regional/Provincial/Municipal Disaster Risk Reduction and Management Council (NDRRMC/RDRRMC/PDRRMC/MDRRMC)

[25] Joint Memorandum Circular was signed by three organizations: National DRRMC, Department of Budget and Management and Department of Interior and Local Government.

[26] The previous Disaster Control Act (PD1566) focused on budget measures after the occurrence of disasters.

city/municipality and Development Council of each barangay.

On the other hand, according to the PDRRMC in Pangasinan Province, necessary budget for the activities has not been adequately secured even though the budget system has changed. The PDRRMC has especially emphasized the importance of securing budget for restoration of dikes, flood control and conservation activities in the upper reaches of the Agno River.

With the enforcement of the DRRM Act, awareness of local residents and concerned parties for proactive disaster preventive measures have steadily enhanced, and disaster prevention activities have also been activated even in barangay level. However, although the budget system has been revised under the new Act, enough budget has not been secured to carry out necessary activities, and each DRRMC seems to be conducting activities within its limited budget.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project aims to reduce flood damage in the project area by constructing flood control facilities and conducting the IEC program for the LGUs and residents. Mitigation of flood damage has been achieved by the project－construction of floodway and diversion structures, river improvement, and construction of bridges－and the results of local interview and beneficiary survey have shown local residents' satisfaction to the benefit of the project. The project has also contributed to the improvement and enhancement of the people's living environment, and the economic and social development. In light of this, the project is deemed as to have yielded positive effectiveness and impacts in various ways. In addition, the IEC program conducted in the project has drawn much attention as a good practice which had promoted awareness of the LGUs and local residents for disaster prevention and enhancement of disaster prevention measures. The project objective to contribute to the reduction of flood damage, enhancement of people's living environment and sanitation situation, and development of local economy and society is consistent with Philippines' development plan and development needs, both at the time of appraisal and the ex-post evaluation, as well as Japan's ODA policy at the time of appraisal, therefore its relevance is high. Project efficiency is fair because while the project cost was lower than planned, the project period was longer than planned. As regards operation and maintenance, some uncertainty has been observed in terms of financial prospects of the LGUs, therefore sustainability of the project effect 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

Importance of Providing Advice and Guidance to the LGUs

The LGUs are responsible for operation and maintenance of the EMCs constructed by the project, based on the MOA which stipulates the property transfer from the DPWH to the LGUs. However, all the LGUs have not been able to secure necessary budget for the operation and maintenance of the EMCs in that there would be cases in the future where the EMCs may not function properly when damaged by heavy typhoons. Basically, each LGU should be responsible for the operation and maintenance of the EMCs and it should secure necessary budget using the newly established LDRRMF. It is also important that the executing agency fully understands the system for the LDRRMF, and to keep providing guidance to the LGUs in order to facilitate their utilization of the Fund to secure necessary budget. Notwithstanding that, in case some LGUs cannot secure necessary budget, which may bring about the possibility that the basic function and effectiveness of the EMCs would be ruined, the executing agency should consider financial arrangements for such LGUs. (For instance, allocating a part of the DPWH's annual operation and maintenance budget to the LGU). Considering that the overall participation of the LGUs in sustainability of flood control projects is expected to increase, with the enforcement of the DRRM Act, it is crucially important to secure sustainable operation and maintenance structures for which the LGUs are responsible.

4.3 Lessons Learned

Importance of Introducing the IEC Program in Flood Control and Water Resource Management Projects

When the executing agency prepares projects on flood control and water resource management in the future, it would be important to incorporate the IEC program (conducting disaster prevention activities such as disaster drills and first aid, installing disaster prevention equipments, providing seminars, training and environmental education at schools, tree planting, cleaning up flood control and drainage facilities etc.) to enhance awareness and reinforce preparedness for flood prevention measures in the project area. Furthermore, initiatives to strengthen flood forecast capacity through Japan's grant aid and technical cooperation have contributed to raise awareness of the LGU and local residents on disaster prevention. These various initiatives are considered to have generated synergy and have led to implement this project, duly incorporating the IEC program. It is important that the executing agency incorporates such soft components in the project scope during project preparation, prior to proceeding with project approval process, from the point of view of securing necessary budget and resources (experts etc.), facilitating smooth project implementation, and enhancing project effectiveness.

[END]

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1.Project Outputs	1) Bayambang Stretch Improvement 2) Guide Channel to Bayambang Stretch 3) Social Development for the Poponto Swamp (including construction of the EMCs) 4) Resettlement Site Development for 149 households 5) Hector Mendoza Bridge Consulting Service: 1) Review of Detailed Design, Assistance in Tendering, Construction Supervision of the Project 2) Study, Design and Supervision of Social Development Measures for the Poponto Swamp and Resettlement Site Development 3) Preparation of Agno River Watershed Management Development Plan 4) Study on Sediment Balance for Tarlac River 5) Construction Supervision for Hector Mendoza Bridge Project (including environmental management) 6) Tarlac River "Overall" Improvement Works Study	1) Design change (re-alignment) took place 2) Design change (re-alignment) took place 3) One EMC not constructed 4) Not developed 5) As planned Consulting Service: 1) As planned 2) Supervision of Social Development Measures for the Poponto Swamp was deleted 3) As planned 4) As planned 5) As planned 6) As planned 7) Additional scope: IEC program
2.Project Period	Phase II: Sept. 1998–Apr. 2005 (80 months) Phase II-B: Mar. 2001–Jul.2006 (64 months) Total 144 months	Phase II: Sept. 1998–Feb. 2011 (150 months) Phase II-B: May 2001–Mar.2004 (35 months) Total 185 months
3.Project Cost Amount paid in Foreign currency Amount paid in Local currency Total Japanese ODA loan portion Exchange rate	 8,451 million yen 8,203 million yen (2,434 million pesos) 16,654 million yen 9,523 million yen Phase II: 1 peso＝3.5 yen (As of Sept. 1997) Phase II-B: 1 peso＝2.8 yen (As of Jan. 2000)	 9,091 million yen 3,950 million yen (1,739 million pesos) 13,041 million yen 9,091 million yen 1 peso＝2.3 yen (Average between Jan. 1998 to Nov. 2009)

[END]

Republic of the Philippines

Ex-Post Evaluation of Japanese ODA Loan Project
Bago River Irrigation System Rehabilitation and Improvement Project

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

0. Summary

With an aim to increase agricultural production, this project rehabilitated the Bago River Irrigation System while strengthening irrigator's associations for smooth operation and maintenance (O&M) in Negros Occidental Province located in the western part of Negros Island. Both at the times of project appraisal and ex-post evaluation the project is consistent with the development policy of the Philippines as seen in the irrigation development policy. Similarly, the project is consistent with the needs of the Philippines, such as to increase agricultural production. As a result of the rehabilitation of a weir, main, and secondary canals by the project, almost 80% of the targets were achieved for cropped area and benefited area. Target was achieved for rice output, and moreover, targets were exceeded for per-hectare yield of rice, gross annual farm income, and irrigation service fee collection rate. Based on the beneficiary survey, positive project impacts are observed, including high level of satisfaction and increase in come among farmers. Although the project period was slightly longer than planned, the project cost was lower than planned. No major problems are observed in the institutional, technical, and financial aspects of the O&M carried out by the executing agency. In light of the above, the project is evaluated to be highly satisfactory.

1. Project Description

Project Location

Rehabilitated Secondary Canal

1.1 Background

Negros Occidental Province is located in the western part of Negros Island, the central part of

the Philippine. In the 1970s the province was known for sugar cane production and exports. In the early 1980s, however, international sugar prices dropped, and the economy stagnated in the province. Although rice was another main crop grown in the province, its production could not keep pace with consumption. One of the main reasons was the aging of irrigation systems. The "Bago Irrigation System," the largest in the province, was more than 30 years old. There were problems with water management as well as O&M. It had low capacity to distribute irrigation water, and as a result, benefited area diminished. In particular, flood and erosion were serious problems. The Bago River, which runs through the center of the irrigation system, would flood and wash away the main canal tunnels. Thus there was an urgent need to rehabilitate the water canals and thereby rebuild the irrigation system.

The Bago Irrigation System has a designed area of 13,277ha, which accounts for one-quarter of the total irrigated area (52,335ha) overseen by the National Irrigation Authority (NIA)'s the Sixth Division (NIA-6)[1]. Considering its scale, rehabilitating the Bago Irrigation System and strengthening the institutional aspects of O&M were viewed important in increasing agricultural production in Negros Occidental Province.

1.2 Project Outline

The objective of this project is to increase irrigated area and agricultural production by rehabilitating the aging Bago Irrigation System and by strengthening irrigator's associations, thereby contributing to improving farmers' incomes and alleviating poverty.

Loan Approved Amount/ Disbursed Amount	3,224 million yen / 2,990 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 2002 / March 2002
Terms and Conditions	< Construction> Interest Rate: 2.2% Repayment Period: 30 years (Grace Period: 10 years) Conditions for Procurement: General Untied <Consulting Service> Interest Rate: 0.75% Repayment Period: 40 years (Grace Period: 10 years) Conditions for Procurement: Bilateral Untied

[1] Panay (4 provinces), Guimaras Island (Guimaras Province), and Negros Occidental Province

Borrower / Executing Agency(ies)	The Government of the Philippines / National Irrigation Administration (NIA)
Final Disbursement Date	February 2010
Main Contractor (Over 1 billion yen)	China International Water & Electric Corporation (China)
Main Consultant (Over 100 million yen)	NTC International Co., Ltd. (Japan) / KRI International Corp. (Japan) / Hydroterre Consultants, Inc. (the Philippines)
Feasibility Studies, etc.	F/S, NIA, 1999
Related Projects	Dispatch of Irrigation Management Transfer (IMT) expert (September 2010 – September 2012)

2. Outline of the Evaluation Study

2.1 External Evaluator

Kenichi Inazawa, Octavia Japan Co., Ltd.

2.2 Duration of Evaluation Study

Duration of the Study: September 2012 – July 2013

Duration of the Field Study: 11-24 November 2012, 31 March – 6 April 2013

3. Results of the Evaluation (Overall Rating: A[2])

3.1 Relevance (Rating:③[3])

3.1.1 Relevance to the Development Plan

The Philippines was under Arroyo administration at the time of project appraisal. The government was implementing the Medium-Term Philippine Development Plan (2001-2004) with an ultimate goal to reduce poverty. A number of priority areas were identified in the plan, including: (1) macroeconomic stabilization and sustainable economic development; (2) social development, and human resource development; (3) rural development; and (4) correction of disparities among regions. With a view of reducing poverty, the plan placed a special emphasis on developing economic and social infrastructures as well as supporting the poor, who accounts for 34%[4] of the population.

At the time of ex-post evaluation, the Government of the Philippines is implementing the

[2] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory
[3] ③: High, ② Fair, ① Low
[4] Data from 2000

Medium-Term Philippine Development Plan (2011-2016). In this plan, development of infrastructures, including irrigation facilities for the whole regions in the country, is recognized as one of the key strategies for economic growth. Concerning agricultural development, the plan emphasizes the need to develop irrigation facilities so as to increase agricultural production and farmers' income levels. In addition, the Ministry of Agriculture of the Philippines has developed the Food Staple Self-Sufficiency Program (2011-2016). Pointing out that rice production is not keeping pace with consumption in the Philippines, the program urges the importance of increasing rice acreage, per-hectare yield, and output. It stresses that irrigation facilities need to be rehabilitated and developed in order to increase irrigated area. In view of the above, the project remains consistent with the development policy of the Philippines.

3.1.2 Relevance to the Development Needs

At the time of project appraisal, the Bago Irrigation System, the largest in Negros Occidental Province, was more than 30 years old. There were many problems with water management and O&M. It had low capacity to distribute irrigation water, and as a result, benefited area was shrinking. The Bago River, which runs through the center of the irrigation system, would flood and erode the main canal tunnels. Thus there was an urgent need to rehabilitate the irrigation canals thereby redevelop the irrigation system.

As a result of the rehabilitation of a weir, main, and secondary canals by the project, farms in the area served by the Bago Irrigation System ("the Bago irrigation area") now receive stable water supply with efficient distribution of irrigation water. Through the ex-post evaluation it was learned that NIA was planning to expand the irrigated area of the Bago Irrigation System further from 2013 onwards[5]. Additionally, the Provincial Government of Negros Occidental continues to make efforts toward increased rice production and stable food self-sufficiency based on their Program for Agricultural Production Improvement and Food Security developed in 2010. In view of the above, the project remains consistent with the development needs of the Philippines at the time of ex-post evaluation.

3.1.3 Relevance to Japan's ODA Policy

Based on the Official Development Assistance (ODA) Charter of Japan endorsed by the Cabinet and the Medium-Term Policy on Official Development Assistance issued in 1999, JICA developed the Medium-Term Strategy for Overseas Economic Cooperation Operations in 1999. This strategy lays out overall policy directions and priority areas for Japanese ODA loans. In the

[5] NIA is planning to self-finance the irrigation development covering 600ha.

strategy the following fields were identified as priorities: (1) making economies more resilient and overcoming constraints in order to achieve sustainable growth (e.g., appropriate macroeconomic management, reinforcing industrial structures, and developing economic infrastructures); (2) poverty alleviation and correction of regional disparities; (3) environmental protection and disaster prevention; and (4) human resource development and system building. In 2000 another document was issued by JICA entitled, "The Assistance Program for the Philippines." It aims to reduce poverty and correct regional disparities while emphasizing the importance of infrastructure development in agriculture and rural development.

This project supports infrastructure development in the Philippines, which aims to stabilize food supply, to end poverty, and to correct urban-rural disparities. It is clearly in line with the priorities described above, and thus the project is consistent with the assistance policy of Japan.

In light of the above, the project has been highly relevant with the country's development plan, development needs, as well as Japan's ODA policy; therefore its relevance is high.

Figure 1: Project Location

3.2 Effectiveness[6] (Rating:③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

・Data concerning Irrigated Area and Increase in Agricultural Production in Project Area

At the time of ex-post evaluation, rice is harvested 5 times in 2 years in the project area (the Bago irrigation area)[7]. The Bago River divides the irrigation system into two parts: the north and the south parts of the river. When double cropping is practiced in the north side, triple cropping is practiced in the south side. In the following year, the practice is switched between the north and the south: triple cropping is practiced in the north while double cropping in the south[8]. Table 1 shows the changes in cropped area, benefited area[9], per-hectare yield, output, gross farm income per hectare, and irrigation service fee collection rate.

Table 1: Data concerning Irrigated Area and Increase in Agricultural Production
(actuals at project appraisal, after project completion, and targets after project completion)

Indicator	Crop Type	Actual				Target
		2002 (At Project Appraisal)	2010 (Upon Project Completion)	2011 (1yr after Project Completion)	2012 (2yrs after Project Completion)	2012 (2yrs after Project Completion)
1) Cropped area (ha)	Rice (Wet season[10])	8,900	9,374	9,117	N/A	11,485
	Rice (Dry Season)	8,500	8,000	9,180	8,972	11,351
	Sugar Cane	170	N/A	N/A	6.5	390
2) Benefited area (ha)	Rice (Wet season)	6,893	9,374	9,076	N/A	10,759
	Rice (Dry Season)	6,101	7,991	9,180	8,945	10,495
	Sugar Cane	170	N/A	N/A	N/A	390
3) Per-hectare yield (ton/ha)	Rice (Wet season)	3.2	4.64	3.78	N/A	3.7
	Rice (Dry Season)	2.5	3.74	3.32	4.35	4.2
	Sugar Cane	75	N/A	N/A	N/A	80
4) Outputs of major crops (ton/year)	Rice (Wet season)	21,446	43,556	34,382	N/A	37,555
	Rice (Dry Season)	20,403	29,894	30,519	38,909	38,950
	Sugar Cane	12,600	N/A	N/A	N/A	27,550
5) Gross farm income per hectare (peso/ha/year)		41,779	100,651	85,352	N/A	61,359
6) Irrigation service fee collection rate (%)		40	45.35	48.36	67.02	60

Source: JICA document (actuals at the time of project appraisal, targets after project completion) and responses to the questionnaire (actuals after project completion)

The analysis of the data in Table 1 is found below:

[6] Sub-rating for effectiveness is to be put with consideration of Impact.
[7] According to NIA, rehabilitation of the weir and irrigation canals enabled the upgrading from double cropping to multiple cropping.
[8] This alternation system allows longer fallow period and thereby would prevent soil degradation and erosion.
[9] According to the executing agency, “cropped area” refers to an area where rice is planted out of the irrigable area served by the Bago River. “Benefited area” refers to the area with a yield of more than 2 tons per hectare out of the cropped area. (i.e., Benefited area never exceeds cropped area.)
[10] The wet season is from May to early November while the dry season is from mid November to April.

1) Cropped Area and Benefited Area

As shown in Table 1, cropped area is larger at the time of project completion (2010) than it was at the time of project appraisal. It is because the project, through the weir rehabilitation and concrete-lining of main and secondary canals, made the opening-and-shutting of the floodgate easier at the weir. The project also made water distribution to irrigation farms more efficient (i.e., improved water speed and less delay in water distribution). Cropped area two years after project completion was 9,117ha in the wet season 2011 and 8,972ha in the dry season 2012, achieving 79.3% (target for wet season 2011: 11,485ha) and 79.0% (target for dry season 2012: 11,351ha) of the targets respectively. Benefited area was 9,076ha in the wet season 2011 and 8,945ha in the dry season 2012 two years after project completion, achieving 84.4% (target for wet season 2011: 10,759ha) and 85.2% (target for dry season 2012: 10,495ha) of the targets respectively. Bad weather had a considerable influence on these results. According to the Negros Occidental Province Irrigation Management Office (NOIMO) under NIA-6, the province suffered from unstable rainfall and temperature throughout the year starting from the dry season 2011 until the dry season 2012. This caused crop acreage to decrease across the province, which also affected the Bago irrigation area.

With regard to sugar canes, cropped area was 6.5ha in 2012, which is below the target. This is mainly because rice is currently more profitable for farmers in the Bago irrigation area. As mentioned earlier, rice can be harvested 5 times over a 2-year period now, while sugar canes can be harvested only once a year[11]. It is also because farmers started to see the advantages of cultivating rice as the project brought stable water supply to the area. Furthermore, with multiple cropping, farmers can better manage weather-related risks and volatility in profits.

Figure 2: Before and After the Rehabilitation of Main Canal

[11] More precisely, sugar canes have a 10-11 month cycle from planting to harvest. They are used to make sugar, other food, and ethanol.

Figure 3: Before and After the Rehabilitation of Secondary Canal[12]

2) Per-Hectare Yield

Regarding per-hectare yield, target was met in the wet season 2011. In the wet season 2012 the actual yield exceeded the target. According to NOIMO, per-hectare yield is expected to improve even further with the introduction of rice seeds more resistant to natural hazards. Data on per-hectare yield was not available for sugar canes.

3) Outputs of Major Crops

Rice output is determined by cropped area and yield per hectare (i.e., output is cropped area multiplied by per-hectare yield). Target was met in the dry season 2012. In the wet season 2010 target was exceeded. Although rice output dropped in 2011 (1 year after project completion) as compared to the previous year, it was due to bad weather. Data on output was not available for sugar canes.

4) Gross Farm Income per Hectare

Target was almost achieved for gross farm income per hectare in 2010-2011 as it will be explained below. Essentially, gross farm income per hectare is determined by two factors: output and farm gate price.[13] (i.e., Gross farm income per hectare is output multiplied by farm gate price.) In Negros Occidental Province farm gate price of rice grew at the rate of 5.96% per year[14] over the period of 2002-12. Applying this 5.96% to the target for 2012 (61,359 peso/ha) and calculating the increment up to 2012 (2 years after project completion), one can estimate an adjusted (assumed) target, which is 104,000 peso/ha. Comparing this adjusted (assumed) target to the actuals shown in Table 1, which are 100,651 peso/ha (2010) and 85,352 peso/ha (2011), one can see that 96.8% and 82.1% of the target was achieved respectively. Thus it can be said

[12] The photos of Figure 2 and 3 were provided by NIA.
[13] The farm gate price is calculated based on price index, such as agriculture price statistics and wholesale market price statistics.
[14] Source: Philippines Bureau of Agricultural Statistics (BAS)

that the project is contributing to the improvement in farmers' incomes in the Bago River Irrigation area.

5) Irrigation Service Fee Collection Rate

The irrigation service fee collection rate has been increasing since the project appraisal. Then in 2012, it exceeded the target of 67.02%. According to NOIMO, it was thanks to the training and workshops[15] which were given to irrigator's association members. Through the training association members learned about effective ways to collect irrigation service fees and how to work more efficiently. As a result, the institutional aspects of the associations were reinforced. In addition, associations began to take irrigation service fee collection more seriously as they progressed to Model No.1 and No.2 of the Irrigation Management Transfer (IMT). (IMT will be discussed in more detail in 3.5.1.) According to the interviews, farmers residing in the project area rightly understand the importance of paying irrigation service fees for proper usage and maintenance of irrigation facilities.

3.2.2 Qualitative Effects

・The Level of Satisfaction and Increase in Rice Output

Questionnaire-based interviews were conducted with farmers residing in the Bago irrigation area during the evaluation study ("beneficiary survey"). The sample size of the beneficiary survey was 100[16], out of which 54 were drawn from the north side of the Bago River while 46 from the south side of the river. As mentioned above, the river runs across the Bago irrigation area, dividing the area into the north and the south parts. The survey targeted rice farmers who have been cultivating rice since before project completion in the Bago irrigation area.

Figure 4 shows farmers' satisfaction levels. The level of satisfaction is generally high among farmers with the majority responding that they were either "very satisfied" or "satisfied" with the project. Figure 5 suggests that the high level of satisfaction can be attributed to the project as many respondents mentioned sufficient water supply and efficient water distribution through rehabilitated canals as the reasons for their satisfaction. Figure 6 shows that for the majority of farmers rice output either "largely increased" or "increased" after the rehabilitation of water canals. Most of the respondents said that it was because water supply improved as shown in Figure 7, suggesting that the project is greatly contributing to increasing rice production in the project area.

