

Republic of Indonesia

FY2018 Ex-Post Evaluation of Japanese ODA Loan

“Integrated Water Resources and Flood Management Project for Semarang”

External Evaluator: Miho Kawahatsu, OPMAC Corporation

0. Summary

The aim of this project was to reduce flood damage and provide a stable water supply in Semarang City, the capital of Central Java province, by the improvement of a floodway and rivers, urban drainage system improvement, and the construction of a multipurpose dam, thereby contributing to the enhancement of the investment environment and regional economic development. The project was consistent with the development policy and development needs of Indonesia both at the times of appraisal and the ex-post evaluation. Furthermore, it was confirmed that it was consistent with Japanese ODA policy at the time of appraisal. Thus, the relevance of the project is high. In the course of implementation, although the project cost was within the plan, the project period exceeded the plan. Therefore, efficiency is fair. As for the project effects, flood control and urban drainage were realized. On the other hand, regarding water resource development, as the planned expansion of the water supply facilities by the Regional Water Company has not yet been completed, the volume is limited to the capacity of the existing facilities, although the project has enabled the supply of raw water. In terms of impact, flood and inundation damage has been significantly reduced since the implementation of the project. In addition, according to the City Government and residents who live in the areas around the facilities of the project, the local economy has been vitalized through the improvement of income levels by the promotion of new industries such as tourism, agriculture, and fisheries and by saving the costs of flood control. Therefore, the effectiveness and impact of the project are high. Regarding operation and maintenance, no major problems have been observed in terms of the institutional, technical, financial aspects and the status of operation and maintenance. Therefore, sustainability is high.

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

1. Project Description



Project Location



Simongan Weir located at the node of the Garang River and the West Floodway improved by the project

1.1 Background

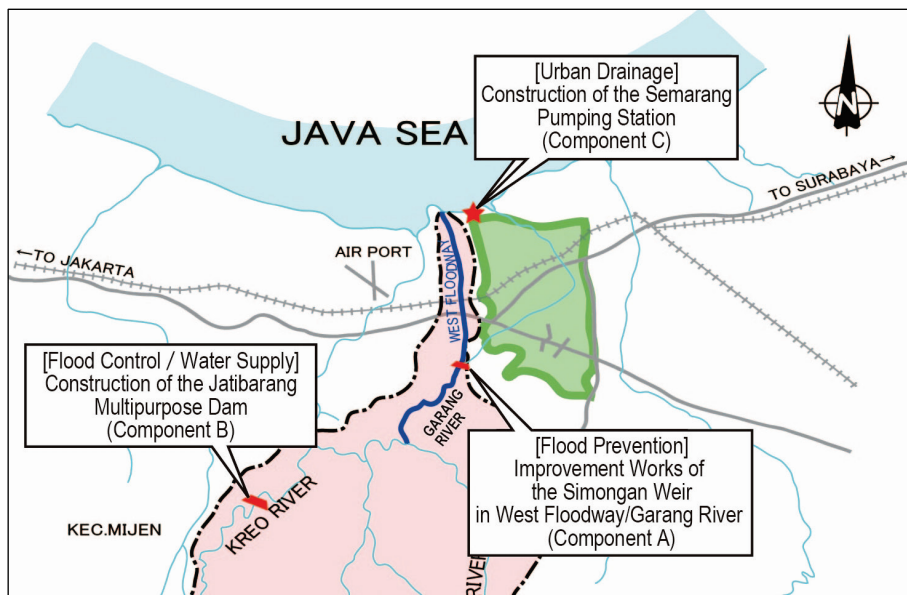
Indonesia, being located in the tropics, has a rainy and a dry season. About 80% of the annual rainfall falls during the rainy season. Naturally, the seasonal disparity in water resources is distinct. During the rainy season, serious damage occurs from flooding and inundation in various places. On the other hand, water shortages are also prone to occur during the dry season. There has been a concern about the expansion of the supply-demand gap, due to the recent increase in water demand accompanied by industrial development and population growth. Although the increase in water demand from progressive urbanization has become apparent in urban areas, the development of water resources and of water supply facilities have been sluggish. Moreover, land subsidence caused by excessive extraction of groundwater has progressed. Consequently, damage from flooding and inundation has been further aggravated during the rainy season. Therefore, it has become an urgent issue to take effective flood control measures and to develop water resources for a stable water supply, especially in urban areas where the water supply-demand gap tends to be wide.

Furthermore, in order to effectively implement water resource development and flood control measures, it is indispensable that a collaborative mechanism is built extending widely to all related organizations, including not only central and local governments but also to residents in the target area. A challenge was to strengthen the establishment of an “integrated water management” system contributed to the actualization of well-coordinated roles and information-sharing among various stakeholders.

1.2 Project Outline

The objective of this project was to reduce flood damage and provide a stable water supply in Semarang City, the capital of Central Java province, by the improvement of a floodway and rivers,

urban drainage system improvement, and the construction of a multipurpose dam, thereby contributing to the enhancement of the investment environment and regional economic development.



Source: Edited based on information provided by the executing agency

Figure 1: Project Sites located in the Western District of Semarang City

<ODA Loan Project>

Loan Approved Amount/ Disbursed Amount	16,302 million yen / 15,671 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 2006 / March 2006
Terms and Conditions	Interest Rate 1.5% Repayment Period 30 years (Grace Period 10 years) Conditions for Procurement General untied
Borrower / Executing Agency	Republic of Indonesia/ Ministry of Public Works and People's Housing, Directorate General of Water Resources ¹

¹ The project was implemented through close collaboration between two Directorates within the Ministry of Public Works and People's Housing (MOPWPH) at the central level, as the Directorate General of Water Resources (hereinafter referred to as DGWR) responsible for river improvement and the construction of the multipurpose dam, and the Directorate General of Human Settlement (hereinafter referred to as DGHS) responsible for the urban drainage system improvement of the project. After project completion, the Pemali-Juwana River Basin Organization (Balai Besar Sungai Pemali Juwana, hereinafter referred to as BBWS-PJ), which is under the direct control of the MOPWPH has been responsible for the O & M of the river and the multipurpose dam. The pumping station has become a fixed asset of the Semarang City Government and the operation and maintenance has been implemented by the Central Second District Pumping Station Operation Unit within the City Government (Unit Pengelola Teknis Dinas Pompa Banjir Wilayah Tengah II, hereinafter referred to as UPTD).

Project Completion	June 2016
Target Area	Semarang, Central Java Province
Main Contractor(s) (Over 1 billion yen)	<ul style="list-style-type: none"> • PT. Waskita Karya (Indonesia) / PT. Wijaya Karya (Indonesia) / PT. Brantas Abipraya (Indonesia) (JV) • PT. Pembangunan Perumahan (Indonesia) / PT. Adihi Karya (Indonesia) (JV) • PT. Brantas Abipraya (Indonesia) / PT. Grundfos Pompa (Indonesia) (JV)
Main Consultant(s) (Over 100 million yen)	<ul style="list-style-type: none"> • CTI Engineering Co., Ltd. (Japan) / Nippon Koei Co., Ltd. (Japan) (JV) • Oriental Consultants Co., Ltd. (Japan) / Nihon Suido Consultants Co., Ltd. (Japan) (JV)
Related Studies (Feasibility Studies, etc.)	<ul style="list-style-type: none"> • The Detailed Design of Flood Control, Urban Drainage and Water Resources Development in Semarang in the Republic of Indonesia (2000) • Special Assistance for Project Formation (SAPROF) (2006)
Related Projects	<p>[Technical Cooperation Project]</p> <ul style="list-style-type: none"> • Project on Capacity Development for River Basin Organizations in Practical Water Resources Management and Technology (2009-2011) • Project on Capacity Development for River Basin Organizations in Integrated Water Resources Management (2015-2019)

2. Outline of the Evaluation Study

2.1 External Evaluator

Miho Kawahatsu, OPMAC Corporation

2.2 Duration of Evaluation Study

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

Duration of the Study: November 2018 – December 2019

Duration of the Field Study: March 31 – April 16, 2019, June 23 – July 2, 2019

3. Results of the Evaluation (Overall Rating: A²)

3.1 Relevance (Rating: ③³)

3.1.1 Consistency with the Development Plan of Indonesia

At the time of the appraisal of the project, the Government of Indonesia was addressing the reduction of flood damage and a stable water supply through integrated water resources management as one of its important strategic programs in the National Medium-Term Development Plan 2004-2009 (*Rencana Pembangunan Jangka Menengah Nasional*: hereinafter referred to as *RPJMN*). It was also mentioned that it was to promote disaster prevention

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

³ ③: High, ②: Fair, ①: Low

activities through the construction of flood control infrastructure with public participation, mainly in densely populated, major industrial areas. In March 2004, the Government formulated a new law on water resources management so that it was subject to planning, implementation monitoring, and evaluation in a comprehensive manner for water resource conservation and water disaster control in each basin.

