Republic of the Philippines

FY2023 Ex-Post Evaluation Report of

Japanese ODA Loan Project

"Flood Risk Management Project for Cagayan River, Tagoloan River and Imus River"

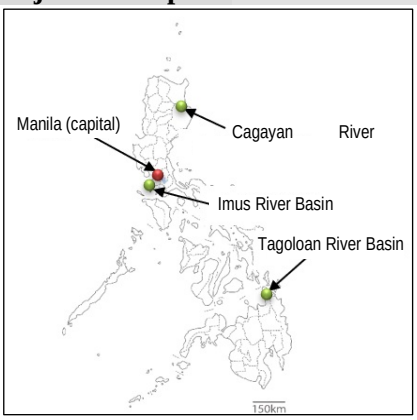
External Evaluator: Miyuki Koga, Octavia Japan Co., Ltd.

0. Summary

This project aimed to mitigate flood damage by implementing structural and non-structural measures against flood (sub-projects) in the Cagayan, Tagoloan and Imus River basins, thereby contributing to the sustainable development of the regional economy. Regarding relevance, this project was consistent with the "development plan" and "development needs." As for coherence, it was consistent with "Japan's ODA policy." While mutual complementarity was observed in terms of "internal coherence," no concrete cooperation or synergy was confirmed in terms of "external coherence." This project was in line with the goals of the international framework (SDGs). Therefore, its relevance and coherence are high. With regard to efficiency, although there were some changes, the outputs were generally in line with the initial plan. However, the project cost and period significantly exceeded the initial plan; thus, the efficiency of the project is low. Concerning effectiveness, the actual values met the target values for the Cagayan and Tagoloan sub-projects. Although the actual values could not be confirmed for the Imus sub-project, interviews with local residents and companies confirmed that flood damage in the surrounding areas had been reduced, compared to before the project implementation. Regarding impacts, interviews covering the three sub-projects confirmed that the reduction in flood damage has enabled residents to live and run their businesses in peace of mind, which also has a positive impact on revitalizing the local economy. Therefore, the effectiveness and impacts of the project are high. Concerning sustainability, there are some minor issues in the institutional/organizational aspect, technical aspect and financial aspect. However, prospects for improvement and resolution are high. Therefore, the sustainability of the project effects is high.

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

1. Project Description



Project Locations
(Source: JICA)

Retarding Basin Developed Under the Imus Sub-project
(Source: DPWH)

1.1 Background

The Philippines is one of the countries in the world that is prone to natural disasters. The economic and human damage caused by these disasters is enormous. Among natural disasters, typhoons, storms and floods cause the most damage. There are concerns that the risk of flooding will increase due to climate change; measures against typhoons, storms and floods are particularly important. The Cagayan River basin (northeastern Luzon),[1] the Tagoloan River basin (northern Mindanao),[2] and the Imus River basin (eastern Cavite, adjacent to the southern part of Metro Manila) are important areas for food supply and industrial development. Prior to the start of this project, flood control plans had been drawn up for these high-priority basins. However, the government was unable to implement fundamental measures due to budgetary constraints, and the flood risk remained high. Therefore, it was an urgent task to carry out river improvement works in these basins for the purpose of reducing flood damage.

1.2 Project Outline

The objective of this project is to mitigate flood damage by implementing structural and non-structural measures against flood in the Cagayan, Tagoloan and Imus River basins, thereby contributing to the sustainable and stable economic development of these areas.

Loan Approved Amount / Disbursed Amount	7,546 million yen / 7,493 million yen
Exchange of Notes Date / Loan Agreement Signing Date	March 29, 2012 / March 30, 2012

[1] This is the country's largest river basin, also known as the "granary of the Philippines."
[2] Located approximately 20 km from Cagayan de Oro City, the central city of the northern Mindanao region.

Terms and Conditions	<Civil Work> Interest rate: 1.40% Repayment period: 30 years (Grace period: 10 years) Conditions for procurement: general untied <Consulting Services> Interest rate: 0.01% Repayment period: 30 years (Grace period: 10 years) Conditions for procurement: general untied
Borrower / Executing Agency(ies)	Government of the Republic of the Philippines / Department of Public Works and Highways (hereinafter referred to as "DPWH") Local Government Units (hereinafter referred to as "LGUs"[3]) are responsible for allocating the budget for and implementing operation and maintenance
Project Completion	July 2020
Target Area	Cagayan River basin (Region II), Tagoloan River basin (Region X), Imus River basin (Region IV-A)
Main Contractor(s) (Over 1 billion yen)	Hanjin Heavy Industries & Construction Co., Ltd. (South Korea), Cavite Ideal International Construction & Development Corp. (the Philippines), Qingdao Municipal Construction Group Co., Ltd. (China)
Main Consultant(s) (Over 100 million yen)	CTI Engineering International Co., Ltd. (Japan) / Nippon Koei Co., Ltd. (JV), CTI Engineering International Co., Ltd. (Japan) (solo order)
Related Studies (Feasibility Studies, etc.)	- "The Study on Comprehensive Flood Mitigation for Cavite Lowland Area" (JICA, 2009) - "The Preparatory Study for Sector Loan on Disaster Risk Management" (JICA, 2010)
Related Projects	[Technical Cooperation] - "The Project for Enhancement of Capabilities of Flood Control and Sabo Engineering of DPWH, Stage 1 and Stage 2" (2000-2005) - "Project for Strengthening the Flood Management Function of DPWH" (2005-2010) [Japan's ODA Loan] - "Cavite Industrial Area Flood Risk Management Project" (loan agreement was signed in November 2017) [Other International Organizations and Agencies] - World Bank: "Metro Manila's Flood Control Master Plan Study" (2011) - World Bank: "Disaster Risk Management Development

[3] The LGUs responsible for the operation and maintenance of each sub-project are Tuguegarao City and Enrile Municipality for the Cagayan River sub-project, Tagoloan Municipality for the Tagoloan River sub-project and Cavite Provincial Government for the Imus River sub-project.

	Policy Loan with a Catastrophe Deferred Drawdown Option (CAT-DDO)" (2011) - Others: assistance for the creation of disaster hazard maps by the United Nations Development Programme (UNDP) and Australian Agency for International Development

2. Outline of the Evaluation Study

2.1 External Evaluator

Miyuki Koga, Octavia Japan Co., Ltd.

2.2 Duration of Evaluation Study

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

Duration of the Study: August 2023-November 2024

Duration of the Field Study: November 8-25, 2023, April 15-20, 2024

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

3.1 Relevance/Coherence (Rating: ③[5])

3.1.1. Relevance (Rating: ③)

3.1.1.1 Consistency with the Development Plan of the Philippines

Prior to the start of this project, the Philippine government formulated the *Philippine Development Plan* (2011-2016), which advocated the need for watershed conservation as well as effective and appropriate infrastructure development to mitigate the negative impacts of flooding. Specific strategies included prioritizing the construction of flood control facilities in areas with high flood risks, adopting climate change adaptation measures and implementing disaster risk reduction and management (including disaster prevention measures) from both structural and non-structural perspectives. Among these, the Cagayan River, Tagoloan River and Imus River basins faced a high risk of flooding; the DPWH's Public Investment Plan (2011-2016) clearly listed them as priority sub-projects in accordance with the abovementioned development plan.

At the time of the ex-post evaluation, the Philippine government has formulated the *Philippine Development Plan* (2023-2028), in which Chapter 15, "Accelerate Climate Action and Strengthen Disaster Resilience," advocates strengthening the disaster prevention and response capabilities of local communities, disaster preparedness and strengthening the functions of LGUs with the aim of adapting to climate change through the formulation of a strategic framework. In addition, the DPWH, the executing agency for this project, has

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

formulated the *Public Investment Program* (2023-2028), which outlines flood control and management policies for the five-year period starting from 2023.

Based on the above, both before the start of this project and at the time of the ex-post evaluation, great importance is placed on national development plans related to climate change and natural disaster countermeasures in the Philippines. Therefore, there is consistency with the policy and measures stipulated in the national and sector plans, etc., at both the time of the appraisal and the ex-post evaluation.