[15] It is one of the project outputs. Refer to the "Efficiency" section under "Output."
[16] A total of 7,700 farming households reside in the area served by the Bago River Irrigation System.

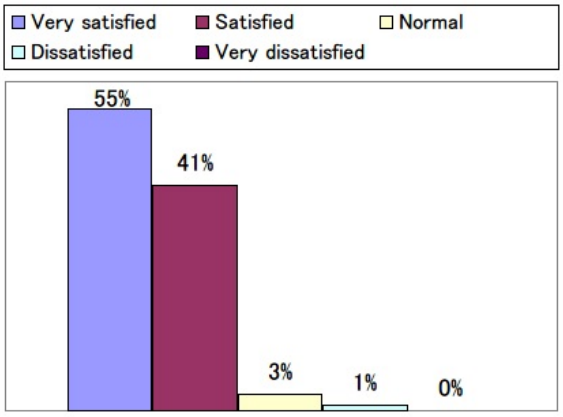

Figure 4: Are you satisfied with the project?

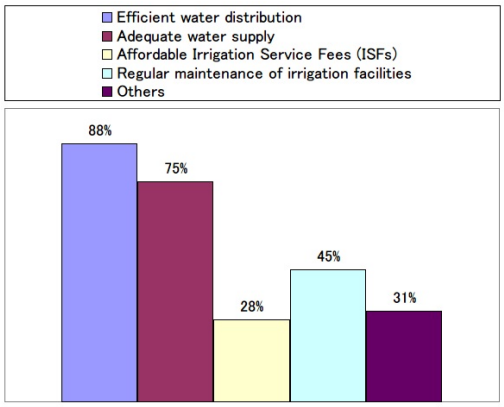

Figure 5: Why are you "very satisfied" or "satisfied" with the project?
(multiple answers allowed)

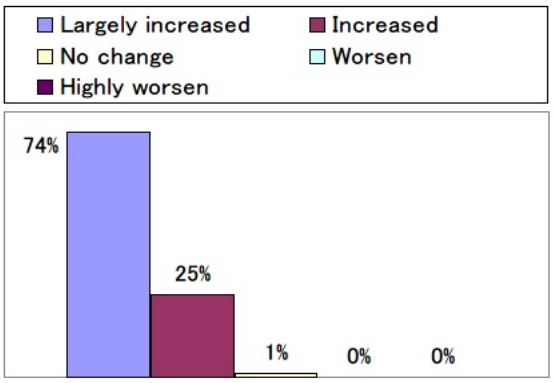

Figure 6: Did rice production (output) increase after the rehabilitation of water canals?

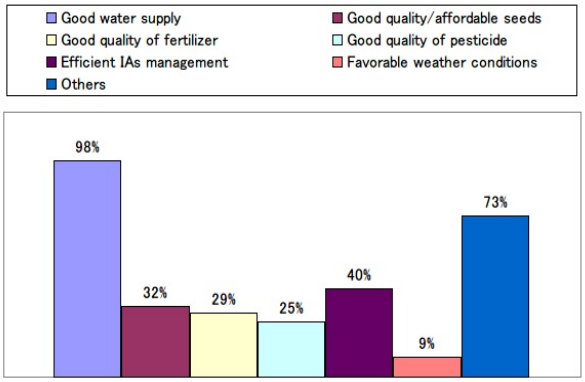

Figure 7: Why do you think rice production "largely increased" or "increased"?

3.3 Impact

3.3.1 Intended Impacts (increase in agricultural income and poverty alleviation)

The beneficiary survey was also designed to measure project impacts other than effectiveness and qualitative effects. The results are found below.

Figure 8 shows the result on income level. The majority of interviewees responded that their incomes either "largely improved" or "improved." In addition, their living standards seem to have improved along with the incomes as seen in Figure 9. How their living standards improved are shown in Figure 10. Many of the respondents pointed to the improvement in diet and housing, better education for children, and purchasing of vehicles, including automobiles and motorbikes. It seems that beneficiaries enjoy choices and options in their lives now as compared to before the project implementation. Interviewees were also asked whether they were satisfied with the current living environment although it might not be directly linked to the project. As shown in Figure 11 and Figure 12, beneficiaries are generally satisfied with the living

environment.

The above results suggest that the project is playing an important role in the betterment of farmers' lives in the Bago irrigation area.

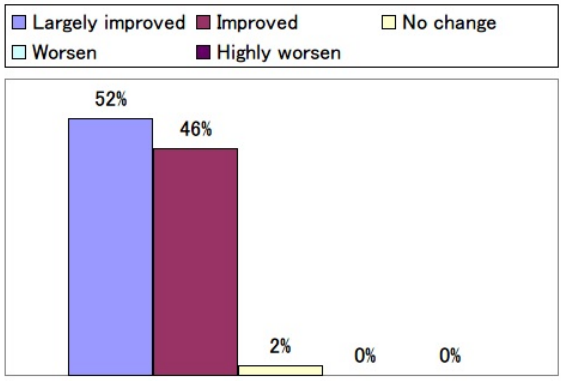

Figure 8: Did your income improve as compared to before the project?

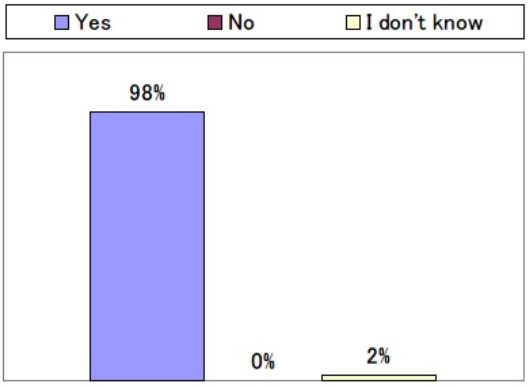

Figure 9: Did your living standard improve along with the income?

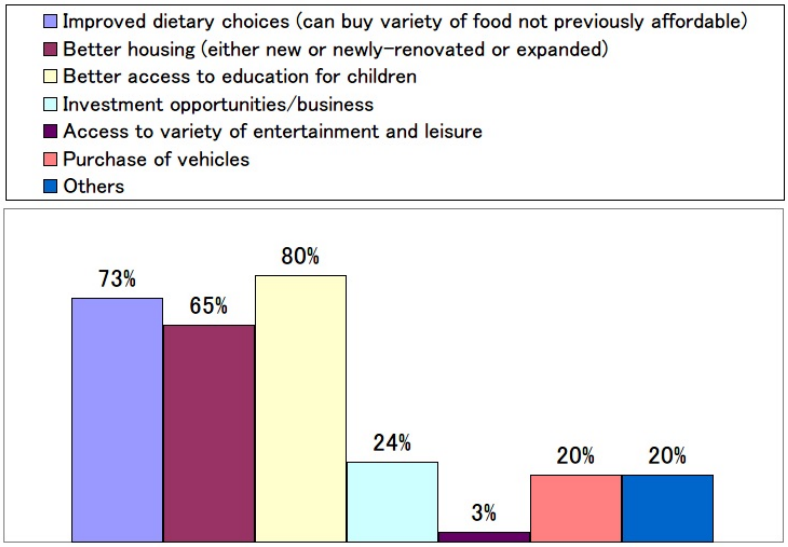

Figure 10: Reason(s) for answering "yes" to the question in Figure 9 (multiple answers allowed)

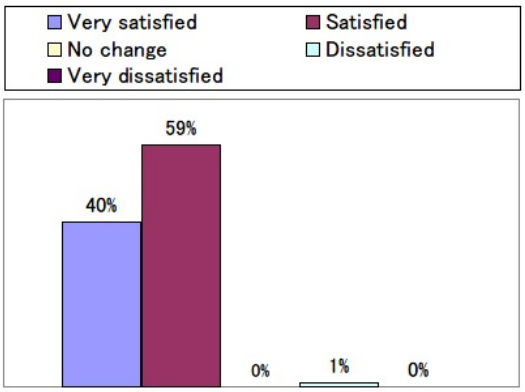

Figure 11: Are you satisfied with the current living environment?

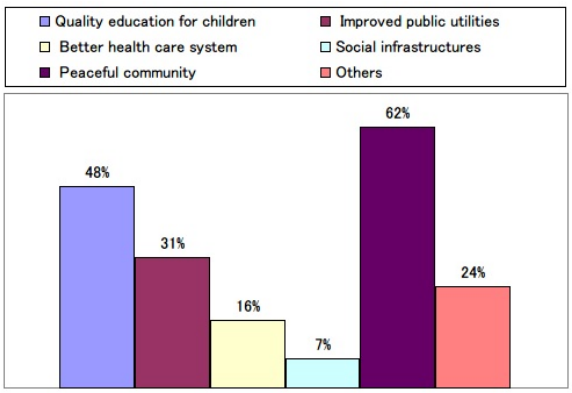

Figure 12: Reason(s) for answering "very satisfied" or "satisfied" to the question in Figure 11 (multiple answers allowed)

3.3.2 Other Impacts

3.3.2.1 Impacts on the Natural Environment

For the tunnel construction an open-cut construction method was planned. This method excavates from the surface, lays a culvert[17], and covers it with soil. For the temporal placement of soil the project needed to secure 30ha of farmland. Thus compensate was required for the land and missed crops. Similarly it was the responsibility of the project to restore the farmland after the construction. According to NIA, compensation was to be paid before project completion based on the market values of land and crops[18]. The interviews and field visits confirmed that the compensation was paid during project implementation indeed. According to NIA, although negotiations with the landowners took time, there was no problem with the process itself. While it was not possible to verify the exact amount of compensation (data was not available), it was confirmed through the interviews that compensation was paid at rates slightly higher than market values of relevant commodities, such as trees, fruits, and vegetables. (According to NIA, farmers agreed on the proposed rates during the negotiation. NIA also stated that payment was made without delay.) It was also confirmed through the evaluation study that the farmland has been duly restored.

The project needed to obtain the Environmental Compliance Certificate (ECC) from the Department of Environment and Natural Resources (DENR) for the tunnel construction. In fact, NIA duly received ECC from DENR as planned before project commencement[19].

DENR and other related institutions formed a team and conducted environmental monitoring regularly during project implementation. At each stage (before project commencement, during implementation, and after the commencement of O&M), environmental monitoring plans were developed with key information, such as responsible body, frequency, and budget. In fact, monitoring was carried out as planned. Within NOIMO, O&M Engineering Division is in charge of environmental monitoring to date. They monitor items, such as air pollution, dust caused by passing vehicles, and water pollution. According to the interviews, no problems have been observed on these items in the project area.

3.3.2.2 Land Acquisition and Resettlement

As the project needed to resettle squatters (105 households) residing inside the project area, NIA secured approximately 5ha of land before project implementation and built housings and

[17] It is a structure used to lay irrigation canals underground.
[18] The negotiation with landowners began at the time of project commencement.
[19] NIA obtained ECC in March 2002. As it will be explained later in the "Efficiency" section under "Output," there was a design change from tunnels to culverts, as a result of which NIA renewed ECC in February 2005.

while developing necessary infrastructures, such as access roads, school, piped water, sewage, and church. The resettlement was carried out based on the Resettlement Action Plan (RAP). The squatters moved out based on the mutual agreement with NIA, and no complaints have been received thus far. Therefore, no major problems are observed in the resettlement[20].

Figure 13: Rehabilitated Main Canal

Figure 14: Rehabilitated Weir and Bago River

(Conclusion on Effectiveness and Impact)

Due to bad weather, only about 80% of the targets set at project appraisal were achieved for cropped area and benefited area in 2012 (two years after project completion). On the other hand, target was exceeded for per-hectare yield of rice, while target was close to being achieved for rice output. The actual irrigation service fee collection rate was 67% in 2012, which is higher than the target rate of 60%. For gross farm income per hectare, target set at appraisal was close to being achieved based on the estimation, Furthermore, positive project impacts, such as improved rice output, incomes, and living standards, are observed according to the beneficiary survey. In view of the above, this project has largely achieved its objectives; therefore its effectiveness is high.

[20] The City Government of Bago constructed electricity supply facilities for these squatters. Currently, the city government is managing the site by patrolling the area and listening to the resettlers.

3.4 Efficiency (Rating: ②)

3.4.1 Project Outputs

The planned and actual outputs of the project are shown in Table 3.

Table 3: Planned and Actual Project Outputs

Plan (At Project Appraisal)	Actual (At Ex-Post Evaluation)
1) Construction Work ■ Rehabilitation of Existing Irrigation System (designed area: 13,277ha) ・Rehabilitation of weir accessories ・Construction of main canal tunnels: 1,600m ・Rehabilitation of main canals: 30.31km ・Rehabilitation/lining of some secondary canals: 95.29km ・Repair of service roads: 120.81km ■ Water Management Improvement ・Diversion work ・Intake structures for terminal canals 2) Institutional Development ■ Training and workshop for the members of irrigator's association (17 groups) and staff of NIA's Bago River Irrigation System Office in order to strengthen organizational operation and functions 3) Consulting Service ■ Main TOR: detailed design, preparation of procurement document, assisting bid evaluation, construction management, and support in environmental monitoring as well as training of irrigator's associations and NIA's System Office. Total: 331MM	1) Construction Work ■ Rehabilitation of Existing Irrigation System (service area: 12,529ha) ・Rehabilitation of weir accessories: as planned ・Construction of main canal tunnels: 1,532m (tunnels were changed to closed conduits) ・Rehabilitation of main canals: 29.86km ・Rehabilitation/lining of some secondary canals: 108.77km ・Repair of service roads: 177.78km ■ Water Management Improvement ・Diversion work: as planned ・Intake structures for terminal canals: as planned 2) Institutional Development ■ Training and workshop were held as planned for irrigator's associations and NIA's Bago River Irrigation System Office (currently known as NOIMO). 44 associations participated. (Although 17 groups existed at the time of project appraisal, they have been divided into smaller groups.) 3) Consulting Service ■ As planned. Total: 447.82MM (International:139.88MM, Local: 307.94MM) 【Additional Output】 ・Construction of irrigator's association offices (10m2): 44 offices (for 44 associations) ・Construction of rice drying and storage facilities: 2 places ・Buffalo wallows: 49 places

There were some deviations from the original outputs. Explanations are found below.

1) Construction Work

There is a difference of 750ha between designed area (13,277ha) and service area (12,529ha). It is because some non-farm land, such as roads and houses, was included in designed area, whereas it is excluded from service area.

Tunnels along main canals (1,600m) were changed to closed conduits (1,532m). This change was made because the strata of the sites were found to be loose at the stage of detailed design. In

addition, closed conduits are less costly than tunnels. Considering all aspects, it was deemed feasible to change the construction method to closed conduits.

With regard to the rehabilitation and concrete-lining of some parts of secondary canals, more kilometers were covered than planned because irrigator's associations and farmers requested to expand the project area. NIA considered this request reasonable.

2) Institutional Development

Training and workshops were held as planned for irrigator's associations and NIA's Bago Irrigation System Office (currently known as NOIMO). The purpose was to enhance the institutional aspects and to improve irrigation service fee collection. The number of irrigator's associations was 17 before the project, which increased to 44 during project implementation. It is because associations were considered too large in size to implement the planned measures for institutional enhancement. According to the interview with NOIMO, "associations were divided up to optimize organizational functions. As a result, training and workshops were carried out more efficiently. (i.e., Trainers/facilitators were able to get to know the participants better, and the participants could concentrate on the sessions thanks to the small group size.)"

3) Consulting Service

For consulting services, more man-months were required than planned due to the delay in construction, which will be discussed later in the "Project Period" section under "Project Input."

4) Additional Outputs

Some outputs were added after project appraisal in order to accommodate the requests from irrigator's associations and farmers. Office buildings were constructed for irrigator's associations as shown in Table 3 because the number of associations increased from 17 to 44 during implementation. Rice drying and storage facilities were constructed because farmers were burdened with expensive services of private operators before project implementation. It was believed that such burden would be relieved if drying facilities were constructed inside the Bago irrigation area. Additionally, Buffalo wallows (see Figure 16) were constructed because it was worried that buffalos, as they typically used main and secondary canals for bathing, might get trapped in concrete-lined canals after the project. The wallows are designed to allow buffalos to go in and out easily for the purpose of bathing.

Figure 15: Institutional Enhancement
(Photo provided by NIA)

Figure 16: Example of Additional Output
(Buffalo Wallow)

3.4.2 Project Inputs

3.4.2.1 Project Cost

The actual project cost was 3,504 million yen (out of which 2,990 million yen was in ODA loan) as compared to the plan of 4,298 million yen (out of which 3,224 million yen was in ODA loan). Thus it is less than planned (82% of the planned amount). One reason is that international competitive bidding enabled an efficient procurement of contractors. Another reason is that tunnels were changed to closed conduits for main canals (change of construction method) as explained above, saving project cost.

3.4.2.2 Project Period

The project period was planned to be 5 years and 9 months (69 months) from March 2002 to November 2007. On the other hand, the actual project period was 8 years and 4 months (100 months) from March 2002 to June 2010, which is longer than planned (145% of the planned period). The reasons are as follows: (1) It took time for the technical review of construction methods at the stage of detailed design; (2) Contractor selection was delayed; (3) Currency fluctuations during project implementation delayed the budget allocation by the central government; (4) Unreasonably bad weather caused delays in construction schedule; (5) Preparation for the institutional enhancement training required longer time because the number of irrigator's associations increased from 17 to 44; and (6) Construction work for the additional outputs lasted until June 2010 although the original outputs were completed in August 2009. The duration of consulting services was extended in accordance with the delay in construction.

Although the project cost was within the plan, the project period slightly exceeded the plan; therefore efficiency of the project is fair.

3.4.3 Results of Calculations of Internal Rates of Return (IRR)

Economic Internal Rate of Return (EIRR)

The economic internal rate of return (EIRR) of the project is 10.04% when recalculated by considering increase in yield (rice and sugar canes) as a benefit, construction and maintenance expenses as costs, and the life of 50 years. It is slightly lower than the rate estimated at the time of project appraisal, which is 14.00%, because the actual cropped area and benefit area were slightly smaller than what was estimated at the time of project appraisal.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

The executing agency of this project is NIA. It is NOIMO under NIA-6 that is responsible for O&M concerning the project. In addition to O&M of the Bago Irrigation System, NOIMO collects irrigation service fees from affiliated irrigator's associations while supporting them with institutional reinforcement.

NOIMO has 37 employees at the time of ex-post evaluation. Under the leadership of Representative Director (Head), two departments (Department of Operation, Maintenance and Engineering, and Department of Administration and Finance) are responsible for O&M of the project facilities, irrigation service fee collection, procurement, and accounting. NOIMO's Operation and Maintenance Division (11 staff members) is in charge of O&M of the project outputs, such as the weir, main canals, secondary canals, and service roads. Irrigator's associations are also responsible for O&M of some outputs based on their abilities, which will be discussed later in the "Irrigator's Associations and IMT." NOIMO's Operation and Maintenance Division (11 members) is composed of well-experienced staff[21], and the staffing level is deemed sufficient.

【Irrigator's Associations and IMT】

With a view to improving national irrigation systems, NIA launched IMT in 2008 to transfer responsibilities of irrigation maintenance to irrigator's associations in stages. Irrigator's associations would sign four-phased IMT contracts with NIA (Model No.1-4) according to their maintenance abilities[22]. NIA would then transfer maintenance-related functions, such as

[21] The team seems to be well-organized; staff members patrol around the project sites every day and address problems in a timely manner by communicating among themselves using mobile phones. It was also observed that they maintain good relationships with irrigator's associations by communicating as appropriate.

[22] The higher the model number is, the greater the responsibilities of irrigator's associations would be, and the higher the required levels of maintenance abilities would be.

irrigation facility maintenance and collection of irrigation service fees, to associations based on IMT contracts.

Irrigator's associations carry out tasks, such as cleaning of canals and protective walls, de-weeding, de-silting, and small repairs (e.g., repair on cracks in protective walls) as per IMT contacts. Out of 44 irrigator's associations that exist in the Bago irrigation area, 35 associations are at the stage of Model No.1 while 9 are at the stage of Model No.2 as at November 2012[23]. Table 4 summarizes the roles and responsibilities of NIA-6, NOIMO, and irrigator's associations (Model No.1 and No.2)[24].

Table 4: Roles and Responsibilities of NIA, NOIMO, and Irrigator's Associations (IMT Model No.1 & No.2)

<table>
<tr><td colspan="2">NIA-6</td></tr>
<tr><td colspan="2">Responsible for supervising and guiding NOIMO.</td></tr>
<tr><td colspan="2">NOIMO</td></tr>
<tr><td colspan="2">Responsible for O&M of the entire Bago Irrigation System and irrigation service fee collection. It is to supervise and support 44 irrigator's associations in an effort to realize effective O&M and efficient fee collection based on IMT contracts.</td></tr>
<tr><td colspan="2">Irrigator's Associations within the Project Area</td></tr>
<tr><td>【Model No.1】
While NOIMO is responsible for managing the entire irrigation system, irrigator's associations are tasked to:
(1) maintain canals of designated or extended sections by de-weeding, removing trash, lubricating gate hoisting machines, and doing temporary repairs for canal overflows;
(2) monitor water levels and flows at designated places, submit data on irrigated and cropped areas; and
(3) issue and send water bills while promoting irrigation service fee payment and assisting fee collection[25].</td><td>【Model No.2】
While NOIMO is responsible for managing main canal system, from the intake weir to secondary canal intake gates, irrigator's associations are in charge of the management of secondary canals, secondary diversion canals, and all terminal facilities. Associations are tasked to:
(1) distribute water fairly in the area served by secondary canals;
(2) submit data on irrigated and cropped areas to NOIMO;
(3) prepare and send water bills;
(4) collect irrigation service fees; and
(5) transfer collected irrigation service fees to NOIMO.</td></tr>
</table>

Before the project commencement irrigator's associations had low participation rates because

[23] As for the associations that are in IMT Model No.2, their performance is currently being observed and monitored by NOIMO as they progressed to this level as recently as August 2012. Their performance will be monitored into the first half of 2013, and the new transfer and/or modification will be considered based on the results.