At the time of the ex-post evaluation, water security was one of the five important pillars in the *RPJMN* of 2015 to 2019. It addressed the fact that risk management for flood damage reduction was to be promoted. In other words, the aim was to minimize flood damage and mitigate the vulnerability of local property in the affected areas through river revetment works and river basin management measures, which were also extended to forests and irrigation. In addition, the importance of comprehensive water resource development and flood control was upheld in the Sector Strategic Plan (2015-2019)⁴ of the Ministry of Public Works and People's Housing (hereinafter referred to as MOPWPH). As such, the project was positioned in a specific activity program underpinned by a budget.

From the above, it can be judged that the project was consistent with the national development policies of Indonesia (the *RPJMN*, the Sector Strategic Plan of MOPWPH, and the water resources law of 2004) at both the times of the appraisal and the ex-post evaluation.

3.1.2 Consistency with the Development Needs of Indonesia

At the time of the appraisal of the project, as Semarang City had been suffering from severe flood damage due to climate and topographical reasons, flood control was a most urgent issue. Since 1973, the city had been hit four times by massive flooding due to river overflows and dyke breaks. Also, inundation occurred in urban areas due to poor drainage every year.

Meanwhile, water shortages during the dry season were a problem in the city due to population growth through urbanization. As of the year 2005, the water supply volume from the water supply facilities remained at only about 2.3 m³/sec. while water demand was about 4.0 m³/sec. in the city. Furthermore, with the population growth of the city, water demand forecast in 2020 was expected to have increased to 6.2 m³/sec., and thus the need for water resource development was high. In addition, with the progress of industrialization, land subsidence caused by the excessive extraction of groundwater had become imminently problematic. With land subsidence progressing at an annual average rate of 3 cm throughout the city, incessant soil erosion was observed, especially in the coastal areas of the Java Sea where damage was particularly severe.

At the time of the ex-post evaluation, regarding the need for flood control, flood-related data for the entire city from 2006 to 2018, shown in Table 1 below, indicates that there is a disaster level of rainfall every year that leads to the “occurrence of flood damage” and that a number of collapsed houses and a death toll are reported in some years. In addition, there are over 2,000

⁴ Rencana Strategis Kementerian Pekerjaan Umum Dan Perumahan Rakyat

hectares of inundated areas recorded. According to the executing agency, although no flood damage caused by river overflow and poor drainage occurs in the target area of the project, the western district of the city where the West Floodway and the Garang River flows down toward the Semarang Pumping Station, severe damage caused by flooding still occurs in the eastern district of the city where improvement works have been belated⁵.

Table 1: Flood-Related Data for the Entire City of Semarang (2006-2018)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Rainfall													
Maximum hourly rainfall per day (mm)	152	108	119	235	139	106	110	147	142	159	79	119	105
Annual number of rainy days	132	123	154	130	172	142	365	156	153	126	186	207	139
Flood Occurrence* ¹													
Date of flood occurrence	1/28	3/8	12/27	2/8	12/11	11/29	1/31	1/23	2/4	2/13	10/6	10/28	11/30
Inundated area (ha)	N/A	N/A	N/A	N/A	2,112	3,101	2,976	2,876	2,025	2,025	2,300	N/A	N/A
Flood Damage Occurrence													
Number of deaths	N/A	N/A	N/A	N/A	N/A	N/A	15	2	NA	2	7	4	7
Number of collapsed houses	N/A	N/A	N/A	N/A	N/A	N/A	10	4	20	11	14	31	47

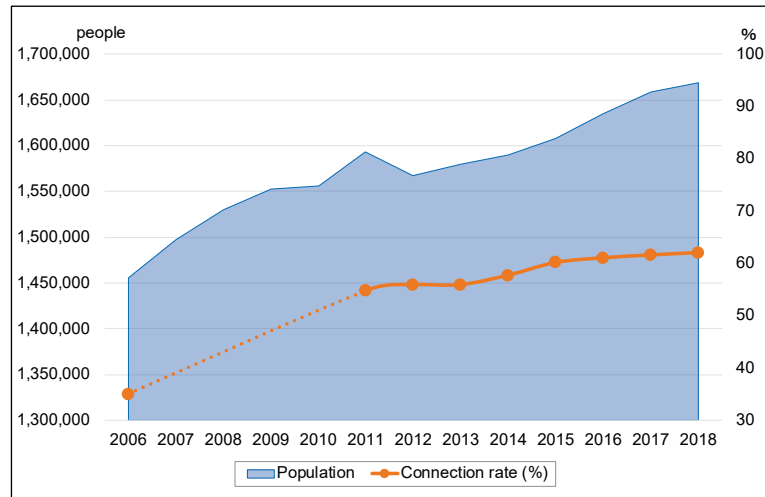
Source: data provided by the executing agency

Note 1: Of the floods that occurred each year, this data is only for the floods that caused the most serious damage in terms of the inundated area

Regarding water resource development needs, as shown in Figure 2 below, the population is steadily increasing in the city, and at the time of the ex-post evaluation, the piped water connection rate was only about 60%. It is deemed that there is room for an increasing public demand for water supply. On the other hand, the construction of water supply facilities in the city has been delayed, and the extraction of groundwater has continued. The executing agency reported that land subsidence caused by excessive extraction has affected people's daily lives. In particular, land subsidence has worsened remarkably in the coastal areas of the Java Sea and downriver in the eastern district of the city. Coastal flooding has often caused problems to buildings and infrastructure in these areas. Therefore, the need for water resources development remains high.

⁵ Regarding flood control in the eastern district of the city, the executing agency has started improvement works for the East Floodway (14.6 km) at its own expense based on the results of the study conducted by the consulting service of the project. These were scheduled to be completed in 2019.

From the above, it is judged that the project was consistent with development needs as the importance of flood control and water resource development was high both at the time of the appraisal and the ex-post evaluation from the perspectives of flood damage, increase in water demand through population growth, and land subsidence in Semarang City.



Source: data provided by the executing agency
 Note 1: data from 2006 to 2010 are missing. The value for 2006 was calculated based on the data of water connection rate, average numbers per household, and the population of Semarang City at the time of the appraisal.

Figure 2: Trends of Population and the Piped Water Connection Rate*¹ in Semarang City

3.1.3 Consistency with Japan’s ODA Policy

At the time of the appraisal, the *Country Assistance Program for Indonesia* (November 2004) was to provide assistance for countermeasures against natural disasters such as perennial floods, landslides, and droughts as a part of the “improvement of basic public services”. This was also important from the viewpoint of improving the investment environment. Concurrently, the Japan Bank for International Cooperation's *Medium-Term Strategy for Overseas Economic Cooperation Operations* (April 2005) placed emphasis on support for infrastructure related to disaster control. In particular, it positioned not only prevention but also recurrence prevention, measures as the direction of support from the mid to long term perspectives. Furthermore, the water problem was regarded as a global issue, and effective support was provided through ODA loan projects.

Therefore, this project was consistent with Japan's *Country Assistance Policy for Indonesia* with the priority areas of Japanese ODA loans to the country, and with the *Medium-Term Strategy for Overseas Economic Cooperation Operations* of the Japan Bank for International Cooperation at the time of the appraisal.

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

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

A comparison of the output of the project between planned and actual is shown in Table 2.

Table 2: Comparison of Output between Planned and Actual

	Plan	Actual	Difference
[Civil Work]			
Component A: West Floodway/Garang River Improvement Works (Flood Prevention)			
A-1 (1)	West Floodway (5,456m)/ Garang River (3,968m) Improvement	Same as on the left	Except for the addition of the public promenade, mostly as planned.
A-1 (2)	Rehabilitation of Simongan Weir	Same as on the left	In addition to the Rehabilitation of the body of Simongan Weir, the Replacement of intake and flushing gates, Downstream riverbed protection, River connection with West Floodway/Garang River, the Rehabilitation of Tawang Channel, and the Construction of the weir operation house were added.
A-2	Flood Monitoring Facilities	Same as on the left	Not changed
A-3	Raising of a Railway Bridge over the West Floodway		Canceled
Component B: Jatibarang Multipurpose Dam Construction (Flood Control / Water Supply)			
B-1	Dam Body Construction (reservoir area 1.1 km ²)	Same as on the left	Except that the dam height was changed to 74m from 77m due to the foundation rock condition, mostly as planned.
B-2	Procurement and Installation of Hydropower Station (1,500kW)		Canceled
B-3	Pilot Project for Community Based Conservation of Greenbelt and Improvement of Catchment Area	Same as on the left	Not changed
B-4		Construction of Dam management office, Pedestrian Bridge, etc.	Originally part of the B-1 in the plan but re-categorized as in the B-4 subcomponent. It was thus as planned.
Component C: Urban Drainage System Improvement (Urban Drainage)			
C-1	Semarang River Improvement Work	Civil and Architectural Works of the Semarang Pumping Station and Retarding Pond (130,000m ³)	Change in the site of the pumping station (see Figure 3 below). Reorganize the entire scope for the construction of new facilities.
C-2	Asin Drainage System Improvement Work	Mechanical and Electrical Works of the Semarang Pumping Station (Drainage capacity 35m ³ /sec. Power generator, etc.)	
C-3	Bandarharjo (Baru River Basin) Drainage System Improvement Work	Revetment Improvement of the Lower Semarang (800m) and Asin River (1,200m) Rehabilitation of the Screw Pumps of Baru Pumping Station	