3.1.1.2 Consistency with the Development Needs of the Philippines

Prior to the start of this project, flood control plans had been formulated for the Cagayan River basin (northeastern Luzon), the Tagoloan River basin (northern Mindanao) and the Imus River basin (eastern Cavite Province, adjacent to the southern part of Metro Manila) as they were identified as high-priority river basins in need of flood control measures. However, the Philippine government was faced with a budget shortfall and was unable to implement fundamental projects, leaving the risk of flooding high. In the Cagayan River basin, flood damage was frequent in Tuguegarao City, the political and economic center of the basin, and the neighboring municipality of Enrile. They faced large-scale riverbank erosion, and sabo measures were an urgent task. The Tagoloan River basin was also known for its vulnerability to flooding. The basin was home to an industrial park developed by the Philippine Veterans Investments Development Corporation (PHIVIDEC), but the industrial park was located in a flood zone at the mouth of the Tagoloan River. The municipality of Tagoloan, which is the center of the park, suffered from flood damage due to storms and high tides. As future investment and further industrial development were expected, strengthening the flood prevention measures was an urgent issue for the industrial park. The Imus River basin is an area with a high economic growth rate. In the close vicinity, there is a special economic zone in which many Japanese firms have established operations (e.g., the Cavite Special Economic Zone). The low-lying areas downstream had suffered from chronic flooding; there were concerns about the impact on economic and social activities. In addition, as urbanization progressed, the water storage capacity of the entire basin decreased, which was increasing vulnerability to flooding.

At the time of the ex-post evaluation, the DPWH indicated that it would undertake immediate restoration in the event that flood control and disaster prevention infrastructure facilities, which are the basis of daily life, were damaged by natural disasters.[6] In response to requests from its regional offices (hereinafter referred to as “RO”), the DPWH has established a system which allows immediate conduct of on-site inspections, procurement of construction contractors and

[6] Department Order No. 27 of the 2023 “DPWH Disaster and Incident Management Operations Manual.”

making budgets available. In addition, in all of the project target areas, structural and non-structural measures are being continued in the river and tributary basins by the DPWH and LGUs. Bank protection works, river channel improvement, erosion prevention works, evacuation shelter construction and awareness-raising activities on flood damage reduction are being carried out with disaster risk reduction and management efforts.[7]

From the above, both structural and non-structural measures were/are being implemented in the project areas before the project commencement and at the time of the ex-post evaluation. The DPWH's efforts are also observed. Therefore, the project is consistent with development needs.

3.1.1.3 Appropriateness of the Project Plan and Approach

According to the ex-ante evaluation of this project, lessons from the past flood control projects indicated that "non-structural measures are required to make the structural measures such as facility construction more effective and efficient, due preparation for land acquisition and coordination during project implementation are imperative for smooth project implementation, and the central government should play a role, as necessary, for efficient operation/maintenance/management by the local governments." In response to this, the following was planned for this project: "comprehensive measures will be taken, combining the structural measure and the planning and support for the implementation of non-structural measure in consulting service. Since the LGUs are responsible for operation/maintenance, cooperation among the related organizations will be strengthened, for instance, for the monitoring on operation/maintenance by the Flood Mitigation Committee (hereinafter referred to as "FMC") which DPWH and the local government have agreed to establish."

Through the questionnaire, interviews with DPWH, etc. during this evaluation study, it was confirmed that the project stakeholders have regularly met to share information and discuss the implementation and progress of structural and non-structural measures at the FMC.[8] Regarding the non-structural measures, it was confirmed that the LGU's Disaster Risk Reduction and Management Office (hereinafter referred to as "DRRMO") had been working in cooperation with residents and other relevant agencies to strengthen the system for early and safe evacuation until the time of the ex-post evaluation.

In light of the above, it can be said that the planning and approach of this project were

[7] For example, at the time of the ex-post evaluation, DPWH was working on projects such as "Bank Protection Work Around Buntun Bridge on the Right Bank of the Upstream Cagayan River" in the Cagayan River basin, "Sabo Project on the Downstream Right Bank of the Tagoloan River" and "Construction of Evacuation Shelters in Manipal City" in the Tagoloan River basin and "Flood Risk Management Project for the Ylang-Ylang River and Rio Grande River in Cavite Province" in the Imus River basin.

[8] For example, an LGU leader assisted in negotiations with large developers over land acquisition. Although it took time to acquire the land, it can be said that there were no particular problems with the project approach, as coordination and cooperation was achieved to the extent possible through the FMCs, etc.

appropriate.

3.1.2 Coherence (Rating: ②)

3.1.2.1 Consistency with Japan's ODA Policy

The *Country Assistance Program for the Republic of the Philippines* (June 2008) formulated by the Ministry of Foreign Affairs of Japan listed "Assistance for Empowerment of the Poor and Improvement of Living Conditions of the Poor" as one of the three priority development issues. Under the priority area, the "expansion of basic social services (improvement of the living conditions of the poor)" and assistance for the development and maintenance of flood control and sabo infrastructure in high-priority areas, as well as assistance for measures necessary for residents to evacuate from disasters, were stipulated as measures for "protecting life from natural disasters." In addition, JICA formulated the *Country Assistance Strategy for the Philippines* (July 2009), which set out support for reducing damage in the event of a disaster through both structural and non-structural measures. Furthermore, the Japan-Philippines Joint Statement of 2011 confirmed that the two governments would promote cooperation in the fields of disaster prevention and disaster management.

This project aimed to mitigate flood damage by implementing flood control measures (structural and non-structural) in areas where there was a high need for river improvement. It is consistent with the disaster prevention and countermeasure measures in the abovementioned *Country Assistance Program for the Republic of the Philippines* and *Country Assistance Strategy for the Philippines*. Therefore, it is consistent with Japan's ODA policy.

3.1.2.2 Internal Coherence

Prior to the start of this project, JICA's technical cooperation projects such as the "Project for Enhancement of Capabilities of Flood Control and Sabo Engineering of DPWH (Stage 1 and Stage 2)" (2000-2005) and "Project for Strengthening the Flood Management Function of DPWH" (2005-2010) had been implemented. The Flood Control and Sabo Engineering Center (FCSEC),[9] whose functions were strengthened through the "Project for Strengthening the Flood Management Function of DPWH," was in charge of hydraulic model experiments conducted during the detailed design of this project. From that perspective, it can be said that there was a mutually complementary relationship.

In addition, a loan agreement was signed for the "Cavite Industrial Area Flood Risk Management Project" in 2017. At the time of the ex-post evaluation of this project, it is ongoing

[9] FCSEC is a department within DPWH that was established in 1999 with the aim of strengthening the technical capabilities of DPWH in the fields of flood control and erosion control. Through the technical cooperation project, FCSEC was at the core of human resource development support in the fields of flood control and erosion control.

with the aim of mitigating flood damage through flood control infrastructure construction in the industrial cluster in the San Juan River basin in Cavite Province. The construction supervision consultant for this project continues to be in charge of the "Cavite Industrial Area Flood Risk Management Project." DPWH, the LGU (Cavite Provincial Government) and the construction supervision consultant are proceeding with the ongoing project through a collaborative and cooperative system based on the trust and experience built through this project. Although concrete collaboration/synergy effects could not be confirmed at the time of the ex-post evaluation, it is clear that a mutually complementary relationship continues to exist even after the completion of the project, and it is possible that the relationship will further develop in the future.

3.1.2.3 External Coherence

Prior to the start of this project, the World Bank was assisting the Philippine government through projects such as the "Metro Manila's Flood Control Master Plan Study" (2011) and "Disaster Risk Management Development Policy Loan with a Catastrophe Deferred Drawdown Option (CAT-DDO)" (2011). The UNDP and the Australian Agency for International Development were providing assistance such as creating hazard maps for disaster-prone provinces. On the other hand, in the project target areas (Cagayan River basin, Tagoloan River basin, Imus River basin), these other international organizations did not provide any assistance for flood control measures (structural/non-structural measures) or disaster risk management; thus, there is no sign of collaboration with this project.

In relation to international frameworks, this project aimed to mitigate flood damage by developing flood control facilities and strengthening the local communities' disaster prevention and countermeasure capabilities in order to adapt to climate change, thereby contributing to improving the local economy and the living environment of residents. In this sense, this project is in line with the objectives of the Sustainable Development Goals (SDGs), such as "Goal 9. Build a foundation for industry and technology," "Goal 11. Create sustainable cities" and "Goal 13. Take concrete actions to combat climate change."

Regarding the relevance of this project, "consistency with the development plan" and "consistency with the development needs" have been confirmed. In addition, the project's planning and approach were appropriate. In terms of coherence, while it is consistent with "Japan's ODA policy" and mutual complementarity is observed in terms of "internal coherence," no concrete collaboration or synergy could be confirmed in terms of "external coherence." On the other hand, it is in line with the goals of the international framework (SDGs). Therefore, its relevance and coherence are high.

3.2 Efficiency (Rating: ①)

3.2.1 Project Outputs

In this project flood control measures were implemented in the Cagayan River basin, Tagoloan River basin and Imus River basin. The planned and actual project outputs are shown in Table 1.