[24] Information was taken from JICA's document. At the stage of Model No.3 "NOIMO manages the main canal from the intake weir to the first intake gates for the secondary canals, while irrigator's associations manage all the downstream system. NOIMO collects irrigation service fees at pre-agreed seasonal rates (different rates for the dry season and the rainy season)." At the stage of Model No.4, "NOIMO transfers the responsibility of managing the entire irrigation system to irrigator's associations. NOIMO merely provides technical support for effective maintenance and fund for facility repair/restoration upon requests from associations." At the time of the ex-post evaluation, none of the irrigator's associations in the project area have progressed to No.3 or No.4.

[25] Depending on the interests and capacities of irrigator's associations, they also take responsibility for irrigation service fee collection.

water distributed through irrigation canals was insufficient. Similarly, not many farmers were willing to pay irrigation service fees or enthusiastic about cultivating before the project. Sufficient irrigation water became available following the project completion. In addition, farmers became increasingly willing to take charge in maintenance work as a result of the introduction of IMT according to the interviews.

3.5.2 Technical Aspects of Operation and Maintenance

Many training and workshops have been offered to NOIMO employees after project completion in an effort to enhance staff skills. For example, lecturers were invited from the Department of Social Welfare and Development (DSWD) to hold sessions on organizational development and efficiency improvement. Additionally, an ODA loan expert, dispatched by JICA from August 2010 to August 2012 after project completion, organized training sessions for many NOIMO employees and association members. The topics covered were water distribution management, financial management, irrigation service fee collection, and IMT implementation & evaluation[26]. When interviewed during the evaluation study, training participants commented, "The training was useful in improving O&M skills. While associations progressed to IMT Model No.1 and No.2, the topics covered in the training turned out to be practical and useful for day-to-day tasks." The work of this JICA expert is also utilized for training of new employees through on-the-job training (OJT). During project implementation, on the other hand, irrigator's association members were trained on O&M through the "Institutional Development" sub-component of the project, when interviewed, leaders of irrigator's associations gave positive comments about the training, such as this: "Organizational enhancement training gave us a chance to re-acknowledge the importance of O&M in irrigation management. The training content was highly relevant, and it is useful for association management." NOIMO's O&M Division has many experienced employees, and irrigator's associations have members who are well-equipped with maintenance skills. Maintenance work, the details of which will be described later in "3.5.4 Current Status of O&M," is carried out without problems. In light of the above, no major problems are observed in the technical aspects of O&M carried out by NOIMO employees and irrigator's association members.

3.5.3 Financial Aspects of Operation and Maintenance

Table 5 shows NOIMO's O&M budgets for the past 3 years. It has been increasing since

[26] There were 7 training sessions in 2011 with a total of 210 participants. In 2012 there were 9 sessions with 159 participants in total.

project completion, and thus no major problems are observed in the financial aspects. Figure 17 shows fund flows concerning collected irrigation service fees, O&M budget, and budgets allocated to irrigator's associations. Collected irrigation service fees flow into the national treasury, which is in turn paid out to NOIMO via NIA as O&M budget. O&M budget can be categorized into salaries and O&M costs. "Regular budget" shown in Table 5 is used for routine maintenance, fuel, utilities, and repairs. According to the interview with NOIMO, the level of regular budget has been sufficient to carry out the necessary maintenance work. In addition, there is the National Irrigation Management Fund (NIMF). This special purpose money is allocated to NIA's Head Office for the following purposes: (1) monetary compensation for association members who carry out cleaning and de-weeding of irrigation canals; and (2) incentive bonuses for associations with high irrigation service fee collection rates.

Now that all irrigator's associations have progressed to IMT Model No.1 or No.2 in the project area, they can access additional fund from NIMF depending on there performance in irrigation service fee collection. It is provided as an incentive bonus on top of the budget allocated for cleaning and de-weeding of irrigation canals. The amount of incentive is determined by the amount of fees collected by irrigator's associations, and it is only granted if the fee collection rate of 56% or higher is achieved in case of IMT No.1 and 65% or higher in case of IMT No.2. Moreover, incentives are paid at higher rates for associations that are at the stage of IMT Model No.2. This means that associations are rewarded more if they progress from Model No.1 to Model No.2. This incentive bonus is designed to be used for training and purchasing of machines and equipment. It was not possible to verify or evaluate the actual uses of O&M budgets by irrigator's associations as data was not available on associations' finances.

Table 5: NOIMO's O&M Budget

(Unit: thousand pesos)

		2010	2011	2012
Salaries		4,101	5,553	5,430
O&M Costs	Regular Budget	2,764	2,135	2,982
	NIMF	N/A	3,047	4,578
Total		6,865	10,736	12,990

Source: questionnaire responses

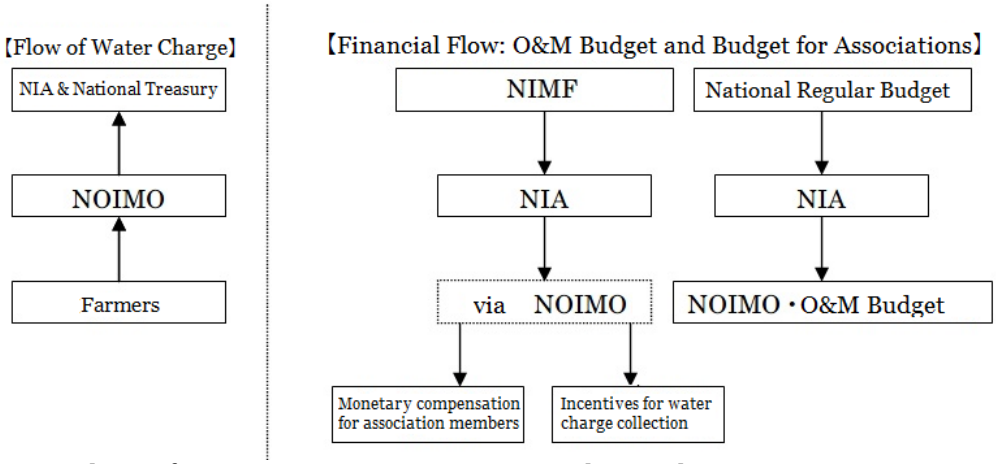

Figure 17: Flows of Irrigation Service Fees, O&M Budget, and Irrigator's Association Budget

3.5.4 Current Status of Operation and Maintenance

No problems were observed through the field study in the status of maintenance of the weir, main and secondary canals, and service roads. The facilities are being utilized properly. Concerning the weir developed by the project, NOIMO is monitoring and adjusting the volume of discharged water, conducting necessary maintenance, and opening and shutting the intake weir as needed. NOIMO operates and maintains the entire main and secondary canals in case of IMT Model No.1. In case of IMT Model No.2, NOIMO manages limited sections of main canals, from the intake weir to the intake gates of the secondary canals. (The tasks include: distribution of irrigation water and opening-shutting of sluice-gate for diversion canals.) Irrigator's associations are responsible for maintaining secondary canals, secondary diversion canals, and all terminal facilities. (The tasks include: cleaning and de-silting of canals, channels, and ditches). No major problems are observed in the status of O&M based on field visits and interviews. Regarding the service roads, NOIMO is graveling and repairing them as needed.

NOIMO procures spare parts based on the annual procurement plan that they develop. Although O&M staff normally works 8 hours a day from Monday to Friday, they come into work on weekends if needed. As for the weir, full-time maintenance staff is always present (24 hours a day, 365 days a year) at an adjacent office as it could require urgent attention.

No major problems have been observed in the O&M system; therefore sustainability of the project effect is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

With an aim to increase agricultural production, this project rehabilitated the Bago River Irrigation System while strengthening irrigator's associations for smooth operation and maintenance (O&M) in Negros Occidental Province located in the western part of Negros Island. Both at the times of project appraisal and ex-post evaluation the project is consistent with the development policy of the Philippines as seen in the irrigation development policy. Similarly, the project is consistent with the needs of the Philippines, such as to increase agricultural production. As a result of the rehabilitation of a weir, main, and secondary canals by the project, almost 80% of the targets were achieved for cropped area and benefited area. Target was achieved for rice output, and moreover, targets were exceeded for per-hectare yield of rice, gross annual farm income, and irrigation service fee collection rate. Based on the beneficiary survey, positive project impacts are observed, including high level of satisfaction and increase in income among farmers. Although the project period was slightly longer than planned, the project cost was lower than planned. No major problems are observed in the institutional, technical, and financial aspects of the O&M carried out by the executing agency. In light of the above, the project is evaluated to be highly satisfactory.

4.2 Recommendations

(Recommendations to the Executing Agency)

NOIMO is currently monitoring the activities of irrigator's associations which have progressed to IMT Model No.1 or No.2 by signing IMT contracts. It is recommended that NOIMO examine the status of O&M and irrigation service fee collection thereby carefully evaluate the performance of associations under Model No.1. If the monitoring and evaluation results suggest that associations are ready for higher levels of responsibilities, the upgrade to Model No. 2 should be processed in a timely manner. With more associations progressing to Model No.2, NOIMO would have less O&M burden. Moreover, it would nurture ownership of irrigator's associations and open up new possibilities for them. Consequently, it would motivate farmers to cultivate and help attain higher irrigation service fee collection rates.

4.3 Lessons Learned

JICA's ODA loan expert conducted a series of training and workshops for NOIMO staff after project completion. According to the interviews, training given by this expert was well received

not only by NOIMO staff but also by irrigator's association members as it contributed to improving irrigation service fee collection in the project area. It is believed that the work of this expert has successfully motivated irrigator's association members to collect irrigation water fees. It has also contributed to the improvement in fee collection methods. The assistance reinforced the project's effort to strengthen the institutional aspects of irrigator's associations. It was also effective in improving the practice of irrigation service fee collection. Therefore, a lesson can be drawn that it is possible to enhance projects effects by providing relevant follow-up assistance such as this after project completion.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1.Project Outputs	[Construction Work] 1) Rehabilitation of the existing irrigation system (designed area: 13,277ha) a) Rehabilitation of weir accessories b) Construction of main canal tunnel: 1,600m c) Rehabilitation of main canals: 30.31km d) Rehabilitation/lining of some secondary canals: 95.29km e) Repair of service roads: 120.81km 2) Water Management Improvement a) Diversion work b) Intake structures for terminal canals [Consulting Service] Total: 331MM (International:119MM, Local:212MM)	[Construction Work] 1) Rehabilitation of the existing irrigation system (service area: 12,529ha) a) Rehabilitation of weir accessories: as planned b) Construction of main canal tunnel: 1,532m (tunnel was changed to closed conduit) c) Rehabilitation of main canals: 29.86km d) Rehabilitation/lining of some secondary canals: 108.77km e) Repair of service roads: 177.78km 2) Water Management Improvement a) Diversion work: as planned b) Intake structures for terminal canals: as planned [Consulting Service] Total: 447.82MM (International: 139.88MM, Local: 307.94MM) 【Additional Output】 a) Construction of irrigator's association offices ($10m^2$): 44 offices (for 44 associations) b) Construction of rice drying and storage facilities: 2 places c) c) Buffalo wallows: 49 places
2.Project Period	March 2002 – November 2007 (69 months)	March 2002 – June 2010 (100 months)
3.Project Cost		
Amount paid in Foreign currency	1,199 million yen	2,492 million yen
Amount paid in Local currency	3,099 million yen	1,012 million yen
Total	4,298 million yen	3,504 million yen
Japanese ODA loan portion	3,224 million yen	2,990 million yen
Exchange rate	1US Dollar ＝ 122 JPY 1peso＝2.3JPY (as at March 2002)	1peso＝2.23 JPY (Average over the project period)

Republic of the Philippines

Ex-Post Evaluation of Japanese ODA Loan Project
"Laoag River Basin Flood Control and Sabo Project"

External Evaluator: Masumi Shimamura
Mitsubishi UFJ Research and Consulting Co., Ltd.

0. Summary

This project aims to reduce flood damage in the project area by constructing flood control facilities. Mitigation of flood damages has been achieved by the project－construction of sabo dams, spur dikes, and construction and restoration of earth dikes－and the results of local interview and beneficiary survey have shown local residents' satisfaction to the benefit of the project. The project has also contributed to the improvement and enhancement of the people's living environment, and the economic and social development. In light of this, the project is deemed as to have yielded positive effectiveness and impacts in various ways. The project objective to contribute to the reduction of flood damage, enhancement of people's living environment and sanitation situation, and development of local economy and society is consistent with Philippines' development plan and development needs, both at the time of appraisal and the ex-post evaluation, as well as Japan's ODA policy at the time of appraisal, therefore its relevance is high. Project efficiency is fair because both project cost and project period exceeded the plan. As regards operation and maintenance, some concerns have been observed in the state of operation and maintenance, therefore sustainability of the project effect is fair.

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

1. Project Description

Project Location

Sabo dam

1.1 Background

The Philippines is exposed to severe geographical and climatic conditions. Approximately twenty typhoons out of around thirty, occurring on the Pacific Ocean every year, approach the country and around ten of them land. Frequent earthquakes and volcanic eruptions also occur in the country as well. In addition to this, the people in the country frequently suffers from fierce flood and mudslides during rainy seasons because of the country's social and economic conditions that urban areas have developed in flat and low-lying, flood-prone areas. Such disasters have become serious impediments to socioeconomic development in the Philippines, and steady countermeasures are needed to control flood and mudslides.

The Laoag River flows through the Province of Ilocos Norte in northern Luzon. It is one of the Philippines' major rivers, draining 1,332 km^2 (approximately the same area as the drainage basin of the Oi River in Japan, which is 1,240 km^2). In the Laoag River drainage basin, floods and sand deposits caused by typhoons were an annual occurrence. Damage was often especially severe in farming areas that were essential to the economy of Ilocos Norte, and about 1,000 hectares of farmland have been lost over the past twenty years. A number of stopgap measures have been implemented to deal with this situation, such as the construction and repair of dikes, but the problem remained unsolved and comprehensive efforts were urgently needed to control flooding.

These backgrounds at that time have shown urgent necessity for flood damage mitigation in the project area by implementing this project in order to improve living environment and sanitation situation[1] of residents and to achieve socioeconomic development of the Laoag River drainage basin.

1.2 Project Outline

The objective of this project is to reduce flood damages in the Laoag River drainage basin by constructing Sabo dams, repairing and constructing dikes and spur dikes in the Laoag River, which flows through the Province of Ilocos Norte in Northern Luzon, thereby improving the region's living environment and sanitation situation, and contributing to its socioeconomic development.

Loan Approved Amount / Disbursed Amount	6,309 million yen / 6,295 million yen
Exchange of Notes Date / Loan Agreement Signing Date	March, 2001 / May, 2001

[1] Mitigation of health damage due to overflow of sewage water, drifting and scattering of decomposed matters etc.

Terms and Conditions	Interest Rate: 1.7% Repayment Period: 30years (Grace Period: 10years) Conditions for Procurement: General Untied Consultant Interest Rate: 0.75% Repayment Period: 40years (Grace Period: 10years) Conditions for Procurement: Bilateral Tied
Borrower / Executing Agency	The Government of the Republic of the Philippines / Department of Public Works and Highways (DPWH)
Final Disbursement Date	September, 2009
Main Contractor (Over 1 billion yen)	Hanjin Heavy Industries & Construction Co., Ltd. (Korea) / Toyo Construction (Japan)
Main Consultant (Over 100 million yen)	Pacific Consultants International (Japan)・Yachiyo Engineering Co. (Japan)・Basic Technology and Management Corporation (Philippines) (JV)
Feasibility Studies, etc.	JICA Master Plan and Feasibility Study (1997)
Related Projects	Technical Cooperation (JICA) - JICA Experts dispatched to DPWH (Section related with river management) - The Project for Enhancement of Capabilities in Flood Control and Sabo Engineering of DPWH (January, 2000–June, 2005) - Strengthening the Flood Management Function of DPWH (Technical Cooperation Project) (July, 2005–June, 2010)

2. Outline of the Evaluation Study

2.1 External Evaluator

Masumi Shimamura, Mitsubishi UFJ Research and Consulting Co., Ltd.

2.2 Duration of Evaluation Study

Duration of the Study: September, 2012–August, 2013

Duration of the Field Study: November 18–December 15, 2012, March 31–April 13, 2013

3. Results of the Evaluation (Overall Rating: B[2])

3.1 Relevance (Rating: ③[3])

3.1.1 Relevance with the Development Plan of the Philippines

At the time of appraisal, the government of the Philippines identified, in its Medium-Term Philippine Development Plan (1999–2004), the importance of mitigation of flood damages, disaster prevention measures, and comprehensive watershed management through development of flood control facilities. The objective of the project aiming to reduce flood damage in the Laoag River drainage basin was consistent with the Philippines' medium-term development plan. The project had been also recognized as one of the priorities in the Medium-Term Philippine Development Plan (1999–2004) of the Department of Public Works and Highways (DPWH).

At the time of ex-post evaluation, the Philippine Development Plan (2011–2016) stipulates the importance of conservation of watersheds, and development of efficient and appropriate infrastructure in order to reduce flood damages. The Philippine Development Plan specifies following strategies to be pursued.

- Prioritize the construction of flood management structures in highly vulnerable areas
- Apply Climate Change Adaptation strategies in the planning and design of flood management structures
- Develop mechanism to expedite immediate financing for the repair and rehabilitation of flood management structures
- Increase LGU and community participation in disaster prevention measures and maintenance of flood management structures
- Implement disaster risk reduction and management from both structural and non-structural infrastructures (flood forecasting, flood warning system, evacuation plan, etc.)

In addition, the policy of the National Water Resources Board, an institution under the Department of Environment and Natural Resources (DENR), states the importance of water resource management, taking into account countermeasures of water related disasters. The project is consistent with the Philippines' development policy, and continuous support for flood prevention measures is highly important.

The project would be categorized as flood control sector or disaster risk reduction and management sector[4] at the time of ex-post evaluation, instead of environmental and

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[2] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[3] ③: High, ② Fair, ① Low

[4] One of the important pillars the National Water Resources Board puts up is "mitigation of water

natural resource sector being categorized at the time of appraisal, given the strategies stipulated in the Philippine Development Plan (2011–2016).

3.1.2 Relevance with the Development Needs of the Philippines

The Laoag River drainage basin has been suffering from frequent flood damages[5] caused by typhoons and landslides at the time of appraisal. They have inflicted significant damage to agriculture, which takes up major portion of local economy in the Province of Ilocos Norte. Therefore, urgent measures were needed to control floods and mudslides.

At the time of ex-post evaluation, the Disaster Risk Management－Enhanced Regional Physical Framework Plan : 2004－2030 of the Region I[6] (including Province of Ilocos Norte) pointed out the importance of flood control measures as one of the countermeasures for disaster risk management, and the necessity to implement the project was mentioned as part of the measures. After the signing of the ODA loan project in 2001, the Laoag River basin continued to suffer from enormous floods and mudslides caused by four super typhoons: Igme (June 2004), Labuyo (September 2005), Helen (July 2008), and Igme (July 2008). From 2005 to 2011, serious damage and human loss occurred: 35 people were killed, more than 1.01 million people were affected, 39,165 houses were damaged and the amount of damage totaled more than 2.28 billion pesos. The necessity of reducing flood disaster continues to be emphasized in Province of Ilocos Norte where the project locates.

3.1.3 Relevance with Japan's ODA Policy

The objective of the project was consistent with the government of Japan's assistance policies and the assistance policy by JICA at the time of appraisal. The Ministry of Foreign Affairs of Japan's Country Assistance Strategy for the Philippines (August, 2000) stipulated in its "Disaster Prevention" section that "Japan has been putting effort in

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related disasters and hazards". The Philippine government recognizes the importance of coordination among relevant departments/agencies and the LGUs in undertaking comprehensive water resource management including disaster prevention measures. The National Water Resources Board under the DENR puts up policies consistent with this.

[5] (1) Number of major typhoons/monsoon rainfalls, (2) Affected number of people (of which number of dead persons), (3) Damage to agricultural production and (4) Damage to infrastructure facilities for major typhoons and monsoon rainfalls which hit the project area around the time of appraisal are as follows:

- 1999: (1) 2, (2) 2,945 people (3 people), (3) 2.0 million pesos, (4) N.A.
- 2000: (1) 2, (2) 5,708 people (2 people), (3) 1.1 million pesos, (4) 10.0 million pesos
- 2001: (1) 1, (2) 88,928 people (3 people), (3) 122.8 million pesos, (4) 21.0 million pesos
- 2002: (1) 3, (2) 2,394 people (N.A.), (3) 1.7 million pesos, (4) 5.4 million pesos
- 2003: (1) 4, (2) 18,878 people (1 person), (3) 1.9 million pesos, (4) 13.2 million pesos

Source: Region I Disaster Risk Reduction and Management Council

[6] Region I consists of 4 provinces: Ilocos Norte, Ilocos Sur, La Union and Pangasinan.

supporting for flood prevention measures and recovery from volcano damages, and will continue to support for flood control, erosion control and earthquake countermeasures as well as institutional and capacity development of relevant government agencies from medium- and long-term perspective. This is because frequent occurrences of large-scale natural disasters inhibit development and are likely to have enormous effects to the poor people." Moreover, Overseas Economic Cooperation Strategy by JICA (2000) emphasized its support for disaster prevention sector, focusing mainly on flood prevention. In fact, most of the support provided in that sector in the Philippines comes from the Japanese government.

Since the onset of the project, there has been no change in the assistance policies of the government of Japan or JICA, which might affect the direction of the project. Thus, the consistency of the project with the Japanese assistance policies is still maintained.

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

3.2 Effectiveness[7] (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)[8]

The project aimed at reducing flood damages by improving flood control ability of the Laoag River to respond to 25-year return period flood. Table 1 summarizes recent damages by major typhoons in the project area based on available data.