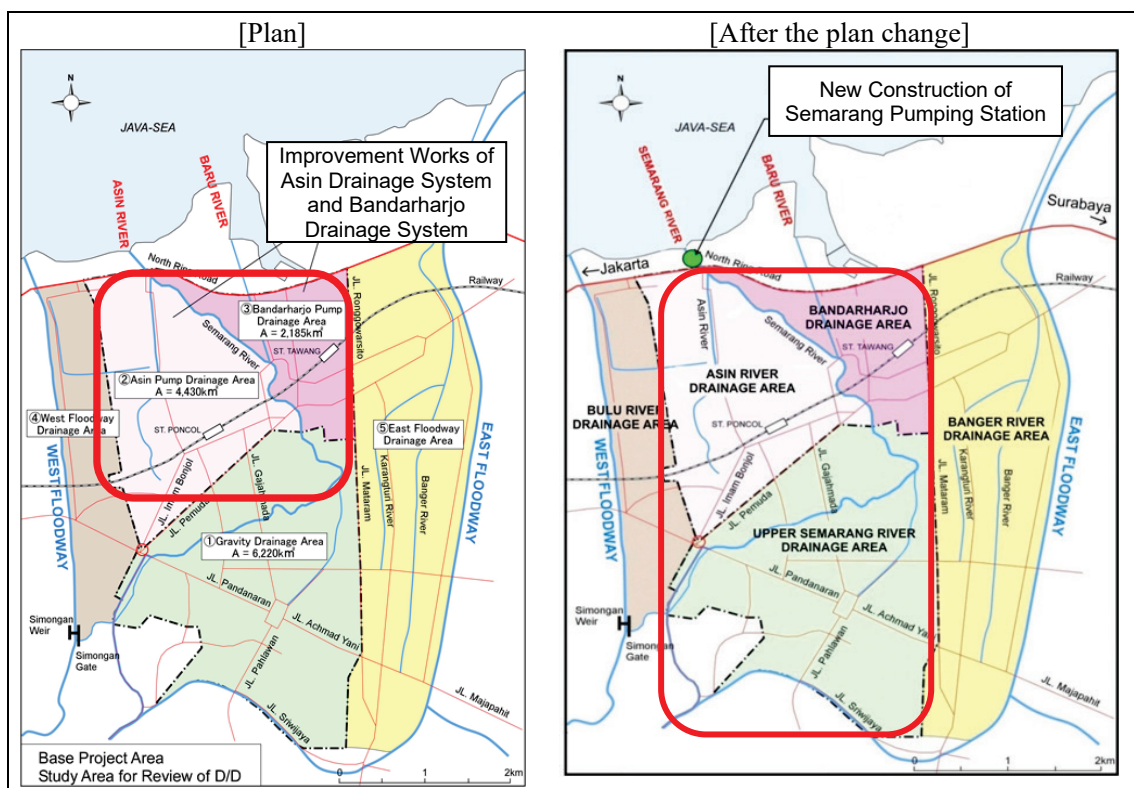
Plan		Actual	Difference
[Consulting Service]			
Component D			
D-1	Water Resources (DGWR)		
Pre-construction Stage Process for Component A and B		Same as on the left	Additional assigned tasks; A-3: 3-D dimensional hydraulic model test for the Simongan Weir and detailed design of the rehabilitation of the Simongan Weir B-1: Assistance for the engineer on acquiring dam design, dam impounding, dam operation certificates
Construction Stage Process for Component A and B		Same as on the left	Additional assigned tasks; B-1: Monitoring and evaluation of initial reservoir filling and dam behavior analysis
Transfer of Knowledge Process		Same as on the left	Not changed
Non-structural Measures for the Disaster Management Process for Component A and B		Same as on the left	Not changed in content, but carried out by the Research and Development Agency, MOPWH
Non-structural Measures for the Watershed Management Process for Component A and B		Same as on the left	
		Study and Design of East Floodway and Dolok Penggaron River System	Additional work
D-2.1	Urban Drainage (DGHS)		
Pre-construction Stage Process for Component C		Same as on the left	Not changed
Construction Stage Process for Component C		Same as on the left	
Transfer of Knowledge Process		Same as on the left	
Non-structural Measures for Urban Drainage for Component C and Water supply		Same as on the left	
D-2.2	Water Supply (DGHS)		
Transfer of Knowledge Process		Same as on the left	Not changed
Study and Design for Water Supply System Improvement		Same as on the left	

Source: information provided by JICA, the executing agency and responses to the questionnaire

In the main construction, with regard to the raising of the railway bridge (70 cm) over the West Floodway as part of the West Floodway/Garang River improvement works, based on a detailed topographical survey and site inspection, as well as consultation with the Railway Corporation and the Road Bureau, it was judged that it would be possible to excavate without raising. Thus, the raising was canceled. It should be noted, however, this, in turn, necessitated the widening of the water channel: from 58m to 60m at the West Floodway and from 115m to 130m in the downstream area.

As for the construction of the Jatibarang Multipurpose Dam, although the aim had been flood control, water supply, and hydropower generation, the installation of the hydropower station was canceled during project implementation. As the implementation conditions, such as the investment cost of ancillary facilities, notably a power generator, and the time of completion,

were not met between the MOPWPH, the hydropower project (which had been assumed to be led by the State Electricity Company, Perusahaan Listrik Negara (PLN) at the time of project planning) was conclusively excluded from the project scope. The process should have proceeded through competitive bidding in the form of public-private partnership. At the time of the ex-post evaluation, a certain private company willing to invest in a power generator and station had already been selected and it was reported that contract negotiation was currently underway. It should be noted that within this component, the construction of a dam management office for staff members of the BBWS-PJ and a pedestrian bridge for residents and tourists visiting the dam were originally included in the subcomponent B-1, but these were arranged separately under the subcomponent B-4.



Source: information provided by the executing agency

Figure 3: Changes in the Project Site and Scope of Component C

Regarding the improvement of the urban drainage system, having considered the issues related to resettlement and land acquisition from the point of view that development was underway in the planned sites around the Baru River and the Asin River, and considering site criteria from the perspectives of land subsidence and the construction schedule, the two pumping stations originally targeted were eventually integrated into the new construction of the Semarang Pumping Station. Inevitably, the whole component was reshuffled and the change was

considered appropriate in light of the project purpose and scope in that the urban drainage system should be improved under the financial and time constraints of Semarang where the population had shown a marked rise. Furthermore, by newly constructing at one site, the drainage capacity was doubled in terms of the flood damage mitigation area of the city. This is judged to be appropriate from the perspective of the project effect. Revetment works for the Semarang River and the Lower Asin River took place through a relevant project funded by the Government of Indonesia, so were outside the scope of the project.

Among the consulting services, regarding the subcomponent D-1 under the jurisdiction of the DGWR, additional works were as follows: the above mentioned hydraulic model test, the detailed design survey accompanying the suspension of the raising of the railway bridge for river improvement, the necessary support for the obtaining of certificates regarding dam construction, and operation and maintenance in accordance with domestic laws and regulations. Although it was not included at the time of appraisal, the problem of land subsidence was critical in the eastern district of the city and thus flood damage there was still extremely serious. Therefore, a survey study in the district on the flood control system was additionally conducted. Based on the basic design of the survey study and the experience of the project, the executing agency is currently engaged in improvement works for the East Floodway at its own expense. These are scheduled to be completed in 2019.

3.2.2 Project Inputs

3.2.2.1 Project Cost

The total project cost was planned to be 22,165 million yen (of which the ODA loan portion was 16,302 million yen), while the actual project cost was 19,678 million yen of which 4,007 million yen⁶ was borne by the Government of Indonesia, and 15,671 million yen was by ODA loan disbursement, as shown in Table 3 below. This was within the plan (89% of the plan).

Within the multipurpose dam construction, the installation of the hydropower station was canceled. However, a hydropower generation project is currently underway in the form of public-private partnership. Moreover, taking into consideration the increment increase, mainly by the urban drainage system improvement, targets have been judged to be appropriately met, on the whole.

It should be noted that the main reason that the ODA loan portion was lower than the planned, despite the increase in output, was that the proportion of local currency actually disbursed for the major part construction was high. In addition, exchange rate fluctuations have occurred since the time of appraisal. While at the time of appraisal, 1 rupiah was equivalent to 0.0115

⁶ The disbursement amount of the Government of Indonesia in local currency was 408,227 million rupiah. This yen equivalent was calculated by applying an average annual rate of IFS data, 1 rupiah = 0.009816 yen during the loan period of 2006 to 2016.

yen (as of September 2005), since 2011, the average rate of 1 rupiah to 2016 has been 0.0088 yen. Moreover, as the actual construction period was extended, it can be said that it was even more affected by exchange rate fluctuations.