Table 1: Planned and Actual Outputs of This Project

Plan at the Time of the Appraisal	Actual
1) Civil Engineering Work	1) Civil Engineering Work →It was mostly as planned but some changes were made to the plan (the main changes are underlined).
- Cagayan River: bank protection (three locations with a total length of 3.14 km [Alibago 940 m, Cataggaman 1,400 m, Enrile 800 m]), excavation of river channel, etc.	- Cagayan River: bank protection (two locations with a total length of 2.48 km [Alibago 960 m, Cataggaman 1,522 m]), <u>the Enrile site's bank protection was cancelled, the excavation of the river channel was cancelled</u> <u>Cataggaman bank protection: 1,400 m was extended to 1,522 m</u> <u>Alibago bank protection: spur dikes were added</u>
- Tagoloan River: dike construction (two locations with a total length of 2.65 km), excavation in towhead, construction of drainage facilities, etc.	- Tagoloan River: dike construction (two locations with a total length of 2.59 km [upstream from Tagoloan bridge 1,917 m, downstream from the bridge 642 m]), <u>excavation (left side of Tagoloan River) was cancelled</u>
- Imus River: construction of retarding basins (two locations) and associated facilities	- Imus River: construction of retarding basins (two locations, 44.01 ha [35 ha along the Imus River, 9.01 ha along the Bacoor River]) and associated facilities, <u>some additional work was done</u>
2) Consulting Services [Detailed Design Consultant] - Detailed design, update the existing master plan (M/P) for each river basin, assist the preparation of the tendering documents, update the environmental management and monitoring plan, finalize the Resettlement Action Plan (herein after referred to as "RAP"), prepare the plan and assist the implementation of the information and education campaign (herein after referred to as "IEC"), prepare plans for water level gauges and flood forecast and warning system, etc.	2) Consulting Services →Implemented mostly as planned

[Construction Supervision Consultant] - Review the detailed design, finalize the tendering documents, assist the procurement, supervise the construction (including assisting the land acquisition, monitoring the implementation of safety management plan), assist the implementation of environmental management and environmental monitoring plans, prepare maintenance manuals, assist the conduct of training, assist the planning and implementation of non-structural measures (assist the formation/improvement/introduction of the flood forecast and warning system, hazard mapping, etc.), review and support the implementation of the IEC plan, etc.	

Source: JICA's document (plan at the time of the appraisal), project completion report and answers to the questionnaire (actual)

1) Civil Engineering Work

This was largely carried out as originally planned with some changes. While some changes were made to the scope during the project implementation, interviews with DPWH and LGUs confirmed that such changes and the process were appropriate and relevant.

Cagayan River: In the Enrile area, a part of the bank protection work (approximately 800 m) was carried out by the DPWH District Engineering Office (hereinafter referred to as "DEO") using its own funds prior to the start of this project. This was because of the urgency of the situation considering the severe erosion damage. The excavation of the river channel was also excluded from this project, as it was integrated with the river channel excavation work that was being implemented by the RO in the vicinity. Instead, the revetment construction section was extended (Cataggaman area) and spur dikes were added to the revetment construction area (Alibago area). In the Cataggaman area, erosion was progressing by several meters every year, and the Philippine side wanted to proceed quickly with the sections that could be dealt with.

Tagoloan River: The excavation on the left bank was canceled as the Philippine side wanted to proceed with the construction as soon as possible. It was carried out prior to this project, using its own funds.

Imus River: In connection with the difficult land acquisition process, concrete block retaining walls have been installed to protect steep slopes around the project site in an attempt to reduce the area to be acquired.[10] In addition, as a result of a ground investigation, it was found that there were many soft rocks with low consolidation, and additional excavation work was carried

[10] Block area: 26,800 m^2, Lawn area: 41,800 m^2.

out.[11]

2) Consulting Services

This was carried out mostly according to the original plan.

3.2.2 Project Inputs

3.2.2.1 Project Cost

The total project cost planned at the time of appraisal was 10,113 million yen (of which 7,546 million yen was to be covered by the ODA loan). In reality, the actual amount was 20,396 million yen (of which 7,493 million yen was covered by the ODA loan), which significantly exceeded the plan (approximately 202% of the plan). By expense items, the civil engineering cost was approximately 2.1 times higher than planned, the consulting service was approximately 2.6 times higher and the land acquisition cost was approximately 3.8 times higher. The reasons for this are as follows: a) the construction cost increased because prices such as labor and material costs increased after the start of the project, b) additional construction work was required for the Imus River sub-project, as mentioned above, c) the land acquisition process for the Imus River sub-project faced difficulties, which significantly increased the acquisition cost compared to the initial estimate, d) changes in exchange rates (weak yen, strong dollar and strong Philippine peso) increased the cost in terms of yen and e) the cost of consulting service increased due to delays in the construction schedule, etc. Regarding these increases, DPWH commented: "the project cost was more than initially expected. The additional funds were approved by the Investment Coordination Committee-Cabinet Committee (ICC-CC) within the government after careful deliberation." Although the excess may have been inevitable, considering that the project cost significantly exceeded the plan while the actual outputs did not increase, it is not judged as efficient.

3.2.2.2 Project Period

At the time of the appraisal, the project period was planned to be six years and three months (75 months) from March 2012 to May 2018.[12] On the other hand, this project was implemented from March 2012 to March 2022 (121 months). No changes were made to the contracts as a result of COVID-19. However, it was confirmed that construction could not be carried out due to the issuance of a construction suspension order by the DPWH for two months[13] from March

[11] Soil removal: 1,053,800 m^3, soft rock excavation: 1,323,530 m^3.

[12] At the time of the appraisal, the completion date of this project was defined as "upon completion of civil engineering work."

[13] The construction supervision consultant of this project commented, "We had to go through checkpoints to cross province boarders. In addition, every time somebody was found to be positive, all those who had come into contact with that person had to undergo antigen testing and be quarantined. Hence, construction did not necessarily progress

2020 to April 2020.[14] This is considered an impact due to an external factor. It can thus be said that the actual project period was 119 months, calculated by subtracting two months from the actual figure of 121 months. Comparing the planned period (75 months) with the actual result (119 months), the actual period is approximately 159% of the plan. If we compare the actual result of 121 months with the planned value (75 months) without taking into account the impact of the external factor, it is approximately 161% of the plan. The reasons for the delay in this project include: a) it took time for the tendering and procurement procedures, selecting consultants and construction companies and b) it took an enormous amount of time to identify those who would be subject to land acquisition, to confirm the target land and to complete the acquisition procedures.

DPWH believes that the delay in land acquisition mentioned in b) above had a major impact on the project period. DPWH explains that surrounding land prices (market prices) continued to rise during land acquisition negotiations with landowners in the Imus River basin, in particular, as a result of which a significant amount of time was required to complete the procedures.

In light of the above, even if the period during which construction was suspended due to the spread of COVID-19 is excluded, the project period significantly exceeded the plan. Therefore, the project period cannot be judged as efficient.

3.2.3 Results of Calculations for Internal Rates of Return (Reference Only)

Economic Internal Rate of Return (EIRR)

The EIRR for the Cagayan River basin was calculated to be 18.2% at the time of the appraisal, considering a reduction in the riverbank erosion damage (loss of land and assets, etc.) as a “benefit,” the project cost (construction cost) and the maintenance cost as “costs” and a project life of 50 years. For the Tagoloan River basin and the Imus River basin, the EIRR was calculated to be 24.8% and 18.6%, respectively, with a reduction in the flood and inundation damage as a “benefit,” the project cost (construction cost) and the maintenance costs as “costs” and a project life of 50 years. In this evaluation, an attempt was made to recalculate the EIRR at the time of the ex-post evaluation applying the same conditions as the time of the appraisal. The results were: 12.0% for the Cagayan River basin, 9.0% for the Tagoloan River basin and 5.9% for the Imus River basin, all of which were lower than what were expected at the time of the appraisal. The reasons for this include: the project cost increased significantly from the initial plan, and there were significant fluctuations in the exchange rate,[15] while the EIRR at the time

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as expected.”

[14] DPWH issued a work suspension order on March 17, 2020, which was followed by the work resumption order on April 30, 2020.

[15] The exchange rate at the time of the appraisal: 1 PHP = 1.81 JPY, at the time of the ex-post evaluation: 1 PHP = 2.28 JPY.

of the appraisal and at the time of the ex-post evaluation were calculated in Philippine pesos.