Table 1: Damages by Recent Major Typhoons in the Project Area

Year and month of major typhoons	Name of typhoons	Number of persons affected	Number of dead or missing persons	Number of damaged houses	Damage to agricultural production (mil. pesos)	Damage to infrastructure facilities (mil. pesos)	Maximum high water level at Gilbert Bridge (m)	Total rainfalls for four days at the times typhoon (mm) Station: Laoag
June 2004	Igme	137,357	21	N.A.	33.3	73.8	8.60	N.A.
September 2005	Labuyo	115,427	4	25,155	31.2	20.7	6.06	N.A.
July 2008	Helen	46,882	1	6,128	9.8	4.7	5.20	N.A.
July 2008	Igme	26,715	3	4,919	2.3	27.1	5.00	N.A.
August 2008	Karen	102,914	3	25,628	213.2	12.0	8.50	426.4

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

[8] At the time of appraisal, Operation and Effect Indicators including maximum flood, maximum high water level, damaged amount etc. had been established, however, adequate measurement has not taken place, therefore, analysis was made based on available data at the time of ex-post evaluation.

Project completion: May 2009								
July 2009	Isang	44,649	1	N.A.	0.8	33.3	5.00	N.A.
October 2009	Pepeng	170,674	3	N.A.	929.2	87.3	N.A.	N.A.
October 2010	Juan	8,534	N.A.	N.A.	38.7	9.4	2.60	N.A.
August 2011	Mina	92,024	3	25,828	55.2	45.6	1.87	655.8
June 2012	Dindo	21,234	0	4,615	10.0	32.7	3.05	N.A.

Source : Utilized data from both Region I Disaster Risk Reduction and Management Council, and Ilocos Norte Provincial Disaster Risk Reduction and Management Council
Maximum high water level data from DPWH Bureau of Research and Standards
Rainfall data from Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)

Note1) Damages are combined damages from flooding and rainstorm, and cannot be separated.
Note2) Damaged amount are damages from each typhoon.
Note3) The observation point for maximum high water level is Gilbert Bridge, and water level is monitored every typhoon and monsoon rainfalls
Note4) The magnitude of each flood is not clear

Differences among each typhoon's scale, including size, strength, duration of stay, and route of passage, and ambiguity of magnitude of flood for each typhoon caused difficulty in making simple comparisons between typhoons, however, comprehensive analysis was endeavored taking into consideration the interview results from local residence as described below

When comparing two major typhoons before and after the project－Karen (August 2008) and Mina (August 2011)－the total amount of rainfalls for four days when Mina approached the project area exceeded that of Karen. The number of persons affected by Mina was less than that of Karen by about 10 thousand, and the amount of damage caused by Mina (damage to agricultural production and infrastructure facilities) was less than that of Karen by around 124 million pesos.

The super typhoon Pepeng that directly hit the project area in October 2009 is said to have caused 50-year return period flood, according to media information, however, interviews with local residents during the field survey showed that no flood damage has occurred even when Pepeng hit the area. According to the beneficiary survey (to be described later), all the respondents answered "no damage" or "small damage" after the project completion. Judging all the facts in a comprehensive manner, the project is deemed as to have realized its effects sufficiently.

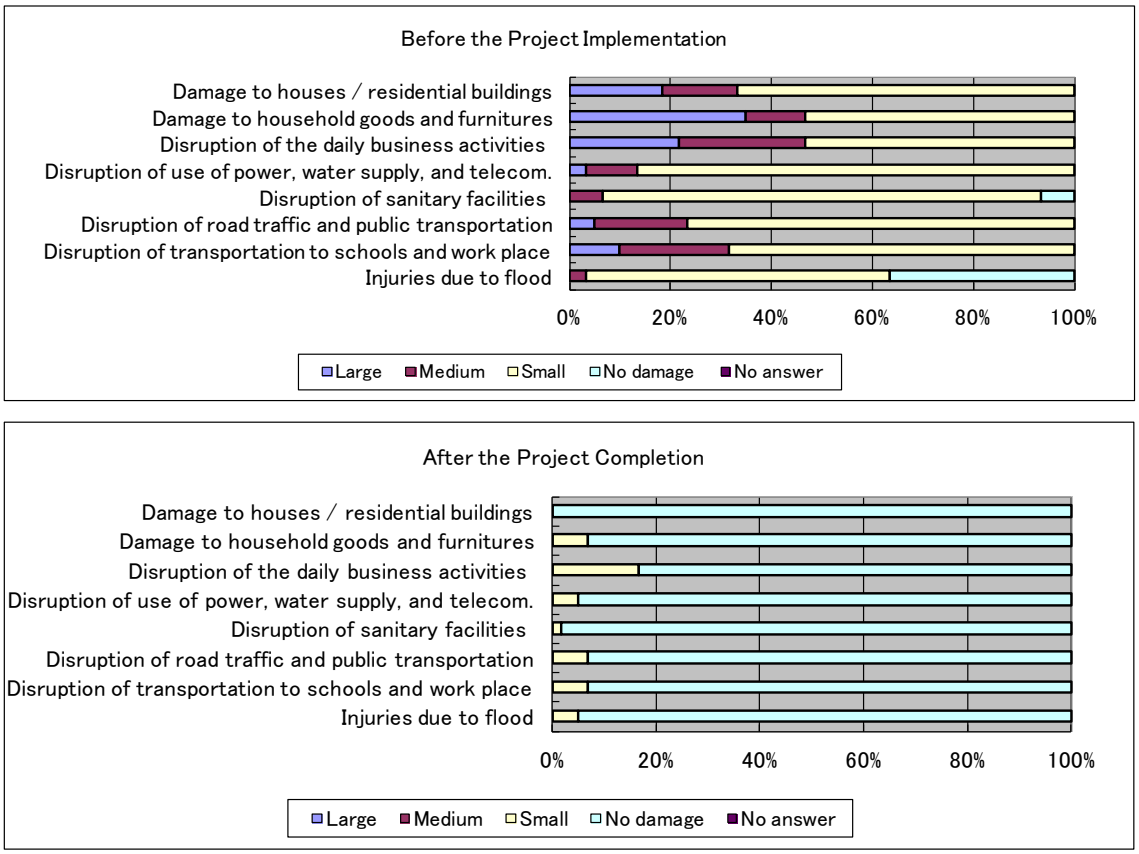
3.2.2 Qualitative Effects

3.2.2.1 Mitigation of Flood Damage

The results of the beneficiary survey[9] to residents and farmers in the project area on

[9] Beneficiary survey was conducted in one city (Laoag City) and ten municipalities in the project

typhoon and monsoon rainfall damages before and after the completion of the project are summarized in Figure 1. The results show that the project has greatly contributed to mitigate flood damages on all items enumerated in the figure, including damage to houses and damage to household goods and furniture.



Source: Results from the beneficiary survey

Figure 1: Comparison of Flood Damage Before and After the Project (N=60)

According to the executing agency, the project area covers one city and ten municipalities,[10] and of which Laoag City and the municipality of San Nicolas have benefited most from mitigation of flood damages thanks to this project.

According to the interview with the beneficiaries (residents in Laoag City and the municipality of San Nicolas) during filed survey, residents have not suffered from flood damage by typhoons and monsoon rainfalls any longer after the project completion. There

area (municipalities of San Nicolas, Piddig, Sarrat, Banna, Dingras, Marcos, Nueva Era, Solsona, Carasi, and Vintar), consisting of 284 barangays. Ten barangays were randomly selected, followed by a random selection of six households from each barangay, totaling to 60 households. (Data collection method: hearing investigation)

[10] Laoag City and the municipalities of San Nicolas, Piddig, Sarrat, Banna, Dingras, Marcos, Nueva Era, Solsona, Carasi, and Vintar.

were also such responses indicating that there has been no inundation of access roads to the Laoag Airport and to the Gilbert Bridge during times of typhoons and monsoon rainfalls. Residents pointed out that they have been living in peace without flood after the project, while they had suffered from flood damages twice or three times a year before the project. In addition, residents indicated that students in primary and secondary schools near Bagbag Bridge, which has been expanded by the project, can continue attending classes during times of typhoons after the project. In fact, the schools had to close classes everytime typhoon occurred prior to the project, but now, it has been utilized as place for evacuation.

Bagbag Bridge

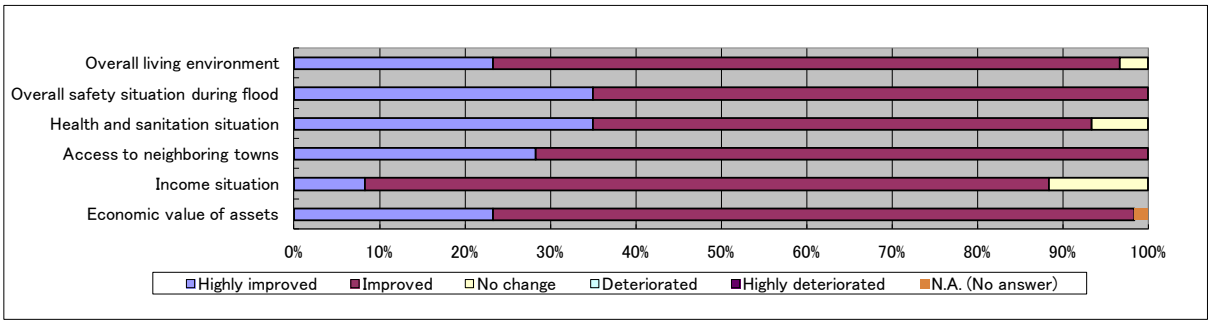
Earth dike in San Nicolas

3.3 Impact

3.3.1 Intended Impacts

3.3.1.1 Improvement of Living Environment in the Project Area

Regarding changes of living environment after the project completion, results of the beneficiary survey to local residents and farmers in the project area is summarized in Figure 2. According to the beneficiary survey results, more than 90% of respondents answered that almost all the items including overall living environment, overall safety situation during flood, health and sanitation situation were “highly improved” or “improved”, thus, it can be confirmed that their living conditions after the project completion have improved. (As regards effects on “income situation”, 88% of respondents answered the situation has “highly improved” or “improved.”)



Source: Results from the beneficiary survey

Figure 2: Respondents' Living Environment After Project Completion (N=60)

The results of interview survey from the beneficiaries (local residents) during the field survey are shown below. Every respondent showed satisfaction with positive impacts from the project on improvement of living environment (especially increased crop yields through creation of new agricultural lands and population growth).

- After the project completion, agricultural productivity has increased since arable areas have expanded. (Prior to the project, agricultural land has been damaged by outflow of sediments due to flooding.)
- After the project completion, new houses were constructed in the area, where it used to be flood-prone, empty land before the project, and resulted in population increase.[11]
- After the project completion, land value has increased due to enhanced productivity of land and improved everyday convenience.

Earth dike and new agricultural land

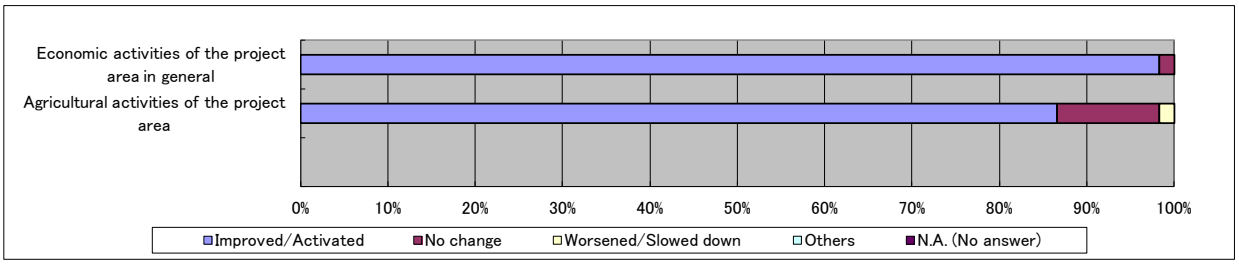
New residential area

3.3.1.2 Promotion of Economic and Social Development in the Project Area

Figure 3 summarizes the beneficiary survey results to residents and farmers in the project area regarding the effects on regional economy after the completion of the project. Over 98% of residents responded "economic activities in the project area in general have

[11] Nalbo Barangay and Zamboanga Barangay in Laoag City

been improved" and about 87% responded "agricultural activities of the project area has been activated". Therefore, it can be considered that the project has given positive impact on local economy.



Source: Results from the beneficiary survey

Figure 3: Effects on Economy of the Project Area (N=60)

The results of interview survey to the beneficiaries (local residents) during the field survey include their comments saying "a shopping mall was newly opened in the municipality of San Nicolas in 2009 after the project, and local economy has been activated. The shopping mall has never suffered from flood damage." Currently, there seems to be a plan to open another large-scale shopping mall in the area.

The executing agency pointed out "functions for Ilocos Norte Irrigation System,[12] developed by National Irrigation Administration (NIA), have improved due to the construction of sabo dams, which have been blocking sediments to flow down the river and stabilizing water flow. As a result, effective water resource utilization has achieved, leading to enhanced agricultural productivity." In fact, close collaboration among DPWH, NIA and Irrigators Association participated by farmers has taken place during the project preparation and implementation. Further coordination is to be taken place as needs arise.

NIA irrigation intake

Irrigation water from NIA intake

[12] NIA Irrigation System was developed in early 1980s. Although the system was damaged by the super typhoon Igme in July 2008, it was already repaired and function for the water intake system was restored at the time when site survey was conducted.

As regards agricultural production data, Tables 2 and 3 show the yield trend of palay (rice) and corm in the project area (one city and ten municipalities) and the whole Ilocos Norte Province, respectively. While no evident correlation between the data shift and the project can be observed, it is possible to regard that the project has contributed to mitigate typhoon damages to a certain extent in the project area in 2008 and 2009.

Table 2: Palay Production in the Project Area and Ilocos Norte Province

	2006	2007	2008	2009	2010	2011
Palay production in the project area: one city and ten municipalities (metric tons)	182,107	192,840	177,049	164,349	190,140	193,654
Palay production growth in the project area: one city and ten municipalities (%)	-	5.89	(8.19)	(7.17)	15.69	1.85
Palay production in the whole Ilocos Norte Province (metric tons)	282,794	282,832	299,984	256,582	301,934	306,726
Palay production growth in the whole Ilocos Norte Province (%)	11.79	0.01	6.06	(14.47)	17.68	1.59

Source: Palay production in the project area: Project Management Office-Laoag River Basin Flood Control and Sabo Project
Palay production in the whole Ilocos Norte Province: Bureau of Agricultural Statistics

Table 3: Corn Production in the Project Area and Ilocos Norte Province

	2009	2010	2011
Corn production in the project area: one city and ten municipalities (metric tons)	27,621	30,633	29,511
Corn production growth in the project area: one city and ten municipalities (%)	-	10.91	(3.66)
Corn production in the whole Ilocos Norte Province (metric tons)	58,368	53,553	52,157
Corn production growth in the whole Ilocos Norte Province (%)	(0.35)	(8.25)	(2.61)

Source: Corn production in the project area: Project Management Office-Laoag River Basin Flood Control and Sabo Project
Corn production in the whole Ilocos Norte Province: Bureau of Agricultural Statistics

3.3.2 Other Impacts

3.3.2.1 Impacts on the Natural Environment

The Environmental Impact Assessment (EIA) was conducted for the project and Environmental Compliance Certificate (ECC) was issued by the DENR in October 1997.

According to the executing agency, no particular issue has been observed since the executing agency has made guidance to the contractors to give necessary environmental consideration during project implementation, and the contractors have taken necessary measures[13] based on the EIA.

[13] Concrete mitigation measures were as follows: constructing a coffer dam in revetment construction (a measure to mitigate effect on water quality and ecological environment), watering the access road (a measure to mitigate effect on air quality), limiting time for construction work (a measure to mitigate noise), properly siphoning of dredged materials onto pre-selected areas (a measure to mitigate effect on topography and geology), and sodding of dike

As regards environmental monitoring during project implementation, a monitoring team (consisting of DPWH, DENR, LGUs of concerned province and city/municipalities, consultants etc.) conducted monitoring activities every quarter. All project sites were subject to monitoring, and the results were compiled in quarterly reports. (Major check items were water quality, air quality, noise, landscape, erosion, and river ecology.)

No particular issue has been observed on the natural environment as a result of the environmental monitoring. No particular complaint was raised from the LGUs and local residents.

No particular issue on natural environment during construction and after the project completion has been pointed out in the interviews with local residents during the field survey. (Inquiries were made regarding effects on fish habitat and wild animals, however, no issue was indicated.) Furthermore, as a result of beneficiary survey (see footnote 9), 6 respondents out of 60 beneficiaries said that there was temporary effect on natural environment during construction, such as muddy waters, scattering of dust and noise, but no complaint was raised. On the other hand, 57 respondents (95% of the total respondents) answered “natural environment has improved” or “there has been no effect on natural environment “after the project completion. Thus, no particular issues have been observed.

3.3.2.2 Land Acquisition and Resettlement

The executing agency has carried out procedures for land acquisition and compensation payments following the DPWH’s guideline (Infrastructure ROW Procedural Manual, April 2003) which is based on the Philippines’ regulation. According to the interviews with local residents during the field survey, consultations were conducted including dissemination of information and public hearing regarding the contents of the project prior to its launch. Consultations with landowners regarding compensation payments for land acquisition were carried out on continuous basis, and agreements seem to have been reached on the amount without any problem. According to the executing agency, some landowners were willing to donate their land for free, as they well understood and supported the project benefit. No particular issue have been observed for land acquisition since the process has taken place appropriately including public hearing and consultations based on the Philippines’ regulation.

With the effort of the executive agency to minimize effect of land acquisition and resettlement,[14] the final land area acquired was 1,628,216 m^2 and the final number of households to whom the executing agency paid compensation for land acquisition was

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embankments with carabo grass (a measure to mitigate erosion) etc.

[14] Design change was carried out for the river wall in Laoag City.

45.[15] Of which, all 5 legal households chose to move to neighboring sites which they owned. As a result, there was no need for the executing agency to develop alternative sites. (The executing agency coped with the situation by paying compensation for lands and buildings.) In addition, compensation for buildings was paid to 40 illegal households. Of which, 20 households received compensation and moved to Mindanao. The remaining 20 households have moved to neighboring sites, thus, livelihood programs were no longer necessary because there was no change in their livelihoods. No particular issue was pointed out by residents regarding land acquisition in the interviews during the field survey.

Endorsement from the National Commission on Indigenous Peoples (NCIP) for sabo dam construction in 5 places[16] has been given without problem, and no particular obstacle for project implementation was observed. In fact, the NCIP concluded that there is no effect on indigenous people living in 3 sabo dam sites－Labugaon, Solosona and Madongan－among 5. As regards remaining 2 sabo dam sites－Cur and Papa－Memorandum of Agreement (MOA) has been concluded between the executing agency and the NCIP, thus, no obstacle was observed for project implementation. Based on the MOA, indigenous people have participated in the construction of sabo dams.[17]

This project has largely achieved its objectives, therefore its effectiveness is high.

3.4 Efficiency (Rating: ②)

3.4.1 Project Outputs

Comparison of planned and actual project outputs is summarized in Table 4.

Table 4: Comparison of Planned and Actual Project Outputs

Planned	Actual	Comparison
Civil Works		
1) Sabo Dam Works (5 dams) - Sediment Capacity: 4,862,000m^3 2) Laoag-Bongo River Improvement Works - Improvement Length: 13.14 km	1) Sabo Dam Works(5 dams) - Sediment Capacity: 4,709,000m^3 2) Laoag-Bongo River Improvement Works - Improvement Length: 14.0 km	No major change of outputs in terms of constructed items, but design changes/extra works took place for sub-items ➔Direct hit of super typhoons Igme (June 2004) and Labuyo (Sept. 2005) had caused sediment deposition and

[15] At the time of project planning, 3 households were identified for relocation and 10 houses to be affected by elevating the dike in Laoag City. At the time of mid-term review of the project, 65 households were identified for relocation.

[16] Labugaon, Solosona, Madongan, Cura, and Papa

[17] According to the executing agency, around 60% of those engaged in sabo dam construction (about 300 workers) was indigenous people.

- Earth Dike: 11,600 m - Riverwall: 1,540 m - Spur Dike: 5 units - Sluiceway: 5 units 3) Alluvial Fan River Improvement Works - Improvement Length: 39km - Earth Dike: 52,000 m - Spur Dike: 1,328 m - Groundsill: 4 units - Sluiceway: 17units - Existing Bridge Extension: 1	- Earth Dike: 12,500 m - Riverwall: 1,100 m - Spur Dike: 6 units - Sluiceway: 10 units 3) Alluvial Fan River Improvement Works - Improvement Length: 39km - Earth Dike: 70,400 m - Spur Dike: 1,036 m - Groundsill: 4 units - Sluiceway: 15 units - Existing Bridge Extension : 1	topographic change, which necessitated design changes/extra works ➔Design change of Riverwall in Laoag City took place to minimize resettlement. In addition, step over dike was constructed for cattle.
Consulting Service		
1) Basic Survey 2) Detailed Design 3) Assistance to DPWH in Construction Management 4) Assistance to DPWH in Environmental Management (Land Acquisition, Compensation and Resettlement, and Environmental Monitoring on Water Quality, Air Quality, Noise, Waste etc.)	1) Basic Survey 2) Detailed Design 3) Assistance to DPWH in Construction Management 4) Assistance to DPWH in Environmental Management (Land Acquisition, Compensation and Resettlement, and Environmental Monitoring on Water Quality, Air Quality, Noise, Waste etc.)	No major change of outputs in terms of consulting service items, but design change took place due to direct hit by super typhoons Igme (2004) and Labuyo (2005), as well as design change of Riverwall took place in Laoag City.

Source : Information from JICA at time of appraisal, results from questionnaire surveys, and interview survey results during field survey

There were scope changes and additional scope for the civil works. According to the executing agency, due to the direct hit of 2 super typhoons: Igme (June 2004) and Labuyo (September 2005),[18] massive sediment deposit, changes in the river conditions and topographical features occurred, which necessitated design changes and additional construction works. These changes and additional scope are considered appropriate in the face of unavoidable factors. The executing agency also changed the design of the riverwall in Laoag City in order to minimize effect of resettlement. In addition, in response to requests from the LGUs, step over dike was constructed for cattle. These changes are considered as appropriate.