Table 3: The Comparison of Project Cost between the Planned and Actual

Unit: million yen

Item	Foreign Currency				Local Currency				Total			
	Plan		Actual		Plan		Actual		Plan		Actual	
	Total	Loan	Total	Loan	Total	Loan	Total	Loan	Total	Loan	Total	Loan
Civil Works, Procurement of Equipment												
Component A	1,246	1,246	0	0	1,488	1,488	12,854	12,854	2,734	2,734	13,344	13,344
Component B	3,236	3,236	0	0	3,073	3,073			6,309	6,309		
Component C	1,459	1,459	490	490	1,729	1,729			3,188	3,188		
Consulting Services												
Component D-1	715	715	1,190	1,190	927	927	1,137	1,137	1,642	1,642	2,327	2,327
Component D-2												
Contingency												
Civil Works	317	317	N/A	N/A	368	368	N/A	N/A	685	685	N/A	N/A
Consulting Services	38	38	N/A	N/A	53	53	N/A	N/A	91	91	N/A	N/A
Price Escalation												
Civil Works	405	405	0	0	1,073	1,073	0	0	1,478	1,478	0	0
Consulting Services	41	41	0	0	134	134	0	0	175	175	0	0
Land Acquisition and Resettlement												
Component A&B	0	0	0	0	2,973	0	1,354	0	2,973	0	1,354	0
Component C	0	0	0	0			187	0			187	0
Administration Cost	0	0	0	0	1,260	0	1,075	0	1,260	0	1,075	0
Tax & Duties	0	0	0	0	1,630	0	1,391	0	1,630	0	1,391	0
Total	7,457	7,457	1,680	1,680	14,708	8,845	17,998	13,990	22,165	16,302	19,678	15,671

Source: planned amounts were provided by JICA, actual amounts were provided by JICA and responses to the questionnaire from the executing agencies

3.2.2.2 Project Period

As shown in Table 4 below, against 93 months planned period, the actual project period was 123 months, with an extension of the loan period in the year 2015. This was 132% of the plan and thus, the project period exceeded the plan.

Table 4: The Comparison of Project Period between the Planned and Actual

	Plan	Actual
Overall	April 2006 (L/A) - December 2013, (Completion Date) (93 months)	April 2006 (L/A) - June 2016, (Completion Date) (123 months)
Civil Work		
Tender and Contract	April 2007 - September 2008	November 2008 - October 2009
River Improvement Works	October 2008 - April 2011	November 2009 - November 2013
Multipurpose Dam Construction	October 2008 - April 2012	November 2009 - December 2014
Urban Drainage System Improvement	December 2008 - June 2012	December 2009 - February 2016
Consulting Services		
Selection of Consultant	April 2006 - November 2006	D-1: October 2006 - November 2007 D-2: October 2006 - December 2007
Consulting Services	December 2006 - December 2012	D-1: December 2007 - June 2016 D-2: December 2007 - March 2016

Source: information provided by JICA

The main reasons for the delays of each item during implementation are as follows:

[River Improvement Works/ Multipurpose Dam Construction]

Due to the delays in the public announcement and technical review, the selection of the consultant was behind schedule by one year, leading to a delay in the main construction by one year. As for the river improvement works and multipurpose dam construction, the project period was extended from 30 months to 42 months and from 36 months to 50 months respectively, due to changes in the quantities required by design review. In the meantime, the start of construction was postponed to avoid the rainy season, and then the construction period was had to be extended due to unexpected landslides and the relocation of a power transmission tower during implementation. As a result, extensions of 48 months for the river improvement works and 62 months for the multipurpose dam construction had to be added to the overall planned schedule. The consulting services were extended from an initially planned 55 months to 103 months, due to the extension of the construction period of the main civil works and the addition of the dam behavior analysis survey and the survey on land subsidence in Semarang.

[Urban Drainage System Improvement]

It was difficult to proceed with works at the planned sites of two retarding ponds, due to the ongoing status of housing land development. In addition, the impact of land subsidence should have been duly considered and reselection of the project site for the facilities had become necessary as of 2008. Thus, the component was to be wholly restructured. In line with the policy of revetment works for the Semarang River and the Lower Asin River, the installation of the Semarang Pumping Station, and the construction of a retarding pond, it was necessary to change the number of materials and equipment and to conduct a detailed survey on the site

location. Thus, for the main construction, the project period had to be extended from 37 months to 76 months. For the installation of equipment, it was extended from 24 months to 49 months. The contract period of the consulting services was also extended, from 72 months to 96 months, due to the aforementioned extension of the construction period.

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

Based on the contents of the project confirmed during the field survey, the portions of flood control and urban drainage were subject to recalculation of Economic Internal Rate of Return (EIRR). Each benefit of the expected reduction of flood damage on immovable and movable property was recalculated based on the Indonesian Consumer Price Index for residential costs. It should be noted that the portion of water resources development was based on the basic premise that PDAM Semarang (the Water Supply Corporation in Semarang) should complete the extension of the water supply facilities, which was out of the scope of the project. Furthermore, as the hydropower station is not yet in operation, neither cost nor benefit has been generated and thus it is not subject to verification.

Table 5: The Comparison of EIRR between the Time of Appraisal and the Time of the Ex-post Evaluation

			As of Appraisal	As of the ex-post evaluation
			EIRR	EIRR
Flood Control	River Improvement Works (Component A)	Dam Construction (Component B)	15.7	7.4 ⁷
Water Resources Development* ¹	Dam Construction (Component B)		17.1	
Hydropower Generation			6.8	
Urban Drainage	Urban Drainage System Improvement (Component C)		15.1	16.3

Note1: As shown in Table 6 below, EIRR was recalculated in accordance with the change in the target value of the water supply based on the updated demand forecast by the survey during project implementation. Providing that dam construction of the project and water supply facilities were completed, it was to be 26%. It should be also noted that a range of economic benefits were considered, including a cost-saving benefit in the household costs of using wells, and a reduction in medical spending due to a lower incidence of water-borne infectious diseases and an increase in benefits from tap water use on the part of industries. Moreover, household costs which were incurred by the switch from groundwater to tap water use were also considered.

While the benefits of flood control are generated from multipurpose dam construction and river improvement works, at the time of appraisal, the benefits of the dam construction per se were presumed to include water resources development and hydropower generation. Thus, over-investment relative to the benefits of the flood control alone was recognised, and thus the EIRR is lower than at the time of appraisal.

⁷ In the case of applying the percentage of the total dam construction cost allocated to flood control (48%) at the time of appraisal, the EIRR was estimated as 13.5%.

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

3.3 Effectiveness and Impacts⁸ (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

After the implementation of the project, the main construction was completed as designed. As shown in Table 6, with regard to the functions of flood control and prevention by the West Floodway/Garang River Improvement Works and the Jatibarang Multipurpose Dam Construction combined, also for the function of urban drainage by the Semarang Pumping Station, the actual values of the operation indicators were less than the planned values. It was confirmed that all design capability had been attained and therefore, it is judged that the operational indicators are achieved. On the other hand, the target value of water supply as a measure of one of the functions of the Jatibarang Multipurpose Dam was estimated based on the premise that the extension of the water supply facilities, albeit outside of the scope of the project, was to have been implemented by PDAM Semarang at the time of planning. At the time of the ex-post evaluation, although the contract for the extension works was being prepared, construction had not yet started⁹. As such, the actual water supply from the dam has been limited to the acceptable capacity of the existing facilities of PDAM Semarang. It should be noted, however, that it was confirmed that whenever the extension of the water supply facilities is completed and the capacity is duly expanded, the dam has been ready and well-equipped to increase the water supply on demand.

Table 6: Operation Indicators of the Project

	Baseline	Target	Actual		
	2005	2018	2016	2017	2018
		2 Years After Completion	Completion Year	1 Year After Completion	2 Years After Completion
West Floodway/Garang River Improvement Works					
The annual highest water level at Simongan Weir (m)	7.2	6.9	1.70	1.75	1.70 [Attainment level] 100%
Annual maximum discharge at Simongan Weir (m ³ /sec)	360	280	266.99	278.86	266.99 [Attainment level] 100%
Discharge capacity at Simongan Weir (m ³ /sec)	660	700	700 (same as designed) [Attainment level] 100%		
Designed high water level at Simongan Weir (m)	--	8.5	8.5 (same as designed) [Attainment level] 100%		

⁸ Sub-rating for Effectiveness is to be put with consideration of Impacts.

⁹ At the time of the ex-post evaluation, according to information from PDAM Semarang, the extension is scheduled to be completed in 2020 in the contract agreement.