Financial Internal Rate of Return (FIRR)

At the time of appraisal, the generation of financial revenues such as facility usage fees and other charges was not anticipated; thus, the FIRR was not calculated. As this project was not designed to seek profitability, the FIRR was not recalculated at the time of the ex-post evaluation.

Although there were some variations in the outputs of this project, it was generally in line with the original plan. On the other hand, the project cost and period significantly exceeded the initial plans. Therefore, the efficiency of the project is low.

Photo 1: Revetment and Spur Dikes Constructed as Part of the Cagayan River Sub-Project

Photo 2: Revetment Constructed as Part of the Tagoloan River Sub-Project

3.3 Effectiveness and Impacts[16] (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

At the time of the appraisal, it was expected that flood damage would be reduced by implementing flood control measures in the priority areas of the Cagayan River basin, Tagoloan River basin and Imus River basin. Table 2 shows the quantitative effect indicators of this project (baseline, target and actual values).

Table 2: Quantitative Effect Indicators of This Project (Baseline, Target and Actual Values)

Sub-Project	Baseline value	Baseline value *Note 1	Target value (2019)	Actual value
Cagayan River	Annual maximum bank erosion at each site (m)	6 to 28 (average)	0	(2021-2023) 0
Tagoloan	Annual highest water	-	-	(2021-2023)

[16] When providing the sub-rating, Effectiveness and Impacts are to be considered together.

River	level at reference point (m) *Note 2			N/A
	Annual maximum flooded area (km^2) *Note 3	1.53 *Note 4	0 *Note 4	(2021-2023) 0
	Annual maximum households inundated by floods (household) *Note 3	610 *Note 4	0 *Note 4	(2021-2023) 0
Imus River	Annual highest water level at reference point (m) *Note 2	-	-	(2023) N/A
	Annual maximum flooded area (km^2) *Note 3	13.78	12.46	(2023) N/A
	Annual maximum households inundated by floods (household) *Note 3	14,534	13,838	(2023) N/A

Source: documents provided by JICA (baseline and target values), answers to the questionnaire, interviews and site visits (actual values)
Note 1: The base year is different for each river as the data were taken at different times: 2002 for the Cagayan River, 2009 for the Tagoloan River and 2003 for the Imus River.
Note 2: At the time of the appraisal, the annual maximum water level at flood control reference point was regarded as a monitoring indicator.
Note 3: At the time of the appraisal, rainfall with a 25-year return period was assumed for Tagoloan River and a 10-year return period for Imus River.
Note 4: Figures only concerning the core areas to be protected by the structural measures.

As shown in Table 2, at the time of appraisal, the target values for the second year after completion (the second year after the facility began operation) were set for multiple operation and effect indicators. The construction work on the Cagayan River and Tagoloan River was scheduled to be completed in 2019, whereas that on the Imus River was planned to be finished in 2022. For the Cagayan River and Tagoloan River, data were collected from 2021 (two years after completion) to the most recent year (2023). For the Imus River, data were collected for the most recent year (2023). Analyses and discussion of the indicators for each sub-project are presented below.

[Cagayan River]

With regard to the “annual maximum bank erosion at each site,” there has been no erosion, and it can be said that the target value has been achieved. Before the project, erosion had progressed at a rate of more than 6 meters per year, which was controlled as a result of the construction of spur dikes and revetments.

[Tagoloan River]

In relation to the “annual maximum flooded area” and the “annual maximum households

inundated by floods," there have been no flooded areas nor inundated households; it can be said that the target values were achieved. According to the LGU, "If this project had not been implemented, approximately 500 people would have had to be evacuated and companies operating in the industrial park would have suffered flood damage when the powerful typhoon (locally known as Odette) struck in December 2021." It was confirmed through the questionnaire and the interviews with surrounding residents and companies in the industrial park that no flood damage had occurred around the target sites since the project was completed.

[Imus River]

Neither DPWH nor LGUs had data on "annual maximum flooded area" or "annual maximum households inundated by floods" that can be compared with the baseline values of this project. Therefore, the actual values could not be reviewed. On the other hand, a company operating near the constructed drainage gate of the retarding basin along the Imus River commented in an interview: "When a major typhoon struck prior to this project (in 2014), the river flooded, and our huts were washed away. We suffered great damage. Ever since the retarding basin was completed, however, there has been no rise in the river water level even in the event of heavy rain caused by a typhoon. There has been no flooding in the surrounding areas." It can thus be inferred that damage from flooding and inundation has been reduced.

At the time of the appraisal, a monitoring indicator was set, which was the "annual highest water level at reference point." However, such data were not recorded by DPWH and could not be reviewed. There are no water level gauges using a remote measurement system around the project sites. Warning levels are color-coded on the concrete revetment wall.[17] LGUs monitor water levels via CCTV and share information and data with DPWH.

Photo 3: The Utility Pole is Utilized to Indicate the Water Level Danger (Imus River Sub-Project)

Photo 4: Revetment Developed Along the Cagayan River (Cagayan River Sub-Project)

[17] See Photo 3. (For example, yellow indicates a warning, orange indicates an alert and red indicates a critical situation.) The Philippine counterpart took inspiration from the actually introduced cases of Japan.

3.3.1.2 Qualitative Effects (Other Effects)

1) Awareness of Flood Risk Management Among Surrounding Residents, Flood Preparedness, Disaster Prevention, Flood Forecasting and Warning, Evacuation Behavior, etc.

As part of this evaluation, interviews were conducted with residents living in the vicinity of the project target areas (hereinafter referred to as "surrounding residents").[18] They expressed opinions such as: "Our homes are located downstream of the river. Because the area is prone to flooding, it is essential that we make preparations to minimize flood damage," "We regularly create hazard maps and check evacuation procedures. We are in contact with the city's disaster management department and have accurate information on flood forecasts and warnings. When evacuation becomes necessary, vehicles equipped with loudspeakers go around residential areas to inform residents" and "Residents share information among themselves about who live where and in what conditions, and who should be given priority for help in the event of a disaster." Based on these comments, it is believed that the surrounding residents have increased their awareness and understanding of flood risk management, and are well prepared for floods. Furthermore, the interviews confirmed that many surrounding residents believe that the measures and efforts taken by DRRMO have been successful. In this project, DRRMO carried out various activities to strengthen the capabilities of local residents, centered on barangays,[19] including raising awareness (IEC), evacuation procedures and evacuation drills to better prepare for floods.

It can be said that these measures help local residents prepare for floods and evacuations.

2) Improving the Technical Capability of the Executing Agency in Flood Control Measures

In the Philippines, flood control measures are divided into roles where DPWH develops structures and LGUs lead non-structural measures. Regarding structures, LGUs and surrounding residents expressed, "High-quality structures were developed through this project, and we are satisfied." Regarding non-structural measures, the surrounding residents largely said, "we are satisfied with the disaster control and preparation actions led by LGUs." In addition, LGU staff who participated in the training held by this project commented that "the QGIS[20] training was particularly useful." It is believed that the QGIS training was an opportunity for LGU staff to acquire new skills. It was an opportunity for LGUs to develop hazard maps and evacuation plans based on accurate and detailed information, which is considered to be the reason for high

[18] Interviews were conducted with 15 households (including shop owners) in each of the sites in the Cagayan River basin, Tagoloan River basin and Imus River basin (45 households in total).
[19] A barangay is the smallest local government unit that makes up cities and towns in the Philippines, and is equivalent to a village, district or ward in Japan.
[20] Abbreviation for Quantum GIS. This is a cross-platform open-source geographic information system (GIS) software with the ability to view, edit and analyze geospatial information data.

satisfaction.

In addition, interviews with senior DPWH officials confirmed that "DPWH's capacity to promote technology has been steadily improving with the experience of implementing the project together with Japanese construction supervision consultants who have a wealth of technical capabilities and experience. This project introduced the first retarding basin in the Philippines, and the experience gained from this project is being utilized to begin the construction of retarding basins in other areas. This will further improve the flood control capabilities of the DPWH. It is expected that flood control will be enhanced in different parts of the country."

In light of the above, it can be said that this project contributes to the improvement in technical capabilities of flood control measures in the Philippines.

3) Adaptation to Climate Change/Combination of Hard and Soft Measures

In interviews with residents and LGUs, comments such as the following were received: "It is becoming more difficult to predict the timing and frequency of typhoons and monsoons every year. This is closely related to recent climate change," and "To adapt to climate change, not only structural but also non-structural measures are important." As mentioned above, non-structural measures are led by the DRRMOs of LGUs. It was confirmed that DRRMOs have been well received by the residents. The combination of structural and non-structural measures, which is the approach of this project, is also considered to be beneficial for adapting to climate change and preparing for future climate change risks.