[18] Typhoon Igme hit the project area in 2004 (prior to civil works; during bidding process) and typhoon Labuto hit the project area in 2005 during construction.

Riverwall in Laoag City

Sluiceway

Inputs for consulting service have increased as summarized in Table 5. According to the executing agency, the reasons for increase were as follows.

- Design changes were conducted due to changes in the river conditions and topographic features caused by the direct hit of two super typhoons Igme (2004) and Labuyo (2005).
- Construction supervision period was increased due to the delay of project implementation.
- Design change of the riverwall in Laoag City took place in order to minimize effect of resettlement.

Table 5: Comparison of Planned and Actual Consulting Service (MM)

	Plan	Actual	Comparison
Foreign	216	247.9	Increased by 31.9
Local	342	407.7	Increased by 65.7
Total	558	655.6	Increased by 97.6

Source：Information from JICA at time of appraisal, results from questionnaire surveys, and interview survey results during field survey

3.4.2 Project Inputs

3.4.2.1 Project Cost

The total project cost was initially estimated at 8,412 million yen, of which Japanese ODA loan would cover 6,309 million yen. In actuality, total project cost was 10,591 million yen, of which Japanese ODA loan provided a total of 6,295 million yen, resulting in a higher amount than the initial estimate (126% of the planned amount).

The major factors of the cost overrun were as follows. Either of them were unavoidable factors. As regards project cost overrun, the Philippine government utilized the local fund to complete the project.

- Rise in the price of iron and steel, fuel and cement:[19] escalating prices of these major inputs, utilized substantially for sluiceway, sheet piles, sabo dams, dikes etc. have pushed up the project cost
- Damages cause by super typhoons: In June 2004, right before the start of the civil works and in September 2005, during civil works, two super typhoons (Igeme and Labuyo) hit the projecting area and the Laoag River had encountered serious flood damage. The existing facilities and facilities under construction were destroyed, and changes in landscape and inundation patterns occurred, which necessitated major reassessment and revision of project design. In addition, repairs for access roads (national, regional, municipal, and barangay roads, respectively) were necessary as they were affected by the typhoons.

3.4.2.2 Project Period

The overall project period was planned as 67 months as opposed to 97 months in reality, representing an expansion to 145% of the initial plan.

Table 6 shows a comparison of planned and actual project period.

Table 6: Comparison of Planned and Actual Project Period

Planned (at the time of Appraisal)	Actual (at the time of Ex-post Evaluation)	Comparison
Mar. 2001*–Sept. 2006 (67 months)	May 2001*–May 2009** (97 months)	Delayed by 30 months

* Loan Agreement conclusion date

** With an agreement with the executing agency, project completion is considered at the time when the civil works were completed.

The delay in the implementation schedule was caused mainly by significant revision and changes in design due to sediment deposition, changes in river alignment and topographic conditions as a result of damages by super typhoons during the project implementation, and associated delays in civil works as well as delays in procurement procedures (selection of contractors).

3.4.3 Results of Calculations of Internal Rates of Return (IRR)

Table 7 summarizes the result of recalculation of the economic internal rate of return (EIRR).

[19] Each input price soared to following figures assuming its price was 100 in February 2002. Structural steel: 184, reinforcing steel: 151, fuel: 142, cement: 102.

Table 7: Assumption and Results of EIRR Recalculation

	At the time of Appraisal	At the time of Ex-post Evaluation
EIRR	15.5%	13.5%
Benefit	Expected amount of total flood damages mitigated (Amount of damage caused by 25-year return period flood or less)	Flood mitigation benefit, land loss prevention benefit, land use restoration benefit, negative benefit,* and benefit from restoration of irrigation facilities **
Cost	Cost required for river improvement works and construction of flood control facilities, and increased O&M cost due to the project	Cost required for river improvement works and construction of flood control facilities, and increased O&M cost due to the project
Project Life	50 years after project completion	

* The crop production in appropriated farmlands for the implementation of the project.
** Utilized the same assumption with that at the time of appraisal for percentage of rise.

The recalculated figure for the project became 13.5%, lower than the one at time of the appraisal (15.5%). The main reason of this is considered to be the increased project cost compared with that of the initial plan.

Both project cost and project period exceeded the plan, therefore efficiency of the project is fair.

3.5 Sustainability (Rating: ②)

As regards sustainability of the project, recent changes in overall disaster prevention sector in the Philippines (enactment and enforcement of a new Act and Joint Memorandum Circular) are taken up in the Column. This section analyzes project sustainability, taking into account such changes.

3.5.1 Institutional Aspects of Operation and Maintenance

The Project Management Office-Laoag River Basin Flood Control and Sabo Project (PMO-LRBFCSP) is responsible for operation and maintenance of flood control facilities and bridge constructed by the project. The PMO-LRBFCSP is the local subordinate office under the Project Management Office – Flood Control (PMO-Flood Control[20]), a project management office of the DPWH. The PMO-LRBFCSP is undertaking operation and maintenance work under comprehensive monitoring by the DPWH-Ilocos Norte 1st and 2nd District Engineering Offices.

There are 7 technical staffs in charge of operation and maintenance of the project, and

[20] The PMO-Flood Control, located in Manila, was established in January 11, 2013 with the DPWH Special Order No.17. (The previous Project Management Office-Major Flood Control and Drainage Projects, Cluster I and Cluster II merged to formulate the PMO-Flood Control.) The PMO-LRBFCSP used to be under the Project Management Office-Major Flood Control and Drainage Projects Cluster II.

some of them have participated in implementation of the project (expansion of existing dikes etc.). In this respect, it can be regarded that mechanism has been secured to maintain coherency and consistency between project implementation, and its operation and maintenance. In addition, the DPWH-Ilocos Norte District Engineering Offices have been conducting an overall monitoring of operation and maintenance work undertaken by the PMO-LRBFCSP. In this regard, a multilevel system has been secured for the operation and maintenance of the project. Therefore, there is no particular problem observed in the institutional aspects of operation and maintenance of flood control facilities and bridges constructed by the project.

At the time of ex-post evaluation, the Memorandum of Agreement (MOA) between the DPWH and the LGUs regarding operation and maintenance has not been signed yet, and the PMO-LRBFCSP is in charge of the entire operation and maintenance work of flood control facilities and bridges constructed by the project. According to the executing agency, discussion regarding the MOA with the LGUs is expected to resume after May 2013, when new institutional mechanisms are in place.[21]

3.5.2 Technical Aspects of Operation and Maintenance

The PMO-LRBFCSP's 7 engineers, who are in charge of operation and maintenance of the project, have rich experiences with average of around 15 years. They have participated in the project implementation and are knowledgeable about issues for considerations on operation and maintenance of the project, therefore, no particular issue is identified for technical capacity of the operation and maintenance staffs in the PMO-LRBFCSP. In addition, technical staffs who monitor the operation and maintenance work of the PMO-LRBFCSP are deployed in the DPWH-Ilocos Norte 1st and 2nd District Engineering Offices, respectively.

As part of the consulting service of the project, 2 technical staffs in PMO-MFCDP-II[22] have participated in study tour to Japan and acquired necessary skills on maintenance of flood control facilities and sabo dams. In addition, one operation and maintenance staff in the PMO-LRBFCSP has participated in JICA training－Water Integration in the

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[21] According to the executing agency, the responsibility for the DPWH and the LGUs were considered as follows:
- LGU－relatively small scale maintenance work such as removal of vegetation and cleaning of channels and drainage, conducting monitoring during times of typhoon, reporting to the DPWH
- DPWH－maintenance and repair of dikes and other flood control facilities, removal of sedimentation etc.

The expected signers of the MOA were the DPWH, the heads of LGUs (one city and ten municipalities) and barangay captain in each barangay. Part of the DPWH operation and maintenance budget were to be allocated to the LGUs for their maintenance costs.

[22] Previous organization before the establishment of the PMO-Flood Control in January 11, 2013. (see footnote 20)

Philippines.

Manuals for the operation and maintenance of facilities constructed by the project have been developed (July 2008), and have been utilized by the PMO-LRBFCSP staffs in their operation and maintenance work.

3.5.3 Financial Aspects of Operation and Maintenance

The annual operation and maintenance costs associated with the project are first estimated by the PMO-LRBFCSP, then estimation will be reviewed by the DPWH-Ilocos Norte District Engineering Offices, followed by a review by the PMO-Flood Control in Manila. Once approved, the budget is drawn out from the DPWH headquarters' ordinary budget and allocated to the PMO-LRBFCSP.

Requested operation and maintenance budget for the project has been fully secured each year after the project completion (since 2010), and therefore, no particular issue has seen at the time of ex-post evaluation. (See Table 8)

Table 8: O&M Budget Allocation for the Project (Note 1)

Year	Requested Amount (mil. pesos)	Allocation (mil. pesos)
2010	16.0	16.0
2011	16.0	16.0
2012	16.0+202 (Note 2)=218.0	218.0
2013	21.6+242 (Note 3)=263.6	263.6

Source：Results from questionnaire surveys, and interview survey results during field survey
Note 1）The figures do not include salaries of staffs
Note2）In addition to ordinary operation and maintenance budget (16.0 million pesos), budget for expansion of existing dikes (additional work) (202 million pesos) was requested.
Note3）In addition to ordinary operation and maintenance budget (21.6 million pesos), budget for expansion of existing dikes (additional work) (242 million pesos) was requested.

The operation and maintenance cost in 2010 (16.0 million pesos) was ordinary maintenance cost (daily maintenance of equipments and facilities, flood control activities etc.). As for the breakdown of the operation and maintenance cost in 2011 (16.0 million pesos), 8 million pesos was for ordinary maintenance (daily maintenance of equipments and facilities, flood control activities etc.), and the remaining 8 million pesos was for repair works of damaged dikes and other flood control facilities caused by four typhoons (Helen, Igme, Julian, and Karen) which hit the project area between July to August 2008. The 2012 budget includes ordinary maintenance cost (16.0 million pesos) as well as cost for expansion of existing dikes (additional work) (202 million pesos). Furthermore, the 2013 budget includes cost for expansion of existing dikes (additional work) (242 million pesos) in addition to ordinary maintenance cost (21.6 million pesos). These budgets have

been fully secured, which indicates that the DPWH has prioritized budget allocation to this project. In addition, budget for urgent repairs from possible flood damages caused by heavy typhoons is to be allocated from the DPWH's Calamity Fund, which the funding source is separately categorized from the annual allocation of operation and maintenance budget.

3.5.4 Current Status of Operation and Maintenance

Four consecutive typhoons (Helen, Igme, Julian, and Karen) directly hit the project area between July to August 2008, and damaged dikes and flood control facilities constructed by the project.[23] In addition, super typhoon Pepeng (occurred in October 2009) aggravated the damages. The PMO-LRBFCSP has already repaired these damages utilizing the local fund (2011 operation and maintenance budget), thus, no particular issue is observed.

Repair work of some part of flood control facilities damaged by the monsoon rainfalls that hit the project area between July to November 2012 (especially the rainfalls in September) and the typhoon Gener in August 2012, still needs to take place, and the PMO-LRBFCSP is planning to prioritize allocation of the 2013 budget for this. The 2013 budget has been fully approved, and no particular problem has seen for repairing the damaged facilities. In addition, the PMO-LRBFCSP is implementing expansion work of existing dikes[24] utilizing both 2012 and 2013 budgets. The sustainability of the project is expected to enhance once the expansion work is completed.

The PMO-LRBFCSP conducts periodic inspection and maintenance work such as removal of vegetation, soil and stone as well as cleaning of channels and diversions. Additionally, non-regular inspection and maintenance works are carried out every time typhoons or monsoon rainfalls approach the project area and the PMO-LRBFCSP makes careful inspection of flood control facilities such as dikes and guide channels constructed by the project. Furthermore, the PMO-LRBFCSP monitors the status of sediments and obstacles. In emergency situation, urgent repair of damaged facilities is conducted using the Calamity Fund as mentioned above.

On the other hand, the PMO-LRBFCSP has not conducted dredging of sediments in the sabo dam as well as riverbed of the Laoag River after the completion of the project.[25] Since the Laoag River is located in the area, with a topographical feature easy to

[23] Dikes and other flood control facilities along Papa River, Madongan River and Solsona River.
[24] The municipalities of Dingras and San Nicolas, and Laoag City were the areas for the expansion work.
[25] According to the executing agency, sediments in the middle and lower Laoag River came from the tributaries and open dikes, not from the sabo dam in the upper river. The executing agency pointed out that sediments already existed during the project implementation stage.

accumulate sedimentation and prone to landslide (the Laoag River is winding through mountainous area), it is crucially important to undertake measure to remove sedimentation in order to secure sustainability of the project.

In addition, private companies are doing quarry business and exporting dredged sediments to be utilized for construction materials. However, dredging sediments as a business for private sector may create risks for deterioration of riverbed (riverbed may become rough due to uneven excavation) and destruction of flood control facilities. It is crucial that the PMO-LRBFCSP, in collaboration with the LGUs, conducts a monitoring of excavation activities since the issue may affect project effectiveness and sustainability.

Some concerns have been observed in terms of current status of operation and maintenance, therefore sustainability of the project effect is fair.

Earth dike extension work (using local fund)

Barangay 46 Nalbo was awarded for "Cleanest and Greenest Barangay of Laoag City"

Column: Disaster Risk Reduction and Management (DRRM) Act of 2010 (RA 10121)
(Changes in Overall Disaster Prevention Sector in the Philippines and Effects on the Project)

In the Philippines, the DRRM Act has come into force in May 2010, and its administrative instruction has come into force in September 2010. The DRRM Act is a proactive regulation that substantially revised the previous Disaster Control Act (PD1566) which focused on measures during and after the occurrence of disasters. The new Act emphasizes the importance of forecasting and undertaking prior measures for possible future disaster risks (enhancing preparedness for risk and disaster prevention). The Act continues to point out the importance of taking prompt measures when disasters occur and undertaking adequate correspondence for restoration after the disaster. By the Act, establishment of Disaster Risk Reduction and Management Councils (DRRMCs) is obligated from the national level to the barangay level, and

a hierarchy system is formed as shown in Figure 4.[26]

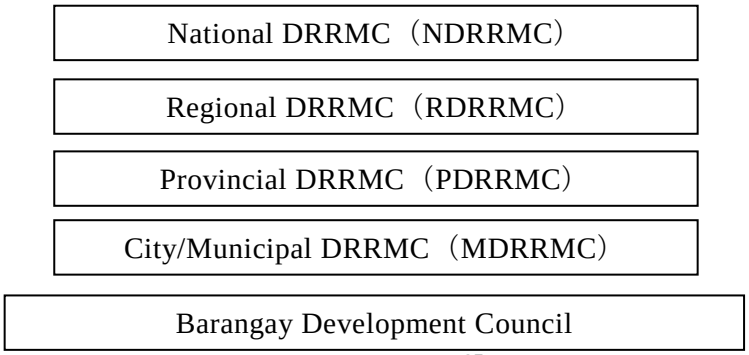


Figure 4: DRRM Structures[27] under the DRRM Act

With the enactment of the Act, budget allocation structures for the LGUs was revised, and the Local Disaster and Risk Reduction and Management Fund (LDRRMF) was established, which enables budget allocation focusing on preventive measures in advance. In addition, the Joint Memorandum Circular regarding the allocation and practical use of the LDRRMF has been signed in March 2010.[28] In concrete terms, based on the Local Disaster and Risk Reduction and Management Plan (LDRRMP) which the LGUs establish, more than 5% of Internal Revenue Allotment would be secured as the LDRRMF, and the LGUs would be able to apply up to 70% of the LDRRMF to allocate funds for prior measures. The rest of the 30% of the LDRRMF will be used for costs to cope with urgent measures when disasters occur.[29]

The Provincial Disaster Risk Reduction and Management Council (PDRRMC) of Ilocos Norte Province, the Disaster Risk Reduction and Management Council (DRRMC) of each city/municipality and each Barangay Development Council have been undertaking disaster prevention measures (providing trainings, conducting dissemination activities and school classes, installing disaster prevention equipments,[30] and cleaning up the Laoag River) for local residents based on the Laoag River watershed management and disaster prevention plan of each LGU. The objective is to enhance awareness and preparedness of local residents. At barangay level, activities such as evacuation drills, solid waste management, cleaning up irrigation channels, and reforestation are implemented although barangays have been facing budget

[26] The rate of organization for each DRRMC at each level is high since DRRMCs were reorganized based on the existing "Disaster Coordination Council"－prior to the DRRM Act, "Ilocos Norte Disaster Coordination Council" was in place which was enhanced into "Ilocos Norte DRRMC" after the enactment of the Act.

[27] National/Regional/Provincial/Municipal Disaster Risk Reduction and Management Council (NDRRMC/RDRRMC/PDRRMC/MDRRMC)

[28] Joint Memorandum Circular was signed by three organizations: National DRRMC, Department of Budget and Management and Department of Interior and Local Government.

[29] The previous Disaster Control Act (PD1566) focused on budget measures after the occurrence of disasters.

[30] Rubber boats, flashlights, helmets, stockpiling food etc.

shortage. In addition, as a part of the National Greening Program initiated by the DENR, tree planting activities have been conducted in the municipalities of Dingras and Solsona. Furthermore, the PDRRMC of Ilocos Norte Province has been implementing a project in collaboration with the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) to develop meteorological weather stations, and thereby to set up flood warning system.

With the enforcement of the DRRM Act, awareness of local residents and concerned parties for proactive disaster preventive measures have steadily enhanced, and disaster prevention activities have also been activated even in barangay level. However, although the budget system has been revised under the new Act, enough budget has not been secured to carry out necessary activities, and the DRRMCs of Ilocos Norte Province, 1 city and 10 municipalities seem to be conducting activities within their limited budget.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project aims to reduce flood damage in the project area by constructing flood control facilities. Mitigation of flood damages has been achieved by the project－construction of sabo dams, spur dikes, and construction and restoration of earth dikes－and the results of local interview and beneficiary survey have shown local residents' satisfaction to the benefit of the project. The project has also contributed to the improvement and enhancement of the people's living environment, and the economic and social development. In light of this, the project is deemed as to have yielded positive effectiveness and impacts in various ways. The project objective to contribute to the reduction of flood damage, enhancement of people's living environment and sanitation situation, and development of local economy and society is consistent with Philippines' development plan and development needs, both at the time of appraisal and the ex-post evaluation, as well as Japan's ODA policy at the time of appraisal, therefore its relevance is high. Project efficiency is fair because both project cost and project period exceeded the plan. As regards operation and maintenance, some concerns have been observed in the state of operation and maintenance, therefore sustainability of the project effect 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

<u>Importance of maintenance (especially removal of sediments)</u>

Since the project completion in May, 2009, the executing agency has not taken measures for removing sediments. According to the executing agency, given the speed

and amount of sedimentation compiling, there is a possibility that sediment storage capacity of sabo dams might fall short of the intended 25 years without regular dredging. In addition, sediments are flowing in to the middle and lower Laoag River from the tributaries and open dikes. In case sediments exceed the sediment storage capacity of sabo dams and flow out to the lower reach or sediments from tributaries and open dikes accumulate, flood control function will decline (i.e., discharge capacity of the Laoag River will decline due to rising riverbed and decreasing river width). This will also diminish agricultural productivity in the project area since sediments may flow into farmlands, which may have negative impact on the effectiveness and sustainability of the NIA irrigation system. Given the fact that the Laoag River is located in the area, with a topographical feature easy to accumulate sedimentation, the executing agency should develop mechanism for appropriate planning, budgeting and implementation for maintenance, including removal of sediments, in order to enhance sustainability of the project. In addition, the executing agency should further collaborate with the DENR and the LGUs to strengthen reforestation initiatives in the upper river basin as part of drastic measures to mitigate sediment discharge.

Furthermore, the executing agency should conduct monitoring and supervision of private sector's quarry business in coordination with the LGUs so as not to affect the sustainability of the project.

Importance of collaboration with the LGUs

The MOA between the DPWH and the LGUs on operation and maintenance of the project has not been signed at the time of ex-post evaluation, therefore, the executing agency is fully responsible for undertaking the operation and maintenance of flood control facilities and bridges constructed by the project. However, it is important that the executing agency develops mechanism for coordination and collaboration with the LGUs in prospect of future role-sharing of the operation and maintenance work with them. In order to secure sustainability of the project, it is crucial to formulate structures that would enable the LGUs to proactively participate in river conservation and disaster prevention activities in collaboration with the executing agency, and to reflect their voices properly to operation and maintenance of the project. In fact, as each LGU plans to prepare the LDRRMP targeting October 1 2013, it would become possible to institutionalize collaborative relationship between the executing agency and the LGUs if such collaborative activities would be stipulated in the LDRRMP.

4.3 Lessons Learned

Importance of participation of the LGUs and local residents in flood control and water

resource management projects

When the executing agency prepares projects on flood control and water resource management in the future, it would be important to incorporate participatory type soft components (e.g., conducting disaster prevention activities such as disaster drills and first aid, installing disaster prevention equipments, providing seminars, training and environmental education at schools, tree planting, cleaning up flood control and drainage facilities etc.) to enhance awareness and reinforce preparedness for flood prevention measures in the project area. As mentioned in the Column, with the enforcement of the DRRM Act, awareness of local residents for proactive disaster preventive measures have steadily enhanced, therefore, the executing agency will be able to facilitate communication with the LGUs and local residents, and provide opportunities to further strengthen their ownership to cope with flood prevention measures by incorporating such soft components in the project scope. In addition, through such initiatives, it would be possible to control flood disasters to some extent even if the magnitude of the flood exceeds the expectation, and would contribute to enhance effectiveness and sustainability of the project as an infrastructure project. Therefore, it is important that the executing agency acknowledges such benefits, and incorporates such soft components in the project scope during project preparation, prior to proceeding with project approval process, from the point of view of securing necessary budget and resources (experts etc.), facilitating smooth project implementation, and enhancing project effectiveness. It is also expected that JICA provides advice to the executing agency to incorporate such soft components to similar type of projects in the future as appropriate.