	Baseline	Target	Actual		
	2005	2018	2016	2017	2018
		2 Years After Completion	Completion Year	1 Year After Completion	2 Years After Completion
Jatibarang Multipurpose Dam Construction					
Amount of water supply from Jatibarang dam to PDAM Semarang (m ³ /sec)	--	2.18*1	0.85	0.85	0.85 [Attainment level] 39%
Urban Drainage System Improvement					
Discharge capacity at Semarang River mouth (m ³ /sec)	40	80	80 (same as designed) [Attainment level] 100%		
Designed high water level at Semarang River mouth (m)	--	0.50	0.50 (same as designed) [Attainment level] 100%		

Source: information provided by JICA and the executing agency, responses to the questionnaire and interviews with concerned parties

Note 1: The figure was reset based on the results of the feasibility study on the water supply system conducted through the Consulting Services (D-2.2) and on the premise that the planned extension of the water supply facilities would be completed during the project period. The target value of water supply from the Jatibarang Multipurpose Dam was thus changed from 1.82m³/sec as set at the time of appraisal, to 2.18m³/sec (as of September 2008).

3.3.1.2 Qualitative Effects (Other Effects)

At the time of appraisal, the qualitative effect was set as the improvement of the investment environment and regional economic development in Semarang. However, in light of the causal sequence between the project contents and its effects, it would be only possible to realize this effect after flood damage is effectively reduced and the water supply is sufficiently increased in the target areas. Consequently, “the improvement of the investment environment and regional economic development in Semarang” was reset as an item for impact. This effect is to be verified in the next section, “Other Positive and Negative Impacts” instead of in “Effectiveness”.

As stated above, water resource development has been carried out through the project, although the outside-of-scope project for the improvement of water supply facilities has been delayed, and the capacity of PDAM Semarang to receive raw water is still limited. Meanwhile, the effects of flood control and urban drainage have been achieved as planned. Therefore, the effectiveness is high.

3.3.2 Impacts

3.3.2.1 Intended Impacts

Mitigation of flood damage was assumed as a quantitative effect of the project. From the completion to the time of the ex-post evaluation, there had been neither levee breach nor overflow in the West Floodway or the Garang River, and there had been no incident of poor drainage at the Semarang Pumping Station. All target values set at the time of appraisal were achieved as shown in Table 7 below. On the other hand, the entire city of Semarang has been at risk of major disasters every year, as shown in Table 1 above. The reduction of flood damage

in the entire city cannot be fully explained as an impact of the project, although the executing agency has reported that the project clearly contributed to reducing flood damage, such as inundation and flooding, in the western district of the city which was targeted by the project. It should be noted that civil



“Old Town” in the target area of urban drainage

works for flood control in the eastern district of the city, where flood damage is still serious, are being implemented to be completed within 2019 as mentioned above.

Table 7: Attainment Status of Flood Damage Reduction

	Baseline	Target	Actual		
	2005	2018	2016	2017	2018
		2 Years After Completion	Completion Year	1 Year After Completion	2 Years After Completion
West Floodway/Garang River Improvement Works					
The annual maximum inundated area by levee breach or overflow (km ²) 50-year return period	4.9	0	Nil in all the items and years [Attainment level] 100%		
The annual number of flooded houses by levee breach or overflow 50-year return period	14,700	0			
Annual reduction in the number of floods by levee breach or overflow	--	0.18			
Urban Drainage System Improvement					
The annual maximum inundated area by poor drainage (km ²) 5-year return period	12.65* ¹	0	Nil in all the items and years [Attainment level] 100%		
The annual number of flooded houses by poor drainage 5-year return period	19,700* ²	0			
Annual reduction in the number of floods by poor drainage	--	0.80			

Source: information provided by JICA and the executing agency, responses to the questionnaire and interviews with concerned parties

Note 1: As a result of the aforementioned changes, the total target drainage area increased from 6.62 km² at the time of appraisal to 12.65 km² (of which the area below sea level is 7.77 km²). The target area after the change covers the following catchment areas; Asin, West Bandarharjo, East Bandarharjo, Old City, Tugu Muda, Semarang, and Simpang Lima.

Note 2: A target value at the time of appraisal. The target value of “the annual number of flooded houses by poor drainage” was not reset after the change of the contents. The total number of buildings in the target area at the time of the ex-post evaluation was 53,899 (Semarang City Statistics Bureau 2017 data).

3.3.2.2 Other Positive and Negative Impacts

(1) Benefits for Residents in the Vicinity of the Target Area

As stated above, the qualitative survey was conducted in order to confirm the status of the improvement of the investment environment and regional economic development in Semarang. In order to confirm the impact of the project, focus group discussions¹⁰ were carried out to collect information directly from local residents in the vicinity of the three target facilities regarding the actual status of reduction in flood damage and inundation. An outline of each group discussion is as follows:

■ West Floodway/Garang River (Residents living upstream, midstream and downstream of the river)

All the participants agreed that the rehabilitation of the Simongan Weir had enabled the regulation of a smooth river water flow. As there is no longer flooding around the West Floodway, land prices around the area have escalated. Furthermore, about 80% of participants mentioned beautification of the scenery around the Simongan Weir. Half said that, as the improvement of the river served to dispel anxiety about flood



Focus Group Discussion by local residents
in West Floodway/Garang River

damage, they are able to carry out their civil activities safely and comfortably. In addition, several people mentioned that the increase of public facilities provided by the project, such as the riverside public facilities, have been used to facilitate health promotion activities.

To suggest an improvement, participants pointed out the necessity for sedimentation removal; sediment flowing down from the upstream accumulates on the riverbed, leading to the possibility that the water level may well rise and heightening the risk of flooding. Also, the problem of plastic waste was pointed out; much plastic from upstream is brought downstream. This also causes an aesthetic problem and participants said that appropriate measures should be taken.

¹⁰ On April 11 and 12, 2019, discussions took place with a total of 31 residents in the vicinity of the three target facilities. Since the comparison of the situation before the project was the underlying agenda, one condition in selecting the participants was that they should be those who had lived around the target area since the commencement year of the project, the year 2006, at the latest, or earlier than that. It turned out that more than half of the participants were in their 50s or older. After each group confirmed the improvement status of flood damage after the project, discussions followed on the topics of the impacts on production and on commercial activities during the rainy season and the improvement of damage control for their properties, etc. In addition, all participants were given the floor to freely discuss both positive and negative impacts, including community participation. Furthermore, from the standpoint of ensuring fairness, anonymous surveys by written questionnaire were conducted to collect opinions.

■ Jatibarang Multipurpose Dam (Residents living in the western and eastern areas of the dam reservoir)

All participants agreed that the dam construction had reduced flood damage downtown. About 80% mentioned that farming has become more active compared to before the construction of the dam, with the cultivation of commercial crops such as green plants and fruits supported by the livelihood program of the project. On the other hand, however, since most of the residents were originally rice farmers before the project, some of them pointed out that some farmers are facing technical difficulties as they switch their business to livestock, fisheries, and commercial crop cultivation. Half mentioned that tourism in the green belt area has enabled them to start local businesses providing meals and lodging for tourists so that their sources of income, as well as their levels of income, have increased.

To suggest an improvement, they pointed out the problem of the removal of waste from the reservoir. In particular, they claimed that regulations should be strengthened on industrial waste discharged from factories located upstream of the dam.

■ Semarang Pumping Station (Residents living in the vicinity of the pumping station)

All participants agreed that even though torrential rain occurs, once the pumping station starts operating, it can drain rainwater from the ground more quickly to reduce flood damage. They also mentioned that the economic situation has improved as prices of land and real estate rise, and they can go to work even during the rainy season without being affected by flooding. In addition, there was a cost-saving effect



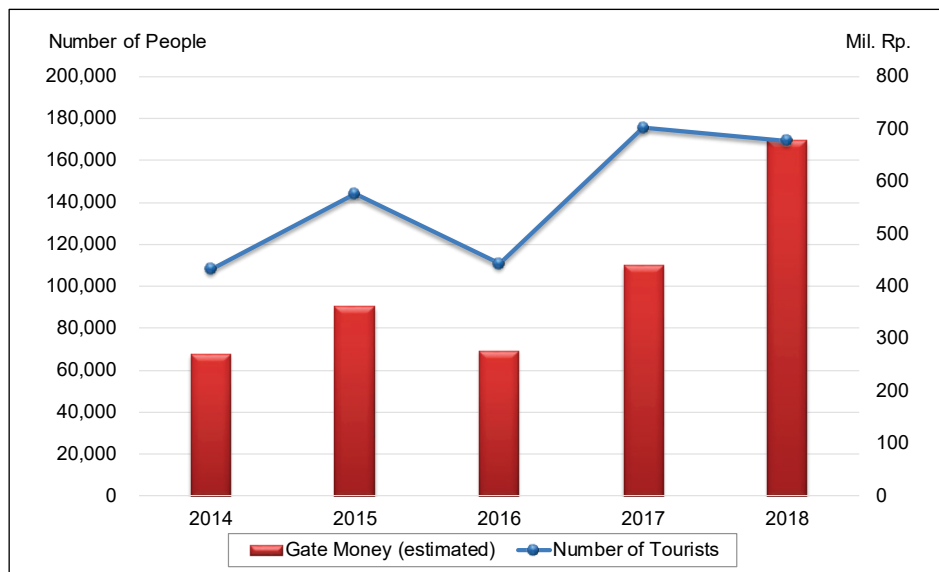
Focus Group Discussion by local residents around the Semarang Pumping Station

as residents do not need to move to a stilted house to avoid inundation and to pay the cost for temporary relocation. In addition, while previously a lot of garbage was strewn all over the town as floodwaters subsided, now the town is kept clean. Half of the participants said that they do not have to use their own drainage pump at home, so electricity costs have also been reduced compared to before the project.