As mentioned above, there has been an increase in awareness of flood risk management among surrounding residents, as well as flood preparedness, disaster prevention, flood forecasting and warning, evacuation behavior, etc. It can be inferred that the contribution of the structural and non-structural measures through this project was not small.

3.3.2 Impacts

3.3.2.1 Intended Impacts

In this evaluation, interviews [21] were conducted regarding the living environment and economic situation with local residents, shopkeepers and businesses that have been operating in the areas surrounding each sub-project since before the project began. Below are some of the comments obtained.

1) Improvement in the Living Environment of Residents

[21] Residents and shopkeepers: interviews were conducted with 15 households (including shopkeepers) in each of the Cagayan River basin, Tagoloan River basin and Imus River basin sites (45 households in total). Companies: interviews were conducted with two companies or industrial park management offices operating in the vicinity of each of the Tagoloan River basin and Imus River basin sites (four locations in total).

[Cagayan River]

- “Before this project was implemented, erosion was progressing along the river. It occurred almost every year, and at one point the road collapsed.” “I felt that my house was also in danger of collapsing, but the river improvement work stopped the erosion and the danger of collapse was averted. Now I can live in peace.”
- “In conjunction with the river improvement work, streetlights and benches have been installed along the river. The scenery is beautiful and it gives us comfort.”

[Imus River]

- “Before this project began, it was not uncommon to observe flooding of more than 2 meters. After the construction of the retarding basin, damage from heavy rains (October 2022) was kept to a minimum. We can now live in peace.”
- “Prior to the start of this project, heavy rains caused water levels to rise, resulting in overflows and flooding. Sometimes the water would not subside for several days. Now, even when there is heavy rain, the water level rarely rises, and people can live in peace.”
- “The retarding basin is large in size and has been talked about on social media. Cycling, jogging and walking are popular activities in the surrounding area.”

[Tagoloan River]

- “When typhoons Sendong (2011) and Yolanda (2013) hit, the Tagoloan River area overflowed and flooded. Flooding of 5 to 7 meters was observed in nearby residential areas. After the completion of this project, there was no overflow even during the largest Typhoon Odette (2021). This I believe is thanks to the river improvement work.”

In conclusion, it is believed that this project has reduced the flood risk around each river, improving the living environment of residents.

2) Improving the Investment Environment by Securing and Improving Transportation and Logistics

[Cagayan River]

- “Before the start of this project, the roads along the Cagayan River collapsed due to erosion, making it unsafe for vehicles to pass through. As a result of the river improvement work, traffic access has improved and the number of people moving around has increased. The number of housing construction projects is also increasing.”

[Imus River]

- “The construction of the retarding basins has led to an increase in the number of people coming and going. The number of restaurants and retail stores in the area has increased, making life more colorful. I think purchasing power has also increased.”

[Tagoloan River]

- “In the Tagoloan River area where the river improvement work has been carried out, there is no longer any damage due to overflow or flooding. I think the number of households in the area is increasing. More vendors are coming to sell fish, food and drink.”
- “There is no longer a fear of farmland flooding. We can now grow agricultural products (vegetables) without worry. As a result of the river improvement work, the access to the area has also improved, and now middlemen come with their trucks to buy our vegetables. Income from selling agricultural products (vegetables) has also increased.”

3) Sustainable and Stable Economic Development Through Flood Damage Reduction

[Cagayan River]

- “Prior to the start of this project, erosion was a big concern in the areas where the river improvement works were done. So, few people invested large amounts of money in building houses. After the river improvement works, the number of new houses and extensions/renovations has increased. I work in the construction industry (plastering), and my income has increased.”
- “Now that I don’t need to worry about our house being washed away by river flooding, I have started a retail business.”

[Imus River]

- “Prior to the start of this project, the water level in the Imus River basin would rise to neck height during floods. Nobody was willing to settle here, and there was little social or economic development. However, there were expectations that the construction of the retarding basin would reduce the risk of flooding. After the construction, the number of people wanting to settle here increased, and land prices have been rising.”
- “After the construction of the retarding basin, a resort facility has opened in the surrounding area. A major insurance company has also started operations in the area.”

[Tagoloan River]

- “I think that more new companies are entering the industrial park, and local residents are benefiting from increased employment opportunities.”
- “In 2015, when the coal power plant was under construction, the Tagoloan River overflowed, and the entire power plant was flooded for over a week. We considered relocating the power plant, but it was difficult because of the enormous cost. This project was implemented around that time. Since then, there has been no overflow or flooding. There has been no damage to the power plant, either.”

Based on the above, it can be said that transportation and logistics access have improved in the areas surrounding the river improvement works. Although factors other than this project

should also be taken into consideration, it is believed that this project has played a role in improving the investment environment and revitalizing the economy in the surrounding areas.

3.3.2.2 Other Positive and Negative Impacts

1) Impacts on the Environment

This project was not classified as a large-scale river and sabo project under the *JICA Guidelines for Environmental and Social Considerations* (issued in April 2010), nor did it fall in an area that is prone to impacts under the guidelines. It was therefore determined that the project would not have significant adverse impacts on the environment and was therefore classified as Category B.

The Environmental Compliance Certificate (ECC) for this project was approved by the Department of Environment and Natural Resources (DENR). The Cagayan River sub-project was approved in January 2012,[22] the Imus River sub-project in April 2013 and the Tagoloan River sub-project in October 2010.

When the project was implemented, air pollution control measures were taken during construction. The contractors sprinkled water on the excavated soil, installed mufflers on trucks and set up a small-scale closing levee and pollution control film to minimize temporary water pollution. The DPWH Environment and Social Security Department supervised these measures and conducted regular environmental monitoring. According to the environmental monitoring reports, noise, air quality, vibration levels, surface water quality, river flow measurements and bottom sediment were all monitored. No significant problems were found, and the results were ultimately below the environmental standards set by the Philippine government.[23] At the time of the ex-post evaluation, it was confirmed through site inspections, the questionnaire and interviews with DPWH that there had been no particular negative impacts on air pollution, water quality, noise, vibration or ecosystems in the vicinity of each sub-project.

Although the environmental monitoring was carried out during the project implementation, interviews with DPWH indicated that environmental monitoring was not conducted at the time of the ex-post evaluation as there were no particular negative impacts on the environment. On the other hand, if residents have any concerns or complaints about the environment in the project area, the LGU's Environment and Natural Resources Office is in charge of addressing the issue. According to the LGUs, no particular concerns or complaints had been received as of

[22] The certificate was reissued in June 2015 due to a change in the project scope.

[23] (Additional explanation) Although the levels are below the environmental standards, it is important to note that the background values (baseline values) in public water bodies in the Philippines are generally high and that values fluctuate widely due to changes in rainfall; thus, when the detected values are not extremely high, the DPWH Environment and Social Security Department monitors the situation by checking on the development. In the case of this project, although there were instances where the standard values were exceeded, the state was not significant and continued (the values would become within the standard values under natural conditions); thus, the external evaluator determined that there were ultimately no problems.

the time of the ex-post evaluation; thus, no particular monitoring is being carried out.[24]

2) Resettlement and Land Acquisition

Table 3 shows the status of resettlement and land acquisition associated with this project. Interviews with DPWH confirmed that it was not deviated from the resettlement plan prepared after the start of the project and that the compensation policy and its implementation were in accordance with the law and due procedures, the *JICA Guidelines for Environmental and Social Considerations* (issued in April 2010) and what were agreed upon at the time of the appraisal.

Table 3: Land Acquisition and Resettlement

Sub-Project	Land Acquisition			Resettlement	
	Acquired Area	Number of Landowners	Compensation Amount	Number of Resettled Households	Compensation
Cagayan River	145,844 m^2	161	Approx. 29 million pesos	0	None
Tagoloan River	88,000 m^2	41	Approx. 17 million pesos	0	None
Imus River	448,096 m^2	70	Approx. 867 million pesos	24	10,000 pesos per households

Source: DPWH

[Cagayan River]

With regard to land acquisition, the area acquired was 145,844 m^2 and the number of landowners was 161. A total of approximately 29 million pesos was paid as monetary compensation for the land and structures that were subject to the land acquisition. According to DPWH, although it took time to identify the landowners, the process was completed without problems in accordance with national laws and regulations. In addition, interviews with LGUs and surrounding residents confirmed that there had been no particular complaints or problems until the time of the ex-post evaluation.

Although resettlement was anticipated at the time of the project planning, no households were relocated in the end. According to DPWH, while some residents were relocated due to project implementation, this was limited to moving within their own land. Interviews with DPWH, LGUs and surrounding residents confirmed that there were no unresolved issues at the time of the ex-post evaluation.