Considerations to be made during project implementation for projects located in natural disaster prone areas

The project was located in disaster prone area from typhoons, and had been hit by super typhoons (Igme: June 2004, Labuyo: September 2005, Helen, Igme and Karen: between July to August 2008) during the project implementation. The executing agency had no choice but to conduct design changes due to changes in the river conditions and topographic features, as well as to restore damaged flood control facilities. These external factors became one of the major causes to exceed the planned period and cost of the project－the executing agency has decided to utilize the local fund to cover the cost overrun to complete the project. As such, it is important for the executing agency to carefully review the project cost and period when adding scope, and to secure mechanism for flexible and agile coordination and approval procedures during project implementation.

[END]

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1.Project Outputs	1) Sabo Dam Works (5 dams) ・Sediment Capacity: 4,862,000m^3 2) Laoag-Bongo River Improvement Works ・Improvement Length: 13.14 km ・Earth Dike: 11,600 m ・Riverwall: 1,540 m ・Spur Dike: 5 units ・Sluiceway: 5 units 3) Alluvial Fan River Improvement Works ・Improvement Length: 39km ・Earth Dike: 52,000 m ・Spur Dike: 1,328 m ・Groundsill: 4 units ・Sluiceway: 17 units ・Existing Bridge Extension: 1 Consulting Service: 1) Basic Survey 2) Detailed Design 3) Assistance to DPWH in Construction Management 4) Assistance to DPWH in Environmental Management (Land Acquisition, Compensation and Resettlement, and Environmental Monitoring on Water Quality, Air Quality, Noise, Waste etc.)	1) Sabo Dam Works (5 dams) ・Sediment Capacity: 4,709,000m^3 2) Laoag-Bongo River Improvement Works ・Improvement Length: 14.0 km ・Earth Dike: 12,500 m ・Riverwall: 1,100 m ・Spur Dike: 6 units ・Sluiceway: 10 units 3) Alluvial Fan River Improvement Works ・Improvement Length:39km ・Earth Dike:70,400 m ・Spur Dike:1,036 m ・Groundsill: 4 units ・Sluiceway: 15 units ・Existing Bridge Extension:1 Consulting Service: 1) As planned 2) As planned 3) As planned 4) As planned
2.Project Period	Mar. 2001–Sept. 2006 (67 months)	May 2001–May 2009 (97 months)
3.Project Cost Amount paid in Foreign currency Amount paid in Local currency Total Japanese ODA loan portion Exchange rate	 3,996 million yen 4,416 million yen (1,577 million pesos) 8,412 million yen 6,309 million yen 1 peso＝2.8 yen (As of Jan. 2000)	 6,295 million yen 4,296 million yen (1,930 million pesos) 10,591 million yen 6,295 million yen 1 peso＝2.2 yen (Average between Sept. 2001 to Dec. 2008)

[END]

Republic of the Philippines

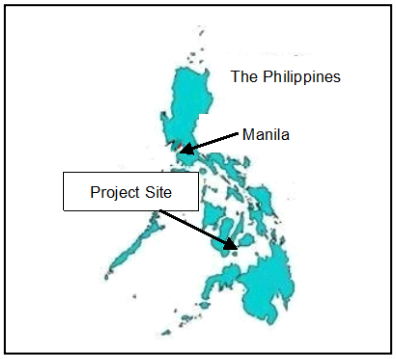
Ex-Post Evaluation of Japanese ODA Loan Project
"Bohol Irrigation Project (Phase II)"

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

0. Summary

With an aim to increase rice production through improved agricultural infrastructure, this project developed an irrigation dam, main, lateral and drainage canals while carrying out land leveling work and constructing main farm ditches in Bayongan located in the northeastern part of Bohol Island. Both at the times of project appraisal and ex-post evaluation, the project is consistent with the development policy of the Philippines as can be seen in the agricultural infrastructure policy. Similarly, the project is consistent with the needs of the Philippines, such as to develop irrigation facilities, at the times of appraisal and ex-post evaluation. Owing to the development of main and lateral canals by the project, targets were generally met for service area and per-hectare yield of rice. Rice production has been increasing after project completion, and the irrigation service fee collection rate is higher after project completion than it was at the time of project appraisal. Furthermore, target for gross farm income per hectare, which was set at the time of project appraisal, was exceeded after project completion, and the results of the beneficiary survey were largely positive. The project period was significantly longer than planned, and the project cost was slightly more than the plan. No major problems are observed in the institutional, technical, and financial aspects of operation and maintenance. In light of the above, this project is evaluated to be satisfactory.

1. Project Description



Project Location

Constructed Main Canal

1.1 Background

Bohol Island, located in Central Visayas, was one of the least economically developed areas in the Philippines[1] before project appraisal. Agriculture was an important industry for the island. Approximately 60% of the island was agricultural land (equivalent to 103,761ha), and almost 50% of its workforce was engaged in agriculture[2]. Having soil suitable for farming, the island had high potential for agricultural production, the main of which was rice cultivation. On the other hand, irrigation systems were underdeveloped, and agricultural productivity was generally low. Consequently, many farmers were in poverty. Thus there was an urgent need to develop agricultural infrastructure, especially irrigation facilities, in order to increase food production and improve livelihoods of farmers.

In Bohol Island an irrigation scheme began in 1970s with the aim of strengthening agricultural infrastructure. Three dams (Malinao, Bayongan, and Capayas Dams) were planned to be constructed so as to irrigate 10,000ha of farmland. Out of the three, Malinao Dam, located upstream, was constructed with Japanese ODA loan ("Bohol Irrigation Project") and completed in 1996 before this project. Capayas Dam, located downstream, was constructed with Japan's Grant Aid and completed in 1991. This project constructed Bayongan Dam, which is located in between the other two.

1.2 Project Outline

The objective of this project is to increase rice production through agriculture development by constructing a dam, main, lateral and drainage canals and by carrying out land leveling work and developing main farm ditches, thereby contributing to the improvement of farmers' livelihoods and poverty alleviation in the east northern part of Bohol Island.

Loan Approved Amount / Disbursed Amount	6,078 million yen / 6,014 million yen
Exchange of Notes Date / Loan Agreement Signing Date	December 1999 / December 1999
Terms and Conditions	<Construction> Interest Rate: 1.8% Repayment Period: 30 years (Grace Period: 10 years)

[1] The average annual household income of Central Visayas, a part of which is Bohol Island, was 85,215 pesos in 1997. It is lower than the national average of 123,168 pesos and Metro Manila's average of 270,993 pesos. (source: National Statistics Office of the Republic of the Philippines)

[2] This information was taken from JICA's project appraisal document.

	Conditions for Procurement: general untied <Consultant> Interest Rate: 0.75% Repayment Period: 40 years (Grace Period: 10 years) Conditions for Procurement: bilateral untied
Borrower / Executing Agency	The Government of the Philippines / National Irrigation Administration (NIA)
Final Disbursement Date	March 2009
Main Contractor (Over 1 billion yen)	Kurimoto, Ltd. (Japan) and Hanjin Heavy Industries & Construction Co., Ltd. (South Korea) (Joint Venture) , Hanjin Heavy Industries & Construction Co., Ltd. (South Korea)
Main Consultant (Over 100 million yen)	Nippon Koei Co., Ltd. (Japan) , PKII Engineers (the Philippines) , Integrated Philconsult, Inc. (the Philippines) , and Sustainable Development Solutions, Inc. (the Philippines) (Joint Venture)
Feasibility Studies, etc.	"Feasibility Study on Bohol Irrigation Development Project (Phase II) in the Republic of the Philippines," JICA, November 1985
Related Projects	【Technical Cooperation Projects】 ■ "Bohol Integrated Agriculture Promotion Project" (November 1996 – November 2003) 【ODA Loan】 ■ "Bohol Irrigation Development Project" (L/A signed in 1983) ■ "Dispatching of Experts to Confirm the Status of Bohol Irrigation Project" (April - October 2010) ■ "Dispatching of Loan Assistance Experts to Follow up on Bohol Irrigation Project" (to facilitate and monitor the action plan implementation) (February 2012 – March 2013) 【Grant Aid】 ■ "Capayas Irrigation Project" (completed in 1991)

2. Outline of the Evaluation Study

2.1 External Evaluator

Kenichi Inazawa, Octavia Japan Co., Ltd.

2.2 Duration of Evaluation Study

Duration of the Study: September 2012 – July 2013

Duration of the Field Study: 25 November – 7 December 2012, 7-13 April 2013

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

3.1 Relevance (Rating: ③[4])

3.1.1 Relevance to the Development Plan

At the time of project appraisal, the Government of the Philippines (Estrada Administration) was implementing the "Medium-Term Philippine Development Plan (1999-2004)." The plan identified national priorities, such as increase in agricultural production, food security, and improved incomes in the regions. With a view to achieving these goals, the Government identified key geographical areas for food production, promoting development and improvement of irrigation facilities. In addition, the Medium-Term Agricultural Development Plan (1993-1998) developed by the Ministry of Agriculture called for an improvement in cereal production, particularly in rice cultivation. Furthermore, the Ministry of Agriculture was implementing the "Golden Harvest Program," promoting the development and dissemination of farming technologies suited to each region. The program recognized Bohol Island as one of the key geographical areas for increasing rice production.

At the time of ex-post evaluation, infrastructure development, including irrigation facilities in the regions, remains a priority for the Government of the Philippines. This is visible in the new Medium-Term Philippine Development Plan (2011-2016), which lists improvement of agriculture infrastructure and increase in farmers' incomes as development priorities. The plan stresses the importance of improving irrigation facilities. In addition, the Ministry of Agriculture has developed the Food Staple Self-Sufficiency Roadmap (2011-2016). It places an emphasis on upgrading and development of irrigation facilities for increased rice acreage, yield per hectare, and output. Furthermore, the National Irrigation Administration (NIA), the executing agency of this project, has a six-year irrigation roadmap, which was developed in 2012. It aims to construct irrigation facilities to irrigate 166,671ha while rehabilitating the existing irrigation facilities covering 284,399ha of land. In view of the above, the project remains consistent with the development policy of the Philippines.

3.1.2 Relevance to the Development Needs

Before project appraisal Bohol Island was one of the least economically developed regions of the country. Agriculture was an important industry for the island. Approximately 60% of the island was agricultural land, and almost half of its workforce was engaged in farming. Having

[3] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory
[4] ③: High, ② Fair, ① Low

soil suitable for agriculture, the island had high potential for agricultural production, particularly for rice cultivation. It was believed that by improving irrigation facilities the island would be able to increase agriculture production and thereby alleviate poverty. In Bohol Island an irrigation scheme began in 1970s with an aim of strengthening agricultural infrastructure. Construction of three dams was planned to irrigate 10,000ha of farmland in total. Out of the three, Malinao Dam, located upstream, was constructed with Japanese ODA loans and completed in 1996 before this project. Capayas Dam, located downstream, was constructed with Japan's Grant Aid and completed in 1991. Then this project constructed Bayongan Dam in between the other two as there was a strong need to improve agricultural infrastructure and farmers' incomes in Bayongan area[5].

At the time of ex-post evaluation, NIA is carrying out concrete-lining of tertiary canals with an aim to achieve efficient distribution of irrigation water to tail-end farms in the project area[6]. Additionally, Malinao Dam mentioned above is currently being redeveloped[7]. With the population growing in all parts of the Philippines, NIA recognizes the importance of stable production and supply of rice as well as sustained self-sufficiency ratio[8]. It is believed that the concrete-lining work and redevelopment of Malinao Dam would contribute to stable production and supply of rice as well as to sustaining self-sufficiency ratio. Therefore, irrigation development remains relevant in the Philippines at the time of ex-post evaluation.

3.1.3 Relevance to Japan's ODA Policy

Based on the Official Development Assistance (ODA) Charter of Japan endorsed by the Cabinet in 1999 and the Medium-Term Policy on ODA issued in the same year, JICA developed the Medium-Term Strategy for Overseas Economic Cooperation Operations. This strategy lays out overall policy directions and priority areas for Japanese ODA loans. In the strategy the following fields were identified as priorities: (1) making economies more resilient and overcoming constraints in order to achieve sustainable growth (e.g., appropriate macroeconomic management, reinforcing industrial structures, and developing economic infrastructures); (2) poverty alleviation and correction of regional disparities; (3) environmental protection and disaster prevention; and (4) human resource development and system building.

[5] Bayongan Dam covers 14 communities in three municipalities (San Miguel, Ubay, and Trinidad).
[6] It will be further discussed in the "Project Output" section under "Efficiency."
[7] The plan is to elevate the body of Malinao Dam by 2m thereby securing sufficient storage capacity and ensuring reliable supply of irrigation water.
[8] In Bohol Province, the self-sufficiency ratio for rice has reached 100% since 2008 (The source of this information is Bohol Department of Agriculture. The calculation is based on a rice consumption of 85kg/year/person. In Japan the calculation is normally made based on 60kg/year/person. (Source: Planning Division, General Food Policy Bureau, Ministry of Agriculture, Forestry and Fisheries, 2006)

The strategy also describes country-specific priorities. For the Philippines the priority is to "reduce poverty and correct regional disparities through agriculture and rural development."

This project provides infrastructure building assistance in the Philippines, which aims to achieve stable food supply, to reduce poverty, and to correct regional disparities. Evidently, the project is in line with the priorities set by JICA (i.e., "(2) alleviating poverty and rectifying regional disparities") and thus consistent with Japan's ODA policy.

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

3.2 Effectiveness[9] (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

1) Data concerning Rice Production Increase through Agriculture Development in the Project Area

Data concerning rice production increase through agriculture development is shown in Table 1 (at appraisal) and Table 2 (at ex-post evaluation).

Table 1: Data concerning Rice Production Increase in the Project Area through Agriculture Development (Actual and Target at Project Appraisal)

Indicator	Actual at Project Appraisal (1999)	Target after Project Completion (Completion Planned in 2005)
1) Designed area / Irrigable area[10] (ha)	N/A	5,300 (Bayongan: 4,140ha, Capayas: 1,160ha)
2) Per-hectare yield of rice (ton/ha)	2.9	4.8
3) Irrigation service fee collection rate (%)	36	N/A

Source: JICA's document

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

[10] In Table 1 and Table 2, "designed area" refers to an area designed to be irrigated within the project area. "Irrigable Area" refers to an area within the service area where irrigation becomes possible with the preparation of land and construction of tertiary canals. "Irrigated Land" refers to an actually cropped area out of the irrigable area. "Benefited Area" refers to an area from which rice is harvested.

Table 2: Data concerning Rice Production Increase in the Project Area through Agriculture Development (Actual after Project Completion)

Indicator	Area / Season		2010 (2 years after Completion)	2011 (3 years after Completion)	2012 (4 years after Completion)
1) Designed area (ha)	Bayongan		4,140		
	Capayas		1,160		
2) Irrigable area (ha)	Bayongan		2,957	2,957	3,300
	Capayas		750	750	750
3) Irrigated area (ha)	Bayongan	Wet Season[11]	1,986	2,586	2,608
		Dry Season	2,325	2,644	2,809
		(ratooning)	-	(276)	(824)
	Capayas	Wet Season	600	624	600
		Dry Season	577	617	672
		(ratooning)	-	(92)	(184)
4) Benefited area (ha)	Bayongan	Wet Season	1,589	2,439	2,604
		Dry Season	1,860	2,620	2,806
		(ratooning)	-	(276)	(815)
	Capayas	Wet Season	406	472	536
		Dry Season	550	500	668
		(ratooning)	-	(92)	(184)
5) Yield of rice per hectare (ton/ha)	Bayongan	Wet Season	4.1	3.6	4.38
		Dry Season	4.1	3.4	4.9
		(ratooning)	-	N/A	N/A
	Capayas	Wet Season	4.8	4.5	4.38
		Dry Season	3.4	4.2	4.97
		(ratooning)	-	N/A	N/A
6) Annual yield of rice (ton)	Bayongan	Wet Season	6,494	8,741	11,407
		Dry Season	7,603	8,937	13,931
		(ratooning)	-	N/A	N/A
	Capayas	Wet Season	1,962	2,109	2,347
		Dry Season	1,977	2,085	3,317
		(ratooning)	-	N/A	N/A
7) Irrigation service fee collection rate (%)	Bayongan		72.47	52.62	62.63
	Capayas		52.76	42.04	44.25

Source: Document provided by NIA

Data shown in Table 1 and Table 2 are analyzed below:

Designed Area/Irrigable Area

As shown in Table 1, it was expected at the time of project appraisal that irrigable area would be equal to designed area after project completion. However, as seen in Table 2, irrigable area in Bayongan and Capayas was 4,050ha in 2012, which is 76.4% of the target (target was 5,300ha, out of which 4,160ha was in Bayongan and 1,140ha in Capayas). The target was not achieved

[11] In the project area the wet season is from May to October, and the dry season is from November to April. Dual cropping is the common practice.

because of the delay in farm preparation,[12] the main of which is land leveling[13]. In Bayongan area, however, irrigable area is gradually expanding, reaching 2,957ha in 2011 and 3,300ha in 2012. According to NIA, they are "trying to achieve proper water distribution by making progress on the concrete-lining work for tail-end farms as well as on the installation of perch tubes.[14] In fact, irrigable area is expanding with more landowners showing support and understanding."

Cropped Area / Benefited Area

It is difficult to analyze cropped area and benefited area because no targets were set for these indicators at project appraisal (see Table 1). What can be said is, however, both cropped and benefited areas are increasing along with the progress made on land leveling. On a side note, ratooning[15] was introduced in the project area in 2011. Since then some amount of rice is harvested using this method, which is shown in Table 2.

Per-Hectare Yield and Annual Yield of Rice

The average per-hectare yield of rice has been around 4.2 tons/ha in Bayongan and Capayas areas since 2010, which is close to the target (87% of the target). This achievement can be attributed to the project for it made the distribution of irrigation water smooth through development of irrigation facilities. Another contributing factor is the introduction of hybrid seeds in 2011. They are more resistant to pests and natural disasters[16]. With respect to annual rice yield, it has been increasing along with benefited area and per-hectare yield[17].

Irrigation Service Fee Collection Rate

Although targets were not set at the time of project appraisal, irrigation service fee collection rate is higher after project completion (2010-2012) than it was at the time of project appraisal

[12] The reason for the delay will be discussed later in the "Efficiency" section under "Output."
[13] It is conducted to correct difference in height that exists in some parts of rice paddies. It has a number of purposes: to distribute irrigation water efficiently; to promote planted rice to grow equally; and to make herbicides more effective.
[14] It is a round-shape cylindrical PVC tube with a diameter of 15cm and a height of 30cm. It functions as a water regulator, keeping water level at 5cm or below. It is used in combination with concrete-lining to realize efficient distribution of irrigation water for the tail-end farms.
[15] It is to harvest a crop which leaves the roots and the lower parts of the plant uncut to give the ratoon or the stubble crop. If fertilizer is applied properly, it can be harvested within 40-50 days. In Japan it is called *Hitsuji* or *Hikobae*, which is rarely practiced in temperate regions.
[16] Data for 2012 shows that 20% of the seed rice was crossbred and 80% was inbred in the wet season, whereas 35% was crossbred and 65% was inbred in the dry season. This indicates that hybrid seed rice is increasingly used these days. NIA aims to make it all hybrid by 2017 as it is estimated that yield will become 5-7 tons/ha when crossbred seed rice is used for the entire cropped area.
[17] Data on the per-hectare yield and annual yield for ratooning was not available.

(see Table 2). This is because NIA has been making efforts to improve fee collection rates. For example, they started the recruitment of Institutional Development Officers in 2011 with the aim of reinforcing irrigator's associations (totally 21 associations) and promoting irrigation service fee payment among farmers[18].

Figure 1: Rice Fields in Bayongan

Figure 2: Developed Lateral Canal

2) Trends in Irrigated Rice Output and Impacts on Local Socio-Economy in Bohol Province

Table 3 shows the trends in province-wide output of rice since project commencement. Generally, it has been increasing. The output was 134,055 tons for the province in 2012, while the output for Bayongan area in the same year was 25,000 tons (wet and dry seasons combined, see Table 2). Thus it can be said that the project accounts for approximately 19% of the provincial rice production in terms of rice output.

Interviews were conducted with the management of the Bohol Agricultural Bureau and staff of Agricultural Promotion Center (APC), which is under the Ministry of Agriculture. Regarding project impacts they commented on the following points: (1) The project anchors the rice self-sufficiency rate of the province which has been 100% since 2008; (2) The project has brought economic benefits[19] because surplus rice is transported to other parts of the country[20] for sale; and (3) The project contributes to the improvement in farmers' incomes[21]. Therefore,

[18] According to NIA, they recruit young professionals who completed master's courses in agriculture or related fields. The responsibilities of IDOs are: to provide farmers with support and advice on cropping; to help make irrigator's associations stronger; and to make farmers aware of water charge payment. Although there was only one IDO in the project area in 2011, the number has increased to four in 2012.

[19] Although no concrete data exists on the surplus rice, it can be estimated as follows. The total amount of rice consumed in Bohol Province is estimated at 107,000 tons per year. This was calculated based on the average rice consumption of 85kg/year/person (Footnote 8) and the population of 1,260,000 (2010 National Census). From Table 3, 134,055 tons of irrigated rice was produced in 2012. Subtracting the estimated consumption from the production gives us 27,000 tons. With the assumption that all 27,000 tons are marketed in other parts of the country, sales are estimated to be 459milliong pesos (about 1.02billion JPY) using the current rice price in the province, which is of 17 peso/kg.