To suggest an improvement, they pointed out that garbage dumped in the Semarang River is retained around the sluice gate of the pumping station which is located at the junction of the Java Sea and lower end of the Semarang River. They claimed that the reduction of garbage and appropriate waste treatment were imperative as they may impede drainage capacity.

■ Jatibarang Multipurpose Dam as a Tourist Destination

The City Government of Semarang has designated and promoted the green belt area around the reservoir of the Jatibarang multipurpose dam as a tourist destination. In addition, revenue from the sales of admission tickets¹¹ is used for environmental conservation and the cleaning activities for the nature reserve at the dam. The number of tourists visiting the dam from outside and inside the city has been more than 100,000 annually and has increased to nearly 200,000 in recent years.



Source: data provided by the City Government of Semarang

Figure 4: Annual Number of Tourists visiting the Jatibarang Multipurpose Dam and Gate Money (estimated)

As mentioned above, along with the confirmed effect of the reduction of flood damage, impacts such as the economic effects of revitalizing urban economic activities, including tourism, through the public facilities established by the project, savings in costs for disaster prevention including related household costs, the improvement of the urban landscape and cleanliness have been confirmed by residents living in the vicinity of the project areas. It should be noted that the improvement of the investment environment could not be numerically confirmed as there is no publicly available data related to investment trends in the project target area. However, as mentioned above, it was judged that activation of the local economy and industrial diversification have been manifested through the improved investment environment in the area where flood damage has been reduced.

¹¹ A price of admission tickets was 4,000 rupiah in 2018, but prior to that it was set at the lower price of 2,500 rupiah. At the time of the field survey in 2019, the price was 5,000 rupiah.

(2) Impacts on the Natural Environment

Regarding environmental monitoring during project implementation, the implementation status was confirmed by the records of the Environmental Monitoring Completion Report of 2015¹² provided by the executing agency. According to the interview with BBWS-PJ and their questionnaire, even after the completion, it was confirmed there had been no serious problems as the Jatibarang



A bridge linking a reserve in the dam reservoir

Multipurpose Dam and the West Floodway and the Garang River are being monitored by the BBWS-PJ. The Semarang Pumping Station is monitored by the city government of Semarang on a regular basis.

Regarding river improvement, in addition to the items that were required to be regularly monitored in the environmental impact assessment¹³ at the time of appraisal, the executing agency also voluntarily determined that water quality and volume should also be monitored after project completion. In addition, monitoring of the ecosystem of the reservoir was entrusted to a local university. It was reported that juvenile fish had periodically been released to analyze their growth in the reservoir. According to the executing agency, there have been no outstanding problems or abnormalities in the results of monitoring so far. Furthermore, regarding the conservation of the ecosystem in the green belt, a zone of the dam planted by the project, the City Government of Semarang has been in charge of operation and maintenance of a towhead in the reservoir as an island wildlife reserve for cynomolgus monkeys. This reserve has become a major tourist attraction in Semarang. Thus, it is perceived that the protection of the ecosystem and the environmental friendliness of the dam has led, and will lead, to the revitalization of tourism of the city.

As stated above, due attention to natural environment monitoring and socio-economic considerations has been continuously made during and after the project. In particular, with regard to the dam, the theme of conservation of the natural environment has been promoted in

¹² Completion Report on Environmental Monitoring Result during Construction Stage for Integrated Water Resources and Flood Management Project for Semarang, February 2015

¹³ In September 2005, the results of the Environmental Impact Assessment Review (ANDAL) of the project were duly reviewed and approved in accordance with the laws of the Government of Indonesia. The ANDAL was subject to examination of local community participation and transparency of information related to the implementation process of the environmental impact survey in accordance with law of the Central Java Province. In addition to environmental and social impact assessments for each target facility, the survey included each plan of environmental management and monitoring respectively.

the form of tourism through a reserve for monkeys. Agriculture and fisheries have also been revitalized through the cultivation of commercial crops such as fruit in the green belt, and through the farming of river fish in the dam reservoir. The protection of the natural environment through the active participation of local residents, including the executing agency, is recognized as the most important priority. In order to further beautify the cityscape and retain project effects, facilitating the smooth treatment of waste and sedimentation flowing from the upstream is recognized as a challenging issue.

(3) Resettlement and Land Acquisition

During the improvement work of the West Floodway and the Garang River, resettlement of squatters took place when the river was widened, but there was no land acquisition of private land. At the time of appraisal, 871 people were assumed to be resettled, but according to the response of the executing agency, this turned out to be 846 people. With regard to the construction of the Jatibarang Multipurpose Dam, a total of about 200 ha of land acquisition occurred, but it was reported that there was no resettlement. It should be noted that with regard to the construction of the Semarang Pumping Station, the project site was changed to the coastal area of the Java Sea where housing land development had not taken place. The relocation of 42 illegal occupants and the demolition of 24 fish-processing plants planned at the time of appraisal was canceled. Thus, there was no issue occurred with regard to resettlement and land acquisition.

According to the above-mentioned Completion Report provided by the executing agency, land acquisition and resettlement were duly processed to be compliant with prescribed legal procedures, and any problems were handled as follows:

Regarding the 10ha plot for the construction of the Jatibarang Multipurpose Dam, both the Provincial Government of Central Java and the City Government of Semarang continued negotiations with the residents of 13 households, settling the issue in November 2013. Resettlement around the West Floodway and the Garang River was carried out promptly without any problems after the agreement was reached with residents. However, 7 illegal vendors had maintained businesses along the riverside. As the City Government of Semarang provided them with a relocation site, a marketplace, and low-cost housing, as a result, it was completely settled by September 2012. Also, the removal of 113 illegal



Focus Group Discussion by local residents around the Jatibarang Multipurpose Dam

structural objects along the river was completed in October 2012 by the City Government of Semarang.

Some of the residents in the western area of the dam reservoir expressed dissatisfaction that as there is no access road to the dam, it is physically difficult for them to engage in the tourist business and farming promoted around the dam. In reply to this, according to the City Government of Semarang, there is an administrative road plan to construct a road. However, it has to be built within the limited lot to avoid the environmental destruction of the green belt. On the occasion of the acquisition of the dam site, the various departments of the City Government provided livelihood support programs to the farmers who had owned paddy fields on the project site, in order that they could swiftly transform their rice farming to afforestation, husbandry, and tourism, etc. It was required that the implementation status be reported to the MOPWPH, and the details were confirmed.

Furthermore, communal facilities, such as walkways, were constructed for local residents to enjoy walking along the riverside. Around the Simongan Weir located in midstream of the river, flowerbeds were made, and public benches were provided. There is also an open space where local residents can have group exercises and meetings. The executing agency and the City Government of Semarang said that no outstanding social problems have occurred, as local residents not only appreciate that flood damage has been significantly reduced by the project, but also, they fully utilize the ancillary amenities¹⁴ of the flood control facilities. During the focus group discussion mentioned above, the necessity for waste treatment was pointed out by all groups. It can be said that these are testimonials that local residents perceive the project facilities as their shared assets.

As stated above, having given due consideration of project-affected persons (PAPs) including the improvement of amenities through providing facilities, land acquisition and resettlement have been deemed to be smoothly processed in an appropriate manner. No major negative impact has been confirmed.

Regarding the effectiveness of the project, while the operation indicators for flood control and urban drainage have been achieved, the amount of the water supply from Jatibarang Multipurpose Dam has been limited to the existing capacity of PDAM Semarang as the extension of the water supply facilities by PDAM Semarang was not completed as planned. However, the dam is ready to supply water itself. Therefore, the effectiveness is high.

Regarding the impact, flood damage and inundation have been significantly reduced in the vicinity of the project sites in the western area of Semarang. As for the qualitative effects, as a

¹⁴ The City Government of Semarang constructed an open theatrical space for public use in a corner of the green belt of the Jatibarang Multipurpose Dam.

result of the attainment of the reduction in flood damage, the local economy has been revitalized. Income levels have been improved by newly promoted industries such as tourism, agriculture, and fisheries, and there has been a saving in household costs for flood countermeasures. As other positive and negative impacts, it was confirmed that there was no particular negative impact on the natural environment. Furthermore, for the Jatibarang Multipurpose Dam, volunteer activities of local residents for environment conservation have led to the promotion of tourism as well as agriculture and fisheries. An effort was made to minimize the possible impact of resettlement and land acquisition, and it was confirmed that the facilities of the project are fully utilized by local residents as amenities.