[24] As supplementary information, according to those who were involved in the project regarding this matter, monitoring activities might have stalled after 2020 due to COVID-19.

[Tagoloan River]

With regard to land acquisition, the acquired area was 88,000 m^2 and the number of landowners was 41. The total compensation amounted to approximately 17 million pesos. Interviews with DPWH, LGUs and surrounding residents confirmed that the land acquisition was carried out smoothly with the cooperation of the LGU and that there had been no particular complaints or problems at the time of the ex-post evaluation.

Regarding resettlement, one household was observed to have voluntarily relocated at the time of appraisal. According to DPWH, it was not an ordinary house. It was rather a farm hut used for agricultural purposes. The hut was built on a delta formed by past floods and was vulnerable to muddy water and flooding. The farmer felt the risk of flooding and abandoned the hut before the start of the project.[25] This means that there was no resettlement caused by this project.

[Imus River]

With regard to land acquisition, the area acquired was 448,096 m^2 and the number of landowners was 70. According to DPWH and LGU, surrounding land prices (market prices) continued to rise during the land acquisition negotiations with landowners; it required a long time to complete the necessary procedures. The total amount of compensation was approximately 867 million pesos. Interviews with DPWH, the LGU and surrounding residents confirmed that there had been no particular complaints or problems until the time of the ex-post evaluation.

A total of 24 households were resettled. The local government (Cavite Provincial Government) provided alternative relocation sites[26] for those affected, in addition to which financial support (10,000 pesos per household) was provided. Furthermore, livelihood support (training on food processing and sewing, provision of the necessary equipment, etc.) was provided. Interviews with DPWH, LGUs, etc. confirmed that there had been no particular complaints or unresolved issues until the time of the ex-post evaluation.

3) Gender Equality, 4) Marginalized People, 5) Social Systems and Norms, People's Well-Being and Human Rights

This project contributes to mitigating flood damage and promoting sustainable and stable development of the regional economy and society through (structural and non-structural) flood control measures in the Cagayan River basin, Tagoloan River basin and Imus River basin. The nature of this project's flood control measures is that the benefits are enjoyed by everyone, regardless of gender or social status. There were no notable findings regarding the project's

[25] According to DPWH, the hut was eventually submerged after the farmer abandoned it.
[26] Land with access to electricity and water services.

impacts on gender, realization of equality, marginalized people, the social system, people's well-being or human rights. However, it was confirmed that local residents are more aware of flood forecasting/warnings and evacuation procedures than before the start of this project, having improved their flood preparedness and disaster prevention awareness. It is believed that the improvement in transportation access and logistics resulting from the flood damage reduction has increased opportunities for residents to participate in economic activities. The development of flood control facilities that bring safety and security and the progress of economic revitalization does benefit local residents (including those who are vulnerable) widely and equally. It also increases options in life, which is thought to create events that lead to people's well-being. It is believed that this project plays a role in helping to achieve such.

6) Unintended Positive / Negative Impacts

The Imus River sub-project's retarding basins were the first to be constructed in the Philippines. According to the construction supervision consultant for this project, the consultant guided the local contractors on the technical methods for constructing the structures (especially the construction of the curved sections) during the project implementation. At the time of the ex-post evaluation, retarding basins were being constructed in other parts of the country using the Philippine government's fund. There are also plans for new construction.

At the request of executive officials of DPWH, the same construction supervision consultant presented case studies on the technical construction methods of flood retarding basins at the Philippine Institute of Civil Engineers (PICE) national conference which was held in Davao City in 2023. It is possible that the technical construction methods of flood retarding basins will be widely recognized in the Philippines. With more adoption of flood retarding basins, flood control measures may become more functional and effective than before. For a country that has been working on flood control measures for years, this can be seen as a positive impact.

It can be said that the expected outcomes and impacts of this project have been achieved largely as planned, and there have been almost no negative impacts on society (including human rights and gender equality), the environment or the economy. This project has mostly achieved its objectives. Therefore, effectiveness and impacts of the project are high.

3.4 Sustainability (Rating: ③)

3.4.1 Policy and System

According to the *Philippine Development Plan* (2023-2028) formulated by the Philippine government, its policy goal is to develop infrastructures essential for economic development and improving the investment environment. In addition, a strategic framework has been created to "accelerate climate action and strengthen disaster resilience," which aims to strengthen

disaster prevention and preparedness of local communities as well as LGUs' functions in order to adapt to climate change. Therefore, the project continues to be in line with the policies and directions of the Philippine government at the time of the ex-post evaluation.

3.4.2 Institutional/Organizational Aspect

The executing agency is DPWH. The plan at the time of the appraisal was that LGUs would operate and maintain the structures to be developed by this project (embankments, revetments, drainage facilities, retarding basins, etc.) after the handover. If there is any damage to the structure due to natural disasters or other reasons and if it is deemed beyond the scope of a regular operation and maintenance, DPWH (RO or DEO) will handle the rehabilitation, including budget requests.

The structures of the Cagayan River and Tagoloan River sub-projects were transferred from DPWH to the LGUs in 2021 based on a memorandum of agreement (MoA) signed between DPWH and the LGUs. The civil engineering work for the Imus River structure was completed in March 2022, and DPWH's final inspection was done in July of the same year. After a one-year warranty period, the structures are scheduled to be transferred from DPWH to the Cavite provincial government in July 2024.

The status of the institutional and organizational aspect of each sub-project at the time of the ex-post evaluation is as below:

[Cagayan River]

DPWH issued a certificate of acceptance in October 2020, and the structures were transferred to the LGUs (Tuguegarao City and Enrile Municipality) in November 2021. At the time of the site visits of this evaluation (November 2023), the LGUs were not aware of their responsibility for maintenance. Although residents have been conducting cleaning activities (weed cutting, garbage removal) around the structures to maintain and beautify the area, a system for the operation and maintenance was not in place. The FMC, mentioned in "3.1.1.3 Appropriateness of the Project Plan and Approach," should have supervised and monitored the operation and maintenance; however, the FMC was not functioning at the time of the site visit. A review of past meeting minutes revealed that until 2021, the then LGU (Tuguegarao City) mayor and LGU staff were clearly aware of their responsibilities for the operation and maintenance after the transfer. Then, the city's mayor was replaced by an election in May 2022. As a result, key staff members were also replaced, which may have led to a lack of proper handover within the LGU.

In addition, the DPWH's RO and DEO were not aware that the "RO or DEO will be responsible for the rehabilitation even after the transfer if it is beyond the scope of a normal operation and maintenance and that RO or DEO will request budget to the DPWH headquarters

and carry out the rehabilitation work." This seems to have been the case because the document prepared for the structure handover in November 2021 did not clearly state that "DPWH will be responsible for the rehabilitation work beyond the scope of a normal operation and maintenance." Instead, the document simply stated: "LGUs are primarily responsible for the maintenance after the transfer." It is possible that this has reduced the awareness of the RO and DEO concerning their maintenance obligation.

In light of this situation, at the invitation of DPWH, LGU and DEO officials met to discuss the ideal operation and maintenance system in January 2024, which was during the ex-post evaluation study. According to the minutes of the discussion, it was pointed out that in the future, LGUs and DEO will jointly monitor the structures. The need to register the structures as LGUs' assets was also discussed. In response, Enrile Municipality issued a document expressing strong support for the resumption of FMCs in March 2024. Furthermore, FMC meetings were held in April 2024 at the Tuguegarao City Hall and Enrile Municipality Hall. According to the minutes and the participants, it was agreed that the FMC meetings would be held once every six months (or whenever necessary) in each city/municipality in the future. DPWH's maintenance responsibility (rehabilitation work for the structures beyond the scope of a normal operation and maintenance) was not clearly mentioned in the MoA signed before the start of this project nor in the document signed at the time of the handover; thus, clear documentation is needed. At the FMC meetings held in April 2024, this point was clarified and discussed.

[Tagoloan River]

At the time of the ex-post evaluation, the DRRMO of the LGU (Tagoloan Municipality) was in charge of the maintenance. One engineer and one assistant staff of the DRRMO are in charge of patrolling, regular inspections, cleaning, repairs, etc., concerning the constructed structures. The LGU also has an engineering office, and in the event of an emergency, the engineering office staff (19 people) can be dispatched upon request from the DRRMO. The DRRMO also works closely with the barangays under the LGU, and a system is in place to monitor the condition of the structures. In addition, DPWH (RO and DEO) also inspects and monitors the constructed structures.