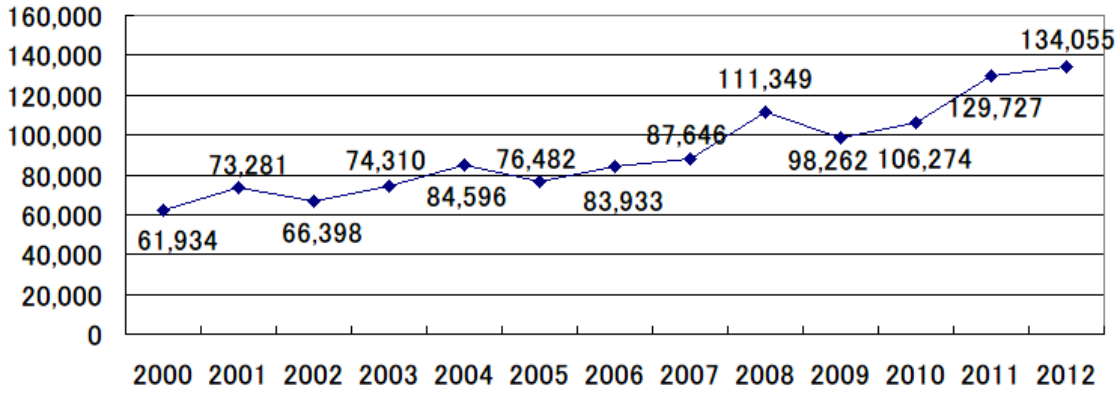
[20] The surplus rice is first transported to Cebu, the capital of the province, in Central Visayas. From Cebu it is shipped to different parts of the country.

[21] It will be further discussed in the "Impact" section ("3.3.1.1 Impact on Farmer's Income and Poverty Alleviation,

the project is believed to have a considerable influence on the local society and economy.

Table 3: Trends in Irrigated Rice Output in Bohol Province

(Unit: ton)



Source: Philippines Bureau of Agricultural Statistics (BAS)

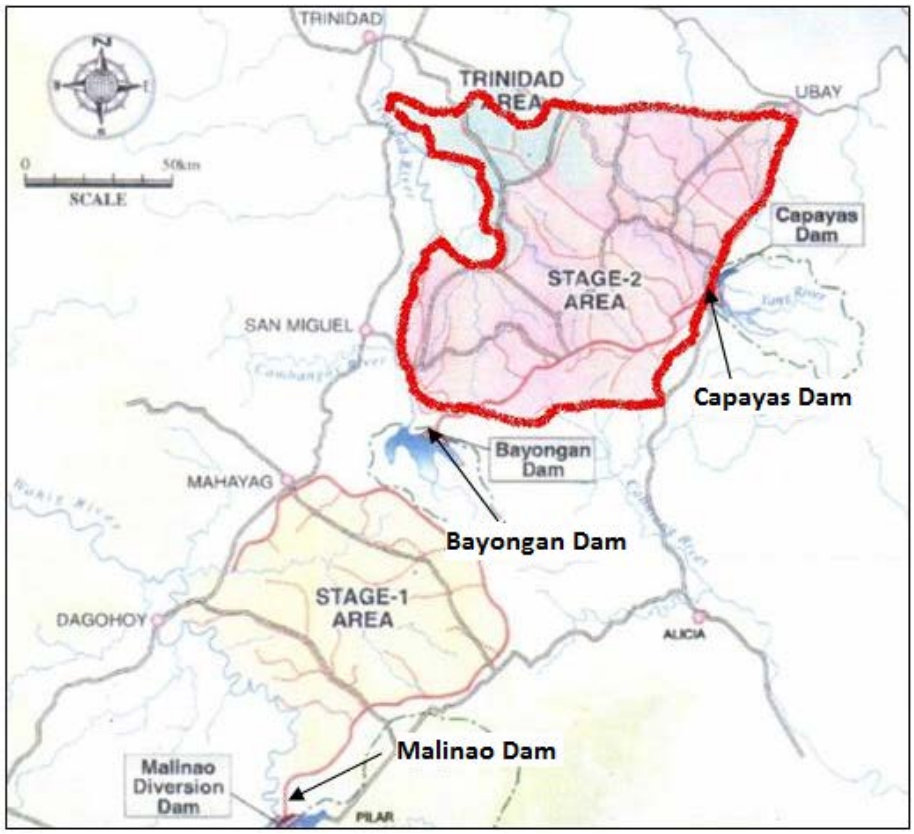


Figure 3: Project Location
(Bayongan area is circled in red)

2) Improvement in Farmers' Incomes").

3.2.2 Qualitative Effects

Job Creation in the Project Area

Farmers in Bayongan area were employed by the construction companies during project implementation. Additionally, it was learned through the evaluation study that most farmers belong to irrigator's associations and receive monetary compensation from NIA for cleaning water canals (e.g., de-silting, de-weeding, and cleaning of concrete panels on protective walls). Farmers were asked in interviews to describe changes they observed during project implementation and after project completion in employment, agriculture, and livelihoods. They commented as follows[22]:

【Farmers' Comments on Employment】

■ I worked for a construction company during project implementation. I did not have any complaints about the pay. (Note: Salaries were paid every 15 days at that time.)

■ As I was previously, I am taking part in the irrigator's association's activities. Many farmers are engaged in maintenance activities, which is mainly to maintain and clean water canals. We receive monetary compensation from irrigator's associations for this, but it is not a salary. I do not have any complaints about the rate of compensation[23].

【Comments on Changes in Agriculture/Livelihoods】

■ Many farmers switched from dry-field farming to rice cultivation before, during, and after project implementation. The main reasons are as follows: (1) Irrigation water became available; (2) Rice yield per hectare improved; and (3) hybrid seeds were introduced.

■ Regarding lifestyle changes, our income increased thanks to the boost in rice production. With extra income, we were able to send our son to university in Cebu.

3.3 Impact

3.3.1 Intended Impacts

3.3.1.1 Impact on Farmer's Incomes (Poverty Alleviation[24])

1) Results from the Beneficiary Survey (Farmers Interviews)

[22] As a part of the evaluation survey, key informant interviews were conducted with 7 farmers who were employed during the project implementation while engaging in water canal cleaning on a part-time basis. Information was not available concerning the number of farmers employed during project implementation and after project completion.

[23] When member farmers carry out operation and maintenance of water canals at the request of irrigator's associations, 400 pesos per km is paid based on the standard set by NIA.

[24] According to the project appraisal document, the project aimed to increase farmers' incomes, and it was viewed as one way of alleviating poverty.

As a part of this evaluation study, farmers residing in Bayongan area (the area downstream of Malinao Dam[25] amounting to 11.2km^2) were interviewed using a questionnaire[26]. The results are shown in Figure 4-11 below.

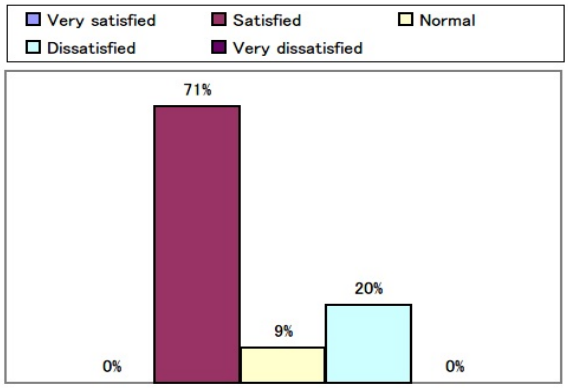


Figure 4: Are you satisfied with the project?

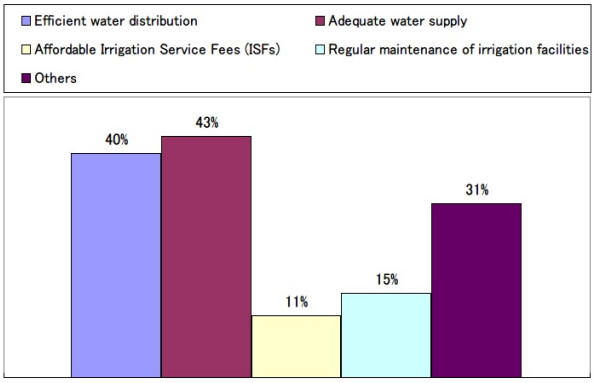


Figure 5: Reason(s) for responding "satisfied" to the question in Figure 4 (Multiple answers allowed)

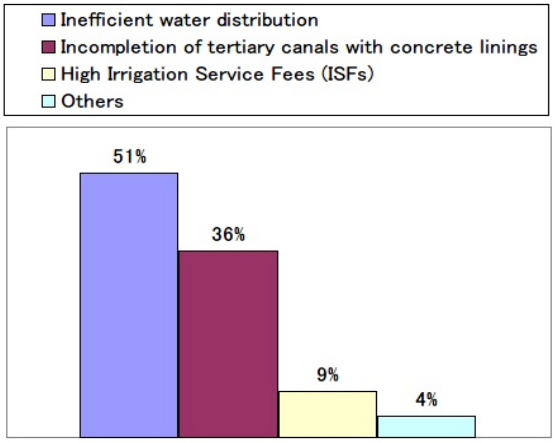


Figure 6: Reason for responding "dissatisfied" to the question in Figure 4

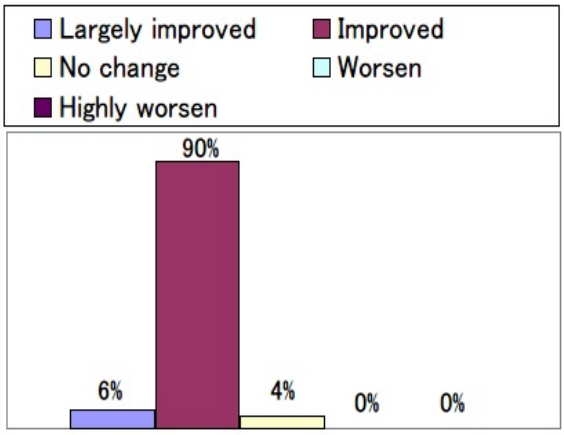


Figure 7: Did rice output improved after project completion?

[25] The area of the Malinao Dam watershed is 138.8km^2. The main rivers in the watershed are the Wahig river (length: 16km) on the west one western side and the Pamaclasan river (length: 12km) on the eastern side. These rivers meet 1.5km upstream of Malinao Dam.

[26] 100 farmers were interviewed using a random sampling method: 53 samples were drawn from farmers residing in the area near the main and the lateral canals, while 47 were drawn from farmers residing in the area near the tertiary canals. There are a total of 3,400 farming households (2012) in the project area.

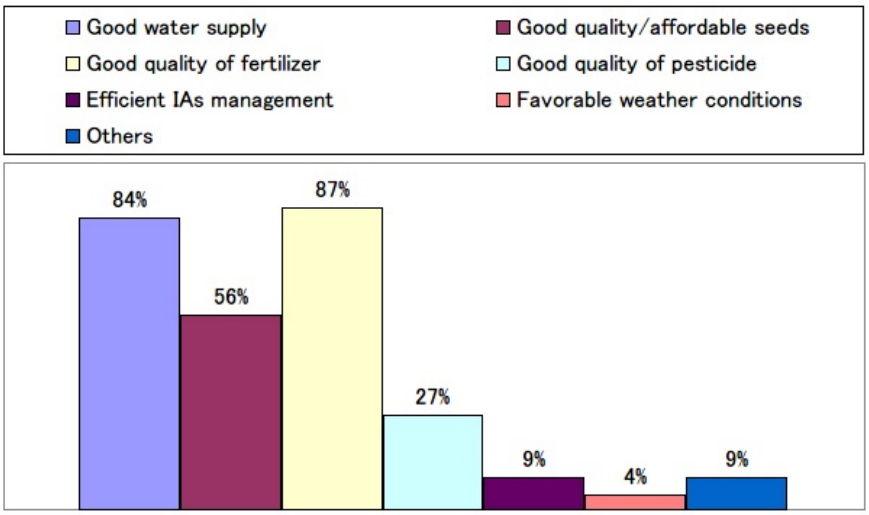


Figure 8: Reason(s) for responding “greatly improved” or “improved” to the question in Figure 7 (Multiple answers allowed)

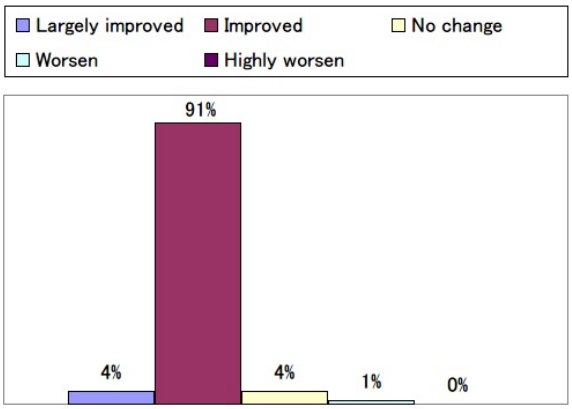


Figure 9: Did your income increase after project commencement?

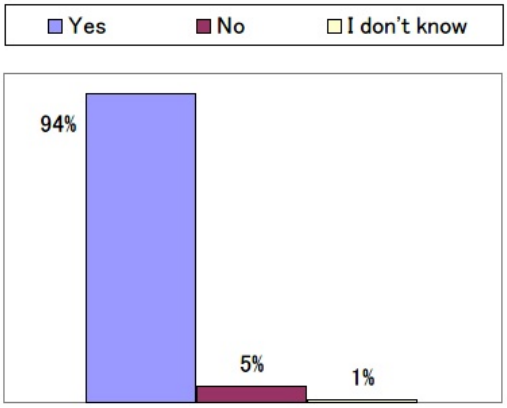


Figure 10: Did the living standard improve along with the increase in income?

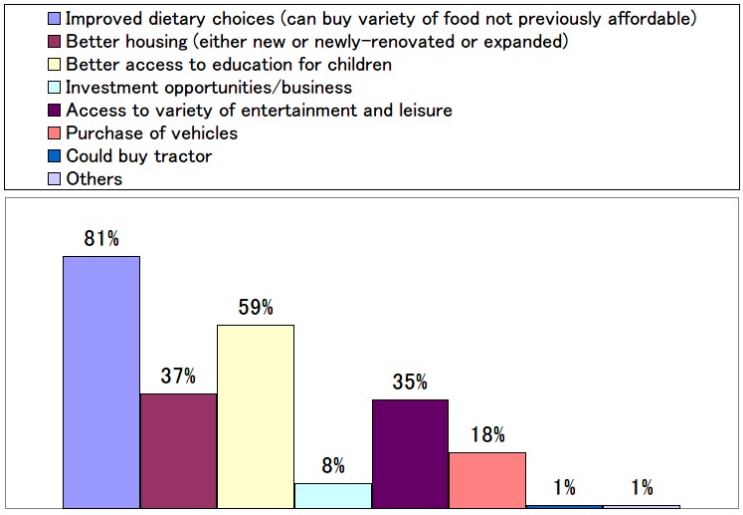


Figure 11: Reason(s) for responding “yes” to the question in Figure 10 (Multiple answers allowed)

It can be seen from Figure 4 that the level of satisfaction is generally high. As Figure 5 suggests, many respondents said they were satisfied with the project because of efficient water distribution and adequate water supply, which were made possible through the construction of irrigation canals. Thus the high level of satisfaction can be attributed to the project. According to Figure 6, some people are not satisfied with the project (about 20% of the interviewees responded "dissatisfied" as seen in Figure 4) because of the little progress[27] made on the concrete-lining of tertiary (field) canals[28]. On the other hand, many farmers said that rice output increased after project completion (see Figure 7). The increase in rice output was attributed not only to the project (i.e., good water supply) but also to the introduction of hybrid seeds and higher qualities of fertilizer (see Figure 8)[29]. Figure 9 suggests that the project is contributing to improving farmers' incomes. Additionally, more than 90% of respondents think that their living standards have improved along with incomes (see Figure10). The reasons are provided in Figure 11, indicating that people are purchasing more food and other basic necessities. Therefore, it can be concluded that the project is contributing to the improvement in incomes and living standards of farmers.

2) Improvement in Farmers' Incomes

Table 4 shows how the gross farm income per farmer[30] changed in Bayongan from the time of project appraisal to after project completion. Gross farm income is essentially determined by farm gate price[31] (i.e., gross farm income is output multiplied by gate price). From 2000 to 2012 gate price of rice grew by an average of 5.97% per year in Bohol Province[32]. Applying this 5.97% to the target set at the time of project appraisal (8,553 peso/ha), the adjusted target can be estimated to be 17,800 peso/ha. Because gross farm income after project completion is 25,427 peso/ha (2012), the actual gross farm income is higher than the adjusted target. It is thus suggested that the project is contributing to improving incomes of farmers in the project area.

[27] It will be discussed later in the "Efficiency" section under "Output."
[28] During the beneficiary survey quite a few farmers expressed their demands for the concrete-lining of tertiary water canals.
[29] The Bohol Bureau of Agriculture is promoting the improvement in qualities of seeds and fertilizer while supplying them. Supports provided by the bureau of agriculture seem to have contributed to the increase in output.
[30] The ex-post evaluation data refers to incomes of farmers who are using irrigation services.
[31] Farm gate price can be obtained by subtracting costs, such as that of marketing and purchasing of seeds, from market price. It is also calculated based on price index, such as agriculture price statistics and wholesale market price statistics.
[32] The source of this information is Philippines Bureau of Agricultural Statistics.

Table 4: Gross Farm Income per Farmer in Bayongan Area

At the Time of Project Appraisal[33]		After Project Completion
Actual	Target	2012
3,347 peso/ha	8,553 peso/ha[34]	25,427 peso/ha

Source: JICA document and NIA document

3.3.2 Other Impacts

3.3.2.1 Impacts on the Natural Environment

1) Total Suspended Particles (TSP), Dust, and Noise during project implementation

Before project implementation, there were concerns that vehicles driving on access roads inside the project area might cause problems of TSP, dust, and/or noise. According to the interview with NIA, 3 staff members conducted environmental monitoring during project implementation. The monitoring findings were presented at monthly meetings, based on which no major problems were observed. According to NIA, no environmental concerns exist currently, either. Furthermore, no major negative impacts were observed through the field visits of the evaluation study.

2) Water Pollution, Impacts on Water Creatures Caused by Excessive Use of Pesticide and Fertilizer, Impact on Soil Due to Expansion of Irrigated Area

Excessive use of pesticide and fertilizer has not caused problems of water pollution. It has not affected water creatures negatively, either. Negative impacts on the natural environment were not observed during the field visits. Additionally, the Agriculture Bureau of Bohol Province is promoting proper uses of fertilizer (e.g., how to mix organic and chemical fertilize) among farmers through workshops and field training. No negative impacts on soil, which could be caused by the expansion of irrigated area, were observed through the field visits and interviews with NIA.

3.3.2.2 Land Acquisition and Resettlement

It was required to resettle 264 households (134 houses[35]) and 9 *barangay* (village) facilities

[33] Information on farmers' non-agricultural incomes was not available through the interviews with NIA and beneficiaries.

[34] The JICA's Appraisal Document (1999) states: "It is expected that the average annual income per farmer would grow from 4,016 pesos to 10,264 pesos after project completion," in which the income was calculated per 1.2ha. The values shown in Table 4, such as 3,347 pesos/ha (at project appraisal) and 8,553 pesos/ha (target), are incomes per 1.0ha.

(church, school, and other public buildings) which existed on the land amounting to 522ha near Bayongan Dam reservoir. The compensation in the amount of 74 million pesos (or 150 million yen) was paid to the heads of households, and the *barangay* (village) facilities[36] were relocated by NIA. In June 2010 one survey was conducted to check the levels of satisfaction. Out of 264 households whose houses were to be submerged after the construction of Bayongan Dam, 34 households were interviewed. The survey results are shown in Table 5. A few respondents said they were not satisfied because they had not received the compensation. NIA later on clarified that the problem lied with the ways in which the compensation money, which was duly paid to the "heads of households," was distributed among family members. According to NIA, no inquiries or claims have been received about the payment of compensation thus far (as at December 2012).

Table 5: Survey Results on Satisfaction Levels among Resettled Residents

Question	Answer
1) Are you satisfied with the actual compensation?	・Satisfied: 23 persons ・Not satisfied: 5 persons ・No answer: 6 persons
2) Reasons for dissatisfaction	・Didn't receive compensation: 2 persons ・Decided the new address voluntarily: 2 persons

Source: JICA document

In this project, landowners are expected to bear the cost of farm preparation, including land leveling work. To make financing of the costs easier, the following system was put in place. First, landowners borrow money from local financial institutions for farm preparation work. NIA then takes over the debt in full amount, for which landowners would repay NIA in a maximum of 10 years with no interest. As discussed earlier in the "Efficiency" section, the project's land leveling work is behind schedule. Even though efforts are being made to make progress on it as well as on the concrete-lining of canals while accommodating local residents' requests, some people are discontent with the water distribution and the concrete-lining status as seen in Figure 4. According to NIA, landowners are exempted from bearing the cost of land leveling if a joint inspection by NIA and landowners finds that it is geographically difficult for irrigation water to reach the farm because the area is higher than the water surface elevation of the farm ditches. Additionally, farmers do not have to pay irrigation service fees if the yield does not reach a prescribed level. Similarly, landowners would be exempted from repaying NIA for

[35] More than one household reside in one building in the Philippines.
[36] NIA provided the compensation money to the residents (head of households) and made 3ha of land available for the relocation of the village facilities. The resettlement was implemented as per the Resettlement Action Plan.

the debt if they had bad harvests due to water shortage. Although measures such as these are in place to minimize the risk of overburdening farmers, continuous efforts are required to explore an appropriate course of actions by listening to farmers.

(Conclusion on Effectiveness and Impact)

At the time of project appraisal three indicators were identified to measure the project's effectiveness: (1) irrigable area; (2) yield per hectare; and (3) gross farm income per hectare. For the first indicator 76.4% of the target was achieved. For the second indicator target was almost achieved (87% of target). For the third indicator, which is gross farm income per hectare, the target set at the time of project appraisal was exceeded. Furthermore, rice production has been increasing since project completion, and irrigation service fee collection rate is higher after project completion than it was at the time of project appraisal although targets were not set for these two indicators. In view of the above, this project has largely achieved its objectives; therefore its effectiveness is high.

3.4 Efficiency (Rating: ①)

3.4.1 Project Outputs

The planned and actual outputs of the project are summarized in Table 6.