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

3.4 Sustainability (Rating: ③)

As shown in Figure 5 below, the executing agency responsible for the operation and maintenance of the project varies depending on the target facility. BBWS-PJ under the Central Government holds responsibility for the operation and maintenance of Garang River/West Floodway/Simongan Weir/Jatibarang Multipurpose Dam. With regard to the operation and maintenance of the Semarang Pumping Station, the UPTD of the City Government of Semarang is the implementing body with technical assistance from the Regional Infrastructure and Settlement Organization (Balai Prasarana and Permukiman Wilayah, hereinafter referred to as BPPW) of the Central Government. Therefore, the following items are described by each facility.

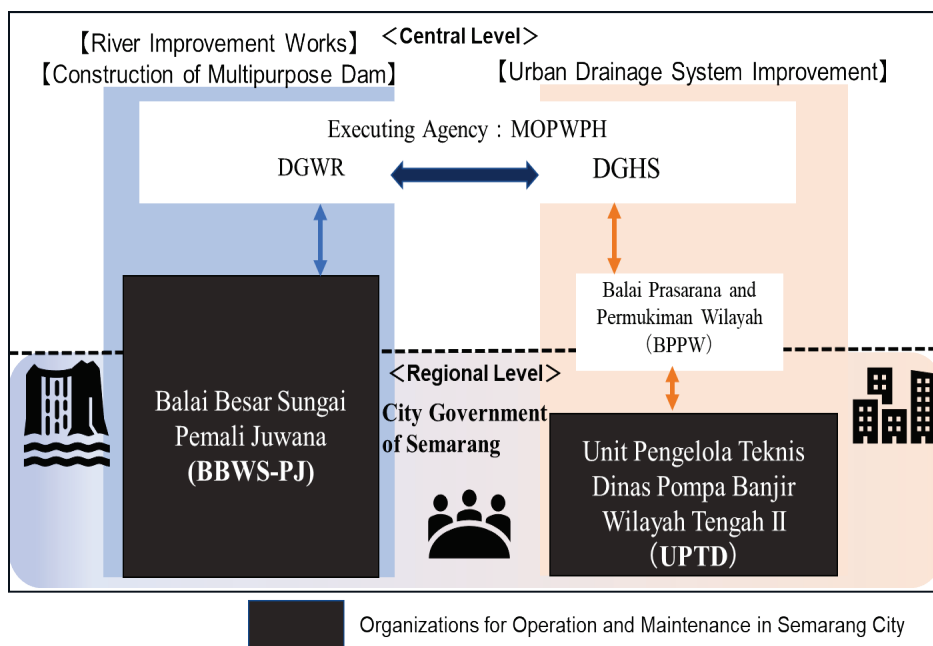


Figure 5: System Diagram for the Operation and Maintenance of each Facility by the Project

3.4.1 Institutional / Organizational Aspect of Operation and Maintenance

The City Government of Semarang has prioritized flood control in recent years¹⁵. As shown in Figure 5, in order to implement effective operation and maintenance, it is deemed imperative to properly reflect local needs in a concerted effort with the MOPWPH that has knowledge and expertise. As the city government is highly appreciative of the project result of flood control in the western area, it is currently fully supportive of BBWS-PJ in its improvement works of the East Floodway in the eastern area of the city, with cross-cutting participation of all the related departments of the City Government.

[Garang River/West Floodway/Simongan Weir/Jatibarang Multipurpose Dam]

BBWS-PJ continues to be responsible for the operation and maintenance of the facilities. Three staff members are in charge of sluice gate operation and safety control at the Simongan Weir. As for the Jatibarang Multipurpose Dam, 23 resident staff engage in operation and maintenance, on duty for 24 hours a day, with a dorm building attached to the site.



The Jatibarang Multipurpose Dam

[Semarang Pumping Station]

The UPTD was newly established within the City Government to exclusively implement the operation and maintenance of the urban drainage facilities of the project in 2014. Twelve officials engage in the operation and maintenance of the pumping station for a day in three work-shifts.

3.4.2 Technical Aspect of Operation and Maintenance

[Garang River/West Floodway/Simongan Weir/Jatibarang Multipurpose Dam]

To comply with the regulations, BBWS-PJ reports on the monitoring of safety management of the dam to the Dam Safety Unit of the MOPWPH every month. If a problem arises, immediate consultation is held with the unit. There is a plan for regular training and workshops so that staff can address on-site problems in all the facilities. This includes not only a thorough acquisition

¹⁵ In 2015, the Government of Indonesia filed a UNESCO World Heritage application for the “Old Town” in Semarang. However, UNESCO pointed out that countermeasures against flooding and land subsidence should be strengthened. <https://whc.unesco.org/en/tentativelists/6011/>(as of July 2019)

by staff of standard operating procedures but also the development of the communication skills necessary to respond to the needs of local residents in an appropriate manner. All defects and accidents have been duly reported and dealt with. The results of training have been taken into account in the evaluation of each staff. Also, the daily performance of staff is confirmed by a trained supervisor.

[Semarang Pumping Station]

According to BPPW that is to supervise the UPTD, as the 20 staff members are well trained for the use of each major piece of equipment procured through the consulting service of the project, there have been no technical problems in terms of the operation and maintenance since project completion. In addition, BPPW noted that since the existing staff may be transferred to other pumping stations in the future, the City Government intends to continue to conduct staff training on operation and maintenance and will ensure the renewal of service contracts for periodic inspections with the manufacturer to prevent mechanical malfunction. As the annual rainfall intensity in Semarang indicates, the utilization rate of the drainage pumps of the facilities is considerably high. Therefore, the executing agency is fully aware that if an accident was to occur, flooding in the vicinity would be most likely disastrous and all the staff needs to be ready to promptly solve any remaining technical problems.

3.4.3 Financial Aspect of Operation and Maintenance

[Garang River/West Floodway/Simongan Weir/Jatibarang Multipurpose Dam]

BBWS-PJ as a subordinate organization of the MOPWPH, will continue to operate through the budget of the Central Government as in the past. In particular, the operation and maintenance costs of the Jatibarang Multipurpose Dam have been secured and disbursed by BBWS-PJ as made a request to the Central Government, as shown in Table 9. BBWS-PJ has recognized the importance of operation and maintenance and has said that it would continue to secure a sufficient budget.

Table 8: National budget & disbursement on Flood Control and Water Resource Development

Unit: 1,000 Rp.

	Actual				Planned
	2015	2016	2017	2018	2019
Budget	28,394,140	46,768,263	63,231,380	98,700,401	43,992,090
Disbursement	23,824,149	45,829,093	58,380,152	88,340,041	
Balance	4,569,990	939,169	4,851,227	10,360,359	
Disbursement Rate (%)	83.9	97.9	92.3	89.5	

Source: information provided by the executing agency

Table 9: Annual O&M expenditure of BBWS-PJ for the Jatibarang Multipurpose Dam

Unit: Rp.

	Actual				Planned
	2015	2016	2017	2018	2019
Electricity	17,211,000	17,211,000	17,211,000	17,211,000	17,211,000
Personnel	0	778,940,000	626,400,000	690,382,000	860,672,000
Fuel for a generator	0	394,980,000	90,864,000	781,440,000	216,480,000
Others	0	221,092,000	380,771,000	242,964,000	125,764,000
Purchase of spare parts	0	100,000,000	0	0	0
Total	17,211,000	1,512,223,000	1,115,246,000	1,731,997,000	1,220,127,000

Source: information provided by the executing agency

[Semarang Pumping Station]

The operation and maintenance of the Semarang Pumping Station has been financed by the budget of the City Government. According to the City Government Public Works Bureau, although the facilities were not officially transferred to the City Government until April 2019¹⁶, the operation and maintenance had been budgeted on an interim basis as being prospective of their future assets. Since the pumping station officially became an asset of the City Government of Semarang, officials have said that deliberation of the budget is expected to be as smooth as ever in the city council and that it will be possible to affirm the securement and disbursement of the budget.

Table 10: Budget & Disbursement for the Semarang Pumping Station
by the City Government of Semarang

Unit: Million Rp.

	Actual		
	2016	2017	2018
Budget	12,727	12,903	12,592
Expenditure	5,023	3,403	5,822
Balance	7,704	9,860	6,770
Disbursement rate (%)	39.46	26.37	42.23

Source: information provided by the executing agency

Table 11: Annual O&M expenditure for the Semarang Pumping Station

Unit: Rp.

	Actual		
	2016	2017	2018
Electricity	1,300,000	1,400,000,000	1,341,376,452
Personnel	756,000,000	844,800,000	1,230,000,000
Fuel for a generator	2,456,000,000	600,000,000	559,520,000
Others	471,000,000	556,888,000	591,000,000
Purchase of spare parts	0	0	2,100,000
Total	3,684,300,000	3,401,688,000	3,723,996,452

Source: information provided by the executing agency

¹⁶ Regarding the registration of the asset transfer to the City Government of Semarang, as the asset value of the Semarang Pumping Station exceeded 100 billion rupiah, it was necessary to go through a review by the Office of President in addition to the Ministry of Finance.

3.4.4 Status of Operation and Maintenance

[Garang River/West Floodway/Simongan Weir/Jatibarang Multipurpose Dam]

Simongang Weir: the facilities have been regularly cleaned to ensure that they function properly, and, regarding the equipment, predetermined periodic inspections have been carried out to ensure good operation.