After the project was completed, FMC meetings were held regularly.[27] Information was shared and discussions were held between the LGU and DPWH regarding the maintenance of the structures.

[27] The most recent meeting was in August 2023.

[Imus River]

The constructed structures are scheduled to be handed over from DPWH to the Cavite Provincial Government in July 2024. The LGU (Cavite Provincial Government) has stated that it will be responsible for the operation and maintenance system after the handover and will assign staff. Of the 20 engineers affiliated with the LGU's engineering office, approximately 10 will be responsible for the maintenance (patrols, regular inspections, cleaning, repairs, etc.) of the constructed structures (two retarding basins).

The functions of the FMC have been transferred from DPWH to the LGU (Cavite Provincial Government). The governor of the province serves as chairman and meets regularly with DPWH and other project stakeholders.

In conclusion, there are no particular problems with the institutional/operational aspect of the maintenance of the Tagoloan River and Imus River sub-projects. Although some issues were observed with the institutional/organizational aspect of the maintenance for the Cagayan River sub-project, these are expected to be resolved in the future.

3.4.3 Technical Aspect

The technical aspect of the operation and maintenance at the time of the ex-post evaluation is discussed below for each sub-project.

[Cagayan River]

The technical offices of the LGUs (Tuguegarao City and Enrile Municipality) have 15 engineers (12 from Tuguegarao City and three from Enrile Municipality). Recent training they received includes "LGU Infrastructure Project Evaluation," "IT-based Data Management," "Sustainability Assessment" and "Monitoring Methods." At the time of the site visits of the evaluation (November 2023), LGU engineers were not aware of their operation and maintenance responsibilities or the existence of the operation and maintenance manual. However, in January 2024, the project's stakeholders gathered where their maintenance responsibilities were reaffirmed and another copy of the project's operation and maintenance manual was given to the LGUs and DEO. DPWH has indicated its intention to provide training to LGUs as necessary. Concerning the DRRMOs (responsible for the project's non-structural measures), their staff recently attended training such as: "Early Warning System," "Disaster Response Monitoring Information Center," "Incident Command System"[28] and "Emergency Dispatch Training." Therefore, there are no major concerns about the technical aspect of the

[28] A standardized organizational management method developed in the United States for use in emergencies such as disasters and incidents.

operation and maintenance of this project. Nevertheless, the contents of the redistributed maintenance manual need to be widely shared.

[Tagoloan River]

LGU engineers participate in the Philippine Institute of Civil Engineers (PICE) national conference and CPD[29] courses. In 2023 LGU engineers attended training such as "Construction Management and Construction Supervision" and "Construction Estimates Using Spreadsheets and CAD Software." It was also confirmed that the project's maintenance manual is in place and is being used as needed. DRRMO, which is responsible for non-structural measures, has recently received training on topics such as "Incident Command System," "Emergency Water Rescue," "Climate and Disaster Risk Assessment and Development of Regional Climate Change Action Plans." Therefore, no problems are observed in terms of the basic knowledge and technical capability needed for the operation and maintenance of this project.

[Imus River]

The interviews with the LGU (Cavite Provincial Government) confirmed that the LGU understood their responsibilities and work related to maintenance even before the handover of the structures. The LGU was also aware of the existence and the contents of the maintenance manual. The LGU engineering office will be responsible for the maintenance. Its engineers participated in the maintenance training conducted by this project. They attended training such as: "Local Government Infrastructure Audit" and "Innovations in Interdisciplinary Approaches to Civil Engineering Challenges" in recent years. As for the DRRMO, which is responsible for the non-structural measures, its staff have recently attended training such as: "Flood Accident Response Safety Training," "Incident Command System" and "Emergency Response Center." Therefore, no problems are observed with regard to the basic knowledge and technical capabilities for the operation and maintenance of this project.

3.4.4 Financial Aspect

The maintenance cost for the structures constructed under this project is, in principle, borne by each LGU unless large-scale repairs are required. The situations concerning the maintenance budget are described below.

[Cagayan River]

The LGUs (Tuguegarao City and Enrile Municipality) have not set aside a separate operation

[29] Continuing professional development (CPD). In Japan CPD programs are offered by organizations such as the Japan Federation of Civil Engineering Construction Managers Association (a general incorporated association).

and maintenance budget dedicated for this sub-project. At the time of the ex-post evaluation, the structures completed under this project are in the process of being registered as LGUs' assets. Once the registration is complete, it is expected that the infrastructure maintenance budget will be registered and increased. Table 4 shows the changes in the budget for the continued non-structural measures. According to the DRRMO, the budget is in an increasing trend and they consider the budget level to be sufficient.

Table 4: Changes in the Non-Structural Measures Budget (Cagayan River Sub-Project)

(Unit: million peso)

	2019	2023	2024
Enrile Municipality	Approx. 7.3	Approx. 10.0	Approx. 10.9
Tuguegarao City	Approx. 32.3	Approx. 65.0	Approx. 66.2

Source: Operation and maintenance manual, LGUs

[Tagoloan River]

From 2020 onwards, the DRRMO has budgeted 0.2 million pesos per year for the maintenance of the structures constructed under this project. In addition, the engineering office within the LGU has been allocating 2.5 million pesos every year as a maintenance budget for various infrastructures under its jurisdiction, and this budget can be utilized as well if necessary. Table 5 shows the changes in the budget for the non-structural measures. According to the DRRMO, the amount is on the rise and they think the budget is sufficient.

Table 5: Changes in the Non-Structural Measures Budget (Tagoloan River Sub-Project)

(Unit: million peso)

	2019	2023	2024
Tagoloan Municipality	Approx. 12.4	28.0	35.0

Source: Operation and maintenance manual, LGUs

[Imus River]

The LGU (Provincial Government of Cavite) stated that 2.5 million pesos were allocated for the maintenance of the structures of this project in 2024. This is five times the estimated amount (approx. 0.5 million pesos) suggested in the project's operation and maintenance manual, which indicates it is sufficient. The LGU also expressed their will to allocate the necessary maintenance budget for 2025 onwards. Table 6 shows the changes in the budget for the non-structural measures. According to the DRRMO, the budget is on the rise and it is considered sufficient.

Table 6: Changes in the Non-Structural Measures Budget (Imus River Sub-Project)

(Unit: million peso)

	2019	2023	2024
Imus City	Approx. 91.6	150.0	Approx. 159.0
Bacoor City	Approx. 110.8	142.5	156.0
Kawit Municipality	Approx. 21.4	Approx. 37.3	Approx. 41.3

Source: Operation and maintenance manual, LGUs

Note: The above cities and municipality participated in the non-structural measures of the Imus sub-project.

Based on the above, it appears that there are no particular problems with the maintenance budget for the Tagoloan River and Imus River structures. Although there are some issues with the maintenance budget for the Cagayan River, there is a good prospect of improvement. Therefore, it is judged that there are no major problems in the financial aspect.

3.4.5 Environmental and Social Aspect

No particular environmental or social mitigation measures have been taken after the completion of the project; negative impacts on the natural environment are not expected in the near future. As discussed in "1) Impacts on the Environment" under "3.3.2.2 Other Positive and Negative Impacts," there had been no major negative impacts at the time of the ex-post evaluation.

3.4.6 Preventative Measures to Risks

At the time of the appraisal, no events that could be considered as external conditions or risks were specified. According to the DPWH, there were no natural disasters or associated construction delays that constituted external conditions or risks during the project implementation.

3.4.7 Status of Operation and Maintenance

The operation and maintenance status at the time of the ex-post evaluation is described below.

[Cagayan River]

There was no damage or malfunction that would impede the function of the structure. By April 2024, the LGUs fully acknowledged their responsibility to maintain the project structures and took the lead in removing waste and cleaning the surrounding area (for two days). The LGUs also indicated they would continue to cooperate with the residents in conducting regular inspections and cleaning activities in accordance with the maintenance manual.

[Tagoloan River]

The sluice gate (right side of Photo 5) had minor damage after the typhoon in 2022. However, LGU's maintenance staff repaired it without problems. Interviews with local residents confirmed that barangay officials do security patrols daily and that grass around the structures is regularly removed.

[Imus River]

The structures (retarding basins) are under the warranty period, and there is no damage that could impair their function. On the other hand, during the site visits (November 2023), grass and trees were overgrown within the retarding basins, and sediment and garbage were confirmed. According to the DPWH, large-scale cleaning and vegetation removal work are carried out in the dry season, as cleaning work is difficult during the rainy season. In April 2024, when the rainy season was over, the DPWH carried out large-scale cleaning work using heavy machinery. Cleaning work on the retarding basin on the Bacoor side was almost completed, and work on the retarding basin on the Imus side was ongoing at the time of the second field visit (April 2024).