Table 6: Planned and Actual Project Outputs

Plan (At Project Appraisal)	Actual (At Ex-Post Evaluation)
[Construction] 1) Construction of Bayongan Dam: Zone earthfill type, active storage capacity 25.1MCM, dam height 35.5m, catchment area 11.2k m^2 2) Main canals: 12.7km (Bayongan area) 3) Lateral canals: 49.7km (Bayongan System) 4) Lateral canals: 18.0km (Cayapas System) 5) Drainage canal: 65.3km 6) Construction of main farm ditches and land leveling work: 2,800ha	[Construction] 1) Construction of Bayongan Dam: as planned 2) Main canals: 17.76km (Bayongan area) 3) Lateral canals: 42.40km (Bayongan System) 4) Lateral canals: 15.82km (Cayapas System) 5) Drainage canal: 66.91km 6) Construction of main farm ditches and land leveling work: 1,479ha
[Procurement of Machine & Equipment] 1) Procurement of equipment for the Integrated Water Management System: dam depth measurement equipment, rain gauge, PC equipment, cable laying 2) Procurement of construction machines: heavy machines (e.g., bulldozers) and vehicles (e.g., trucks)	[Procurement of Machine & Equipment] 1) Procurement of equipment for the Integrated Water Management System: as planned 2) Procurement of construction machines: as planned

[Consulting Services] 323MM (International: 157MM, Local: 166MM) Main TOR: review of tendering document, support for tender evaluation, construction supervision, training of NIA staff in the Integrated Water Management System, support for reinforcement of irrigator's associations, and support for environmental monitoring.	[Consulting Services] 410.87MM (International: 108.60MM, Local: 302.27MM) As planned.

There are some deviations from the plan as seen in Table 6. The reasons are explained below.

1) Construction

Small deviations are found in the extension of main, lateral, and drainage canals because a design review was carried out at the stage of detailed design. With regard to the construction of main farm ditches and land leveling work, only 50% of what was planned has been achieved. One reason is that landowners disagreed with the terms of the farm preparation work during project implementation[37]. However, as it was mentioned in the "Effectiveness" section above, NIA is currently using its own fund to make progress on concrete-lining of tertiary canals[38] (see Figure 12 below) and perch tube installation (see Figure 13 below) for tail-end farms. By making such efforts to realize smooth water distribution management, NIA is increasingly gaining understanding of landowners, and as a result, prepared farmland (leveled land with main farm ditches) is increasing in area.

3) Consulting Services

The man-month increased as the project period was extended. The reason for project period extension will be explained below in the "Project Period" section under "Project Inputs".

[37] According to NIA, landowners hesitated to convert their lands into paddy fields partly because at that time they could not see sufficient volume of irrigation water distributed to tail-end farms.

[38] For concrete-lining of tertiary canals, NIA's Head Office allocated 50 million pesos (or 100 million yen) to Bayongan area in 2012. Although concrete-lining work is also on-going in Malinao area, a priority is given to Bayongan area when it comes to budget allocation because more requests have been received in Bayongan area from local farmers and NGOs since before project completion. Through the field study the progress on concrete-lining of tertiary canals was confirmed as follows: 11% of planned in Bayongan area; 63% in Malinao area, and 29% in Capayas area. (Unfortunately, detailed data, such as the plan, extension, and actuals, was not available.) The progress on concrete-lining of tertiary canals depends on the level of budget allocated by NIA's Head Office. Considering that the budget was allocated to Bayongan area in 2012 for the first time, concrete-lining construction is expected to make further progress in the future.

Figure 12: Concrete-Lining of Tertiary Canal

Figure 13: Perch Tubes (used to adjust paddy field water)

3.4.2 Project Inputs

3.4.2.1 Project Cost

The actual cost of the project was 7,653 million yen (out of which 6,014 million yen in ODA loan) as compared to the plan of 7,153 million yen (out of which 6,078 million in ODA loan). The project cost is thus slighter higher than planned (107% of the plan). One reason for this is that material costs increased during project implementation, pushing up the cost of constructing Bayongan Dam, main, and lateral canals[39]. Another reason is that there was a need to review the design system plan for the Integrated Water Management System after project commencement, which increased the cost of procurement. Furthermore, the compensation for land acquisition and resettlement cost more than initially estimated. It is because market prices of commodities, which determine the amount of compensation, increased during project implementation[40]. Finally, the cost of administration and consulting services increased as the project was extended.

3.4.2.2 Project Period

The planned project period was 5 years and 7 months (67 months), from December 1999 to June 2005. In reality the project required 8 years and 10 months (106 months), from December 1999 to September 2008, which is significantly longer than planned (158% of the plan). The reasons are as follows: (1) Contractor selection required more time than planned; (2) Review of the project scope (e.g., the number of main and lateral canals to be extended) at the stage of detailed design too time; (3) Long processing time was required for allocating the local portion

[39] In addition, the lowest bid submitted for the construction work was higher than the initial estimation, and as a result, the construction cost increased.

[40] According to NIA, the amount of compensation is determined by the Provincial Appraisal Committee (PAC) organized by NIA and the Provincial Bureau of Agriculture. They take account of market price and fair price.

of the project budget[41] because the Central Government faced peso shortage due to currency fluctuations (peso depreciated against yen), (4) Long spell of rain and La Niña[42] caused delay in construction schedule; (5) While NIA opted for competitive tender, bids had to be re-invited a few times for the procurement of the Integrated Water Management installation because not many firms had the required technical know-how. Finally, the consulting service was extended due to the delay in construction schedule.

The project cost slighter exceeded the plan, while the project period significantly exceeded the plan; therefore efficiency of the project is low.

3.4.3 Results of Calculations of Internal Rates of Return (IRR)

Economic Internal Rate of Return

The Economic Internal Rate of Return (EIRR) of the project is 17.38% when recalculated by considering increase in farmers' net incomes and tourism revenue[43] as benefits, project cost (e.g., construction cost) and maintenance cost as costs, and a project life of 50 years. The recalculated EIRR is slightly lower than the initial estimate of 19.08% because the construction cost was higher than initially planned.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

NIA remains the executing agency of the project, which has not changed since project appraisal. Three irrigation areas in Bohol, namely Malinao, Bayongan, and Capayas, are administered by NIA's regional office ("NIA-7"). For operation and maintenance (O&M) concerning the project, it is Bayongan Office under NIA-7 that is responsible. Although it was originally a part of NIA-7, Bayongan Office was separated from NIA-7 in 2010 following the completion of this project. Currently, it is operating under the supervision of NIA-7.

Bayongan Office has 20 employees at the time of ex-post evaluation (as at December 2012). Under the leadership of General Manager, two departments, namely Operation and Engineering Department and Administration Department, are in charge of O&M of the project facilities,

[41] The delay was most serious from 2003 to 2005, and it also affected the budget approval and allocation of other ODA loan projects in the Philippines.

[42] It is a phenomenon during which the sea surface temperature across the equatorial Eastern Central Pacific Ocean becomes lower than normal. During La Nina temperature goes down while rainfall tends to increase.

[43] "Tourism revenue" was considered as a benefit because the project area has some tourist attractions, such as Chocolate Hills, and the area near Bayongan Dam reservoir is one of the viewpoints. (Note: The local government has spent its own budget to build ramadas and benches for visitors.)

irrigation service fee collection, procurement of machines and equipment as well as accounting. Out of the 20 employees, 11 are dedicated to the O&M of project outputs (e.g., Bayongan Dam, main and lateral canals, and drainage canals).

Twenty-one irrigator's associations exist in Bayongan irrigation area. Under these associations there are 225 Turnout Service Areas (TSAs). TSA is a unit under irrigator's associations that manages irrigation water for tertiary canals. Tasks of irrigator's associations include: to assist Bayongan Office in collecting irrigation service fees (e.g., follow up on farmers who have not paid); to monitor the irrigation water distributed to canals; and to maintain canals as commissioned by Bayongan Office (e.g., de-silting, de-weeding, and cleaning of concrete panels on protective walls). On the other hand, TSAs are responsible for monitoring the status of water distribution in the tertiary canals. They also assist the collection of irrigation service fees (covering areas with tertiary canals) as is the case with irrigator's associations.

The staffing level of Bayongan Office seems sufficient[44] as far as O&M is concerned. It was also observed that Bayongan Office is on good terms with irrigator's associations by communicating as appropriate[45]. Additionally, stakeholder meetings among NIA, local NGOs, and farmers are organized on a regular basis. In view of the above, no major problems are observed in the institutional aspects of O&M carried out by Bayongan Office.

【Irrigator's Associations and IMT】

With a view to improving national irrigation systems, NIA launched IMT in 2008 to transfer irrigation maintenance functions to irrigator's associations in stages. Irrigator's associations would sign four-phased IMT contracts with NIA (Model No.1-4) according to their maintenance abilities[46]. NIA would then transfer functions, such as maintenance of irrigation facilities and collection of irrigation service fees, to associations based on IMT contracts.

There are 21 irrigator's associations in the Bayongan Irrigation System as mentioned earlier. All of them are in Model No.1 currently. At the stage of Model No.1, system-wide maintenance is managed by NIA and Bayongan Office, while maintenance of canals is done by irrigator's associations (e.g., de-weeding, trash removal, temporary repairs for canal overflow, etc.).

[44] A good system seems to be in place at Bayongan Office concerning O&M of the project facilities. Staff tries to address maintenance problems in a timely manner by going to the site as soon as it is reported.

[45] The System Management Committee, organized by the management and employees of Bayongan Office as well as irrigator's association staff members, is meeting regularly. The committee meets twice a year before the planting times (the wet season and the dry season) to discuss and share information about crop acreage and irrigation water distribution plan. According to Bayongan Office, the committee will continue to meet regularly in the future.

[46] The higher the model number is, the greater the responsibilities of irrigator's associations would be, and the higher the required levels of maintenance abilities would be.

Associations also assist collection of irrigation service fees (e.g., delivering water bills, organizing campaigns to promote ISF payment, etc.)[47].

3.5.2 Technical Aspects of Operation and Maintenance

NIA is conducting training and workshops for O&M staff of Bayongan Office and irrigator's association members after project completion. In 2012 JICA's ODA loan expert taught a training course on maintenance skills, which was attended by a total of 62 O&M staff and irrigator's association members. When interviewed, training participants commented that "the training content was relevant and useful for the actual maintenance work." In addition, in 2009 which is immediately after project completion, NIA offered a training course covering topics, such as water distribution, water-saving technique for irrigation canals, and water management system. It was attended by many O&M staff and irrigator's association members. On-the-job training (OJT) is also provided as needed. When interviewed during the field study, staff of Bayongan Office and irrigator's association members made positive comments about training, such as this: "As we carry out O&M work, we keep in mind that improvement in O&M is the key to keeping canals in good conditions and attaining fair and appropriate distribution of irrigation water. We are eager to utilize what we learned in the training and workshops." Furthermore, O&M staff of Bayongan Office are well experienced in their work, and irrigator's association members are equipped with necessary maintenance skills. Maintenance work, which will be described later in "3.5.4 The Current Status of Operation and Maintenance," is carried out without problems. In view of the above, no major problems are observed in the technical aspects of O&M carried out by Bayongan Office staff and irrigator's association members.

3.5.3 Financial Aspects of Operation and Maintenance

Table 7 provides O&M related budgets and expenditures of Bayongan Office for the past three years. O&M budget is allocated by NIA-7 and used for salaries or maintenance work. Collected irrigation service fees are used to fund the O&M budget.

In 2012 O&M budget of Bayongan Office increased from the previous year[48]. Looking at the

[47] It was not until December 2011 that all associations in the project area signed onto IMT Model No.1. Thus it is too early to review the effects of IMT or to speculate how the situation would evolve. However, the evaluation study did confirm that Bayongan Office was providing advice to irrigator's associations regarding water distribution and other activities at a committee meeting. On the other hand, collection of irrigation service fees is a responsibility of Bayongan Office, and irrigator's associations provide support to Bayongan Office in this regard.

[48] NIA-7's explanation about Table 7: "In 2010 we were in the process of separating Bayongan Office from NIA-7. Although O&M budget was allocated to Bayongan Office that year, expenditures were covered by the budget of NIA-7 (which is shown in parentheses). Therefore, 2010 utilization of Bayongan Office alone is not known, although it does not mean that budget was not expended. Budgets and expenditures of Bayongan Office separately are known

levels of budgets and expenditures, NIA-7 has been allocating sufficient budget for the Bayongan irrigation area. In addition, Bayongan Office commented in an interview that their "office receives sufficient level of budget." Thus the level of O&M budget of Bayongan Office is deemed sufficient.

Table 7: O&M Budget and Utilization of Bayongan Office

(Unit: peso)

		2010	2011	2012
Budget	Salaries	315,000 (2,800,000)	355,000	790,645
	Maintenance	150,000 (3,500,000)	200,000	2,186,370
	Total	465,000 (6,300,000)	555,000	2,977,015
Utiliza-tion	Salaries	N/A (796,233)	313,943	556,260
	Maintenance	N/A (291,804)	153,633	227,112
	Total	N/A (1,088,037)	467,576	783,372

Source: NIA-7
Note 1: Numbers shown in parentheses are budget/utilization of NIA-7.
Note 2: Utilization for 2012 represents the amount up to the end of October.

Figure 14 shows a result from the beneficiary survey (sample size: 100, see 3.3.1.1 for interviewee selection) regarding the level of irrigation service fees borne by farmers[49]. Although some farmers think the fee is "very high" or "high," more than 70% of the farmers responded that the fee is "fair."

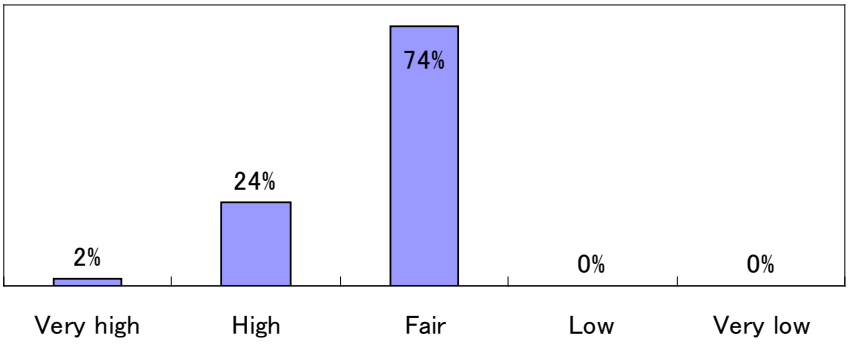


Figure 14: What do you think of the level of irrigation service fee? (Dry season 2012)

from 2011 onwards as the office began its full operation."

[49] In the Bohol irrigation area farmers pay irrigation service fees to NIA's Management Office at the rate of 150kg of unhulled rice or equivalent in cash (2,550 pesos based on 17 pesos/kg) per hectare of paddy fields (the wet season and the dry season are counted separately). (All farmers in this area have cadastres based on which irrigation service fees are determined.) Farmers are exempted from paying irrigation service fees if their harvest is less than 2t of unhulled rice per hectare due to droughts, climate change, pests, epiphytotic, and shortage of irrigation water.

3.5.4 Current Status of Operation and Maintenance

No problems were observed during field visits in the water volume adjustment for Bayongan Dam, management/operation/data measurement of the Integrated Water Management System, and routine O&M, including the opening-and-shutting of floodgates for main, lateral, and drainage canals. Each facility was being managed and utilized properly. As mentioned above, the project facilities are operated and managed by Bayongan Office, and staff is on duty around the clock to manage the Bayongan Dam as well as the Integrated Water Management System. Their tasks include: opening-and-shutting of floodgates to adjust discharged water; monitoring dam water levels; and measuring rainfall. For the main and lateral canals, staff is managing the distribution of irrigation water as well as opening-and-shutting of sluice-gates for diversions. Similarly for the drainage canals, opening-and-shutting of drainage gates is being managed properly. As described in "3.5.1. The Institutional Aspect of Operation and Management," Bayongan Office delegates certain maintenance activities to irrigator's associations (e.g., de-silting, de-weeding, cleaning concrete panels of protective walls). No major problems are observed in the maintenance work carried out by irrigator's associations according to the interviews with association members. Additionally, it was also confirmed during field visits that heavy machines and vehicles procured by the project are properly utilized and stored.

With regard to spare parts, Bayongan Office sends procurement requests to NIA-7 as needed. Although it takes longer to procure certain items, it has been on schedule for most items according to the management of Bayongan Office. O&M staff normally work 8 hours per day from Monday to Friday, but they also come into work on weekends in case of an emergency. A maintenance manual is available in the office, which is utilized by staff members as needed for the day-to-day maintenance work.

No major problems have been observed in the operation and maintenance system, therefore sustainability of the project effect is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

With an aim to increase rice production through improved agricultural infrastructure, this project developed an irrigation dam, main, lateral and drainage canals while carrying out land leveling work and constructing main farm ditches in Bayongan located in the northeastern part of Bohol Island. Both at the times of project appraisal and ex-post evaluation, the project is

consistent with the development policy of the Philippines as can be seen in the agricultural infrastructure policy. Similarly, the project is consistent with the needs of the Philippines, such as to develop irrigation facilities, at the times of appraisal and ex-post evaluation. Owing to the development of main and lateral canals by the project, targets were generally met for service area and per-hectare yield of rice. Rice production has been increasing after project completion, and the irrigation service fee collection rate is higher after project completion than it was at the time of project appraisal. Furthermore, target for gross farm income per hectare, which was set at the time of project appraisal, was exceeded after project completion, and the results of the beneficiary survey were largely positive. The project period was significantly longer than planned, and the project cost was slightly more than the plan. No major problems are observed in the institutional, technical, and financial aspects of operation and maintenance. 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 NIA continue its effort to achieve results for farmers in Bayongan area while duly reflecting farmers' interests. To that end, it is recommended that NIA allocate sufficient budget and carry out the concrete-lining of tertiary canals in due consideration of farmers' opinions. NIA's Head Office allocated budget for the concrete-lining work in Bayongan area for the first time in 2012. Although some progress has been made since then, many irrigator's associations and farmers are requesting that progress should be made on the concrete-lining work so as to realize efficient distribution of irrigation water. It is thus important that NIA continue the work of concrete-lining.
- It is recommended that the Provincial Agricultural Bureau, in collaboration with NIA, continue to provide training and workshops for rice farmers and irrigator's associations to disseminate rice cultivation technologies, including the introduction of new seeds, and to promote agriculture as a profitable business. Farmers were introduced to irrigation rather recently, and it takes more than the work of concrete-lining to improve cultivation practices of irrigator's associations and farmers. It is essential to develop capacities of farmers in rice cultivation technologies and techniques through training. It is also recommended that NIA continue its effort to recruit more Institutional Development Officers (IDOs), who seem to be well-received by irrigator's associations and farmers for their support and services.

(Recommendations to JICA)

- It is recommended that NIA lead the monitoring of cropped and benefited area, output as well as irrigation service fee collection while keeping in mind that irrigation was introduced in the project area rather recently. Collecting data for these performance indicators would allow NIA to identify an appropriate course of actions and assistance. NIA should put effort into such monitoring and JICA should continue extending relevant assistance as needed (e.g., training for irrigator's associations and farmers) with a view of enhancing project effects.
- In addition, it would be beneficial if JICA periodically requested continued allocation of budget for the concrete-lining work.

4.3 Lessons Learned

- At the time of ex-post evaluation, various efforts are being made toward project objectives, including concrete-lining of tertiary canals, training, and workshops. As these efforts were started in full scale only after project completion, some farmers are still voicing dissatisfaction with the supply of irrigation water in tail-end farms. In the future, essential supports including capacity building should be explored and planned thoroughly at the stage of project formulation so that project objectives could be attained at an earlier stage.
- JICA's ODA loan expert gave training and workshops to staff of Bayongan Office and irrigator's associations after project completion. It was learned through interviews that the work of this expert was useful not only for Bayongan Office but also for irrigator's associations as it led to improved maintenance work by association members. Judging from the fact that assistance of this kind was effective, it would be beneficial for JICA to consider extending technical assistance which would enhance project effects from early stages, such as before and during project implementation, for similar projects in the future.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1.Project Outputs	[Construction] 1）Construction of Bayongan Dam: Zone earthfill type, active storage capacity 25.1MCM, dam height 35.5m, catchment area 11.2k m^2 2) Main canals: 12.7km (Bayongan area) 3) Lateral canals: 49.7km (Bayongan System) 4) Lateral canals: 18.0km (Cayapas System) 5) Drainage canal: 65.3km 6) Construction of main farm ditches and land leveling work: 2,800ha [Procurement] 1) Procurement of equipment for the Integrated Water Management System: dam depth measurement equipment, rain gauge, PC equipment, cable laying 2) Procurement of construction machines: heavy machines (e.g., bulldozers) and vehicles (e.g., trucks) [Consulting Services] 323MM (International: 157MM, Local: 166MM) Main TOR: review of tendering document, support for tender evaluation, construction supervision, training of NIA staff in the Integrated Water Management System, support for reinforcement of irrigator's associations, and support for environmental monitoring.	[Construction] 1) Construction of Bayongan Dam: as planned 2) Main canals: 17.76km (Bayongan area) 3) Lateral canals: 42.40km (Bayongan System) 4) Lateral canals: 15.82km (Cayapas System) 5) Drainage canal: 66.91km 6)Construction of main farm ditches and land leveling work: 1,479ha [Procurement] 1) Procurement of equipment for the Integrated Water Management System: as planned 2) Procurement of construction machines: as planned] [Consulting Services] 410.87MM (International: 108.60MM, Local: 302.27MM) As planned, consultants provided the following services: review of tendering document, support for tender evaluation, construction supervision, training of NIA staff in the Integrated Water Management System, support for reinforcement of irrigator's associations, and support for environmental monitoring
2.Project Period	December 1999 – June 2005 (67 months)	December 1999 – September 2008 (106 months)
3.Project Cost Amount paid in Foreign currency	4,474 million yen	1,636 million yen
Amount paid in Local currency	2,679 million yen	6,017 million yen
Total	7,153 million yen	7,653 million yen

Japanese ODA loan portion	6,078 million yen	6,014 million yen
Exchange rate	121 JPY / US 3 JPY / peso (As at Sep 1999)	2.21 JPY/ peso (average over project period)