Jatibarang Multipurpose Dam: offices and other structural facilities have been used cleanly and repaired as needed. In the event of unforeseen circumstances or problems in dam management, it has been determined in advance that institutional supervision and guidance will take place in an appropriate manner. The dam has been properly maintained to ensure good operation.

[Semarang Pumping Station]

Each facility where necessary equipment is stored is regularly cleaned so that it functions properly and is used cleanly. In particular, all of the equipment is inspected as prescribed on a regular basis and is properly maintained to ensure good operation.

At the time of the ex-post evaluation, the institutional/organizational structure for operation and maintenance had remained unchanged and had continued since the completion of all components. With regard to the technical aspect of operation and maintenance, each executing agency has provided the necessary training to deployed staff members and has appointed appropriate personnel to match the characteristics of each facility. Furthermore, rigorous periodic inspections by manufacturers of the procured equipment have also been carried out. Thus, operation and maintenance has been sustained without any problems. Regarding the financial status of the executing agency, it has been confirmed that the necessary budgets have been secured by the Central Government and the City Government for the operation and maintenance of each facility. In light of the above, it can be seen that operation and maintenance has been well sustained, and that each facility has been fully utilized.



Pumps of the Semarang Pumping Station

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

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The aim of this project was to reduce flood damage and provide a stable water supply in Semarang City, the capital of Central Java province, by the improvement of a floodway and rivers, urban drainage system improvement, and the construction of a multipurpose dam, thereby contributing to the enhancement of the investment environment and regional economic development. The project was consistent with the development policy and development needs of Indonesia both at the times of appraisal and the ex-post evaluation. Furthermore, it was confirmed that it was consistent with Japanese ODA policy at the time of appraisal. Thus, the relevance of the project is high. In the course of implementation, although the project cost was within the plan, the project period exceeded the plan. Therefore, efficiency is fair. As for the project effects, flood control and urban drainage were realized. On the other hand, regarding water resource development, as the planned expansion of the water supply facilities by the Regional Water Company has not yet been completed, the volume is limited to the capacity of the existing facilities, although the project has enabled the supply of raw water. In terms of impact, flood and inundation damage has been significantly reduced since the implementation of the project. In addition, according to the City Government and residents who live in the areas around the facilities of the project, the local economy has been vitalized through the improvement of income levels by the promotion of new industries such as tourism, agriculture, and fisheries and by saving the costs of flood control. Therefore, the effectiveness and impact of the project are high. Regarding operation and maintenance, no major problems have been observed in terms of the institutional, technical, financial aspects and the status of operation and maintenance. Therefore, sustainability is high.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency (to BBWS-PJ, UPTD and the City Government of Semarang)

Removal of Sedimentation and Waste Management

In order to continuously enhance the effectiveness of each facility constructed by the project as a flood control measure, it is urgent that the large amount of sediment and garbage flowing down from upstream is disposed of. This is not only an effective countermeasure against flooding, which is the project objective, but also an issue of the sanitary waste management of sediment and garbage, which greatly affects the landscape and the environmental hygiene of the city as a whole. As such, it is indispensable that awareness campaigns are carried out for citizens regarding segregation and reuse to lead to waste reduction. There should also be the regulation of the thorough disposal responsibilities of the waste generators, and cooperation with the

Environment Department of the City Government and local communities. It should be noted that some garbage dumping into rivers may be unavoidable, and that sediment flowing from the upstream is physically inevitable. Thus, waste and sediment are risks that affect the project effect. It is highly desirable that, from the viewpoint of Life Cycle Assessment, the waste treatment and management plan should be duly reassessed and optimized based on the calculated material flow rate of sediment in the given structure.

Support for the Promotion of Tap Water Use

Although a water resource has been developed through the construction of the multipurpose dam, it is imperative that the water supply facilities are expanded in order to maximize the benefits. In Semarang, external diseconomies exist in that land subsidence has progressed due to the extraction of groundwater and, in turn, there has been further aggravation to the level of damage by inundation in the city. However, the ratio of tap water use has been stagnant in reality, as it imposes a burden on citizens and companies to switch to tap water from free-of-charge groundwater. Therefore, before the completion of the extension of water supply facilities planned in 2020, it is highly recommended that, based on close consultation with PDAM Semarang, the City Government should provide support measures to motivate citizens to use tap water, e.g. by incentivizing through discount rates according to the amount of water used in a water supply contract, and by proactive communications and PR on the quality and safety of treated water.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

Importance of Building Mutually Complementary Partnerships between Central and Local Governments

A regional flood control project based on the concept of integrated water resources management incorporates soft and hard dimensions, such as the construction of facilities as well as social development e.g. through disaster prevention drills, etc. This requires various levels of collaboration and coordination among Ministries of the Central Government, Provincial and City Governments. In the case of a project involving a wide variety of relevant organizations, it is often difficult to share the project objective in a cross-sectoral manner, as each organization tends to place a premium on its own position. Nonetheless, this project is a good example in which the needs of the Local Governments and the knowledge of the Central Government were properly bridged as equal partners in the field of project management in order to cohesively engage for the achievement of the project objective. This was thanks to the establishment of the Project

Management Unit under the initiative of the MOPWPH from the project planning phase. Through the deployment of resourceful persons in the Unit, who are able to coordinate with the Central, Local Governments, and contracting construction companies, including JICA, the Unit has carried out the process management of the project from a wide perspective, steering exhaustive information. In addition, in the pre-construction stage, it was reported that as the Semarang consultant had been offered, with sociological discipline, the role of informing local residents in the project sites about the future benefits of the project, and therefore dialogues with the local residents were smoothly conducted. Even after project completion, it is deemed that the level of local higher education institutions producing capable local engineers, and flexible recruitment on the basis of individual performance adopted by the executing agency may continue to have a major effect on the management status of operation and maintenance. Therefore, in the case of the projects jointly implemented by the Central Government and Local Governments, it is important that information regarding the personnel recruitment systems of related organizations and the level of graduates from local higher education institutions is rigorously collected from the stage of project planning with the aim of establishing a system for promoting cooperation between the Central and Local governments. In accord with the above, it is vital that the deployment of resourceful persons with coordination capability is supported and expediated in establishing a project implementation system at the local level.

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs	[Civil Work] (A) River Improvement Works A-1 (1) West Floodway/Garang River Improvement A-1 (2) Rehabilitation of Simongan Weir A-2 Flood Monitoring Facilities A-3 Raising of Railway Bridge over West Floodway	[Civil Work] (A) River Improvement Works A-1 (1) Mostly as planned. A-1 (2) Replacement of intake and flushing gates, Downstream riverbed protection, River connection with West Floodway/Garang River, Rehabilitation of Tawang Channel, Construction of weir operation house were added. A-2 As planned. A-3 Canceled
	(B) Jatibarang Multipurpose Dam Construction B-1 Dam Body Construction B-2 Procurement and Installation of Hydropower Station B-3 Pilot Project for Community Based Conservation of Greenbelt and Improvement of Catchment Area	(B) Jatibarang Multipurpose Dam Construction B-1 Mostly as planned. B-2 Canceled B-3 As planned B-4 Construction of Dam management office and Pedestrian Bridge etc.
	(C) Urban Drainage System Improvement C-1 Semarang River Improvement Work C-2 Asin Drainage System Improvement Work C-3 Bandarharjo (Baru River Basin) Drainage System Improvement Work	(C) Urban Drainage System Improvement C-1 Changed to Civil and Architectural Works of Semarang Pumping Station and Retarding Pond C-2 Changed to Mechanical and Electrical Works of Semarang Pumping Station C-3 Changed to Revetment Improvement of the Lower Semarang and Asin River Rehabilitation of the Screw Pumps of Baru Pumping Station
	[Consulting Service] (D-1) Consulting service for Component A & B (55 months) (D-2) Consulting service for Component C (72 months)	[Consulting Service] (D-1) Additionally, for A-3, 3-D dimensional hydraulic model test for the Simongan Weir and detailed design of the rehabilitation. For B-1 assistance for the engineer on acquiring dam design, dam impounding, dam operation certificates, and monitoring and evaluation of initial reservoir filling and dam behavior analysis. Study and Design of East Floodway and Dolok Penggaron River System were added. (103 months) (D-2) As planned except for the detailed site survey for the site change and associated delay (96 months)
2. Project Period	April 2006 – December 2013 (93 months)	April 2006 – June 2016 (123months)

Item	Plan	Actual
3. Project Cost		
Amount Paid in Foreign Currency	7,456million yen	1,680million yen
Amount Paid in Local Currency	14,709million yen (1,279,024 million rupiah)	17,998million yen (1,425,326 million rupiah)
Total	22,165million yen	19,678 million yen
ODA Loan Portion	16,302million yen	15,671million yen
Exchange Rate	1rupiah = 0.0115 yen (As of September 2005)	1rupiah = 0.009816 yen (Average between 2006 and 2016)
4. Final Disbursement	July 2016	