Therefore, the operation and maintenance status at the time of the ex-post evaluation can be said to be generally good.

There are no particular concerns regarding the sustainability of the Imus River and Tagoloan River sub-projects. As for the Cagayan River sub-project, slight issues have been observed in the institutional/organizational, technical and financial aspects including the current status of operation and maintenance; however, it is in a transitional period as discussed above and no major concerns remain. Slight issues have been observed in the operation and maintenance, however, there are good prospects for improvement/resolution. Therefore, sustainability of the project effects is high.

Photo 5: Developed Sluice Gate and Farmland (Field)
(Tagoloan Sub-Project)

Photo 6: Retarding Basin Developed Along the Imus River
(The photo was taken during the rainy season. The mud and vegetation were removed several months later during the dry season.)

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project aimed to mitigate flood damage by implementing structural and non-structural measures against flood (sub-projects) in the Cagayan, Tagoloan and Imus River basins, thereby contributing to the sustainable development of the regional economy. Regarding relevance, this project was consistent with the “development plan” and “development needs.” As for coherence, it was consistent with “Japan’s ODA policy.” While mutual complementarity was observed in terms of “internal coherence,” no concrete cooperation or synergy was confirmed in terms of “external coherence.” This project was in line with the goals of the international framework (SDGs). Therefore, its relevance and coherence are high. With regard to efficiency, although there were some changes, the outputs were generally in line with the initial plan. However, the project cost and period significantly exceeded the initial plan; thus, the efficiency of the project is low. Concerning effectiveness, the actual values met the target values for the Cagayan and Tagoloan sub-projects. Although the actual values could not be confirmed for the Imus sub-project, interviews with local residents and companies confirmed that flood damage in the surrounding areas had been reduced, compared to before the project implementation. Regarding impacts, interviews covering the three sub-projects confirmed that the reduction in flood damage has enabled residents to live and run their businesses in peace of mind, which also has a positive impact on revitalizing the local economy. Therefore, the effectiveness and impacts of the project are high. Concerning sustainability, there are some minor issues in the institutional/organizational aspect, technical aspect and financial aspect. However, prospects for improvement and resolution are high. Therefore, the sustainability of the project effects is high.

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 desirable to continue the FMC in all sub-projects. For the Cagayan River sub-project in particular, FMC meetings have only just resumed after not being held since 2019. Therefore, DPWH should follow up so the meetings will be held regularly and surely in the future. It is preferable for the structures of this project to be registered as LGUs’ assets. To ensure that DPWH’s support for maintenance is provided, it is also desirable to make sure they are listed on DPWH’s inventory; it is recommended that DPWH provide maintenance support as needed.

Regarding the Cagayan River sub-project, the document signed by DPWH and LGUs at the time of the handover in July 2021 did not state that “the DPWH is responsible for large-scale repairs.” It is advisable to clarify the responsibility of each party and exchange a new memorandum of agreement (MoA) between the DPWH and LGUs. In addition, since the

operation and maintenance manual was only redistributed in January 2024, it is advisable to conduct operation and maintenance training related to the project for LGUs and DEO.

4.2.2 Recommendations to JICA

In this project, retarding basins were introduced for the first time in the Philippines and the flood control structures were designed to be handed over to the LGUs after completion. It is thus desirable to regularly collect information on the continuation of the operation and maintenance system and the status of the FMC meetings even after the handover and to offer advice for improvements to DPWH and LGUs as necessary.

4.3 Lessons Learned

Measures That Assisting Countries Should Take If the Developed Facilities Are Transferred After the Completion and the Need to Insist on the Continuation of the Maintenance System

In the Cagayan River sub-project, the structures were handed over from DPWH to the LGUs after completion, which was followed by a change in LGU's leadership. Due to the reassignment of maintenance staff, there was no continuity in the maintenance system. In any projects in which developed facilities are designed to be transferred from the executing agency to another organization such as a local government after completion, it is desirable for both the assisting country and the recipient country to promptly check with the project stakeholders and make every effort to ensure that the maintenance system continues if there is any major change such as a change in leadership.

Land Acquisition in Areas Where Land Prices Are on the Rise: The Importance of Proceeding Quickly Before Prices Deviate from the Market (Actual) Prices

In the Imus River sub-project, the land acquisition procedures were delayed, which led to increased compensation payments. This river basin has seen remarkable economic revitalization in recent years, which has resulted in rising land prices. For this project, it would have been better to carefully anticipate the increases in land prices and proceeded promptly. When formulating similar projects in the future, it is desirable to unambiguously plan to follow through the procedures and pay compensation promptly before there is any deviation from market (actual) prices if the project requires land acquisition in areas with notable economic revitalization.

5. Non-Score Criteria

5.1 Performance

5.1.1 Objective Perspective

This was the first time that retarding basins were constructed in the Philippines. The

construction supervision consultant for this project guided the local contractors on the technical methods for constructing the structures (especially the construction of the curved sections) during the project implementation. At the time of the ex-post evaluation (2024), utilizing the experience gained from this project, the Philippine government has allocated budgets to construct retarding basins in other parts of the country; new construction plans are also under consideration. At the request of DPWH's high officials, the project's consultant presented a case study on the technical construction methods of retarding basins at the Philippine Institute of Civil Engineers (PICE) national conference held in Davao City in 2023. It is possible that the technical construction methods of retarding basins spread to other parts of the country going forward. With the wider introduction of retarding basins, flood control measures may become more functional and effective than before. It can be said that the stakeholders of this project are playing a role in sharing and disseminating information and technology widely for future projects and flood damage reduction in the country, which has been working on flood control measures for many years.

5.2 Additionality

None

(End)

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs	1) Civil Engineering Work - Cagayan River: bank protection (three locations with a total length of 3.14 km [Alibago 940 m, Cataggaman 1,400 m, Enrile 800 m]), excavation of river channel, etc.	1) Civil Engineering Work → It was mostly as planned but some changes were made to the plan (the main changes are underlined). - Cagayan River: bank protection (two locations with a total length of 2.48 km [Alibago 960 m, Cataggaman 1,522 m]), <u>the Enrile site's bank protection was cancelled, the excavation of the river channel was cancelled</u> <u>Cataggaman bank protection: 1,400 m was extended to 1,522 m</u> <u>Alibago bank protection: spur dikes were added</u>
	- Tagoloan River: dike construction (two locations with a total length of 2.65 km), excavation in towhead, construction of drainage facilities, etc.	- Tagoloan River: dike construction (two locations with a total length of 2.59 km [upstream from Tagoloan bridge 1,917 m, downstream from the bridge 642 m]), <u>excavation (left side of Tagoloan River) was cancelled</u>
	- Imus River: construction of retarding basins (two locations) and associated facilities	- Imus River: construction of retarding basins (two locations, 44.01 ha [35 ha along the Imus River, 9.01 ha along the Bacoor River]) and associated facilities, <u>some additional work was done</u>
	2) Consulting Services [Detailed Design Consultant] - Detailed design, update the existing master plan (M/P) for each river basin, assist the preparation of the tendering documents, update the environmental management and monitoring plan, finalize RAP, prepare the plan and assist the implementation of IEC, prepare plans for water level gauges and flood forecast and warning system, etc.	2) Consulting Services → Implemented mostly as planned

	[Construction Supervision Consultant] - Review the detailed design, finalize the tendering documents, assist the procurement, supervise the construction (including assisting the land acquisition, monitoring the implementation of safety management plan), assist the implementation of environmental management and environmental monitoring plans, prepare maintenance manuals, assist the conduct of training, assist the planning and implementation of non-structural measures (assist the formation/improvement/introduction of the flood forecast and warning system, hazard mapping, etc.), review and support the implementation of the IEC plan, etc.	
2. Project Period	March 2012-May 2018 (75 months)	March 2012-March 2022 (121 months)
3. Project Cost Amount Paid in Foreign Currency	10,113 million yen	20,396 million yen
Amount Paid in Local Currency	5,180 million yen	1,779 million yen
Total	4,933 million yen	18,617 million yen
ODA Loan Portion	(7,546 million yen)	(7,493 million yen)
Exchange Rate	1 USD = 76.8 JPY 1 PHP = 1.81 JPY (As of November 2011)	1 USD = 111.3 JPY 1 PHP = 2.28 JPY (Average between 2013 and 2022 [average of the rates during the implementation of the major project component using the IMF's International Financial Statistics])
4. Final Disbursement	July 2020	